COMMISSIONS 27 AND 42 OF THE I. A. U.

INFORMATION BULLETIN ON VARIABLE STARS

Nos. 5601 – 5700

2005 February – 2006 May

H–1525 BUDAPEST XII, Box 67, HUNGARY

URL http://www.konkoly.hu/IBVS/IBVS.html

HU ISSN 0374–0676

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CONTENTS

2005

2006

AUTHOR INDEX

INDEX OF VARIABLES

Star	IBVS No.	Star	IBVS No.
GSC 01331-00726	5699	GSC 02772-00761	5614
GSC 01399-00895	5625	GSC 02772-01010	5614
GSC 01399-01976	5625	GSC 02772-01244	5614
GSC 01419-00091	5697	GSC 02773-00330	5614
GSC 01419-00805	5697	GSC 02773-01034	5614
GSC 01999-00011	5696	GSC 02774-00126	5614
GSC 02007-00733	5659	GSC 02774-00453	5614
GSC 02007-00751	5659	GSC 02774-00960	5614
GSC 02007-00761	5659	GSC 02774-01779	5614
GSC 02050-00745	5654	GSC 02775-00063	5614
GSC 02076-01720	5689	GSC 02775-00792	5614
GSC 02076-01849	5689	GSC 02775-01107	5614
GSC 02076-01885	5689	GSC 02775-01188	5614
GSC 02076-01976	5689	GSC 02776-01630	5614
GSC 02102-01349	5699	GSC 02776-01687	5614
GSC 02137-00222	5645	GSC 02776-00384	5614
GSC 02256-00915	5614	GSC 02776-00417	5614
GSC 02256-01368	5614	GSC 02776-00572	5614
GSC 02257-01396	5614	GSC 02777-01022	5614
GSC 02257-02585	5614	GSC 02778-01326	5614
GSC 02336-00281	5610	GSC 02777-01366	5614
GSC 02336-00305	5609	GSC 02778-01488	5614
GSC 02336-00519	5609	GSC 02778-01851	5614
GSC 02336-00621	5609	GSC 02779-00288	5614
GSC 02393-00680	5700	GSC 02779-01587	5614
GSC 02652-01324	5648	GSC 02780-00766	5614
GSC 02660-02075	5692	GSC 02780-01969	5614
GSC 02685-01453	5645	GSC 02780-02053	5614
GSC 02714-00043	5624	GSC 02780-02269	5614
GSC 02765-01629	5614	GSC 02791-01524	5645
GSC 02766-00775	5614	GSC 02791-02148	5645
GSC 02766-01156	5614	GSC 02808-00139	5645
GSC 02766-01184	5614	GSC 02858-02003	5629
GSC 02766-01793	5614	GSC 02858-02449	5629
GSC 02767-00877	5614	GSC 02859-00794	5629
GSC 02767-01716	5614	GSC 02859-01458	5629
GSC 02769-00149	5614	GSC 02982-00235	5699
GSC 02769-00719	5614	GSC 03047-00176	5685
GSC 02769-00785	5614	GSC 03059-00636	5685
GSC 02770-00066	5614	GSC 03101-00683	5645
GSC 02771-00142	5614	GSC 03449-00680	5700
GSC 02771-00771	5614	GSC 03556-03216	5646
GSC 02771-00790	5614	GSC 03617-01169	5621
GSC 02771-00807	5614	GSC 03617-01181	5621
GSC 02771-00945	5614	GSC 03617-01387	5621
GSC 02772-00638	5614	GSC 03629-00740	5682

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5601

Konkoly Observatory
Budapest
11 February 2005

HU ISSN 0374 – 0676

THE 2003.5 POST-PERIASTRON BRIGHTENING OF ETA CARINAE

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After the photometric coverage of the optical light curves at the 2003.5 periastron passage, we continued our UBV monitoring of η Car with the same telescope and equipment as described by van Genderen et al. (2003). The spectroscopic event, characterized by the disappearance of high-excitation lines, follows one to two weeks after the periastron passage (JD 245 2808: Steiner & Damineli 2004). The passage almost coincides with the peak in visual light called the *flare-like event* by van Genderen et al. (2003).

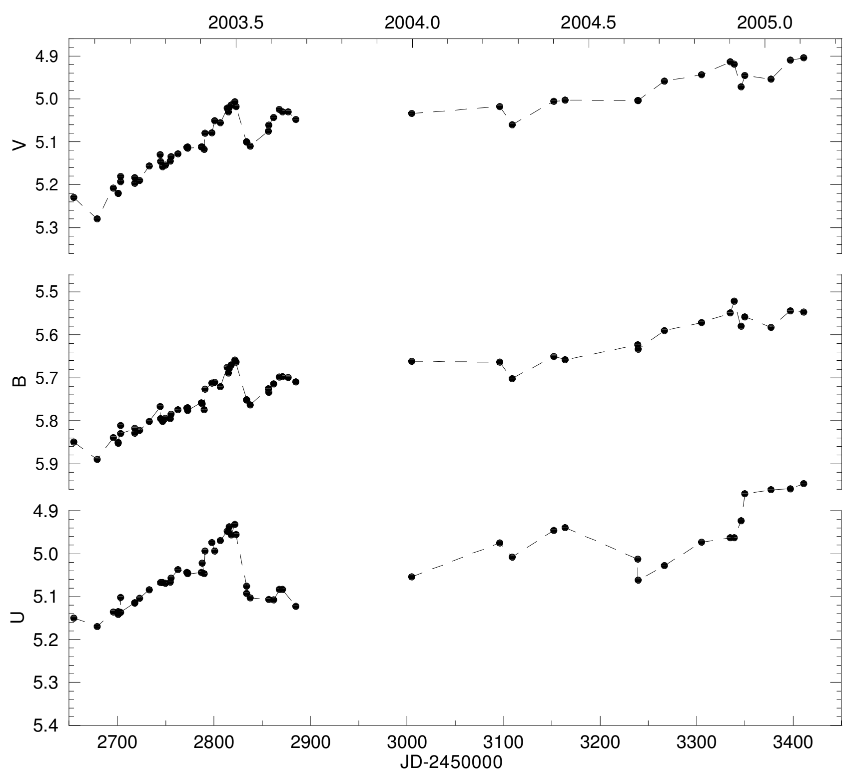

Figure 1. η Car in UBV: new data since 2004.0 together with the data by van Genderen et al. (2003).

Figure 1 shows from 2004 onward the new UBV data as a function of Julian date. Mean errors in V, B and U are $0\stackrel{\rm m}{.}02$, $0\stackrel{\rm m}{.}04$ and $0\stackrel{\rm m}{.}06$, respectively. As discussed by van Genderen et al. (2003), our $U-B$ scale for η Car is systematically too blue by $\sim 0\stackrel{\rm m}{.}25$, due to filter transmission differences with respect to the standard UBV system and because of incomplete standardisation.

It is evident that after the egress from the eclipse-like dip at JD 245 2840, the brightness in V and B continued to rise – even more so in B than in V. Around JD 245 3340 the brightness reached $V = 4\stackrel{\rm m}{.}9$, the highest level so far, with $B-V = 0\stackrel{\rm m}{.}62$. The U magnitude behaved differently, as usual: after the eclipse-like dip, which is much deeper than in the other bands, there is hardly a recovery to a secondary light peak as observed in V and B. However, during 2004 the U brightness rose as well.

The colour indices (Figure 2) show a most interesting behaviour: $U-B$ declines sharply (in fact a hint of a weak decline appeared already during the maximum of the flare-like event). Part of this sharp decline is presumably due to an UV-deficit reaching us a couple of months after the occurrence of the UV-shadow of the primary (shielding ionizing photons of the approaching secondary, see Smith et al. 2004; van Genderen & Sterken 2005).

After periastron, U shows an oscillation, as seen in our new $U-B$ data of 2004. This oscillation is exclusively present in the Balmer continuum radiation, and its cause is still unclear. In the well-covered cycle 1992–1998, the successive maxima in this flux usually were separated by about 200 d, sometimes 400 d (van Genderen et al. 1999; 2001). So far, the new $U-B$ data presented here are compatible with these time scales.

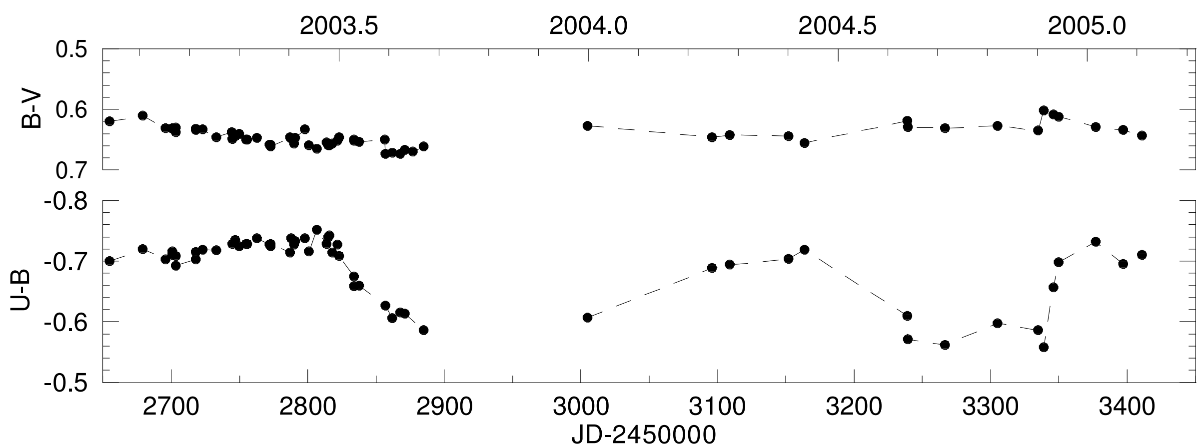

Figure 2. Colour index behaviour of η Car.

References:

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Smith N., Morse J., Collins N.R., Gull T.R., 2004, *ApJ*, **610**, L105

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5602

Konkoly Observatory
Budapest
17 February 2005

HU ISSN 0374 – 0676

CCD MINIMA FOR SELECTED ECLIPSING BINARIES IN 2004

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Observatory and telescope:
Sylvester Robotic Observatory (SRO): 33 cm f/4.5 Newtonian on Paramount GT-1100s mount

Detector:	SBIG ST-7e, Kodak KAF-0401E, 9 μm $\times$ 9 μm, FOV $15''.8 \times 10''.5$ SBIG ST-9, KAF-0261E, 20 μm $\times$ 20 μm, FOV $11''.9 \times 11''.9$[1] SBIG ST-7XE, Kodak KAF-0402ME, 9 μm $\times$ 9 μm, FOV $15''.8 \times 10''.5$ All cameras were cooled to $-10^\circ > T > -30^\circ$ C

Method of data reduction:
Aperture photometry using MIRA Pro 7, by Axiom Research. Digital tracing paper method, bisection of chords, curve fitting, and (occasionally) Kwee and van Woerden (1956).

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
BF Aur	53010.7487	0.0002	I	c	ST-7e
V776 Cas	53351.7116	0.0001	I	V	ST-7XE
SU Cep	53144.8552	0.0001	I	V	ST-9
EG Cep	53187.8343	0.0001	I	R	ST-7XE
XZ CMi	53010.8555	0.0003	II	c	ST-7e
RW Com	53007.94105	0.00005	II	c	ST-7e
RW Com	53008.06044	0.00005	I	c	ST-7e
EK Com	53093.7813	0.0001	II	c	ST-7e
BI CVn	53095.7933	0.0002	II	c	ST-7e; Sine $O-C$ relation[4]
V0628 Cyg	53172.8647	0.0003	I	c	ST-7XE; Abrupt period change?? [4]
V0700 Cyg	53261.7653	0.0002	I	c	ST-7XE; Piecewise linear $O-C$ plot[4]
V0859 Cyg	53141.8049	0.0005	II	c	ST-9
V1130 Cyg	53139.7936	0.0001	I	c	ST-9
EX Del	53160.8803	0.0001	I	c	ST-7XE; New period, 0.3309880 d [4]
AR Dra	53007.83558	0.00005	I	c	ST-7e
CV Dra	53093.8837	0.0003	II	c	ST-7e
YY Eri	53024.6709	0.0001	I	V	ST-7e

[1] With x2 tele-extender lens

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
SX Gem	53048.6821	0.0001	I	c	ST-7e
AV Gem	53015.7747	0.0002	I	c	ST-7e
QW Gem	53040.6172	0.0002	I	c	ST-7e
SZ Her	53145.8592	0.0001	I	V	ST-9
AK Her	53136.7703	0.0005	I	c	ST-9
V0502 Her	53082.0075	0.0002	II	c	ST-7e
V0502 Her	53121.8893	0.0002	II	c	ST-7e
V0742 Her	53090.895	0.001	II	c	ST-7e
V0842 Her	53081.8388	0.0001	I	V	ST-7e
V0842 Her	53111.80053	0.00005	I	c	ST-7e
V0878 Her	53088.9686	0.0002	I	V	ST-7e
V0921 Her	53087.9381	0.0002	I	c	ST-7e; Period uncertain[2]
V0342 Lac	53166.8349	0.0003	II	c	ST-7XE
Y Leo	53089.6776	0.0001	I	c	ST-7e; Cyclic $O-C$ relation[4]
VZ Leo	53087.7141	0.0001	I	c	ST-7e
AP Leo	53092.7672	0.0002	I	V	ST-7e
AP Leo	53111.7045	0.0002	I	c	ST-7e
BL Leo	53112.7145	0.0003	II	c	ST-7e
CE Leo	53051.882	0.0001	I	c	ST-7e
RT LMi	53006.9073	0.0001	I	c	ST-7e
RZ Lyn	53047.6917	0.0003	I	c	ST-7e
DF Lyr	53173.8661	0.0001	II	c	ST-7XE
MZ Lyr	53138.868	0.001	I	c	ST-9
V0404 Lyr	53159.79647	0.00005	I	c	ST-7XE
IX Mon	53053.709	0.001	I	c	ST-7e
V2357 Oph	53137.7985	0.0005	II	c	ST-9
V0647 Ori	53020.767	0.002	II	c	ST-7e
IM Per	53352.6518	0.0002	II	c	ST-7XE
AS Ser	53143.7715	0.0003	II	c	ST-9; Poor $O-C$ relation[4]
CX Ser	53143.8626	0.0004	I	c	ST-9; Period uncertain[2]
V1123 Tau	53020.5985	0.0002	I	c	ST-7e
XZ UMa	53048.7928	0.0001	I	c	ST-7e; Possible eccentric orbit[4]
TW UMa	53089.756	0.001	I	c	ST-7e
AA UMa	53040.7538	0.0003	I	c	ST-7e
II UMa	53081.713	0.002	I	V	ST-7e
GI Vul	53132.9381	0.0002	I	c	ST-7e
KN Vul	53160.7803	0.0003	I	c	ST-7XE
NO Vul	53123.8924	0.0001	I	c	ST-7e
GSC 3449-0680	53058.68	0.001	II	R	ST-7e; Newly discovered variable[3,4]
GSC 3449-0680	53058.96	0.001	I	R	ST-7e
GSC 3449-0680	53066.809	0.001	I	R	ST-7e
GSC 3449-0680	53074.938	0.001	II	R	ST-7e
GSC 3449-0680	53077.744	0.001	II	R	ST-7e

Remarks:

Attention is directed towards the website maintained by the author and others (see Eclipsing Binary $O-C$ Files below) that provides Excel files with times of minima and $O-C$ plots for some 1400+ eclipsing systems. It is being continually updated and expanded. Another very useful utility (see below) is the Eclipsing Binary Ephemeris Generator, maintained by Shawn Dvorak, which gives eclipse predictions visible at a specified location for a give night.

[2] Sparse data
[3] See IBVS 5600
[4] See "Eclipsing Binary $O-C$ Files" in the references

Acknowledgements:

Thanks are due to Environment Canada for the website satellite views (see reference below) that were essential in predicting clear times for observing runs in this cloudy locale. Thanks are also due to Attilla Danko for his “Clear Sky Clocks”, (see below). This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France.

References:

Danko, A., Clear Sky Clocks, `http://cleardarksky.com/`
Dvorak, S., Eclipsing Binary Ephemeris Generator,
`http://www.rollinghillsobs.org:8000/perl/calcEBephem.pl`
Kwee, K.K., & van Woerden, H., 1956, *B.A.N.*, **12**, (464), 327-330
Nelson, R.H., Eclipsing Binary $O-C$ Files,
`http://www.aavso.org/observing/programs/eb/omc/nelson_omc.shtml`
Satellite Images for North America, `http://gfx.weatheroffice.ec.gc.ca/`

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5603

Konkoly Observatory
Budapest
25 February 2005

HU ISSN 0374 – 0676

TIMES OF MINIMA FOR NEGLECTED ECLIPSING BINARIES IN 2004

DVORAK, S.W.

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Observatory and telescope:
25cm catadioptric telescope at Rolling Hills Observatory (RHO)

Detector:	SBIG ST-9XE, Peltier cooling, Kodak KAF-0261 chip, $18.5' \times 18.5'$ FOV, 512×512 pixels.

Method of data reduction:
Reduction of the CCD frames was done with sextractor and custom-written applications.

Method of minimum determination:
The times of minima were computed using the Kwee and van Woerden method as implemented in AVE [1].

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
AP And	53006.5578	1	I	*V*	
EX And	53329.5768	5	I	*V*	
V0417 Aql	53099.8376	3	I	*V*	
HU Aur	53038.5395	1	I	*V*	
KO Aur	53027.6129	1	I	*V*	
V0410 Aur	53315.6949	3	I	*V*	
CR CMa	53017.698	2	I	*V*	
TX CMi	53318.8024	5	I	*V*	
EG Cas	53267.7188	7	I	*V*	
MT Cas	53302.6749	4	I	*V*	
MT Cas	53329.6671	2	I	*V*	
QQ Cas	53306.7049	1	I	*V*	
V0471 Cas	53266.8038	5	I	*V*	
V0480 Cas	53327.785	2	I	None	
EE Cet	53331.6475	3	I	None	
AC Cnc	53329.8698	6	I	*V*	
TX Cnc	53330.8963	2	I	*V*	

[1] AVE is written by Rafael Barbera and the software can be obtained from
`http://www.astrogea.org/soft/ave/introave.htm`

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
RS Col	53064.5749	3	I	*V*	
EK Com	53033.7782	4	I	*V*	
SX Crv	53033.8712	6	I	*V*	
NU Cyg	53144.842	2	I	*V*	
NU Cyg	53278.649	4	I	*V*	
V0700 Cyg	53168.7630	1	I	*V*	
V0704 Cyg	53313.64	1	I	*V*	
V0706 Cyg	53139.8491	4	I	*V*	
V0711 Cyg	53327.586	2	I	None	
V0726 Cyg	53145.8229	2	I	*V*	
V0963 Cyg	53110.8392	1	I	*R*	
CM Dra	53082.9089	1	I	*I*	
GM Dra	53111.8280	1	I	*R*	
ZZ Eri	53281.8984	3	I	*V*	
W For	53028.5287	5	I	*R*	
FT Gem	53277.88	1	I	*V*	
KQ Gem	53316.872	2	I	*V*	
KL Her	53281.590	2	I	*V*	
V0502 Her	53075.9135	2	I	*R*	
V0731 Her	53114.8520	4	I	*R*	
V0732 Her	53174.841	5	I	*V*	
V0829 Her	53118.8640	3	I	*V*	
V0842 Her	53134.6371	2	I	*V*	
V0899 Her	53099.7496	5	I	*V*	
V0921 Her	53131.802	4	I	*I*	
V0921 Her	53146.724	3	I	*V*	
EU Hya	53054.6768	1	I	*V*	
AG Lac	53316.5415	6	I	*V*	
HX Lac	53310.598	2	I	*V*	
NR Lac	53352.6185	5	I	*V*	
OO Lac	53360.5503	2	I	*V*	
BL Leo	53130.6170	3	I	*R*	
EX Leo	53008.9407	4	I	*V*	
RW Leo	53135.6407	5	I	*V*	
VZ Leo	53111.6921	2	I	*R*	
V Lep	53352.7588	2	I	*V*	
RR Lep	53016.592	2	I	*V*	
VW LMi	53072.7344	2	I	*V*	
TZ Lyr	53084.8804	5	I	*I*	
V0404 Lyr	53088.8659	2	I	*V*	
V0411 Lyr	53317.567	1	I	*V*	
BB Mon	53075.5673	2	I	*R*	
GH Mon	53012.6570	3	I	*V*	
HM Mon	53354.7496	3	I	*V*	
MX Mon	53032.6758	2	I	*V*	
V0396 Mon	53051.5611	3	I	*V*	
V0460 Mon	53026.7408	5	I	*V*	
V0494 Mon	53045.6043	2	I	*V*	

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
V0514 Mon	53082.5608	8	I	*I*	
V0981 Oph	53175.6915	5	I	*V*	
V0640 Ori	53008.7038	2	I	*V*	
V0641 Ori	53292.9208	2	I	*V*	
V0647 Ori	53025.6584	1	I	*V*	
V1363 Ori	53317.7003	3	I	*V*	
V0357 Peg	53025.5357	3	I	*V*	
FL Peg	53271.673	2	I	None	
II Per	53327.9116	2	I	None	
DZ Psc	53310.6905	4	I	*V*	
BR Pup	53072.6611	4	I	*V*	
OU Ser	53100.7194	3	I	*V*	
VY Sex	53118.6939	2	I	*V*	
V3794 Sgr	53134.8273	6	I	*V*	
V0781 Tau	53082.6304	2	I	*I*	
V1123 Tau	53020.5977	3	I	*V*	
VZ Tri	53330.7958	3	I	*V*	
BM UMa	53076.6530	3	I	*R*	
BS UMa	53134.7083	2	I	*V*	
HX UMa	53032.8037	4	I	*V*	
KM UMa	53051.918	1	I	*V*	
HN UMa	53086.6376	4	I	*V*	
UY UMa	53141.727	1	I	*R*	
CG Vir	53068.8674	2	I	*V*	
HW Vir	53112.7162	1	I	*V*	
HW Vir	53112.7745	2	I	*V*	
HW Vir	53112.8329	2	I	*V*	
VV Vir	53174.6345	2	I	*V*	
BI Vul	53281.7126	4	I	*V*	
KN Vul	53148.813	1	I	*V*	

Reference:

Kholopov, P.N. et al., 2003, *General Catalogue of Variable Stars version 1.4*, Vol. IV, `http://www.sai.msu.su/groups/cluster/gcvs/gcvs/`

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5604

Konkoly Observatory
Budapest
25 February 2005

HU ISSN 0374 – 0676

THE DWARF NOVA RX VOLANTIS IN QUIESCENCE

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The variable has been found as S 6185 Vol by Hoffmeister (1963). He also provided the finding chart which is given by Downes et al. (2001). Munari & Zwitter (1998) tried to take an optical spectrum with the ESO 1.5 m telescope, but found the system to be too faint. They give an upper limit for its brightness of 22^{m}. In May 2003, the system has been observed in outburst, reaching a magnitude of about 15. Superhumps where detected with a period of 0.06117 d which showed a brightening near the termination of the outburst, and a regrowth before the start of the final, rapid decline (Kato et al. 2003).

We performed spectroscopic observations using the ESO Faint Object Spectrograph and Camera (EFOSC2) at the 3.6 m telescope on La Silla, Chile. Three spectra, each of 30 min exposure time, have been obtained on 2005-02-15 starting at 02:47 UT using grism #6 and a $1''$ slit.

Standard reduction has been performed with IRAF. The BIAS has been subtracted and the data have been divided by a flat field, which was normalised by fitting Chebyshev functions of high order to remove the detector specific spectral response.

The three spectra have been combined and then optimally extracted (Horne, 1986). Wavelength calibration yielded a final FWHM resolution of 1.2 nm and a spectral range of 390 nm to 790 nm. The spectrum has been corrected for the instrument function and was flux–calibrated using the spectrophotometric standards LTT 2415, LTT 3218, and LTT 3864. From the variation between the three standard stars we estimate the uncertainty of the flux–calibration as 3%.

The finding chart in Fig. 1 shows two stars at the position of RX Vol with a separation of $2\overset{''}{.}3$. We first took the spectrum of the brighter one in the west, which turned out to be an early K-type star. The spectrum discussed in this paper is the one of the fainter star, which is marked in the chart.

This spectrum is plotted in Fig. 2. It is dominated by the Balmer lines and He I lines in emission. Also present, but very weak, is Fe II at 516.9 nm. No indication for any high excitation lines like He II are found. The properties of the identified emission lines are listed in Table 1.

In order to derive information on the possible temperature range of the disc of RX Vol, we have measured the Balmer decrement, which is defined as ratio of line intensities $H_\alpha : H_\beta : H_\gamma$. In the case of RX Vol, we find $H_\alpha/H_\beta = 1.74$ and $H_\gamma/H_\beta = 0.67$. A comparison of these ratios, as well as the equivalent widths of the lines with the model

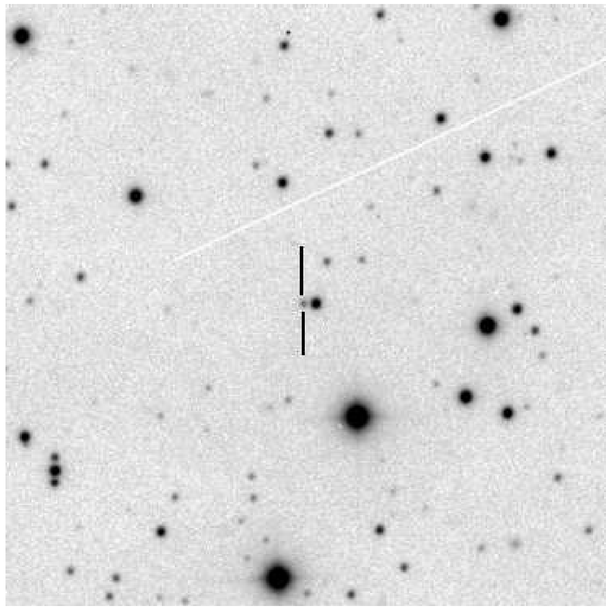

Figure 1. The R image of a 2″× 2″ region around RX Vol. North is up, east is left. The one star of the older finding charts actually resolves into two, the fainter one being the variable.

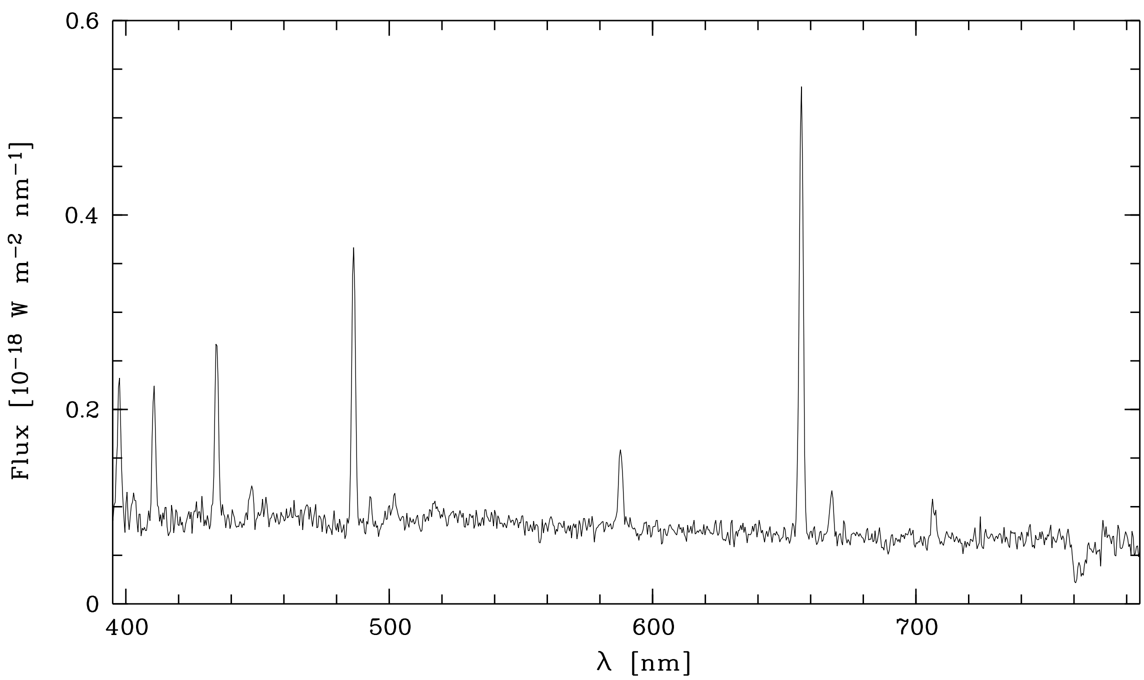

Figure 2. The optical spectrum of RX Vol, dominated by Balmer lines and He I in emission is typical for a dwarf nova in quiescence.

Table 1: Measured line width, computed velocity, and measured line flux and equivalent width are given for the major emission lines in the spectrum of RX Vol.

Transition	λ [nm]	FWHM [nm]	$v_{\rm rot} \sin i$ [km s^{-1}]	F [10^{-18} W m^{-2}]	$-W$ [nm]
Hα	656.2	1.7245	789	0.875(4)	12.57(8)
Hβ	486.1	1.5903	981	0.503(3)	6.40(4)
Hγ	434.0	1.5521	1072	0.337(7)	3.97(7)
Hδ	410.2	1.4650	1072	0.241(5)	2.91(3)
He I	447.1	1.6221	1088	0.072(3)	0.85(3)
He I	492.1	1.1239	685	0.047(2)	0.60(2)
He I	587.6	1.8518	946	0.180(9)	2.35(9)
He I	667.8	1.6041	721	0.101(8)	1.53(10)
He I	706.5	1.9725	837	0.085(7)	1.38(15)

data from Williams (1991) yields moderately high temperatures and densities. We find the best match for a disc temperature of 8000 K, a density Log$N = 12.5$, and an inclination of 34°. A temperature up to 10000 K is still in agreement with our data but yields a slightly lower density and higher inclination.

The high Balmer decrement, the presence of H I and He I emission lines and the absence of high excitation lines agree very well with the classification of RX Vol as a dwarf nova of SU UMa subtype.

On average we find a projected rotation velocity of about 1000 km/s. From this moderate value, we conclude that RX Vol is seen at rather low inclination. This agrees with the average line profile, a single peak, as well as with the relatively high values of the equivalent widths. However, the Balmer lines seem to be slightly broader than the He I lines. We have previously found a similar effect for the emission lines of other cataclysmic variables, eg. AG Hya (Tappert & Schmidtobreick, 2005) and V842 Cen (Schmidtobreick et al, 2005). It probably indicates that the lines origin in different regions of the accretion disc.

We measured the actual brightness of the star on our acquisition file (Fig. 1). By comparison with the magnitudes of USNO 0237-0126168, 0237-0126141, 0236-0127843, and 0236-0127895, we derive R = $20\overset{\rm m}{.}0(1)$.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5605

Konkoly Observatory
Budapest
25 February 2005

HU ISSN 0374 – 0676

SPECTROSCOPIC AND PHOTOMETRIC OBSERVATIONS OF SN 2004dj

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The supernova SN 2004dj in NGC 2403 was first reported by Nakano et al. (2004). It has been classified as a normal type II-P supernova (Patat et al. 2004). We present spectroscopic and photometric observations of the supernova SN 2004dj obtained at the Ondřejov observatory and Lelekovice private observatory during August, September, and October 2004.

We obtained a total of 15 spectra of the supernova during 8 nights between 3rd August and 1st September 2004 at the Ondřejov 2m reflector using the Coudé spectrograph (for a description see Škoda et al. 2002) with a spectral range 6330 to 6773 Å. The resolution power of the spectrograph in the Hα region is about 13 000. We used the Coudé 700mm camera with the SITe CCD 2030$\times$800 15μ pixels. Spectra were obtained as a series of exposures during the same night were co-added. The development of the Hα profile is shown in Fig 1. All spectra were normalized to 1 using the continuum near 6330 Å. All spectra were analysed using principal component analysis (PCA) combined with our own version of robust regression (Mikulášek et al. 2003), where all 8 observed Hα line profiles are expressed as a linear combination of basic mutually orthonormal functions, i.e., principal components. After a careful analysis we concluded we could confine ourselves to the first three terms of the PCA decomposition, since the amplitude of higher order terms being negligible with respect to the errors. Telluric lines were removed prior to the analysis.

The Hα line is described by the radial velocities of the minimum and maximum of the broad P Cygni profile and by the ratio of the maximum and minimum line intensity of the profile (see Tab. 1, Fig. 2). The radial velocities are calculated relative to the frame coupled with supernova. Measured values of radial velocities were corrected for the radial velocity of the host galaxy NGC 2403, which is 129 km/s (Ho et al. 1997). The positions of the line minimum and maximum were found to decrease from 6960$\pm$20 to 4890$\pm$40 km/s and 1273$\pm$4 to 772$\pm$5 km/s, respectively. The initial change in radial velocities is steep, however it flattens out with time (see Fig. 2a). We found only a small change in the ratio of the maximum and minimum line intensities. Initially, the ratio was 5.29$\pm$0.10, then it reached 6.3$\pm$0.2 at JD 24453234.6$\pm$0.5 before it dropped down to 4.9$\pm$0.2 (Fig. 2b). The blue edge of the absorption part of the line profile remained more or less constant: 10 300 km/s.

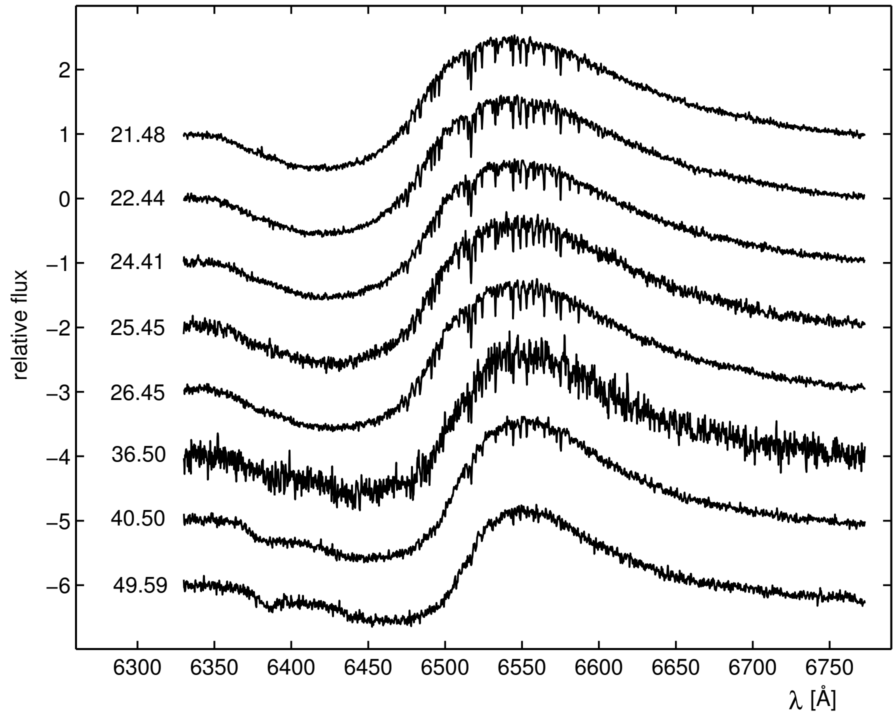

Figure 1. Spectra of SN 2004dj obtained at the Coudé spectrograph of the Ondřejov 2m telescope. The y axis denotes the relative flux, individual spectra are shifted and labeled with the Julian date at the middle of the exposure of co-added spectra ($JD-2453200$).

Table 1: The Hα line characteristics of SN 2004dj. The JD given is the mid-exposure time of co-added spectra, N is the number of co-added spectra, $RV_{\rm max}$ and $RV_{\rm min}$ are the radial velocities of the maximum and minimum of the Hα profile corrected for the radial velocity of the host galaxy ($RV_{\rm g} = 129$ km/s, Ho et al., 1997), respectively, $I_{\rm max}/I_{\rm min}$ is the ratio of the maximum and minimum intensities, $RV_{\rm abs}$ is the corrected radial velocity of the blue absorption feature and $I_{\rm cabs}$ is its central depth.

JD-2450000	N	$RV_{\rm max}$ [km/s]	$RV_{\rm min}$ [km/s]	$I_{\rm max}/I_{\rm min}$	$RV_{\rm abs}$ [km/s]	$I_{\rm cabs}$
3 221.48	2	6955±25	1275±5	5.3±0.2	9090±70	0.030±0.011
3 222.44	2	6840±30	1206±5	5.5±0.2	9040±90	0.023±0.011
3 224.41	2	6530±60	1091±6	5.3±0.2	8750±60	0.040±0.013
3 225.49	2	6340±110	1028±9	5.9±0.3	8730±130	0.035±0.024
3 226.45	1	6210±50	970±6	6.0±0.2	8720±230	0.012±0.014
3 236.50	2	5590±120	707±9	5.8±0.6	8300±150	0.07±0.05
3 240.50	2	5250±50	687±5	6.1±0.2	8310±50	0.070±0.017
3 249.59	2	4890±40	672±5	4.9±0.2	8290±30	0.130±0.020

We want to draw attention to the absorption feature in the blue part of the absorption wing of the Hα P Cygni profile (see Fig. 1). The center of the absorption feature was to move towards the red, similarly to the maximum of the main Hα line profile (see Fig. 1). The depth at the center of the feature increases from 0.021 ± 0.006 to 0.112 ± 0.015 with respect to undisturbed Hα profile. A similar feature was observed in SN 1999em (see Fig. 13 in Leonard et al. 2001). However, it remains uncertain whether the absorption feature belongs to the Hα line profile or whether it can be attributed to absorption of some other chemical element.

Ondřejov photometric observations have been carried out with the 0.65-m f/3.6 telescope equipped with an AP7 CCD camera (SITe 512×512 pixels) at the primary focus, in

BVR Johnson-Cousins standard photometric bands (Bessell 1990). Stars GSC 4120:685 and GSC 4120:725 served as the comparison and check stars, respectively (see Figure 3).

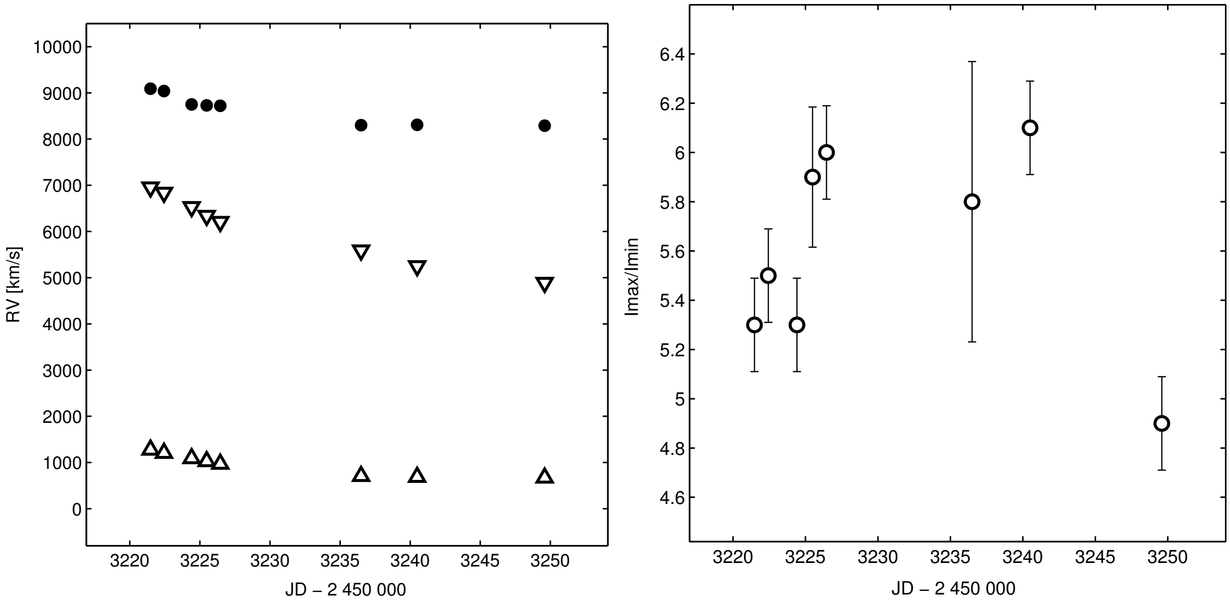

Figure 2. (a) Time dependence of radial velocities of Hα's profile maximum (Δ) and minimum (∇). Dots ($\bullet$) denote the radial velocity of the absorption feature center found in the blue part of the wing. (b) Time dependence of the ratio of maximum and minimum intensity of the Hα's profile.

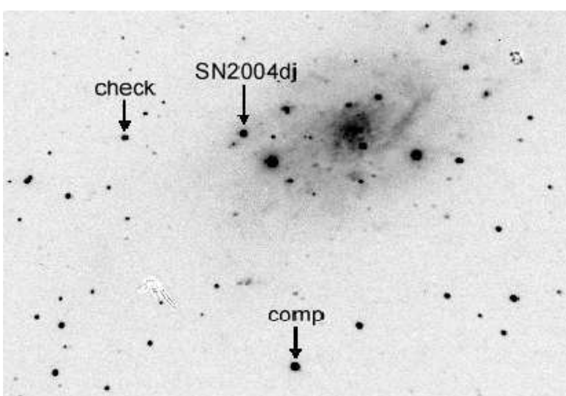

Figure 3. An image taken at Ondřejov showing the position of SN 2004dj, the check star (GSC 4120:725, 13.085 R) and the comparison star (GSC 4120:685, 11.48 R).

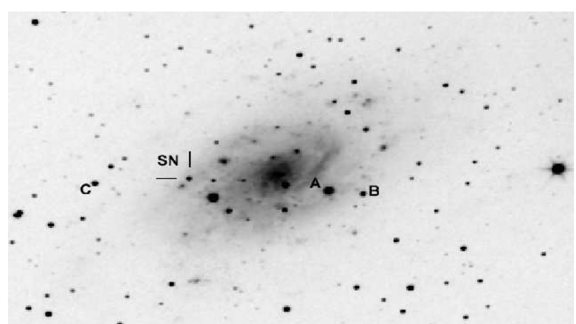

Figure 4. An image taken at Lelekovice showing the position of SN 2004dj and the comparison stars, GSC 4120:764 (A, 10.205 R), GSC 4120:718 (B, 13.165 R) and GSC 4120:725 (C, 13.085 R).

In Lelekovice, we obtained photometry in the R Johnson-Cousins standard photometric band using the 0.35-m f/4.7 telescope equipped with the SBIG ST-6V CCD. We co-added 6-10 individual images with exposure times of 60 seconds to improve the signal-to-noise ratio. We used the comparison star GSC 4120:764 and the two check stars, GSC 4120:718 and GSC 4120:725 (see Fig. 4) to obtain the Lelekovice R light curve.

The comparison stars from both Ondřejov and Lelekovice posts were calibrated using the calibration fields near M31 and M13, which have already been well calibrated using the standard fields measured by Landolt (1992). The comparison stars and calibration fields near M31 and M13 were observed during two nights under average conditions with an estimated accuracy of 0.05 mag in R. All data except of the last one: JD=2453297.406, R=13.91 mag, have been reported in Hornoch (2004a,b). The results of photometric observations are shown in the Fig. 5 and Table 2 (only in electronic version).

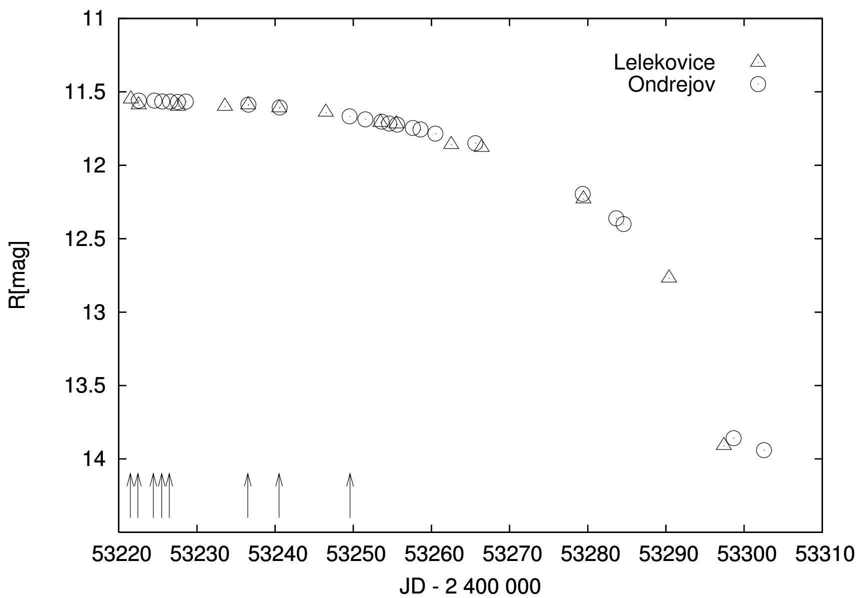

Figure 5. The R light curve from both Lelekovice (triangles) and Ondřejov (circles) observatories. Arrows indicate nights when the spectra in Fig. 1. were obtained. All of them were taken during the phase of the very slow decrease after the brightness maximum.

Acknowledgements:

This research has made use of NASA's Astrophysics Data System. This work was supported by grants GA ČR 205/02/0445, 205/02/0735, 205/04/1267 and 205/04/P224. The Astronomical Institute Ondřejov is supported by project Z10030501.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5606

Konkoly Observatory
Budapest
25 February 2005

HU ISSN 0374 – 0676

SOME PHOTOELECTRIC MINIMA OF ECLIPSING BINARY STARS

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Observatory and telescope:
Photoelectric observations were made in years 2002-2004 with Maksutov telescope (diameter 350 mm, focus length 3420 mm) at the Astronomical Observatory of the Jagiellonian University 'Fort Skala'.

Detector:	Uncooled one channel photometer tube with Russian photomultiplier FEU 92, and photon counter was used. Observations were made using wide-band B filter.

Method of data reduction:
The observations were corrected for the dead time effect, and differential atmospheric extinction, using mean extinction coefficients.

Method of minimum determination:
The minima times were computed using Kwee method (Kwee & van Woerden, 1956) except observation TV UMi in JD 2452784, and HT Vir in JD 2452722, where Gaussian fit was used.

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
V376 And	53252.4473	0.0003	II	B	
DV Boo	52720.588	0.001	I	B	
EE Cet	53262.5011	0.0003	I	B	
	53345.3255	0.0004	I	B	
	53351.4036	0.0002	I	B	
V899 Her	53098.4878	0.0005	I	B	
	53255.3646	0.0004	II	B	
	53266.3160	0.0003	II	B	
VW LMi	52693.5614	0.0002	I	B	
IZ Per	52572.4621	0.0004	I	B	
II UMa	52723.5654	0.0004	I	B	
TV UMi	52784.383	0.002	II	B	
	53259.559	0.001	I	B	
HT Vir	52722.6397	0.0002	I	B	

Acknowledgements:
I am greatly thankful to M. Kurpinska-Winiarska & S. Zola, and M. Winiarski for access to their reduction programs.

Reference:

Kwee, K.K., van Woerden, H., 1956, *BAN*, **12**, 327

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5607

Konkoly Observatory
Budapest
4 March 2005

HU ISSN 0374 – 0676

THREE RR LYRAE STARS WITH VARIABLE PERIODS IN OPHIUCHUS

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These stars were reported to be RR Lyrae Variables by Boyce and Huruhata (1942) and Hoffmeister (1966); no ephemeris were published until today. Photographic plates of a field centered around 67 Oph, taken with the Sonneberg Observatory 40cm Astrograph during three intervals spread over the years from 1938 to 1994, were used to check the behaviour of these objects (see Table 1).

The elements listed below were obtained by means of least-squares solutions. Photographic amplitudes were derived with respect to magnitudes of the comparison stars given in Table 2.

Remarks:

V820 Oph
Elements valid for J.D. 2429100-2443300 and J.D. 2443700-2449500 resp.

NSV 10140
Elements valid for J.D. 2429100-2445000 and J.D. 2445000-2449500 resp. Nine times of maxima out of the second set (observed between J. D. 2445530 and J.D. 2446642) were also used to derive a meaningful period value for the first set of elements. Although this is quite arbitrary, it has turned out to be the only method to include the early observations in a good composite light curve as shown in Fig. 4. For this reason, ephemeris[1] should be used as preliminary because the true period change might be stronger than derived in this paper.

NSV 10478
Due to the availability of additional older plates, a total number of 269 plates (J.D. 2425324-2449488) was used to examine this star. Elements given below are at least valid for an interval of JD 2436800-2449500. Unfortunately the distribution of the older plates is insufficient to determine a date of the period change as well as the value of the period acting in the time before the interval mentioned above.

This research made use of the SIMBAD data base, operated by the CDS at Strasbourg, France.

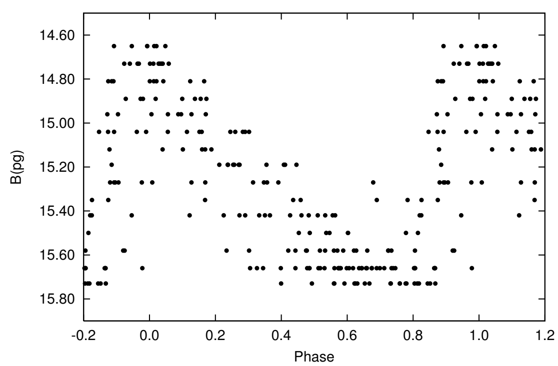

Figure 1. Composite light curve of V820 Oph

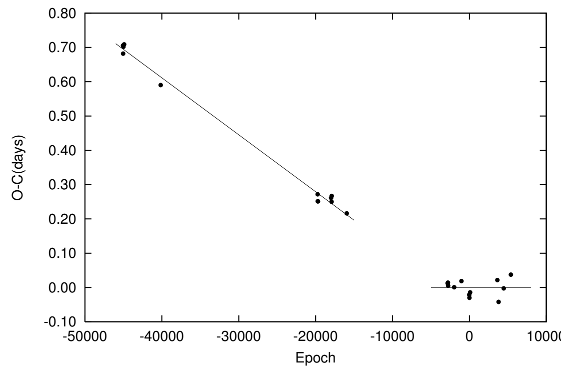

Figure 2. (O−C) diagram for V820 Oph

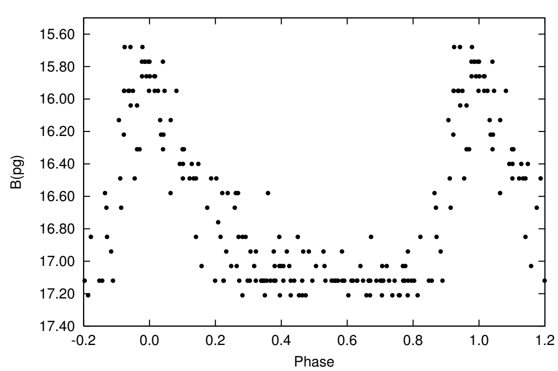

Figure 3. Composite light curve of NSV 10140

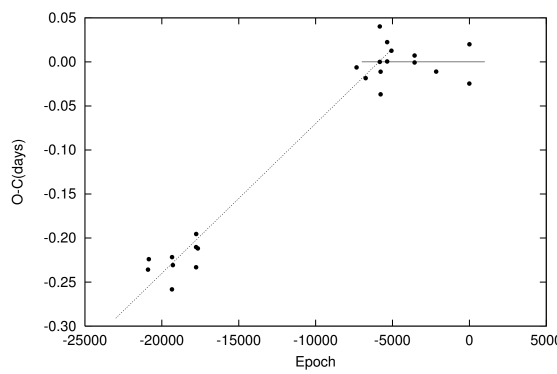

Figure 4. (O−C) diagram for NSV 10140

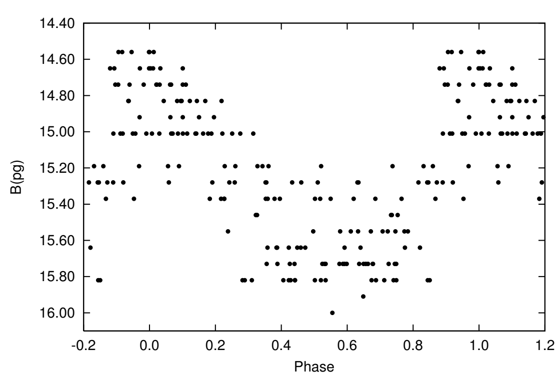

Figure 5. Light curve of NSV 10478 (J.D. 2436840 - 2449488)

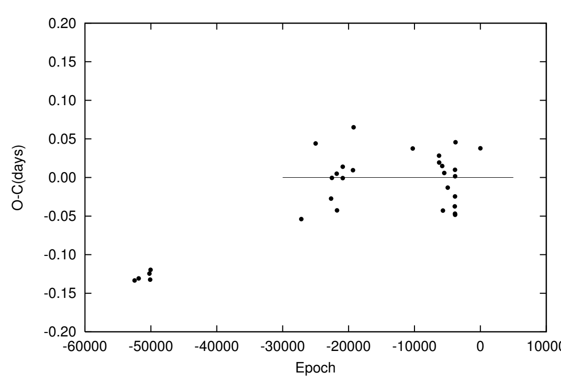

Figure 6. (O−C) diagram for NSV 10478

Table 1. Summary of this paper

Star	Type	Epoch 2400000+	Period (day)	Max.	Min.	M−m	No. of Plates
V820 Oph (1)	RRab	29785.399	0.3905520	$14.^{m}7$	$15.^{m}7$	$0.^{p}22$	105
		±8	±4				
V820 Oph (2)		47379.431	0.3905686				96
		±7	±24				
NSV 10140(1)	RRab	39678.430	0.4900743	$15.^{m}8$	$17.^{m}1$	$0.^{p}17$	98
		±7	±8				
NSV 10140(2)		49127.454	0.4900573				68
		±13	±25				
NSV 10478	RRab	49124.451	0.4520359	$14.^{m}7$	$15.^{m}7$	$0.^{p}25$	175
		±11	±8				

Table 2. Comparison stars and cross references

	V820 Oph HV 11033 USNO 0900-10444265		NSV 10140 S 9288 USNO 0900-11438187	
Comp. No.	USNO	m*	USNO	m*
1	0900-10436768	$14.^{m}6$	0900-11441724	$15.^{m}7$
2	0900-10454891	$14.^{m}9$	0900-11433031	$15.^{m}8$
3	0900-10451472	$15.^{m}0$	0900-11442001	$16.^{m}3$
4	0900-10441376	$16.^{m}1$	0900-11439742	$17.^{m}4$

	NSV 10478 S 9302 USNO 0900-12232376	
Comp. No.	USNO	m*
1	0900-12246201	$14.^{m}2$
2	0900-12233841	$14.^{m}8$
3	0900-12226131	$15.^{m}4$

* Magnitudes refer to the B values of the USNO−A2.0 catalogue

Table 3. Heliocentric times of maxima and $O-C$ values according to the elements derived in this paper.

Star	JD (max.*)	Epoch	$O-C$	Star	JD (max.*)	Epoch	$O-C$
V820 Oph (I)	29785.410	0	0.011	NSV 10140 (II)	46506.628	−5348	0.001
	29788.511	8	−0.013		46507.630	−5346	0.023
	29808.450	59	0.008		46642.386	−5071	0.013
	29844.389	151	0.016		47380.399	−3565	0.000
	31696.347	4893	−0.023		47381.387	−3563	0.008
	39671.44	25313	−0.003		48067.449	−2163	−0.011
	39678.450	25331	−0.023		49124.489	−6	−0.024
	39685.480	25349	−0.023		49127.474	0	0.020
	40354.534	27062	0.016	NSV10478	25406.445	−52469	−0.133
	40381.472	27131	0.006		25687.614	−51847	−0.131
	40383.442	27136	0.023		26427.603	−50210	−0.125
	41150.468	29100	0.005		26475.511	−50104	−0.132
V820 Oph (II)	46271.400	−2837	0.012		26504.454	−50040	−0.120
	46289.368	−2791	0.014		36840.321	−27175	−0.054
	46298.342	−2768	0.005		37820.433	−25007	0.044
	46608.449	−1974	0.001		38883.550	−22655	−0.027
	46974.430	−1037	0.019		38936.465	−22538	−0.001
	47368.474	−28	−0.021		39270.525	−21799	0.005
	47379.401	0	−0.030		39289.463	−21757	−0.043
	47415.349	92	−0.014		39681.420	−20890	−0.001
	48801.513	3641	0.022		39685.503	−20881	0.014
	48862.378	3797	−0.042		40383.442	−19337	0.009
	49124.489	4468	−0.003		40426.441	−19242	0.065
	49488.539	5400	0.037		44484.340	−10265	0.038
NSV 10140 (I)	38883.550	−1622	0.020		46288.406	−6274	0.028
	38910.515	−1567	0.031		46298.342	−6252	0.019
	39648.507	−61	−0.029		46507.630	−5789	0.015
	39651.484	−55	0.008		46554.584	−5685	−0.043
	39678.428	0	−0.002		46646.396	−5482	0.006
	40417.432	1508	−0.030		46884.600	−4955	−0.013
	40418.435	1510	−0.007		47366.446	−3889	−0.037
	40419.430	1512	0.007		47381.376	−3856	−0.025
	40473.320	1622	−0.011		47385.422	−3847	−0.047
NSV 10140 (II)	45530.427	−7340	−0.006		47386.383	−3845	0.010
	45822.489	−6744	−0.018		47390.393	−3836	−0.048
	46270.460	−5830	0.041		47391.347	−3834	0.002
	46271.400	−5828	0.000		47415.349	−3781	0.046
	46296.356	−5777	−0.036		49124.489	0	0.038
	46298.342	−5773	−0.011				

* Mid-exposure times of plates with brightest observations

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ERRATUM FOR IBVS 5607

The correct identifier for NSV 10478 is USNO 0900-12232367.

The Editors

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5608

Konkoly Observatory
Budapest
4 March 2005

HU ISSN 0374 – 0676

AS 325: DISCOVERY OF ECLIPSES IN AN ENIGMATIC EMISSION LINE STAR

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Since the discovery in 1948 of its unusual spectrum (Merrill and Burwell, 1950), the history of AS 325 has been full of mystery. The complex spectrum prevented unambiguous classification and every paper published made a different claim about its nature. In that first reference it was classified as an F star with emission lines. In 1972 an A7Ia+pec. spectral type was published by Stock and Wroblewski (1972). Sanduleak and Stephenson (1973) presented a low dispersion spectrum obtained in 1967 showing only the strongest emission lines and the star was again classified as Fe pec., based upon the presence of a strong K-line in absorption. It's also type F in Henize (1976) from observations made between 1949 and 1951. Lutz (1977) found a G8III spectral type from the absorption lines in observations taken in 1975 and 1976, this survey having a far better dispersion than the previous ones. Bopp and Howell (1989) first mentioned the possibility of AS 325 being a binary system and proposed it as an analog of XX Oph mainly due to the FeII emission features. [It is interesting to note that strong FeII lines in emission are reported in the spectrum of some symbiotic stars like the VV Cep system WY Vel (Sanduleak and Stephenson, 1973), which is classified as ZAND in the GCVS (Kholopov et al., 2004).]
Observations from 2001 (Pereira et al., 2003) showed the continuum increasing toward the blue and the star was consequently classified as a peculiar Be object.
Finally, from recent observations, a new model has been published by Cool et. al (2005) proposing a binary system made up of a Be star and a K2.5III cool companion.

There are ASAS-3 V band observations (Pojmanski, 2002) ranging from February 14, 2001 to the present, and the ASAS variability catalogue lists it as MISC-type (see Pojmanski and Maciejewski, 2004, for a more detailed description of ASAS variability types) with a period of 169.635 days (Pojmanski and Maciejewski, 2004b). However, no trace of this published period was found in a period analysis performed with AVE (Barberá, 1999). On the contrary, the ASAS-3 data show that AS 325 is a long period eclipsing binary which also shows out of eclipse variations. There are at least three types of variability detectable in the light curve:

* Algol-type eclipses (∼0.7 mag. deep in V), shown in Figure 1.
* A mean magnitude long term brightening of 0.6 magnitudes (from V= 10.6 to V= 10.0), as shown in Figure 2.
* Some flickering activity with 0.1 mag. peaks showing a quasi-cyclicity of ∼20 days, especially during the first three years of observations when the star was fainter. These variations presumably come from the Be star and are shown in Figure 3.

The light curve also exhibits some low amplitude stochastic variability.

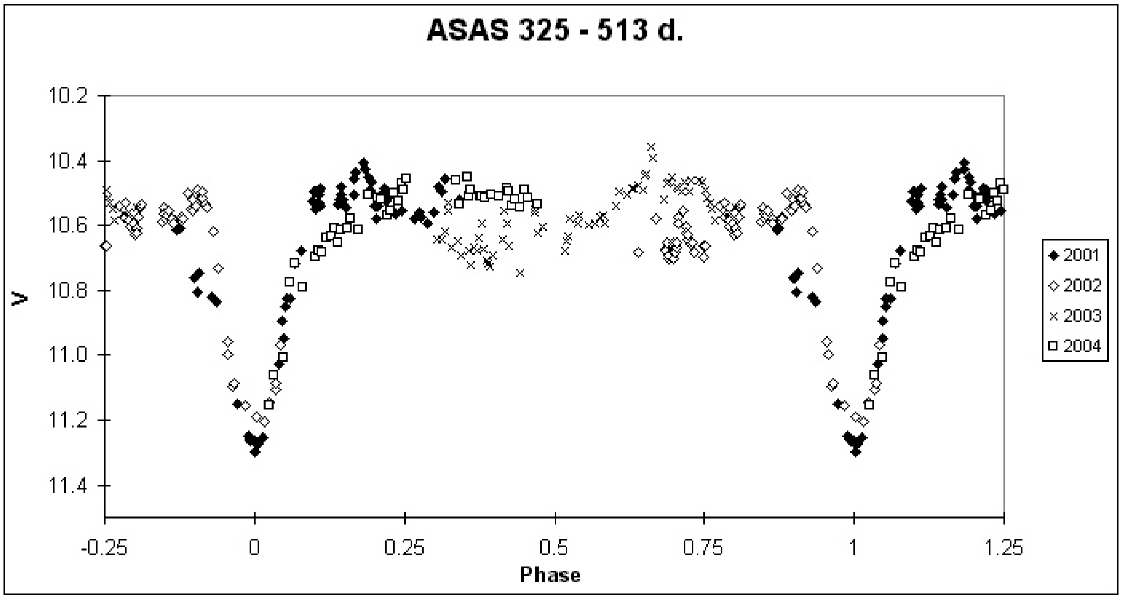

Figure 1. Light curve of AS 325 with a period of 513 days using ASAS-3 observations. The long term secular brightening has been detrended.

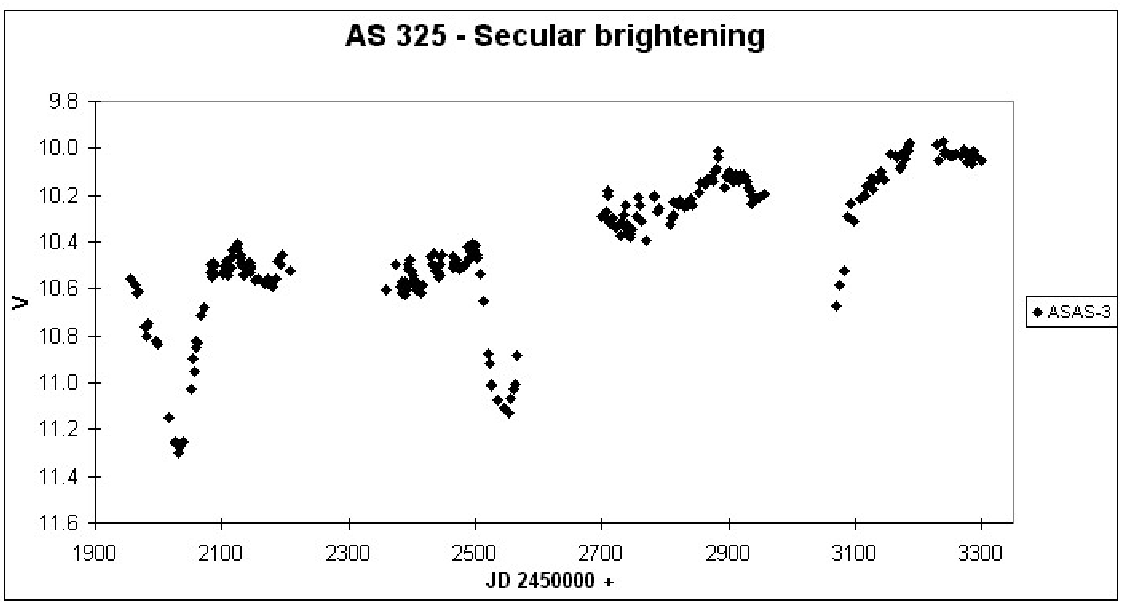

Figure 2. Light curve of AS 325 between 2001 and 2004 using ASAS-3 data.

This system was included by Munari and Zwitter (2002) in their Table 1 in a subset called “possibly symbiotic stars or closely related objects” published in their Atlas of Symbiotic Stars. The ASAS-3 based eclipsing light curve fully confirms the binarity. The period of 513 days is also fairly typical of known eclipsing symbiotic stars. A couple of examples are AR Pav, 604 days (Skopal et al., 2001) and V1413 Aql, 434 days (Munari, 1992). The long term brightening may represent changes in the accretion rate in this interacting binary.

The lack of photometric observations in the past makes further analysis very difficult. It looks like AS 325 hasn't shown signs of previous strong activity at least visually (see catalogues in VizieR for more). The New Suspected Variables Supplement (NSVS) (Kazarovets et al., 1998) classifies it as a slow irregular variable (L:) ranging from 9.6 to 10.2p. Tycho epoch photometry (Hog et al., 1997) shows almost no variability between 1990 and 1992, and interestingly with gaps in the observations exactly at the times of eclipse. Tycho-2 (Hog et al., 2000) derived mean magnitude is V= 10.08 with a $B-V$ of 0.67.

The emission line spectrum and the colors indicate that the hot star is the primary and during eclipse the cool giant is occulting it partially, according to the light curve shape. The approximate duration of the eclipses is 86 days but both duration and light elements are only approximate since the shape of the light curve is affected by the intrinsic variability. The 2002 eclipse was sharper than that of 2001. There are no signs of a secondary eclipse but the observations are scarce. ASAS-3 only covered the mideclipse in 2001 and 2002 and shows minima around HJD 2452031.5 and 2452543.5.

Light elements for AS 325:

$$\begin{array}{c} \text{Min I} = \text{HJD}2452031 + 513\text{d} \times \text{E} \\ \pm 3 \quad \pm 4 \end{array}$$

In Figure 4 spectral measurements are plotted against the phased light curve suggesting that all spectra but those taken by Sanduleak and Stephenson (1973) in August 3rd and 6th, 1967 (phase 0.98), were taken at maximum light. In Bopp and Howell (1989) is noted that Sanduleak and Stephenson's (1973) spectrum showed the K-line stronger and broader than in their March 27th, 1985 (orbital phase 0.54) spectrum. This is consistent with the cool giant being in front of the hot star during primary eclipse. The early spectral type suggested for the cool component is not common for a symbiotic system but neither is it unknown. For instance, AG Dra consists of a K3 giant and a white dwarf with a similar orbital period of 550 d. (Friedjung et al., 2002). It has even been called a “yellow symbiotic” (Cunha et al., 2000). Also, TX CVn consists of a K5 giant orbiting a B9shell star (Kenyon and Garcia, 1989).

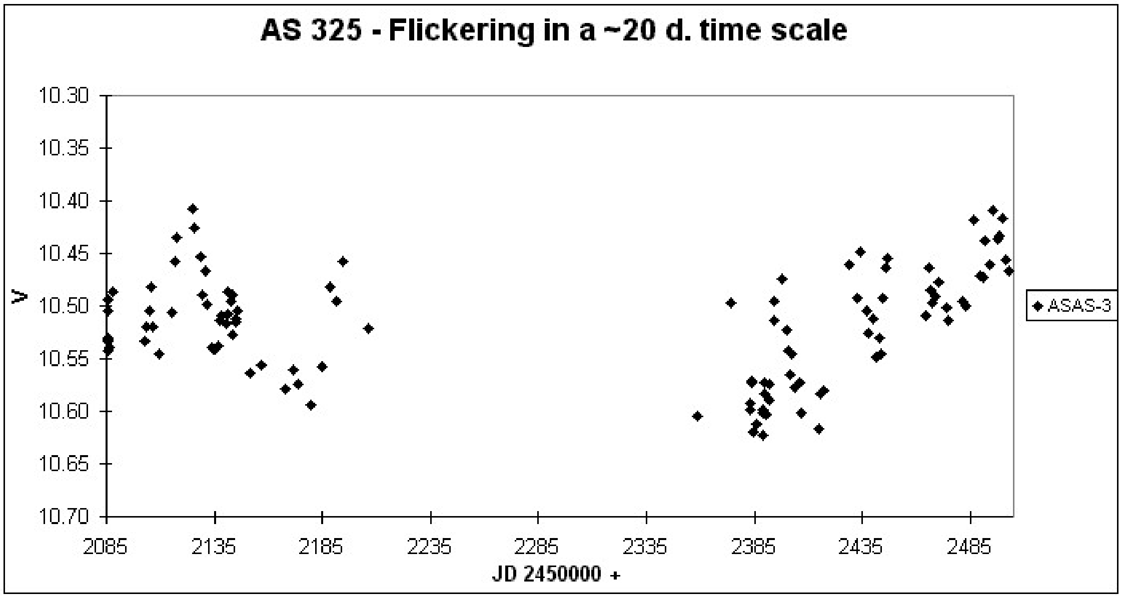

Figure 3. Light curve of AS 325 during 2001 and 2002 showing short term variability with a quasi-cycle length of around 20 days.

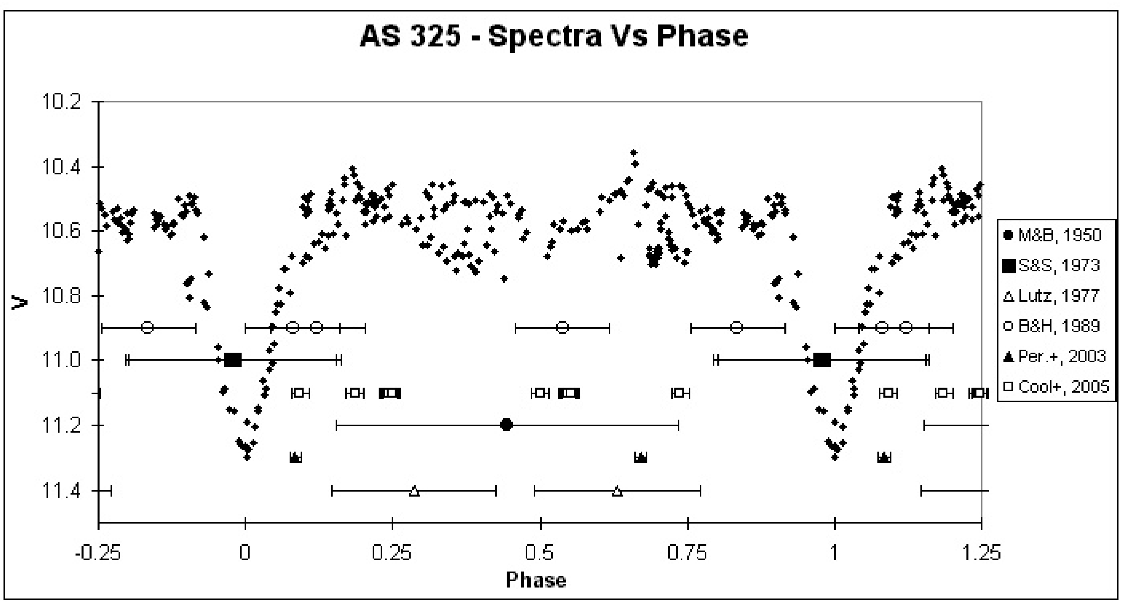

Figure 4. The same light curve is presented in Fig.1 but also showing the dates when spectra were taken. The reference dates are for the publications mentioned in this paper. The error bars show the uncertainty in phase units.

Call for observations

The upcoming 2005 eclipse is well placed in time to ensure complete coverage of the primary eclipse both photometrically and spectroscopically. Table 1 shows the predicted times of first and last contact as well as of mideclipse. Given the uncertainty in the elements and the intrinsic variability, it is important to start observing several days before the predicted time of ingress. Note that the 2006/7 event will take place right in the seasonal gap when Sagittarius is in conjunction with the Sun. High dispersion spectroscopy being undertaken for the first time during an eclipse will shed light on the nature of the components of AS 325, helping to classify and further understand this interesting and somewhat uncommon system.

Table 1 - Predictions for the next eclipses of AS 325 based on a 513 days period of 86 days eclipse duration.

Year	Ingress	Mideclipse	Egress
2005	June 5	July 18	August 30
2006/7	October 31	December 13	January 25
2008	March 27	May 9	June 21

Acknowledgements: The author wants to thank John Greaves and Patrick Wils for their collaboration and suggestions. This research has made use of the SIMBAD and VizieR databases operated at the Centre de Données Astronomiques (Strasbourg) in France.

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ERRATUM FOR IBVS 5570

In the list of new eclipsers GSC 1294-1710 should be GSC 1294-0710.

S. Otero

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5609

Konkoly Observatory
Budapest
4 March 2005

HU ISSN 0374 – 0676

BVRI CCD OBSERVATIONS OF THE F-TYPE NEAR CONTACT SYSTEM ST TRIANGULI

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As a part of our continuing study of solar type near contact binaries, we observed the rather faint but interesting variable, ST Trianguli [GSC 2336 0305, $\alpha(2000) = 02^{\rm h}41^{\rm m}32\overset{\rm s}{.}83$, $\delta(2000) = +35^\circ 43' 30\overset{\prime\prime}{.}9$]. The variable was discovered by Hoffmeister (1967) who gave a finding chart, and designated it as an EA system. Kurochkin (1973) and Busch, Haussler, and Splittgerber (1979) gave timings of minimum light, charts and photographic light curves. Busch, Haussler and Splittgerber (1979) and Zejda (2002, 2004) have contributed many additional eclipse timings for this system.

Our present BVRI light curves of ST Tri were taken at the SARA 0.9-m telescope at Kitt Peak National observatory both on-site on 20, 22-27 December 2003 by RGS, DRF and NCH and in remote mode on 4 and 5 November 2005 by RGS, and NCH. The ST7 CCD camera with standard UBVR_cI_c Johnson-Cousins filters were used. From 180 to 200 observations were taken in the BVRI pass bands. CCD advanced calibrations and flux measurements were performed in XP using the APWIN software by NCH and RGS.

The light curves and color curves of the variable are given in Figures 1 and 2 as normalized flux versus phase. The stars (GSC 233 60621 $\alpha(2000) = 02^{\rm h}41^{\rm m}29\overset{\rm s}{.}73$, $\delta(2000) = +35^\circ 42' 36.4\overset{\prime\prime}{.}$) and (GSC 2336 0519, $\alpha(2000) = 02^{\rm h}41^{\rm m}24\overset{\rm s}{.}20$s $\delta(2000) = +35^\circ 44' 29\overset{\prime\prime}{.}2$) were used as comparison and check stars, respectively. Standard star reductions reveal that ST Tri is a 14th magnitude, early F-type system (F2 to F5). The check star is a V = 13.46(2) mag, K5(1)V star, and the comparison is a V= 14.21(2) G0(2) type dwarf.

A finding chart of ST Tri (V), the comparison (C) and check star (K) are given in Figure 3 along with the WU Ma variable GSC 2336 0281. Six mean epochs of minimum light were determined from B,V,R,I timings of two primary and four secondary eclipses: HJD I = 2453000.85415(13), 2453319.9022 (4) and HJD II = 2452995.8239 (8), 2452999.6577(10), 2453313.9182(31) and 2453319.66019(22) using parabola fits. We calculated the following ephemeris from all timings:

$$\text{HJD Tmin I} = 2451550.2872(16) + 0.47905145(19)\text{d} \times \text{E}$$

The period appears to have been constant over the past 30,000 orbital cycles. Future precision timings and archival work is needed to reveal the long term period behavior of this system.

The light curves show an interval of constant light in the secondary eclipse revealing the system to be one of the rare EB binaries with total eclipses. Thus, our solution is unambiguous. Pre-modeling was done with Binary Maker 2.0 (Bradstreet 1992). This indicated that a pre-contact Algol-like model was best. From the starting parameters, a simultaneous BVRI synthetic Wilson code (Wilson & Devinney 1971, Wilson 1990, 1994) solution was calculated. The binary has a secondary, cooler component filling its Roche Lobe and a primary component filling 98% of its associated critical surface. The mass ratio is 0.38 and the temperature difference is about 1900 K. The secondary, less massive component is a K-type dwarf. A hot spot was adjusted on the primary component to a mid-latitude position. Its place precludes it from being a stream impact spot so it would be identified as a facula arising from magnetic activity. An Algol-like configuration usually means that the more massive, now detached star, had once filled its critical Roche surface. Thus, the binary may be approaching its final, W UMa, contact stage. The solution is shown overlaying the data in Figures 1 and 2. A geometrical representation of ST Tri with a spot is given in Figure 4. The complete model is given in Table 1.

We wish to thank SARA TAC for their allocation of observing time, and a small research grant from the American Astronomical Society which supported this run.

TABLE I

Synthetic light-curve parameters for ST Tri

$\lambda_B, \lambda_V, \lambda_R, \lambda_I$ (nm)	440, 550, 640, 790
x_{1B}, x_{2B}, y_{1B}, y_{2B}	0.794, 0.852, 0.263, −0.018
x_{1V}, x_{2V}, y_{1V}, y_{2V}	0.698, 0.798, 0.256, 0.006
x_{1R}, x_{2R}, y_{1R}, y_{2R}	0.604, 0.797, 0.284, 0.108
x_{1I}, x_{2I}, y_{1I}, y_{2I}	0.514, 0.616, 0.246, 0.16
g_1 , g_2	0.32, 0.32
A_1 , A_2	0.500, 0.500
x_{bol1},x_{bol2},y_{bol1},y_{bol2}	0.641 , 0.643, 0.246 , 0.16
Inclination	$87\overset{\circ}{.}2 \pm 0\overset{\circ}{.}5$
T_1, T_2 (K)	6750, 4890 ± 0.0004
Ω_1, Ω_2	2.670 ± 0.002, 2.6197
q (m_2/m_1)	0.381 ± 0.001
pshift	0.0001 ± 0.0004
$L_1/(L_1+L_2)_B$	0.937 ± 0.001
$L_1/(L_1+L_2)_V$	0.912 ± 0.001
$L_1/(L_1+L_2)_R$	0.895 ± 0.001
$L_1/(L_1+L_2)_I$	0.873 ± 0.001
r_1, r_2 (pole)	0.431 ± 0.001, 0.279 ± 0.001
r_1, r_2 (point)	0.543 ± 0.001, 0.402 ± 0.004
r_1, r_2 (side)	0.459 ± 0.001, 0.290 ± 0.001
r_1, r_2 (back)	0.483 ± 0.001, 0.323 ± 0.009
fill-out$_1$, fill-out$_2$	98.11 ± 0.06%, 100%
Spot Parameters:	Primary Component
Colatitude	121°± 1°
Longitude	$157\overset{\circ}{.}8 \pm 0\overset{\circ}{.}3$
Spot radius	$10\overset{\circ}{.}6 \pm 0\overset{\circ}{.}3$
Temperature factor	1.116 ± 0.005

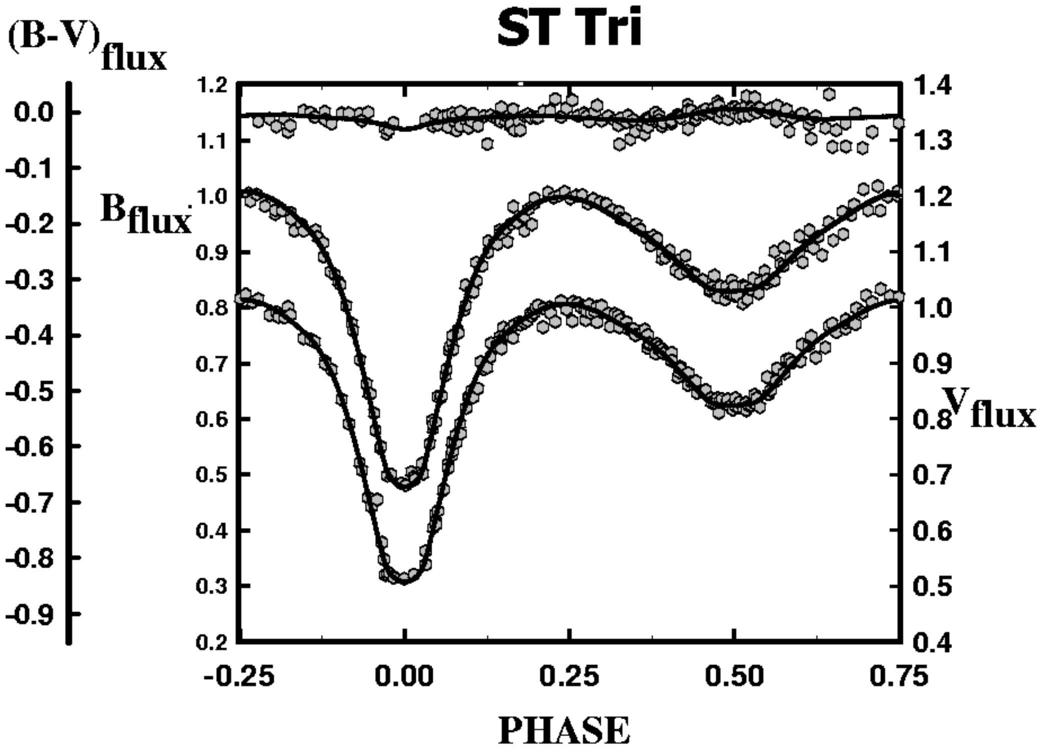

Figure 1.

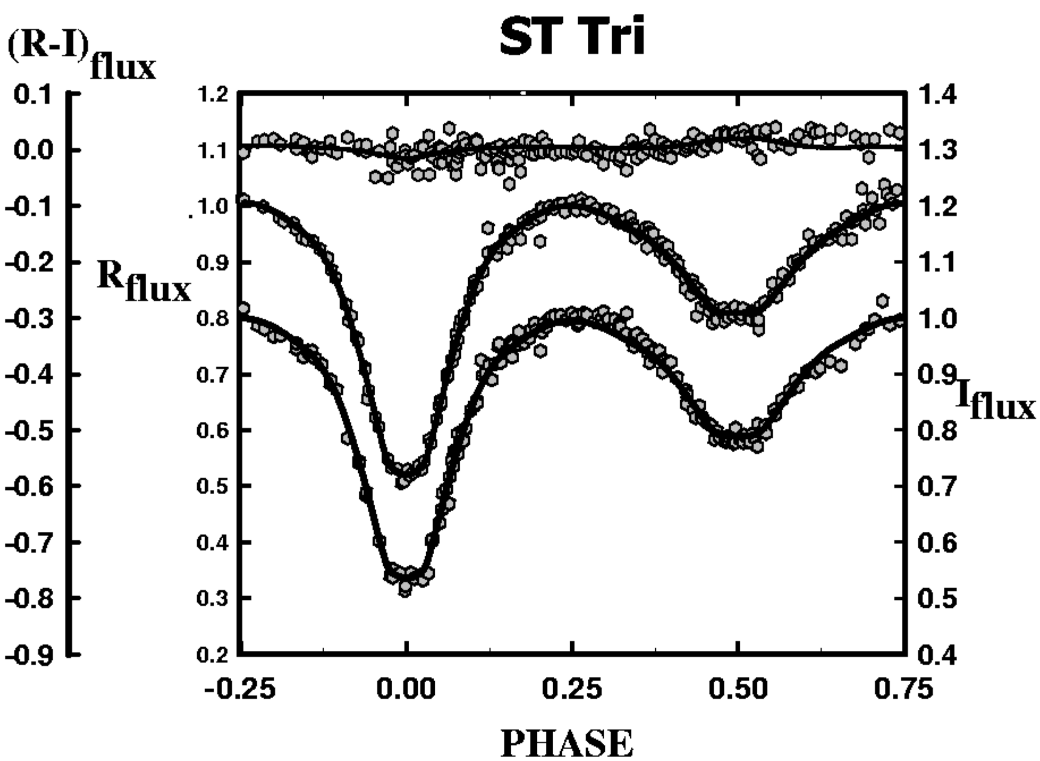

Figure 2.

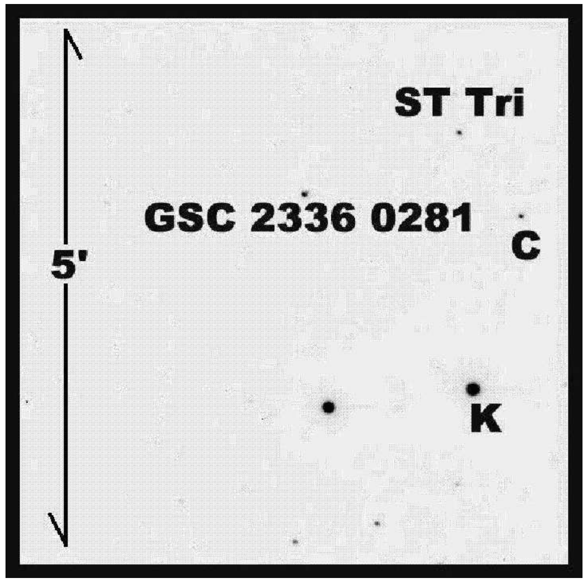

Figure 3.

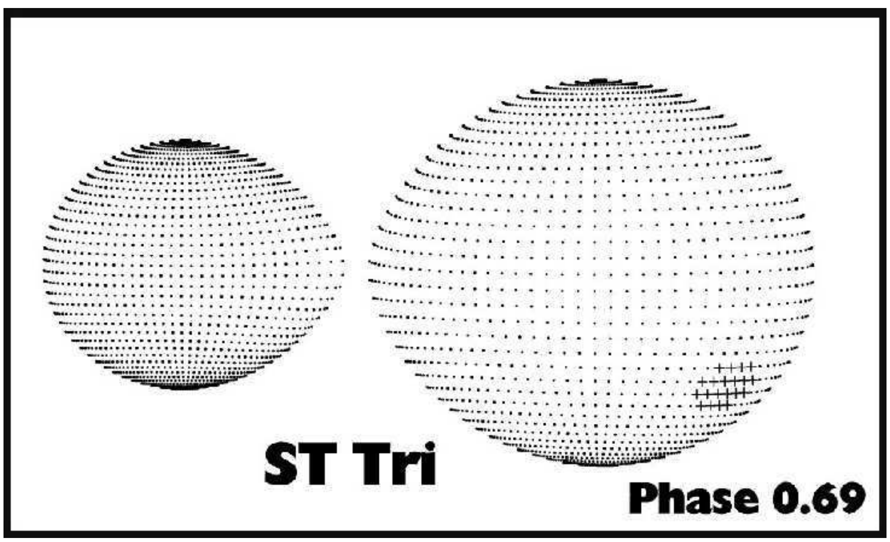

Figure 4.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5610

Konkoly Observatory
Budapest
4 March 2005

HU ISSN 0374 – 0676

UBVRI CCD OBSERVATIONS OF THE G-TYPE CONTACT SYSTEM GSC 2336 0281

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During our recent observations of ST Tri at the SARA telescope, we noticed that our comparison star was variable at a high level. The star was GSC 2336-0281 [$\alpha(2000)$=02$^{\rm h}$41$^{\rm m}$41$^{\rm s}$.0, $\delta(2000)$= +35°42′55″]. Later, we found that this WUMa binary had been discovered earlier by Zejda (2002). Our observations are reported here.

Light curves were taken at the SARA 0.9-m telescope at Kitt Peak National observatory both on-site on 19, 21-27 December 2003 by RGS, DRF and NCH and in remote mode on 4 and 9 November 2005 by RGS, and NCH. The ST7 CCD camera with standard UBVR_cI_c Johnson-Cousins filters were used. From 127 to 158 observations were taken in the BVRI pass bands and 44 observations were taken in U. CCD advanced calibrations and flux measurements were performed on PC in XP using the APWIN software by NCH and RGS.

The light curves and color curves of the variable are given in Figures 1 and 2 as normalized flux versus phase. The comparison and check stars were the same pair of stars used for ST Tri (Samec 2005).

The finding chart for GSC 2336 0281 has been published (Samec 2005). Our standard magnitudes derived for the system range from F9 to G0 in $B-V$ to G0 to G4 in $V-R$ for this V = 13.48-13.98 magnitude system. We measured an average $U-B$ magnitude of 0.23(1) for the variable at phase 0.25 which is characteristic of a G6 type dwarf single star. This may indicate interstellar reddening and thus magnitude extinction. Four mean epochs of minimum light were determined from B,V,R,I timings of two primary and secondary eclipses: HJD Min II = 2452995.7337(3), 2452999.8481(4) and HJD Min I = 2452996.6688(6), 2452999.6624(8). These were calculated from parabola fits.

We calculated the following ephemeris from all timings:

$$\text{HJD Tmin I} = 2452996.6731(19) + 0.37397969(91)\text{d} \times \text{E}$$

The period appears to have been constant over the 4000 orbits since its discovery. Future precision timings and archival work is needed to reveal the long term period behavior of this system.

We calculated a preliminary but full UBVRI simultaneous synthetic light curve solution to the UBVRI data. Pre-modeling was done with Binary Maker 2.0. This indicated that the system was a W-type, W UMa binary. From the starting parameters, the Wilson code (Wilson & Devinney 1971, Wilson 1990, 1994) was used to do the calculation. Our calculation gave a mass ratio of 0.42, an inclination of 73.°7 and a temperature difference of about 100 K. The Roche-lobe configuration has a 22% fill-out. A full tabled solution is given as Table 1. A cool spot is adjusted on the more massive, cooler component. The solution gave a colatitude of 70° and a longitude of near zero putting it on the "neck" of the Roche Lobe where intercomponent mass flow or streaming is expected. This has also been detected on other contact systems. The solution is shown overlaying the data in Figure 1 and 2. A geometrical representation of GSC 2336-0281 with a spot is given in Figure 3. For systems without total eclipses, radial velocity curves are needed to determine a definitive mass ratio. So our solution is preliminary.

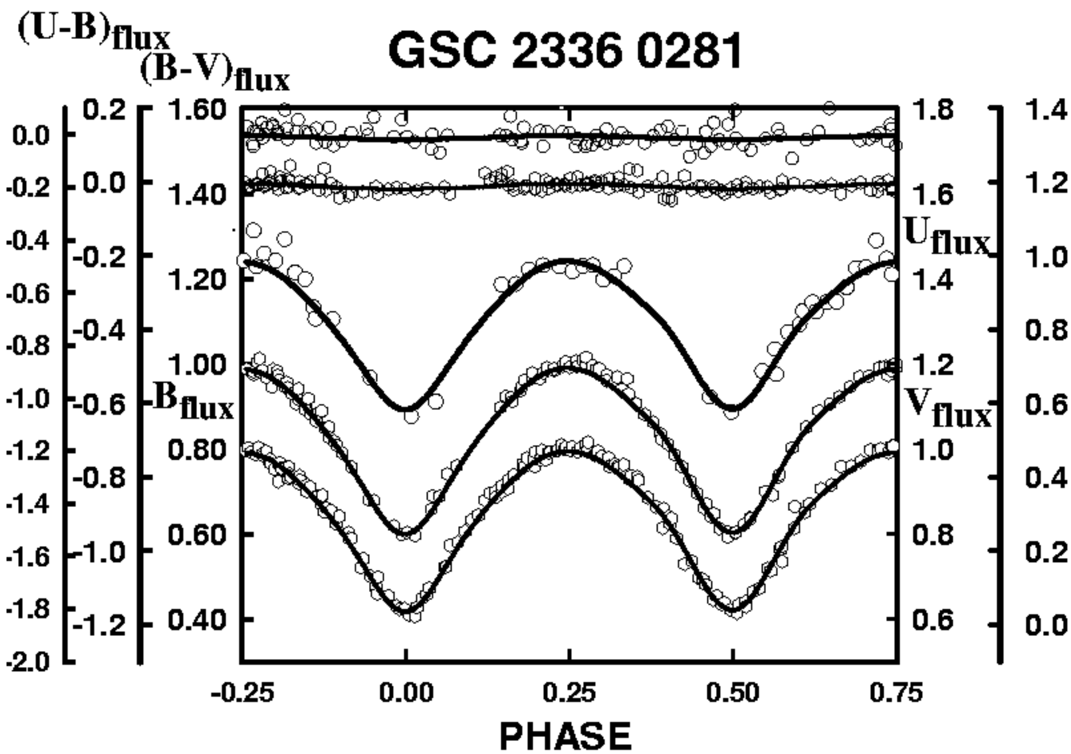

Figure 1.

We wish to thank SARA TAC for their allocation of observing time, and a small research grant from the American Astronomical Society which supported this run.

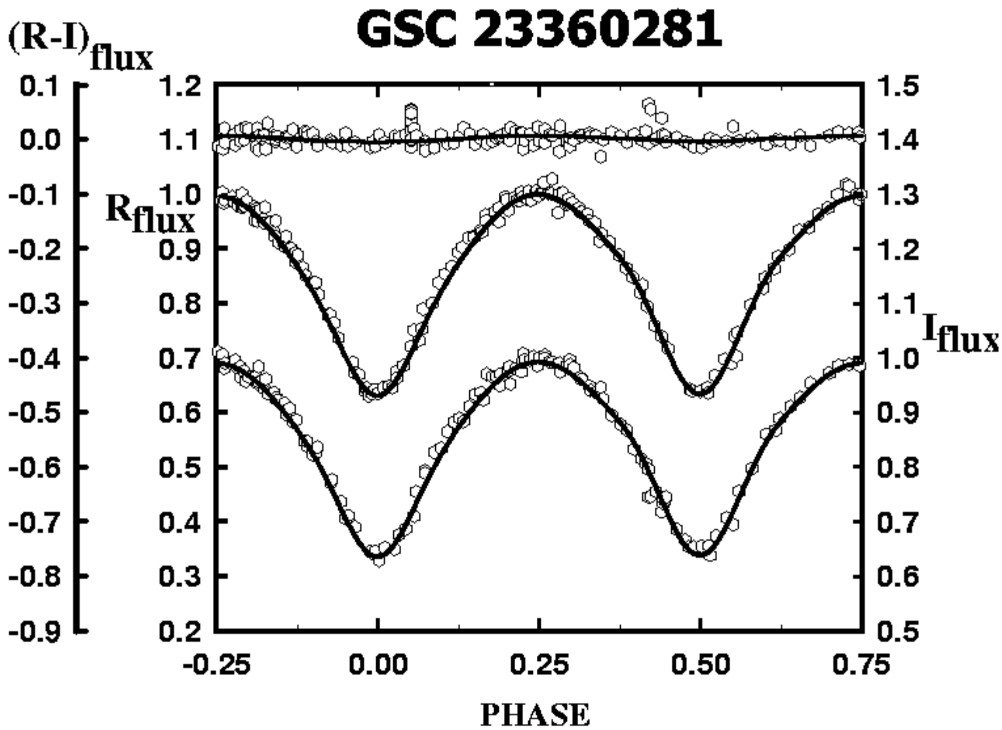

Figure 2.

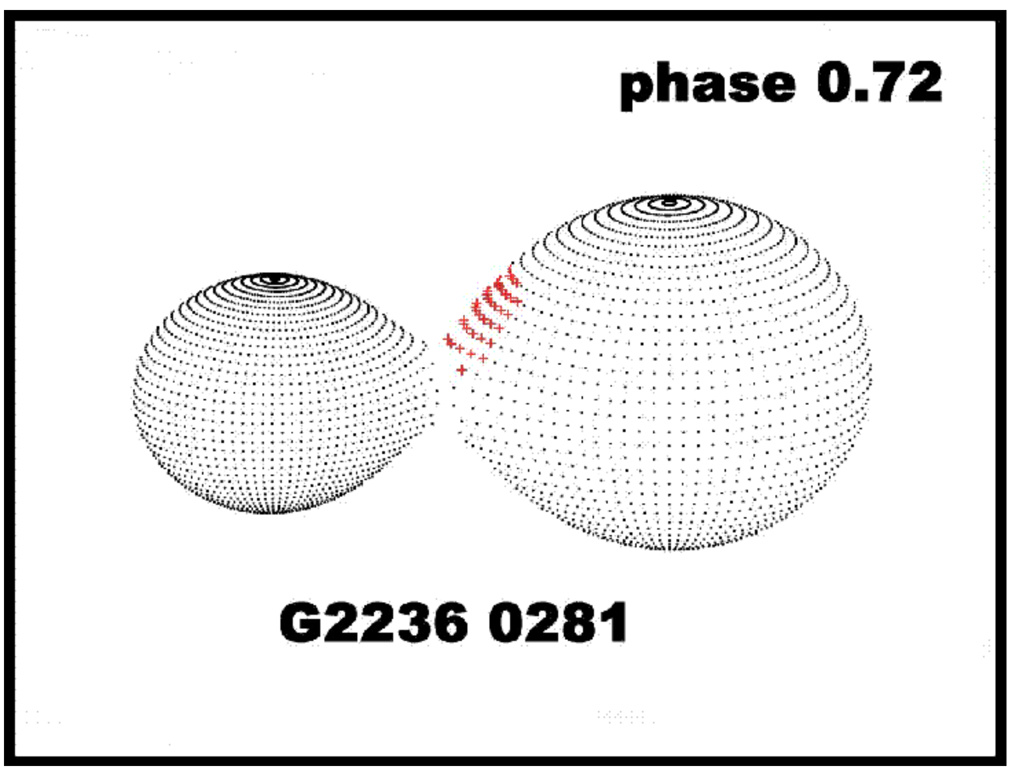

Figure 3.

TABLE I

Synthetic light curve parameters for GSC 2336 0281

λ_B, λ_V, λ_R, λ_I (nm)	440, 550, 640, 790
x_{1B}, x_{2B}, y_{1B}, y_{2B}	0.877, 0.877, −0.024, −0.024
x_{1V}, x_{2V}, y_{1V}, y_{2V}	0.847, 0.847, 0.098, 0.098
x_{1R}, x_{2R}, y_{1R}, y_{2R}	0.778, 0.778, 0.200, 0.200
x_{1I}, x_{2I}, y_{1I}, y_{2I}	0.623, 0.623, 0.230, 0.230
g_1, g_2	0.32, 0.32
A_1, A_2	0.500, 0.500
x_{bol1}, x_{bol2}, y_{bol1}, y_{bol2}	0.649 , 0.649, 0.193 , 0.193
Inclination	$73^\circ.2 \pm 0^\circ.1$
T_1, T_2 (K)	5500 (fixed), 5608 ± 8
$\omega_{1,2}$	2.659 ± 0.002
q (m_2/m_1)	0.418 ± 0.001
pshift	0.9988 ± 0.0002
$L_1/(L_1+L_2)$U	0.653 ± 0.004
$L_1/(L_1+L_2)$B	0.659 ± 0.002
$L_1/(L_1+L_2)$V	0.665 ± 0.002
$L_1/(L_1+L_2)$R	0.667 ± 0.002
$L_1/(L_1+L_2)$I	0.671 ± 0.002
r_1, r_2 (pole)	0.439 ± 0.001, 0.297 ± 0.002
r_1, r_2 (side)	0.471 ± 0.001, 0.311 ± 0.002
r_1, r_2 (back)	0.502 ± 0.001, 0.351 ± 0.004
fill-out	22%
Spot Parameters:	Primary Component
Colatitude	$70^\circ.8 \pm 0^\circ.9$
Longitude	$2^\circ.9 \pm 0^\circ.1$
Spot radius	$15^\circ.7 \pm 0^\circ.2$
Temperature factor	0.865 ± 0.004

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5611

Konkoly Observatory
Budapest
4 March 2005

HU ISSN 0374 – 0676

MULTICOLOR OBSERVATIONS OF ASAS 002511+1217.2

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Name of the object:
ASAS 002511+1217.2 (RX J0025.1+1217, 1RXS J002510.8+121725, 2MASS J00251111+1217121)

Equatorial coordinates:	**Equinox:**
R.A.= $00^h25^m11^s087$ **DEC.=** $+12°17'12''.25 \pm 0''.4$ (Price, 2004)	2000

Detector:	Various AAVSO observer instruments. Details available upon request.

Filter(s):	CCD: U, B, V, R_J, R_C; I_C, unfiltered CCD

Date(s) of the observation(s):
2004.09.11 – 2004.11.05

Comparison star(s):	Finder chart and comparison stars are available at `http://charts.aavso.org/`. Comparison stars were based on the Tycho-2 catalog (comparison $V < 10^m.5$) and field photometry by Henden (comparison $V > 10^m.6$).

Availability of the data:
Data available for download at `http://www.aavso.org/data/download`

Type of variability:	UGWZ

Remarks:

ASAS 002511+1217.12 is a newly discovered cataclysmic variable in Pisces. It was discovered by G. Pojmanski and the ASAS-3 survey on 11.203 UT Sept., 2004 (Price, 2004). The AAVSO has collected 31839 CCD observations of ASAS 002511+1217.2 over a 55 day period following its discovery on Sep 11.203 (Price, 2004). Figure 1 shows all the CCD data. The errors depend on the observer and are available upon request but typically can be estimated to be $\pm$ $0^{\mathrm{m}}_{.}02$ for CCD observations. It is interesting to note that an echo-outburst occurred, reaching a maximum at JD 2453282.52.

Before combining data for statistical analysis, each observer's data set was individually transformed to an uniform zero-point by subtracting a linear fit from each night's observations. This was done so that we could remove the overall trend of outburst, and to combine all observations into a single data set. The analysis of CCD observations by the Lafler-Kinman (1965) method has enabled us to show the presence of the $0^{\mathrm{d}}_{.}05701 \pm 0^{\mathrm{d}}_{.}00006$ period of superhumps (Fig. 2). The periodogram presents the peak, which corresponds to the mentioned period. As an example of the superhump profile, we plotted the superhumps observed on Sept., 20, 2004 at the Crimean Astrophysical Observatory on the phase diagram of Fig. 3.

Taking JD 2453264.4332 as initial epoch for superhumps and period mentioned above, we build an $O-C$ diagram for superhump maxima (Fig. 4), using 71 times of superhump maxima. Not all nights' results are plotted on the $O-C$ diagram because some photometric data have too large scatter for accurate extrema determinations. The $O-C$ diagram presented here contains points between the super- and echo-outburst. Precise $O-C$ analysis at later time intervals (after echo-outburst) is complicated by the destruction of the superhump profile and, to a lesser extent, by increasing photometric noise due to the decreasing magnitude of the object. The solid line is an approximation by a 6th-order polynomial fit.

We propose that the period is not constant, but variable, as can be seen from the $O-C$ diagram. On the first 150 epochs the period increased with $\acute{\mathrm{P}}$ (dP/P) $= 4.77 \cdot 10^{-6} \pm 0.33 \cdot 10^{-6}$. Behavior of the period on further time scales should be investigated by future researchers, when more data become available.

Acknowledgements:

We acknowledge the help of AAVSO observers in continued monitoring of this object. This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France. One of us (PN^7) would like to thank Curry Foundation and AAVSO for providing the $ST8XE$ camera and filters. (AG^1) is very grateful to Kira Makogon and Mykolaj Khotyaintsev for useful help and discussion on the question of the preparing this manuscript in LaTeX-format.

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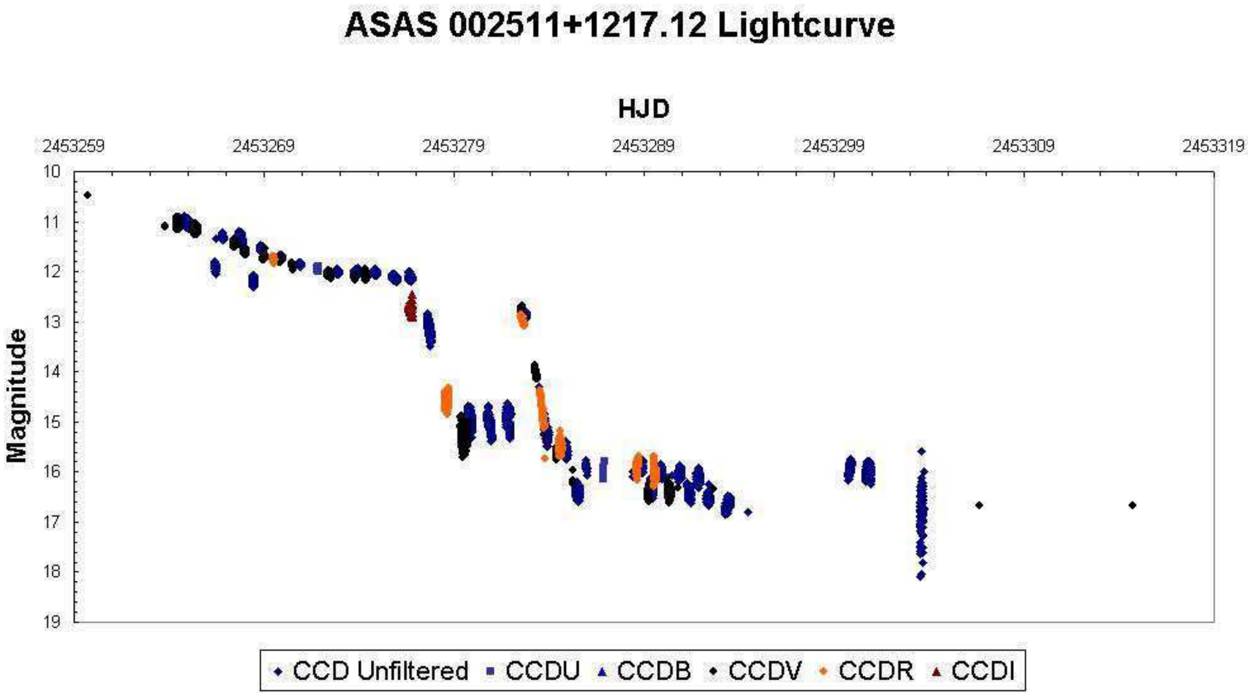

Figure 1. CCD Data

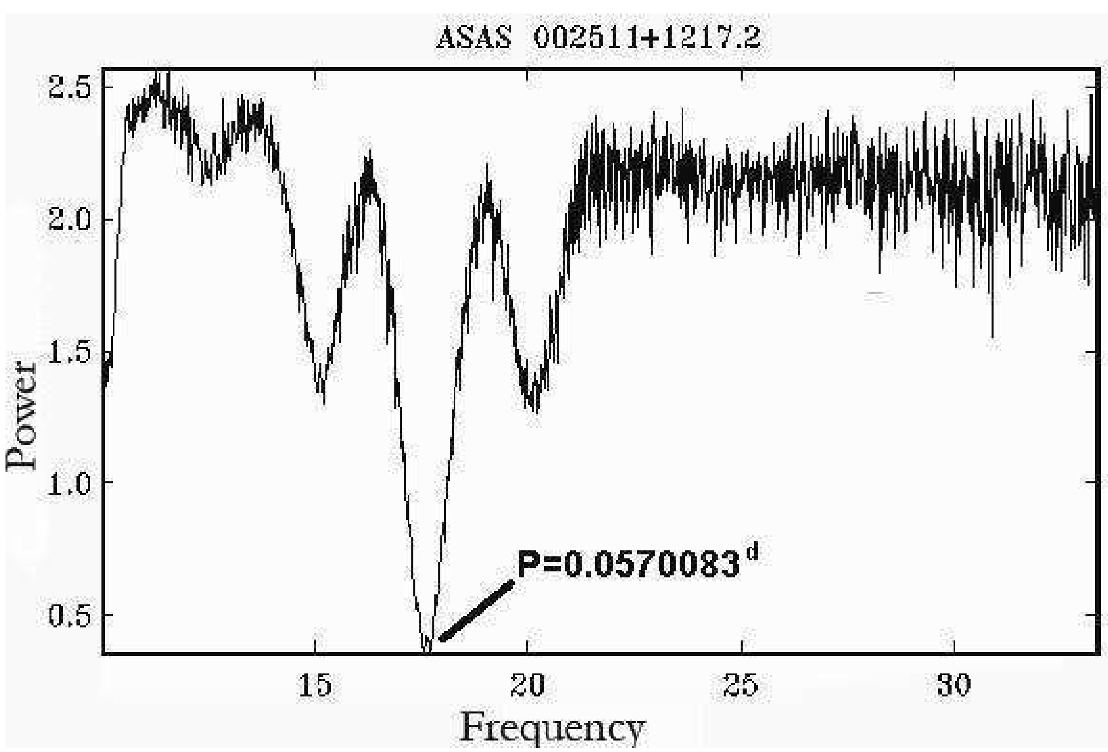

Figure 2. Periodogram

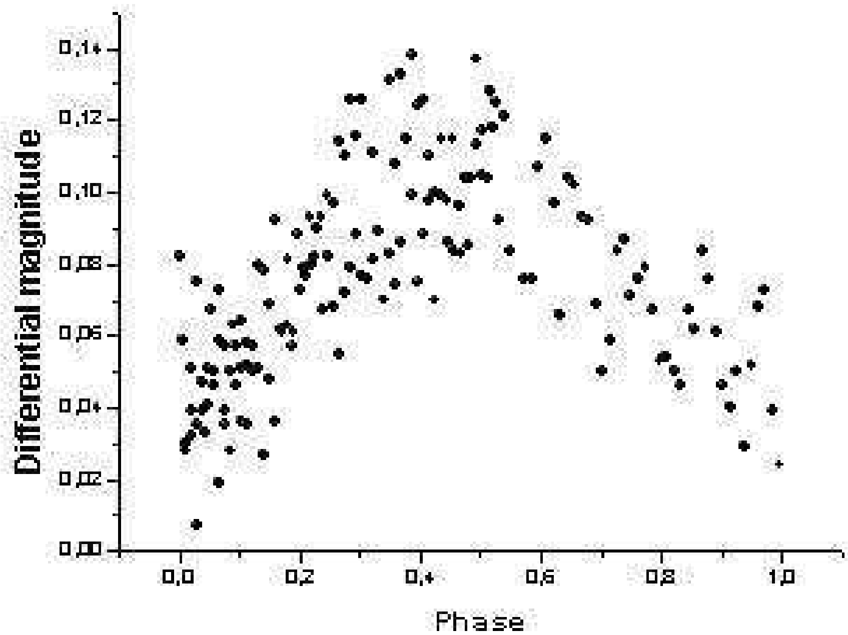

Figure 3. Phase diagram for superhumps

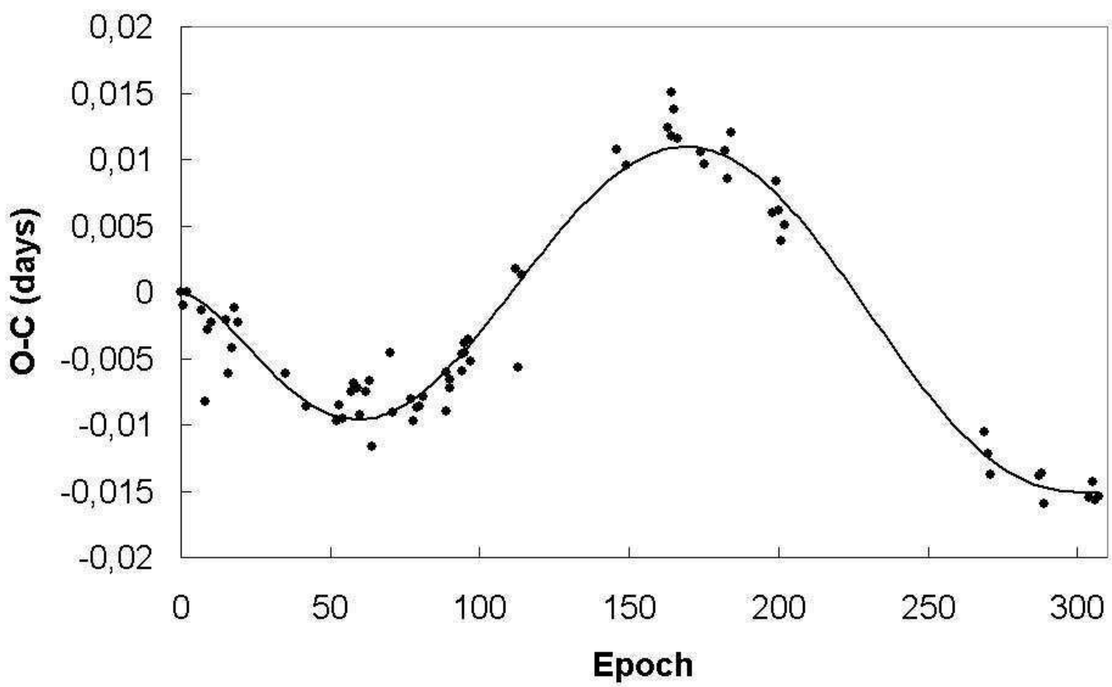

Figure 4. $O - C$

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5612

Konkoly Observatory
Budapest
4 March 2005

HU ISSN 0374 – 0676

UBVRI ANALYSIS OF THE ECLIPSING BINARY V1128 TAURI

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As a part of our study for solar-type eclipsing binaries, we observed the variable V1128 Tauri [GSC 664 694, HIP 17878; $\alpha(2000)=\ 03^{\rm h}49^{\rm m}27\overset{\rm s}{.}8$, $\delta(2000)=\ +12^\circ54'44''$]. The variability of V1128 Tau was discovered by HIPPARCOS (ESA 1997). According to the TYCHO catalog (ESA 1997), V1128 Tau is a solar-type binary, with a spectral type of G0. Our preliminary standard star work has confirmed this. We obtained a $B-V=0.606\pm0.039$. Timings of minimum light have been published by Hegedüs et al. (2003), and Tas et al. (2003). Tas et al. give the following ephemeris:

$$\text{HJD Tmin I} = 2452236.060963 \pm 0.000014 + (0.30537332 \pm 0.00000002\text{d}) \times \text{E}. \qquad (1)$$

Our observations were made with the Southeastern Association for Research in Astronomy (SARA) 0.9-m reflector and AP7 CCD at Kitt Peak, on 24-27 December, 2003, by RGS, DRF, and NCH. Standard $UBVR_CI_C$ filters were used. Between 70 and 100 high precision observations were taken in each pass band. The stars [GSC 664 1304, HIP 17876, $\alpha(2000)=\ 03^{\rm h}49^{\rm m}27\overset{\rm s}{.}5$, $\delta(2000)=\ +12^\circ54'32''$, $B-V=0.726\pm0.052$] and [GSC 666 710, $\alpha(2000)=03^{\rm h}49^{\rm m}38\overset{\rm s}{.}7$, $\delta(2000)=\ +12^\circ54'01''$, $B-V=0.854\pm0.072$] were used as the comparison and check stars, respectively. A finding chart for V1128 Tau, the comparison star, and check star is given as Figure 1. The light curves are given in Figure 2, as normalized flux versus phase.

Three precision mean epochs of minimum light were determined from eclipse timings in all five pass bands, using parabola fits: HJD Tmin I = 2453000.6523 ± 0.0002 and HJD Tmin II = 2452998.6665 ± 0.0002 and 2453000.8044 ± 0.0003. From our observations, we calculated the following linear ephemeris, which we then used to phase our data:

$$\text{HJD TMin I} = 2453000.6522 \pm 0.0004 + 0.30530 \pm 0.00009 \times \text{E} \qquad (2)$$

A linear fit to all available timings of minimum light gives:

$$\text{HJD TMin I} = 2453000.6533 \pm 0.0001 + 0.305373219 \pm 0.000000037 \times \text{E} \qquad (3)$$

Due to the fact that the $O-C$ plot seemed to indicate a period change, we also calculated a quadratic fit to all available timings:

$$\text{HJD Tmin I} = 2453000.6525 \pm 0.0002 + 0.30537273 \pm 0.00000011 \times \text{E} \qquad (4)$$
$$-0.000000000034(\pm 0.000000000007) \times \text{E}^2$$

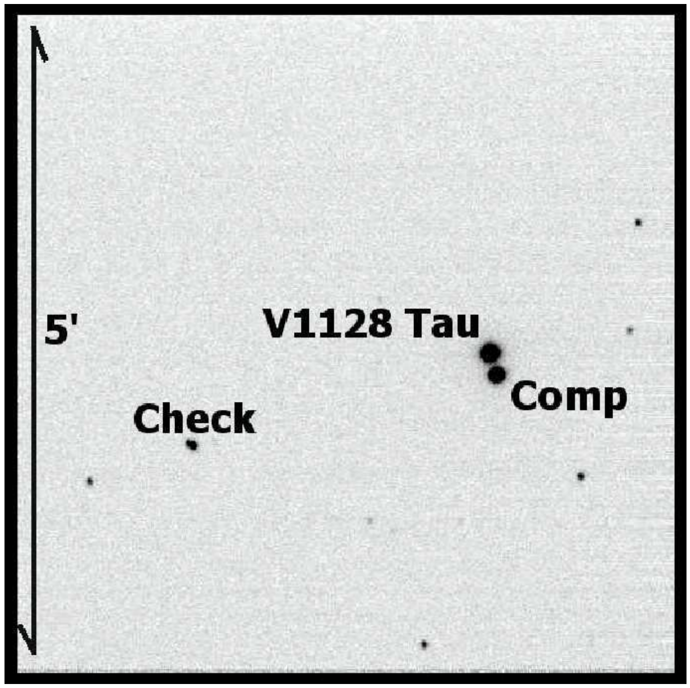


Figure 1.

Figure 3 gives the $O-C$'s calculated from the linear portion of equation (4), with the quadratic term shown overlaying. The plot shows indications of a variable, decreasing period, just as one would expect in the case solar-type binaries due to magnetic braking. Although the timings cover only about 15000 orbits, the quadratic term is already very significant. A complete table of minima and linear and quadratic residuals are given as Table 1. The linear residuals are calculated from equation (3) and the quadratic ones are calculated from equation (4). Further observations, as well as archival searches for photographic minima, are needed to confirm this behavior.

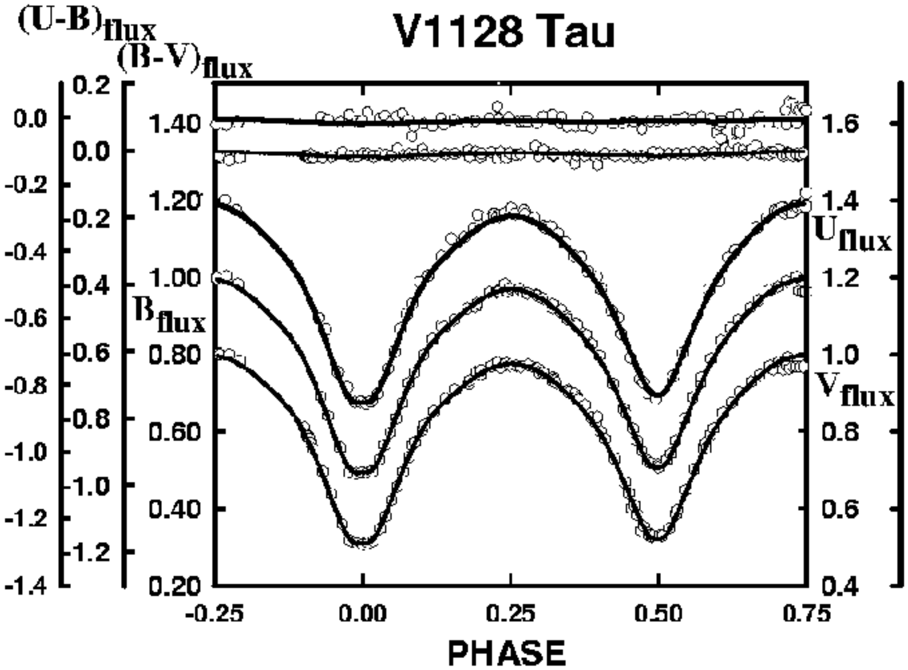
To arrive at an independent solution, we first pre-modeled with Binary Maker 2.0 (Bradstreet 1992) and obtained preliminary solutions in all five pass bands independently. Both detached and semi-detached configurations were tested. Parameters derived from the initial Binary Maker solutions were then used as the starting values for a simultaneous 5-color synthetic light curve solution using the Wilson Code (Wilson & Devinney 1971, Wilson 1990, 1994).

Our solution indicates that the system is a W-type W UMa system; the cooler star is almost twice the mass of the hotter component ($m2/m1 = 1.944 \pm 0.004$). The mass ratio is constrained by the totality of the primary eclipse. The W-type phenomena is indicative of strong (saturated) magnetic activity on the primary component, which masks the true temperature of the star. The components fill their Roche lobe to only 18.5%. Other parameters include the temperatures, $T_1 = 6000$ K (fixed) and $T_2 = 5830$ K, and orbital inclination of 85°.

The observed O'Connell effect is more evidence for magnetic spot activity; our model includes a single large magnetic region on the surface of the secondary, less massive component, with a mean temperature factor of 0.89 of the surface temperature (5220 K). The position and size of the region is given by the parameters: co-latitude = 125°, longitude = 266°, and radius = 25°.

Table 1: Epochs of Minimum Light, V1128 Tau

Epochs 2400000+	Cycles	Linear Residuals	Quadratic Residuals	Weight	Reference
48500.0620	−14738.0	−0.0008	0.0001	1.0	ESA 1997
51822.5237	−3858.0	0.0002	−0.0003	1.0	Hegedüs et al. 2003
51830.4633	−3832.0	0.0001	−0.0004	1.0	Hegedüs et al. 2003
51830.6165	−3831.5	0.0007	0.0001	1.0	Hegedüs et al. 2003
52236.4578	−2502.5	0.0009	0.0008	1.0	Tas et al. 2003
52236.4578	−2502.5	0.0010	0.0008	1.0	Tas et al. 2003
52236.6096	−2502.0	0.0000	−0.0002	1.0	Tas et al. 2003
52236.6101	−2502.0	0.0005	0.0004	1.0	Tas et al. 2003
52240.4271	−2489.5	0.0004	0.0002	1.0	Tas et al. 2003
52240.4274	−2489.5	0.0007	0.0005	1.0	Tas et al. 2003
52248.3670	−2463.5	0.0006	0.0004	1.0	Tas et al. 2003
52248.3672	−2463.5	0.0008	0.0006	1.0	Tas et al. 2003
52254.3201	−2444.0	−0.0011	−0.0013	1.0	Tas et al. 2003
52254.3205	−2444.0	−0.0007	−0.0008	1.0	Tas et al. 2003
52258.2906	−2431.0	−0.0005	−0.0006	1.0	Tas et al. 2003
52258.2906	−2431.0	−0.0004	−0.0006	1.0	Tas et al. 2003
52258.4440	−2430.5	0.0003	0.0001	1.0	Tas et al. 2003
52258.4444	−2430.5	0.0006	0.0005	1.0	Tas et al. 2003
52263.3298	−2414.5	0.0001	0.0000	1.0	Tas et al. 2003
52263.3301	−2414.5	0.0004	0.0002	1.0	Tas et al. 2003
52263.4819	−2414.0	−0.0005	−0.0007	1.0	Tas et al. 2003
52263.4819	−2414.0	−0.0005	−0.0006	1.0	Tas et al. 2003
52277.2233	−2369.0	−0.0009	−0.0011	1.0	Tas et al. 2003
52277.2235	−2369.0	−0.0007	−0.0009	1.0	Tas et al. 2003
52277.3762	−2368.5	−0.0007	−0.0008	1.0	Tas et al. 2003
52277.3771	−2368.5	0.0002	0.0000	1.0	Tas et al. 2003
52277.3772	−2368.5	0.0003	0.0001	1.0	Tas et al. 2003
52313.2582	−2251.0	−0.0001	−0.0002	1.0	Tas et al. 2003
52314.3272	−2247.5	0.0001	0.0000	1.0	Tas et al. 2003
52315.2437	−2244.5	0.0006	0.0005	1.0	Tas et al. 2003
52536.4871	−1520.0	0.0011	0.0012	1.0	Tas et al. 2003
52536.4872	−1520.0	0.0011	0.0013	1.0	Tas et al. 2003
52563.5116	−1431.5	0.0000	0.0002	1.0	Tas et al. 2003
52563.5119	−1431.5	0.0003	0.0005	1.0	Tas et al. 2003
52565.3429	−1425.5	−0.0010	−0.0008	1.0	Tas et al. 2003
52565.3435	−1425.5	−0.0003	−0.0001	1.0	Tas et al. 2003
52565.4967	−1425.0	0.0002	0.0003	1.0	Tas et al. 2003
52565.4968	−1425.0	0.0003	0.0005	1.0	Tas et al. 2003
52565.4976	−1425.0	0.0011	0.0013	1.0	Tas et al. 2003
52565.4977	−1425.0	0.0012	0.0014	1.0	Tas et al. 2003
52608.2474	−1285.0	−0.0013	−0.0011	0.5	Tas et al. 2003
52608.2484	−1285.0	−0.0003	−0.0001	0.5	Tas et al. 2003
52608.4011	−1284.5	−0.0004	−0.0001	1.0	Tas et al. 2003
52608.4013	−1284.5	−0.0001	0.0001	0.5	Tas et al. 2003
52998.6665	−6.5	−0.0019	−0.0011	1.0	Present Observations
53000.6523	0.0	−0.0010	−0.0002	1.0	Present Observations
53000.8044	0.5	−0.0016	−0.0008	1.0	Present Observations


V1128 Tau
(U-B)flux
(B-V)flux
Bflux
Uflux
Vflux
PHASE

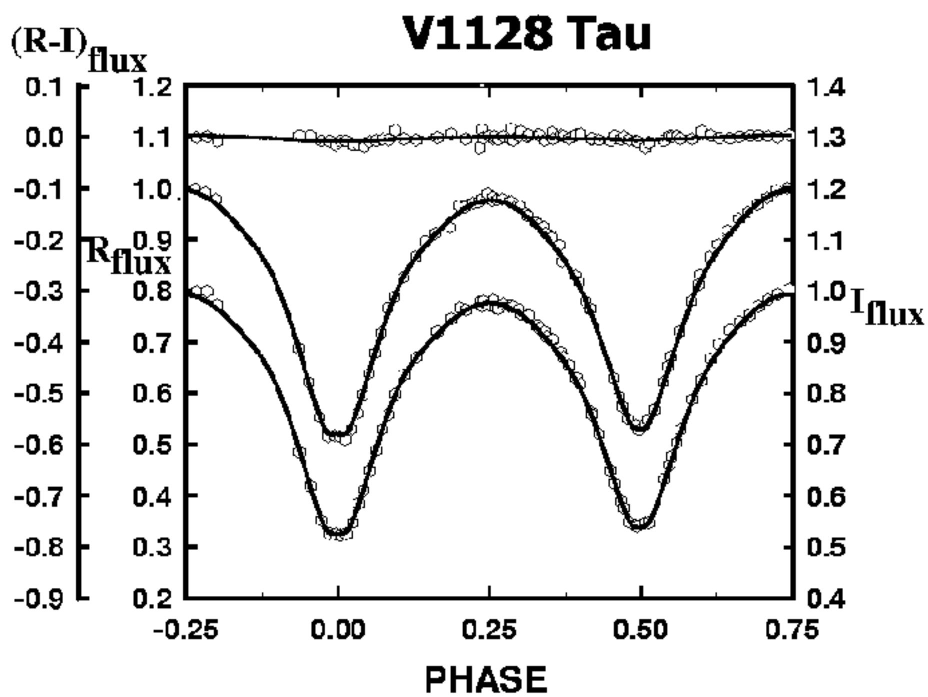

V1128 Tau
(R-I)flux
Rflux
Iflux
PHASE

Figure 2.

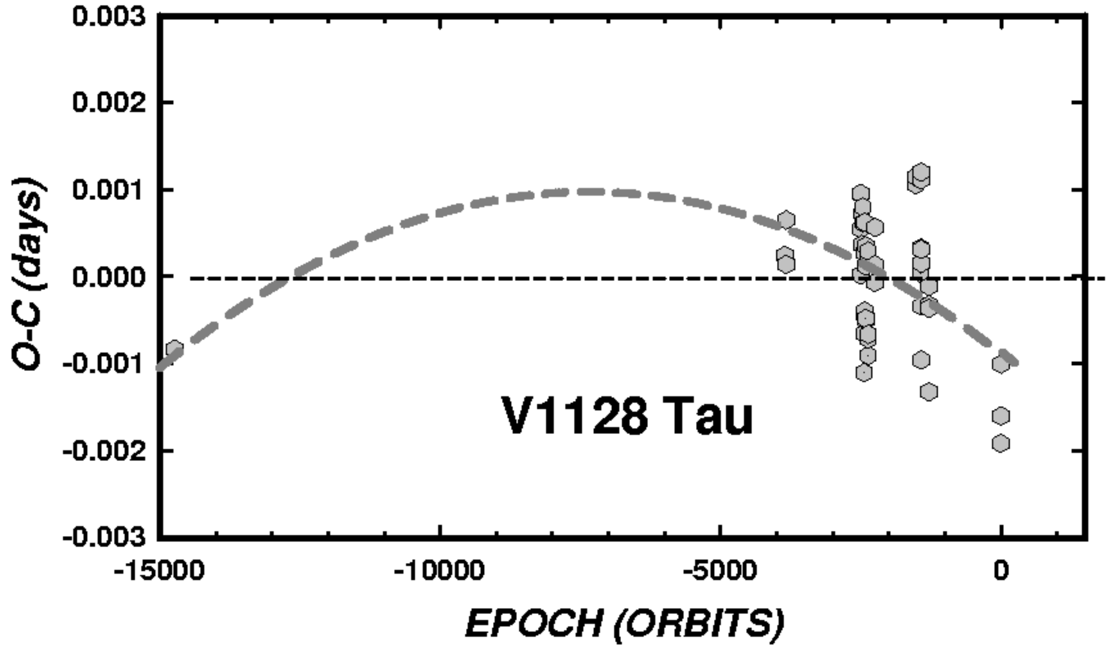


Figure 3.

Our solution is shown overlaying the phased, flux-normalized data in Figure 2; while a geometrical representation of V1128 Tau is given in Figure 4. Out tabled solution is given in Table 2. Tas et al. (2003) has published a large collection of B,V data using 3 different telescopes and detectors over two observing seasons. A Wilson solution was calculated on the combined curves. Their solution is of W-type with an inclination of 85° and a mass ratio of $m1/m2 = 2.2$. They also showed asymmetries in the light curves indicating spot activity in the system. The differences between Tas et al. (2003) and the present solution arise due to a combination of the following factors. Tas et al.'s (2003) solutions are based only on B and V observations, while ours is based on $UBVR_CI_C$, thus giving a better fix on the parameters, especially those related to temperature. They used one dimensional limb darkening coefficients, while we used two dimensional coefficients as well as bolometric albedos. Tas et al.'s (2003) choice of coefficients was different from ours. We used Van Hamme's coefficients which are included with the Wilson code based on Kurucz atmospheres and the temperature of the primary component. Our primary component temperature was fixed at 6000 K, better reflecting its K0 spectral type. We also allowed our spot to adjust in latitude. Also, it is best not to combine light curves from different seasons for active W UMa binaries.

We wish to thank the Southeastern Association for Research in Astronomy (SARA) for their allocation of observing time, as well as NASA and the American Astronomical Society for their continued support of our undergraduate research programs through their small research grants.

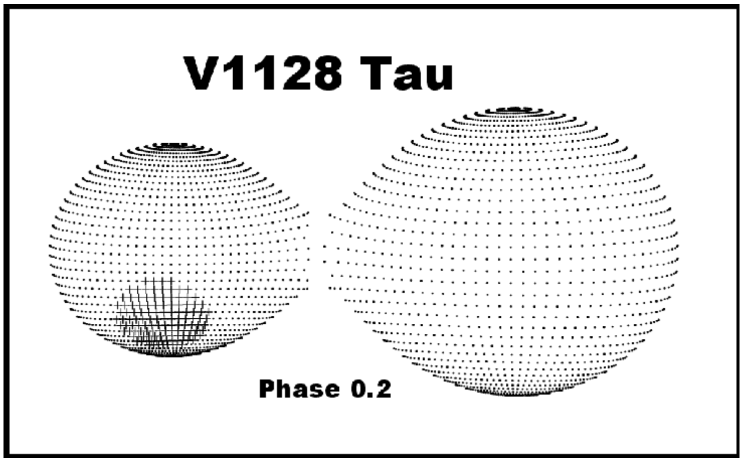


Figure 4.

Table 2: Synthetic light curve parameters for V1128 Tau

λ_B, λ_V, λ_R, λ_I (nm)	360, 440, 550, 640, 790
x_{1U}, x_{2U}, y_{1U}, y_{2U}	0.872, 0.872, 0.143,0.143
x_{1B}, x_{2B}, y_{1B}, y_{2B}	0.829, 0.829, 0.185,0.185
x_{1V}, x_{2V}, y_{1V}, y_{2V}	0.745, 0.745, 0.256,0.256
x_{1R}, x_{2R}, y_{1R}, y_{2R}	0.653, 0.653, 0.269,0.269
x_{1I}, x_{2I}, y_{1I}, y_{2I}	0.56, 0.56, 0.26, 0.26
g_1 , g_2	0.32, 0.32
A_1 , A_2	0.500, 0.500
$xbol_1$, $xbol_2$	0.647 , 0.647
$ybol_1$, $ybol_2$	0.221 , 0.221
Inclination	$84\overset{\circ}{.}92 \pm 0\overset{\circ}{.}06$
T_1, T_2 (K)	6000, 5828 $\pm$ 1
ω_1,ω_2	5.061 $\pm$ 0.001
q (m_2/m_1)	1.944 $\pm$ 0.001
pshift	0.998 $\pm$ 0.001
$L_1/(L_1+L_2)U$	0.402 $\pm$ 0.009
$L_1/(L_1+L_2)B$	0.394 $\pm$ 0.008
$L_1/(L_1+L_2)V$	0.386 $\pm$ 0.009
$L_1/(L_1+L_2)R$	0.382 $\pm$ 0.007
$L_1/(L_1+L_2)I$	0.377 $\pm$ 0.009
r_1, r_2 (pole)	0.312 $\pm$ 0.001, 0.422 $\pm$ 0.001
r_1, r_2 (side)	0.327 $\pm$ 0.001, 0.450 $\pm$ 0.001
r_1, r_2 (back)	0.367 $\pm$ 0.005, 0.482 $\pm$ 0.002
fill-out	18.5 $\pm$ 0.1%
Spot Parameters:	Primary Component
Colatitude	$125^\circ \pm 1^\circ$
Longitude	$266^\circ \pm 1^\circ$
Spot radius	$25\overset{\circ}{.}0 \pm 0\overset{\circ}{.}3$
Temperature factor	0.998 $\pm$ 0.001

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Tas, G.; Evren, S.; Çakirli, .; Íbanoglu, C., 2003, *A&A*, **411**, 161
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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5613

Konkoly Observatory
Budapest
11 March 2005

HU ISSN 0374 – 0676

NEW GCVS DATA FOR SELECTED VOLUME III VARIABLES

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Finishing our work on revision of positional information for all stars of the GCVS (Samus et al., 2002, 2003), we identified variables in GCVS Volume III constellations with positional catalogs. Having accurate coordinates for these stars, we were able to retrieve their observations from the ASAS-3 (Pojmanski, 2002) and ROTSE-I/NSVS (Woźniak et al., 2004) data bases, often the only sources of data making it possible to study sufficiently bright variables. These observations were analyzed using the period-search software developed by Dr. V.P. Goranskij for Windows environment, in a search for information significantly appending or improving that in the GCVS and especially for new periods. For the present paper, we retained only the stars not included into the ASAS-3 web variable-star catalog or into the ROTSE1 catalog (Akerlof *et al.*, 2000), or stars present in these catalogs but with our results significantly different from those presented there. In Table 1, we collect the relevant data for 49 stars in seven constellations. For a half of all cases, even the variability types were significantly modified or completely changed. The epochs in Table 1 are minima for eclipsing stars and maxima for other variables. Though both ASAS-3 and ROTSE-I/NSVS data were used to derive the tabulated variability types and light elements, the magnitudes in maximum and minimum, with the labeled exceptional case of old photographic magnitudes (HK TrA, for which the ASAS-3 data do not reveal its really large variability amplitude), are V-band magnitudes from ASAS-3. Figure 1 presents sample light curves, plotted using ASAS-3 V-band observations, for some of the variables.

Of special interest are several red variables in Triangulum Australe, earlier erroneously announced by Hoffleit (1931) as RR Lyrae stars; some of them even had absolutely wrong periods published. Additional cases of similar misclassifications by Hoffleit (1931) can be found among stars included into the ASAS-3 variable-star web catalog.

The information presented in this paper will be incorporated in the GCVS on-line version in April, 2005. By the same time, accurate coordinates will be presented for all GCVS Volume III stars.

We wish to express our sincere thanks to Dr. V.P. Goranskij for providing us with his excellent period-search software. Thanks are due to Dr. M.L. Hazen for sending us many unpublished finding charts for Harvard variables. The work of the GCVS team is supported, in part, by grants from the Russian Foundation for Basic Research, The Federal Scientific and Technological Program "Astronomy", the program "Non-Stationary Processes in Astronomy" of the Presidium of Russian Academy of Sciences, and the program of support for leading scientific schools of Russia (grant NSh-389-2003-2).

Table 1. New data on GCVS Volume III variable stars

Star	RA (J2000)	Dec	Type	V	Epoch, JD 24...	P, days	Remark
				SAGITTARIUS			
V2012	18 37 12.4	–26 10 22	M	12.7–(14.0	52490	490	
V2142	19 22 36.7	–18 29 12	SRA	11.7–(12.6	52086	243	
V2168	19 42 37.5	–38 39 56	EA	13.0–14.6	52439.740	2.06888	
V2187	19 47 24.0	–45 03 55	RRAB	13.3–14.2	52192.527	0.59310	
V2195	19 48 48.7	–42 40 55	SRA	13.2–(14.6	52071	136	
V2201	19 52 50.3	–43 01 42	EA	11.3–12.8	52039.794	4.8151	
V2219	19 59 58.4	–39 22 55	RRAB	13.5–14.7	52743.871	0.47738	
V2246	20 12 30.5	–37 44 06	RRAB	13.2–14.2	52721.853	0.60654	
V2248	20 13 13.5	–37 59 42	EW	13.5–14.5	52470.639	0.31480	DSCT in ASAS-3
V3812	18 23 41.4	–23 29 15	M	12.7–(13.8	52527	240	
V3813	18 24 10.2	–27 19 44	SRA	11.8–13.1	52758	246:	
V3866	18 42 03.2	–19 46 36	EA	12.2–13.0	52184.519	3.08201	
V3958	19 29 50.0	–44 49 14	SRA	10.8–12.4	52902	111	
				TRIANGULUM AUSTRALE			
TU	15 50 07.2	–61 16 38	M	12.7–(14.2	52732	376:	
VV	15 56 07.2	–60 25 18	SRB	12.0–13.7		230:	
AC	16 07 55.9	–64 25 05	SR	12.5–13.8		165:	
AH	16 10 59.8	–62 31 03	EA	13.1–14.0	52052.633	1.399562	
AX	16 15 48.2	–61 58 54	M	12.4–(14.4	52527	312	
BQ	16 21 24.9	–64 42 17	M	12.7–(14.6	52720	139.4	
BX	16 22 03.8	–60 23 04	SRA	12.8–14.8	52698	165	
CN	16 28 29.6	–61 55 51	CWA	12.1–12.6	53074.9	12.232	
HK	15 42 30.8	–65 38 47	M	11.0–(18p	52714	263	
HN	16 36 09.8	–65 11 12	M	11.8–(15.0	52638:	382	
HU	16 23 15.0	–61 45 26	SRA:	11.6–12.9:	53115	369	
IQ	15 36 59.1	–64 53 49	EA	10.8–11.4	51963.763	3.1942	$D = 0\overset{p}{.}12$
IV	16 43 14.9	–62 02 55	M:	12.8–(13.9	52198	350:	
KV	15 45 32.5	–66 50 22	M	11.0–(14.0	52564	352	
				TUCANA			
X	22 49 48.8	–64 59 31	RRAB	13.4–14.2	52032.88	0.57307	
ZZ	22 16 54.0	–63 48 15	M	10.6–(14.9	52055	304	
CC	01 02 42.9	–65 27 22	SRS	6.22– 6.37	53048	20.5	
				VELA			
TX	09 13 57.9	–54 50 12	SRD	11.2–11.5	52932	55.5	
DV	09 49 21.1	–45 29 40	SRB	11.9–12.7		147	
HO	10 24 56.1	–51 14 59	M	11.4–(14.0	52986	299	
				VIRGO			
TU	13 56 53.2	–12 33 20	RRAB	13.6–14.6	52388.66	0.65655	
AP	14 28 30.3	+07 17 37	M	11.0–(14.7	52795	283	
CQ	14 21 25.2	+06 26 33	SRA	8.7– 9.5	53071	74	
NX	13 35 25.8	–22 23 17	M	11.5–(15.1	52820	324	
OO	15 01 31.5	+02 26 20	SR	12.0–12.7	53133	109	
				VOLANS			
RV	08 32 52.6	–70 04 24	RRAB	13.0–13.9	53132.599	0.64991	
RW	08 36 02.1	–65 05 17	EA	13.4–15.0	52140.927	2.8624	
SW	08 50 10.5	–66 23 12	RRAB	12.1–13.1	53003.783	0.60111	
TT	08 58 00.5	–65 34 05	M	12.3–(14.5	52194	168	
TZ	08 12 54.3	–72 30 08	M	12.2–(15.0	52863	324	
UU	08 16 00.2	–68 28 21	SRB	8.5– 9.9		134	
				VULPECULA			
XX	19 21 01.2	+24 59 32	M	13.2–(14.8	51330	300:	
BB	20 32 19.5	+27 39 44	EA/RS	12.0–12.7	51345.913	0.93892	1RXS source
DZ	21 10 09.0	+25 56 23	EA	11.8–12.5	51353.847	1.5941	
EL	20 35 42.4	+25 29 12	SRA	12.5–13.8	51383	230	
IM	20 43 06.0	+22 28 55	EW	11.5–12.0	51442.693	0.45428	

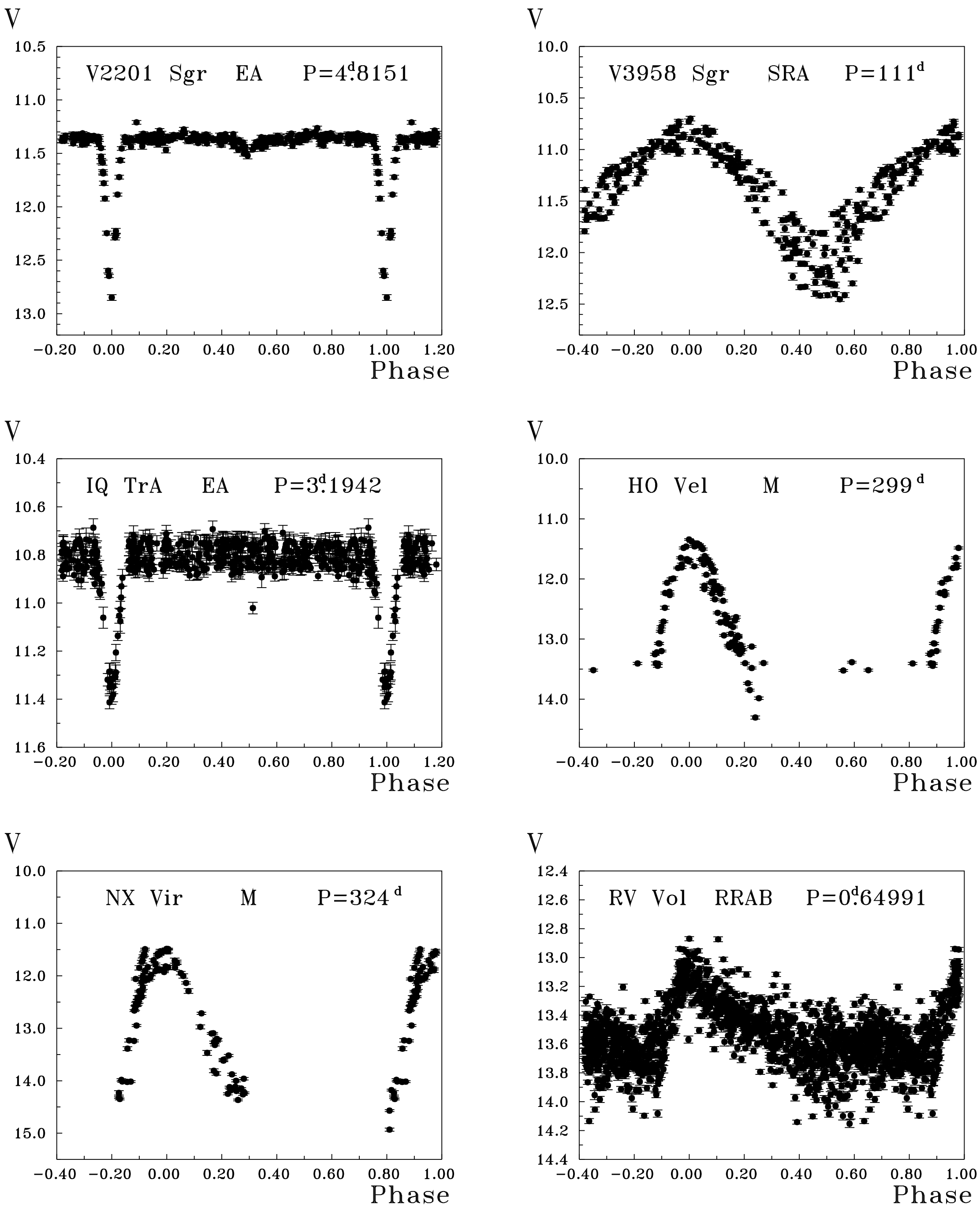

Figure 1. The sample light curves for six GCVS Volume III variables.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5614

Konkoly Observatory
Budapest
11 March 2005

HU ISSN 0374 – 0676

59 NEW VARIABLE STARS FROM SAVS SKY SURVEY

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We present 59 new variable stars discovered by the Semi-Automatic Variability Search sky survey (Niedzielski et al. 2003) operating at the Astronomical Observatory of the Nicolaus Copernicus University in Piwnice, near Toruń. Photometric data were collected with the semi-automatic telescope equipped with a 135/2.8 telephoto lens and SBIG ST-7XE CCD camera with KAF-0402ME chip. Observations were collected between September and December 2004 while monitoring 8 fields (each $2° \times 3$ °wide) covering 48 square degrees at the boundary of constellations of Pegasus and Andromeda ($23^h27^m30^s < \alpha < 23^h56^m30^s$ and $+29° < \delta < +37°$). About 9,600 stars brighter than 14.5 mag were observed in near-Johnson V band in total. The list of observed fields, detailed hardware specification and description of data reducing software as well as original data are available on survey's web site `http://www.astri.uni.torun.pl/~gm/SAVS`.

The list of the new regular variable stars is presented in Table 1. Their phased light curves in V band are shown in Figure 1. The long-term variables are listed in Table 3 and their light curves are displayed in Figures 2 and 3. The stars, for which variability type cannot be resolved with our photometric data (mostly long-term, red irregular or semi-regular variables), were classified as "miscellaneous" and marked with MISC in Table 3. The original photometric data are available from the survey's web site.

For several of the new variables, listed in Table 2, additional spectral observations were performed with the 0.9m Schmidt-Cassegrain telescope equipped with the Richardson spectrograph and a Wright CCD camera. Using the 600 gr/mm grating we obtained spectra between 3800 and 5800 Å with 2 Å/pix reciprocal dispersion. These spectra, after standard reduction performed with IRAF[1] were used for spectral classification.

The spectra used for spectral classification are presented in Figures 4 and 5 for early and late spectral types star, respectively. Most characteristic spectral features used for classification are indicated.

Reference:

Niedzielski, A., Maciejewski, G., Czart, K., 2003, *AcA*, **53**, 281

[1]IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

Table 1. List of new regular variables. *SAVS ID* – identifier consisted of Right Ascension and Declination of a star calculated for J2000.0, *Other ID* – cross-identification with other catalogs, m_V – observed maximal brightness in near-Johnson V band, Δm_V – amplitude of variation, P – period of variation in days, T_0 – time of primary minimum for eclipsing binary systems or time of maximum for periodic pulsating variables (in Heliocentric Julian Days), *Type* – type of variability.

SAVS ID	Other ID	m_V	Δm_V	P [days]	$T_0[HJD]$	Type
233103+355546	GSC 2777-1366	11.14	0.26	1.629275	2453258.417607	EB
233409+341854	GSC 2774-1779	12.10	1.10	3.917881	2453263.483003	EA
233416+363957	GSC 2778-1851	12.86	0.40	0.364527	2453255.339741	EW
233709+303713	GSC 2766-1184	12.04	0.56	0.801886	2453255.587692	EW
233710+313611	GSC 2766-775	13.36	0.78	0.375736	2453254.587540	EW
233827+363450	GSC 2778-1326	11.68	0.15	0.395043	2453254.414478	EW
234042+340240	GSC 2774-126	13.11	0.28	1.877176	2453259.421076	EW
234114+352438	GSC 2774-453	12.85	0.41	0.798466	2453254.471528	EB
234350+354920	–	13.30	0.39	0.340714	2453256.520397	EW
234413+320523	GSC 2771-945	11.95	0.10	0.347764	2453255.395819	EW
234520+323958	GSC 2771-807	12.15	0.13	0.813644	2453255.772549	EW
234521+340821	GSC 2775-1107	11.12	0.28	0.354665	2453255.350226	EW
234819+344833	GSC 2775-1188	11.43	1.37	1.429164	2453258.051395	EA
234823+361839	GSC 2779-288	9.93	0.49	2.588628	2453260.757154	EA
235439+364516	GSC 2780-2053	10.03	0.21	0.367193	2453256.092084	EW
235630+362854	GSC 2780-1969	12.00	0.48	2.498501	2453258.369159	EA
233204+322755	GSC 2769-149	12.18	0.23	7.849294	2453279.850000	DCEP
234416+321042	GSC 2771-790	12.21	0.20	0.057163	2453255.484126	DSCT
235119+333351	GSC 2772-761	14.01	0.36	0.219197	2453258.780402	RRAB
235508+332228	GSC 2772-1010	12.01	0.12	0.318456	2453255.882075	RRC

Table 2. List of new variables for which spectral type was determined. *SAVS ID* – identifier, *Other ID* – cross-identification with other catalogs, Sp_{SIMBAD} – spectral type recorded in SIMBAD database, Sp_{NEW} – spectral type determined from our observations.

SAVS ID	Other ID	Sp_{SIMBAD}	Sp_{NEW}
SAVS 233827+363450	GSC 2778-1326	–	F3 V
SAVS 234823+361839	GSC 2779-288	F2	F5 V
SAVS 233103+355546	GSC 2777-1366	–	G8 V
SAVS 235439+364516	GSC 2780-2053	–	G0 V
SAVS 234959+312055	SAO 73540	M0	M1 III
SAVS 235131+363603	SAO 73559	M0	M3 III
SAVS 234514+305230	SAO 73479	K7	M3 III
SAVS 235106+360735	GSC 2780-2269	M5	M5 III
SAVS 233754+365304	GSC 2778-1488	–	M5 III

Table 3. List of new semiregular and irregular variables. *SAVS ID* – identifier consisted of Right Ascension and Declination of a star calculated for J2000.0, *Other ID* – cross-identification with other catalogs, m_V – observed maximal brightness in near-Johnson V band, Δm_V – amplitude of variation, P – period of variation in days, T_0 – time of primary minimum for eclipsing binary systems or time of maximum for periodic pulsating variables (in Heliocentric Julian Days), *Type* – type of variability.

SAVS ID	Other ID	m_V	Δm_V	P [days]	$T_0[HJD]$	Type
232802+292558	GSC 2256-915	10.24	0.07	–	–	MISC
232804+335631	GSC 2773-1034	12.57	0.52	–	–	MISC
232913+361523	GSC 2777-1022	12.23	0.16	–	–	MISC
232929+295305	GSC 2256-1368	11.22	0.32	–	–	MISC
232930+353002	GSC 2773-330	11.87	0.24	–	–	MISC
232942+310743	GSC 2765-1629	11.10	0.26	–	–	MISC
233158+325051	GSC 2769-785	12.13	0.20	–	–	MISC
233206+323557	GSC 2769-719	10.51	0.22	–	–	MISC
233352+300736	SAO 91347	9.12	0.11	–	–	MISC
233403+295211	NSV 14620	10.01	0.68	–	–	MISC
233531+302158	GSC 2766-1156	11.43	0.17	–	–	MISC
233649+334136	GSC 2770-66	12.47	0.48	–	–	MISC
233754+365304	GSC 2778-1488	10.75	0.20	–	–	MISC
233828+312111	GSC 2766-1793	13.07	0.27	–	–	MISC
233854+351217	GSC 2774-960	11.54	0.53	114.504	2453451.258422	SR
234029+295912	GSC 2257-1396	11.12	0.20	–	–	MISC
234056+360927	SAO 73432	9.46	0.09	–	–	MISC
234258+344544	SAO 73457	9.97	0.26	–	–	MISC
234514+305230	SAO 73479	9.32	0.11	–	–	MISC
234617+302446	GSC 2767-1716	12.94	1.64	–	–	MISC
234632+335103	GSC 2775-63	10.22	0.13	–	–	MISC
234651+353917	GSC 2779-1587	10.76	0.14	–	–	MISC
234755+290107	GSC 2257-2585	13.34	0.28	–	–	MISC
234859+311759	GSC 2767-877	9.77	0.13	–	–	MISC
234859+315849	GSC 2771-771	11.88	0.18	–	–	MISC
234958+344158	GSC 2775-792	13.84	0.50	–	–	MISC
234959+312055	SAO 73540	9.59	0.19	–	–	MISC
235034+321429	GSC 2771-142	9.49	0.17	–	–	MISC
235106+360735	GSC 2780-2269	9.19	0.37	–	–	MISC
235111+342447	GSC 2776-1630	12.05	0.56	65.445	2453379.762068	SR
235131+363603	SAO 73559	9.20	0.08	–	–	MISC
235132+351854	GSC 2776-1687	12.45	0.29	58.005	2453360.889533	SR
235246+335518	GSC 2776-384	13.15	0.38	–	–	MISC
235301+335135	–	11.74	0.16	–	–	MISC
235357+331056	GSC 2772-1244	13.72	0.51	–	–	MISC
235417+323533	GSC 2772-638	11.62	0.24	–	–	MISC
235525+360949	GSC 2780-766	10.56	0.08	–	–	MISC
235526+344700	GSC 2776-417	12.70	0.24	–	–	MISC
235608+350531	GSC 2776-572	11.40	0.21	–	–	MISC

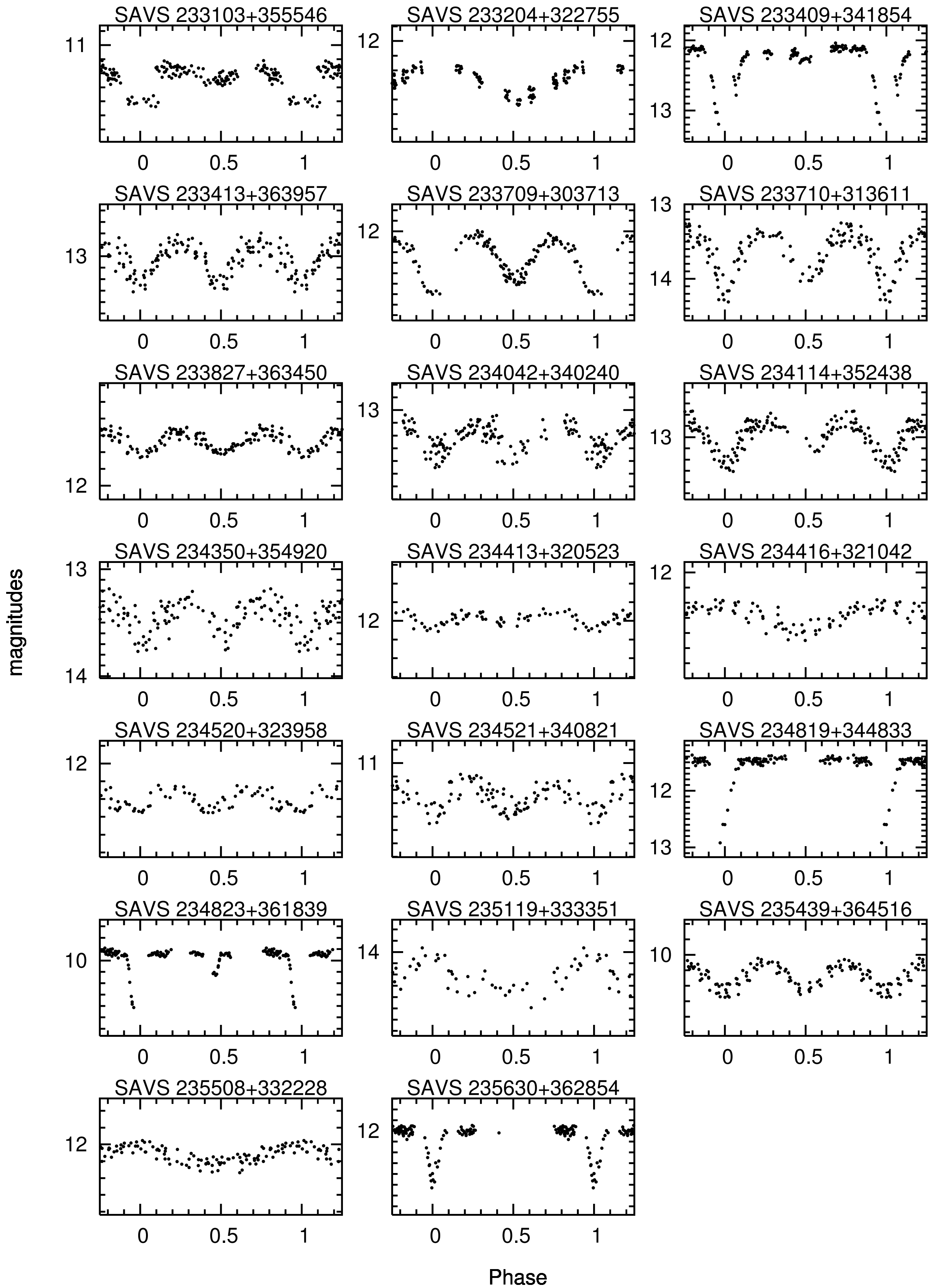

Figure 1. Light curves of new regular variables.

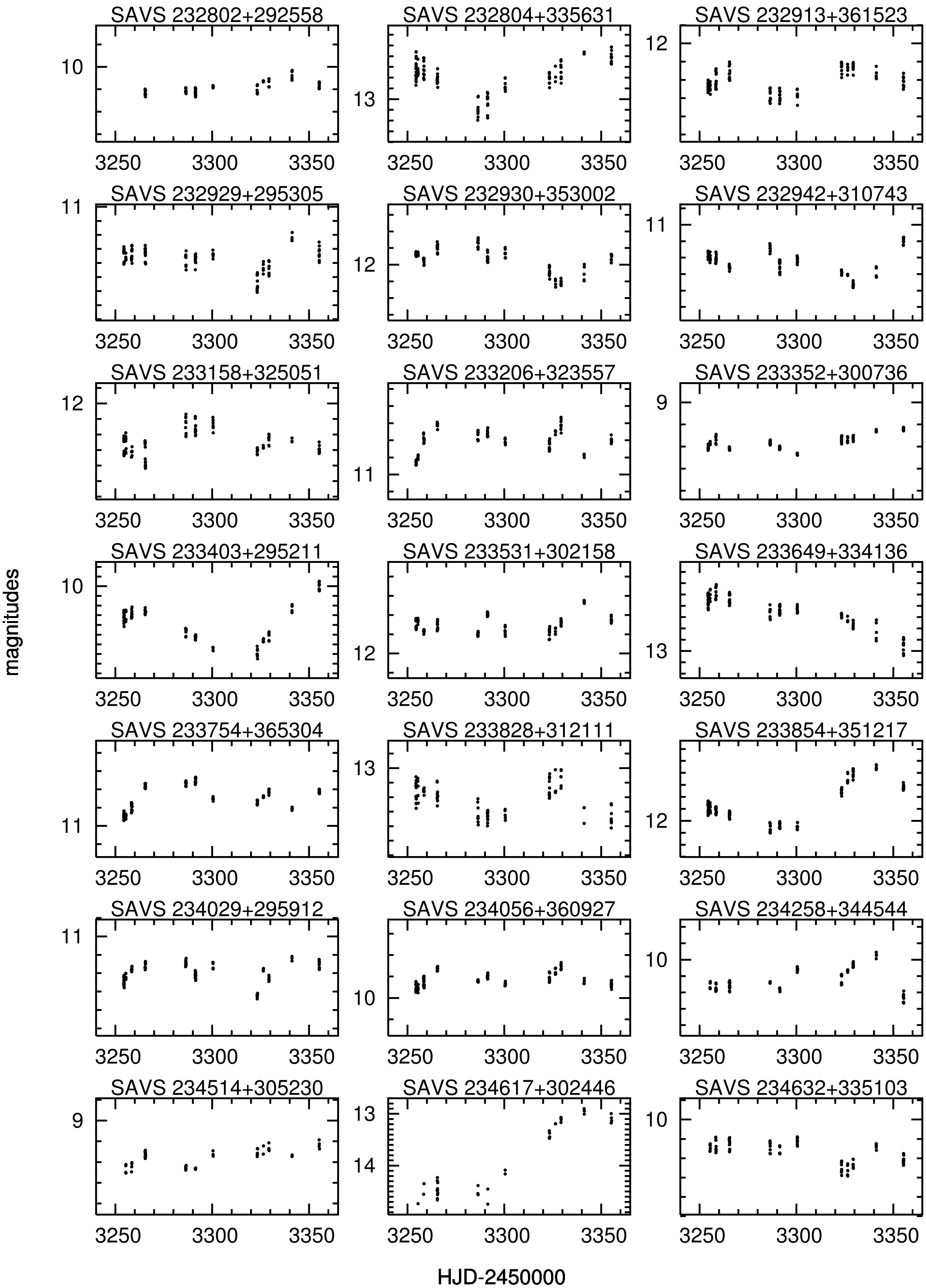

Figure 2. Light curves of new semiregular and irregular variables.

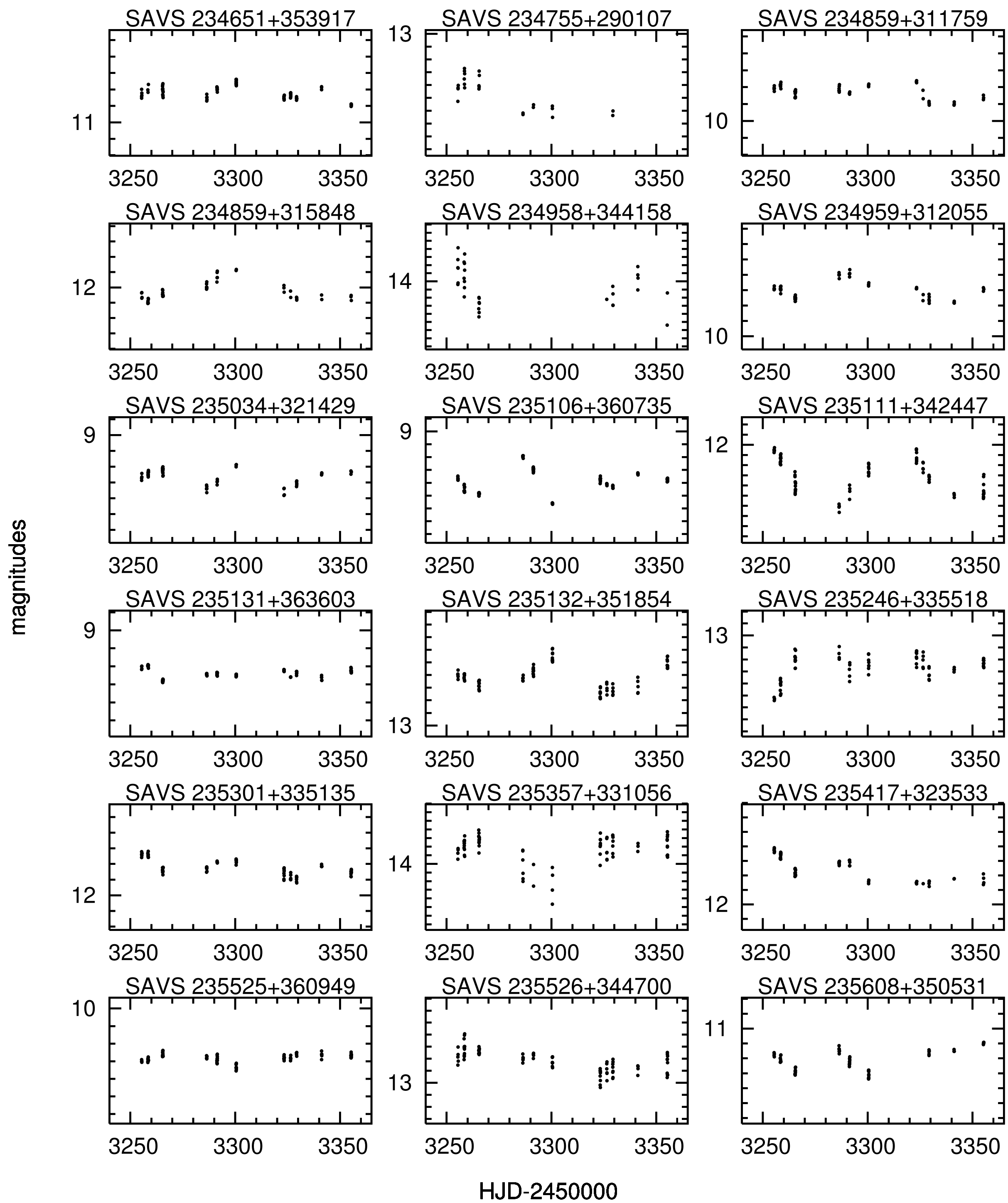

Figure 3. Light curves of new semiregular and irregular variables.

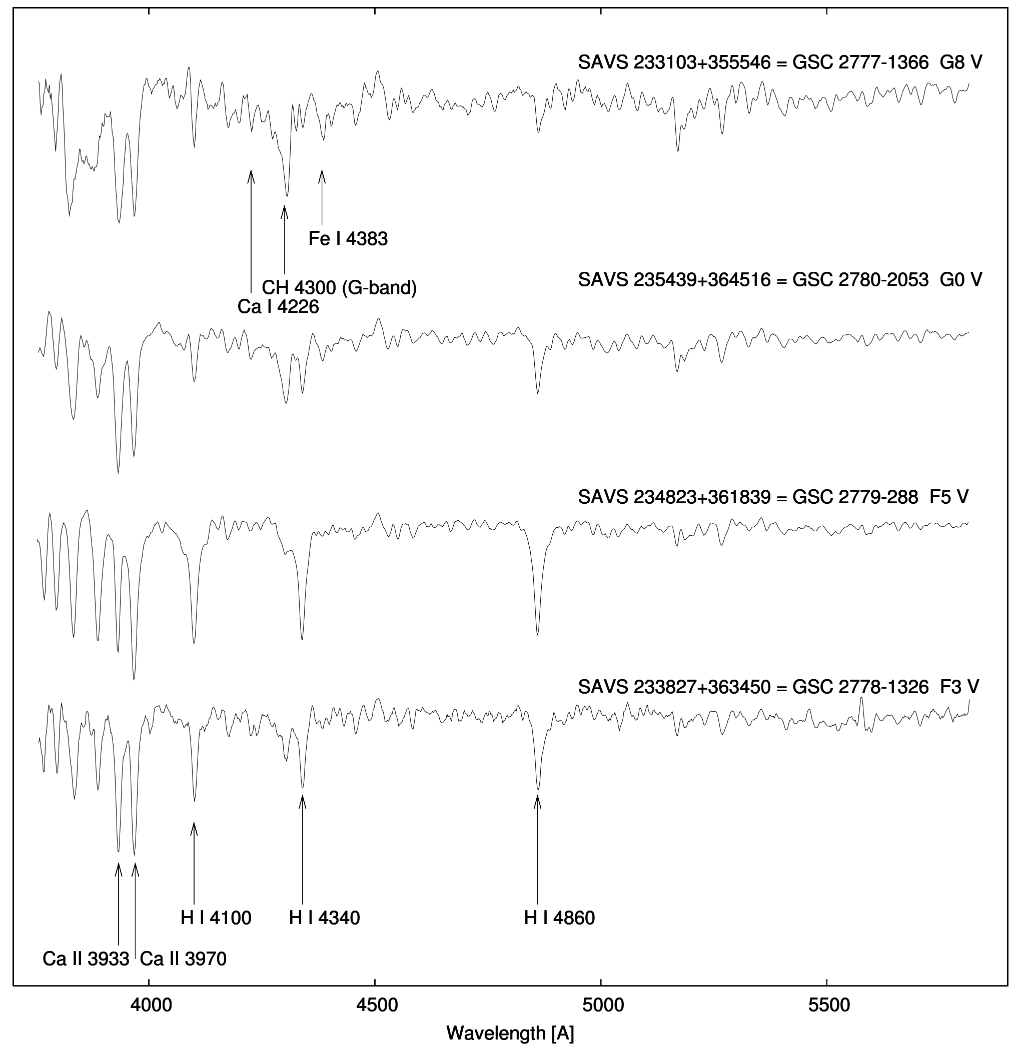

Figure 4. Spectra of several newly detected variables of early spectral type.

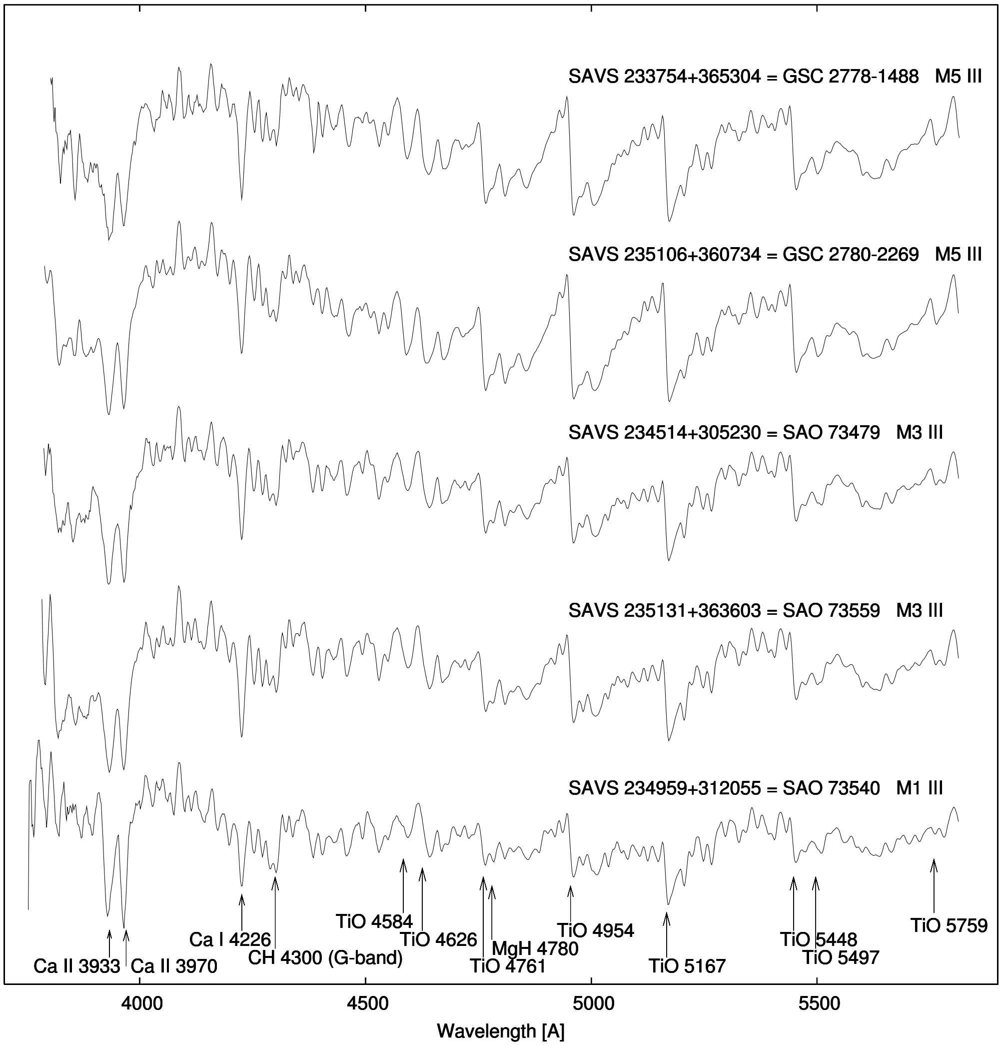

Figure 5. Spectra of several newly detected variables of late spectral type.

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5615

Konkoly Observatory
Budapest
18 March 2005

HU ISSN 0374 – 0676

OPTICAL OBSERVATIONS OF BQ Cam USING ROTSE3D OBSERVATIONS

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BQ Cam is the optical counterpart of the transient X-ray source V0332+53. This system which consists of a Be star and a 4.4 s X-ray pulsator has an orbital period of 34.25 days, eccentricity of 0.31 and semi-major axis of 48 light seconds (Stella et al., 1985). The mass function of 0.1 $M_\odot$ indicates an inclination angle smaller than 11° for the Be star of mass between 16-20 $M_\odot$ and a neutron star mass of 1.4 $M_\odot$.

Two optical brightenings of BQ Cam were detected: one is in 1983 and the other is in 1989 (Goranskij, 2001). Both optical brightenings which were related to the ejection of circumstellar shells were accompanied by X-ray outbursts. Bernacca et al. (1984) indicated that the H_α line showed a P-Cygni profile on their spectra which was obtained in about 20 days after the maximum brightness of BQ Cam was reached. However, Kodaira et al. (1985) did not confirm this identification and found that H_α emission line is the most prominent feature in their spectra. Iye and Kodaira (1985) and Corbet et al. (1986) reported the decline of the equivalent width of the H_α emission line in their spectrum which was related to evolving circumstellar envelope that surrounds Be star.

At the beginning of the year 2004, Goranskij and Barsukova (2004) informed that BQ Cam reached to its brightness maximum predicting a new X-ray outburst within 1-2 years. About 300 days later, Swank et al. (2004) reported the first All Sky Monitor detection of the November 2004 X-ray outburst.

Optical observations of BQ Cam were obtained between JD 2453235 (August 2004) and JD 2453384 (January 2005) using ROTSE3d robotic telescope located at Bakırlıtepe, Turkey. It operates without filters and has a wide passband which peaks at 550 nm (Akerlof et al., 2003). ROTSE magnitudes were calculated by comparing all the field stars to USNO 2.0 R-band catalog. About 1600 CCD frames were analyzed following the procedure described in Kızıloğlu et al. (2005), Smith et al. (2002) and Smith et al. (2003).

All frames are dark-and-flat-field corrected automatically as soon as they are exposed. A pipeline procedure feeds corrected frames to SExtractor package (Bertin and Arnouts, 1996). 5 pixel (17 arcsec) diameter aperture is used to determine all source candidates within the FOV. Gaussian centers and the instrumental magnitudes of the identified objects are compared against USNO A2.0 catalog with a triangle-matching technique. An approximate R-band magnitude zero point offset of each frame is calculated using a relative photometry algorithm which results in a calibrated list of R-band magnitudes of the objects. Unfortunately ROTSE has no color information. Approximate V-band values can be obtained by applying a constant correction factor from the observations of the reference stars (Goranskij, 2001). We applied differential photometry in order to eliminate the atmospheric and other systematic effects over hundred days of observations. These include seeing variations in a specific night and between observation days, and also pointing variations of the order of $\sim 0\overset{\circ}{.}3$ in large FOV ($1\overset{\circ}{.}8$). Table 1 lists the reference stars used for the light curve. m_{ROTSE} is the mean measured ROTSE magnitude and σ is the estimated error of the mean for all the frames.

Table 1. Coordinates and photometric magnitudes of BQ Cam and the reference stars.

Star	$\alpha(J2000)$	$\delta(J2000)$	USNO.A2.0 R	m_{ROTSE}	σ
BQ Cam	$03^h34^m59\overset{s}{.}92$	$+53°10'23\overset{''}{.}3$	14.2		
1	$03^h34^m52\overset{s}{.}90$	$+53°11'53\overset{''}{.}6$	13.8	13.919	0.106
2	$03^h35^m11\overset{s}{.}46$	$+53°08'56\overset{''}{.}3$	13.3	13.255	0.103
3	$03^h35^m03\overset{s}{.}73$	$+53°12'09\overset{''}{.}1$	13.2	13.147	0.102

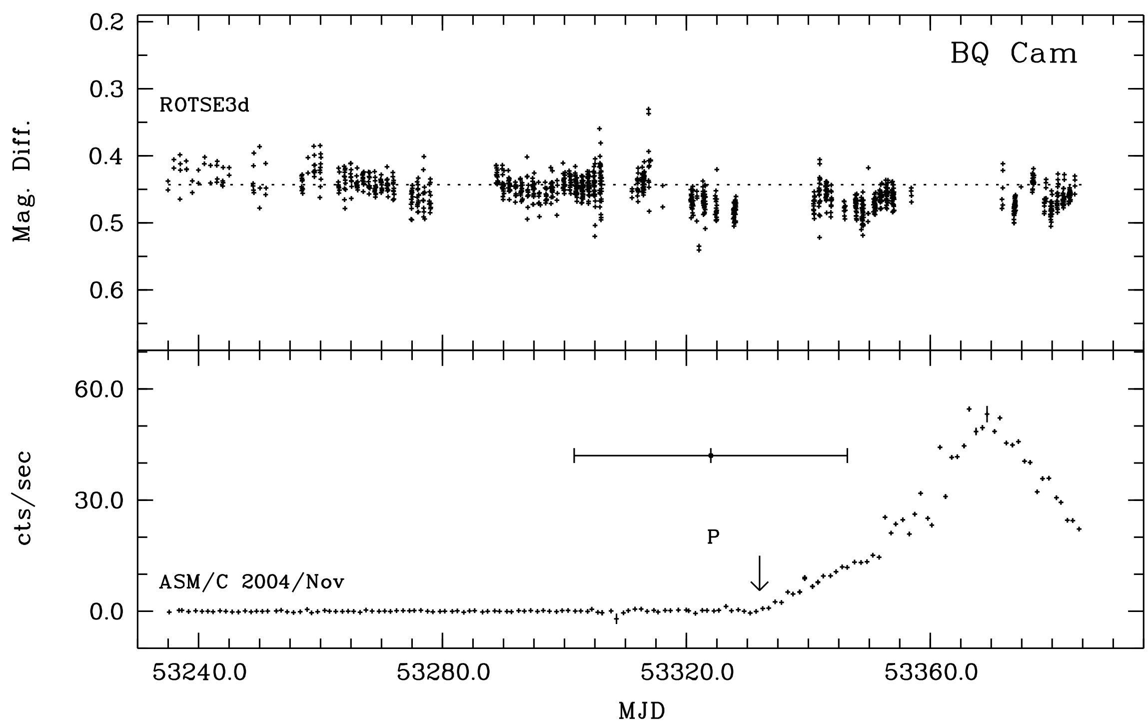

Figure 1. ROTSE3d light curve of BQ Cam (upper panel) and X-ray light curve (lower panel) of V0332+53 taken with RXTE/ASM (daily average of 5.0-15.0 KeV band light curve). Error bars on ROTSE3d data points are not shown for clarity however estimated errors are of the order $\sim 0\overset{m}{.}02$. Dotted line shows mean differential magnitude calculated for the data before the periastron passage time. Arrow points the first ASM detection of November 2004 outburst (MJD = JD − 2400000.5). The region of periastron passage is also indicated with its uncertainty in time.

In Figure 1 the difference in the ROTSE magnitudes of BQ Cam and the mean of the reference stars were plotted together with the X-Ray observations. RXTE-ASM/C-band daily averaged data of V0332+53 shows the Nov 23, 2004 X-ray outburst in counts/s. On the same figure the periastron passage time is also shown with its uncertainty in time. The X-ray outburst occurs close to the time of periastron passage.

The light curve of BQ Cam which is in Be star phase remained almost the same during the observation time interval of about 150 days, however $\sim 0\overset{m}{.}04$ decrease in brightness before the X-ray outburst is notable. Observed rapid low-amplitude variability on time scales of few days is typical to BQ Cam (Goranskij, 2001). Figure 2a is an example of low-amplitude irregular variability with an amplitude of about $\sim 0\overset{m}{.}02$. Figure 2b shows a near sinusoidal variation of duration $\sim$ 11 days. The fading of the source can be expected after the X-ray outburst was completed if the cessation of X-ray outburst was

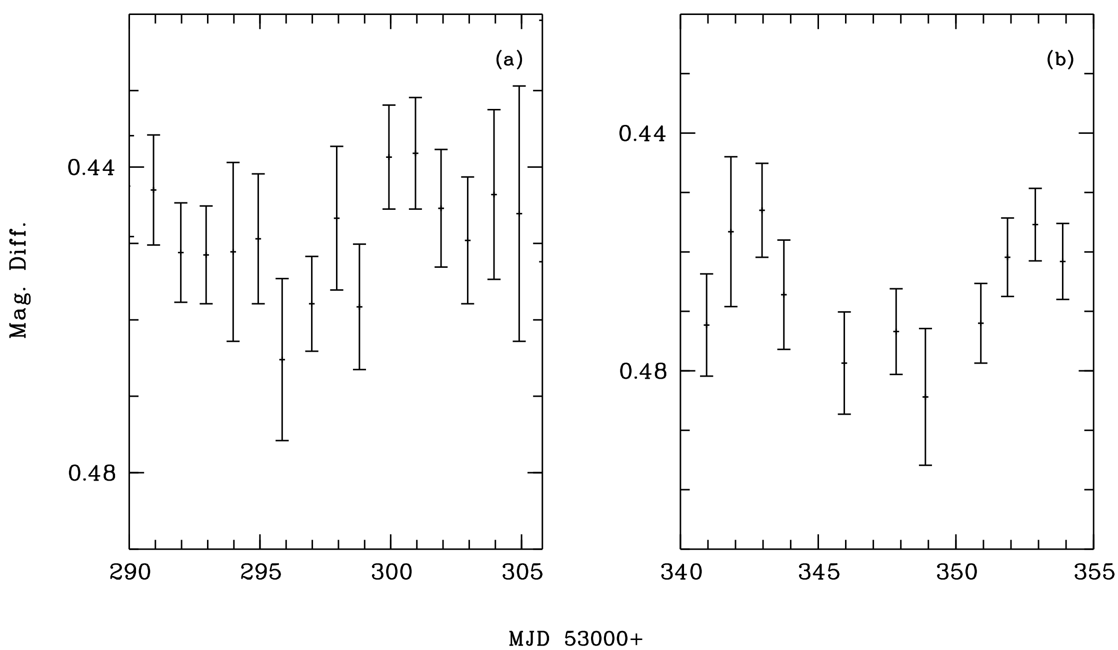

Figure 2. Examples of the daily averaged variations of ROTSE3d light curve of BQ Cam before and after November 2004 outburst (MJD = JD − 2400000.5). Error bars are the variance of variations within each night of observations.

Further ROTSE3d observations are being performed to see the long term variations.

Acknowledgements:

This study was supported by TUG (Turkish National Observatory), TUBITAK (Turkish Scientific and Research Council).

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5616

Konkoly Observatory
Budapest
18 March 2005

HU ISSN 0374 – 0676

NEW TIMES OF MINIMA OF ECLIPSING BINARY STARS

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Department of Physics, Faculty of Arts and Sciences, Çanakkale Onsekiz Mart University, TR-17100, Çanakkale, Turkey; e-mail: bakisv@physics.comu.edu.tr

Observatory and telescope:
40-cm Cassegrain-Schmidt telescope of the Çanakkale University Observatory, (ÇUG40) 40-cm Cassegrain telescope of the TÜBITAK National Observatory, (TUG40) 30-cm Cassegrain-Schmidt telescope of the Çanakkale University Observatory, (ÇUG301, ÇUG302)

Detector:	ST10XME camera, Peltier cooling, KAF 3200ME chip, $17' \times 12'$ FOV, 1092×736 pixels. ST237 camera, Peltier cooling, TC237 chip, $11' \times 8'$ FOV, 320×240 pixels. SSP5 photometer, Hamamatsu R4457 photomultiplier tube at Çanakkale University Observatory. SSP5 photometer, Hamamatsu R4457 photomultiplier tube at TÜBITAK National Observatory

Method of data reduction:
Reduction of the CCD frames was made with C-MUNIPACK[1] software, and reduction of photoelectric observations was made by ATMEX[2] software.

Method of minimum determination:
Kwee – van Woerden method (Kwee & van Woerden, 1956).

[1]Motl, D., 2004, C-MUNIPACK, `http://integral.sci.muni.cz/cmunipack/`
[2]Keskin, V., 2001, ATMEX, `http://astronomy.sci.ege.edu.tr/~keskinv/`

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
AP Aur	52739.4577	0.0007	II	–	ÇUG301
TT Aur	53300.5112	0.0003	II	BV	ÇUG40
AR Boo	52772.3160	0.0002	II	–	ÇUG301
UW Boo	52772.3166	0.0002	I	–	ÇUG301
SV Cam	52725.4855	0.0002	I	–	ÇUG301
TV Cas	53308.3275	0.0003	I	Rc	ÇUG302
	53337.3289	0.0016	I	B	ÇUG40
EM Cep	53244.4535	0.0010	II	V	TUG40
	53261.3670	0.0010	II	U	ÇUG40
	53280.3229	0.0010	I	U	ÇUG40
GSC 4288-0186	52791.5388	0.0003	I	–	ÇUG301
	52864.3624	0.0006	I	–	ÇUG301
	52967.5258	0.0004	I	–	ÇUG301
	53137.4431	0.0005	I	BVIc	ÇUG302
	52861.3828	0.0003	II	–	ÇUG301
	52867.4522	0.0014	II	–	ÇUG301
	52879.5890	0.0012	II	–	ÇUG301
	52934.2099	0.0005	II	–	ÇUG301
	53134.4590	0.0004	II	BVRcIc	ÇUG302
	53213.3532	0.0003	II	BV	ÇUG302
	53219.4218	0.0004	II	BVRcIc	ÇUG302
UW Cyg	52772.5171	0.0001	I	–	ÇUG301
ZZ Cyg	52786.3575	0.0001	I	–	ÇUG301
Y Leo	52710.3099	0.0001	I	–	ÇUG301
UU Leo	52736.3725	0.0005	II	–	ÇUG301
UX Leo	52718.3936	0.0002	I	–	ÇUG301
EW Lyr	52780.4049	0.0001	I	–	ÇUG301
	52781.3824	0.0013	II	–	ÇUG301
	52860.3080	0.0002	I	–	ÇUG301
V502 Oph	52772.3815	0.0002	I	–	ÇUG301
FZ Ori	52725.3101	0.0002	I	–	ÇUG301
IU Per	53308.3821	0.0003	I	Rc	ÇUG302
RZ Tau	53308.4687	0.0001	I	Rc	ÇUG302

Remarks:

We are presenting 33 minima times of 18 eclipsing binaries. Updated ephemerides for primary and secondary minimum light of recently discovered eccentric binary GSC 4288-0186 by Bakis, et al. (2003) are as follows:
Min.HJD=2453137.4429 + 6.06846649 × E
Min.HJD=2452515.4852 + 6.06840357 × E, respectively.

Acknowledgements:

This work was partly supported by the Research Found of Çanakkale Onsekiz Mart University and TÜBITAK National Observatory.

References:

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Kwee, K. K., & van Woerden, H., 1956, *Bull. Astron. Inst. Neth.*, **12**, 327.

ERRATA FOR IBVS 5381 AND 5496

Errata for the paper IBVS No. 5381 titled *"GSC 4288-186: a New Eccentric Binary"*: Minima times reported as

52515.4800	II
52591.2761	I
52594.3713	II

should be changed as

52515.4840	II
52591.2817	I
52594.3767	II

Erratum for the paper IBVS No. 5496 titled *"BVR Photometry of the Contact Binary Star V829 Herculis"*: the comparison and check stars were given in the paper as BD+38°2701 and BD+38°2708, respectively. They should be BD+35°2882 for comparison and BD+35°2891 for the check star.

Volkan Bakis

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5617

Konkoly Observatory
Budapest
22 March 2005

HU ISSN 0374 – 0676

XY Pic: A DETACHED BINARY MISCLASSIFIED AS A W UMa SYSTEM

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Recently Selam (2004) published a list of 64 genuine W UMa-type binaries observed by *HIPPARCOS*. These had been extracted from a larger sample based on theoretical fitting of their light curves, using the simplified light curve synthesis by Rucinski (1993), yielding the fundamental system parameters. During the selection process, detached and semi-detached systems were excluded.

We here report on observations of one of the supposedly genuine W UMa or EW-type systems, XY Pic (HD 38873), which we show is not an EW system. The *HIPPARCOS* light curve is shown in Fig. 1 (taken from the on-line *HIPPARCOS* catalogue; ESA 1997). The light curve resembles somewhat an EW system, although with some asymmetry. In the GCVS (e.g. Kazarovets et al. 2003) it is also listed as an EW type variable.

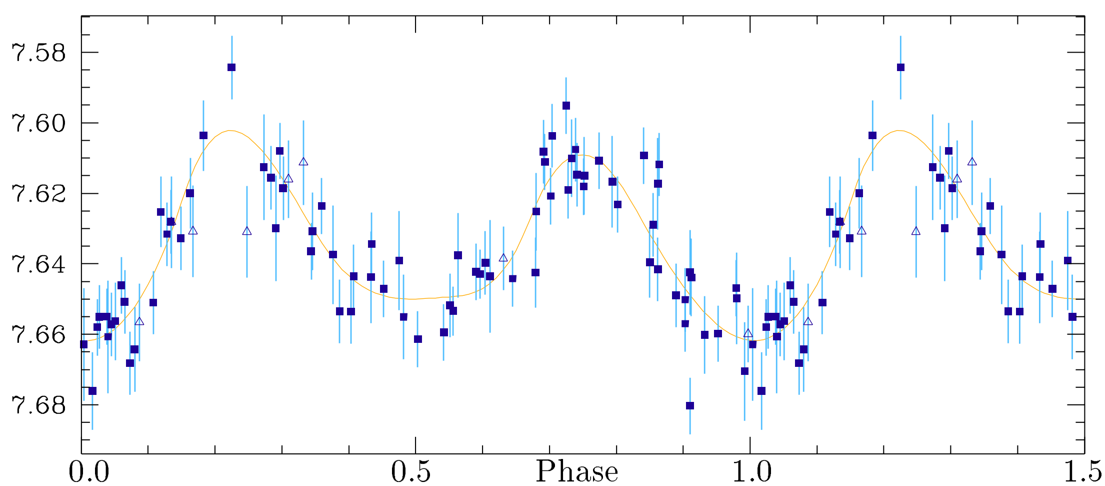

Figure 1. The HIPPARCOS light curve of XY Pic from ESA (1997).

We observed XY Pic on February 5 and 7, 2005 using the FEROS spectrograph at the ESO/MPI-2.20m telescope at La Silla, Chile. Standard data reduction was performed with MIDAS including bias and flatfield correction, order extraction and wavelength calibration. The spectra have a FWHM resolution of 0.15 Å (R$\sim$48000) and cover the range 3800–9000 Å.

In Fig. 2 we show a part of the three spectra, labeled by modified Julian date, and with the rest-wavelength of the prominent Ca I line at 6162.173 Å indicated. As can be seen, the star is not a fast rotator as expected for an EW system, and also the period $P = 0.2972608$ d^{-1} is incompatible with the observed spectral line shift. The star may indeed be a binary, as indicated by the shift of the lower spectrum, but with a period much larger than typical EW-type periods.

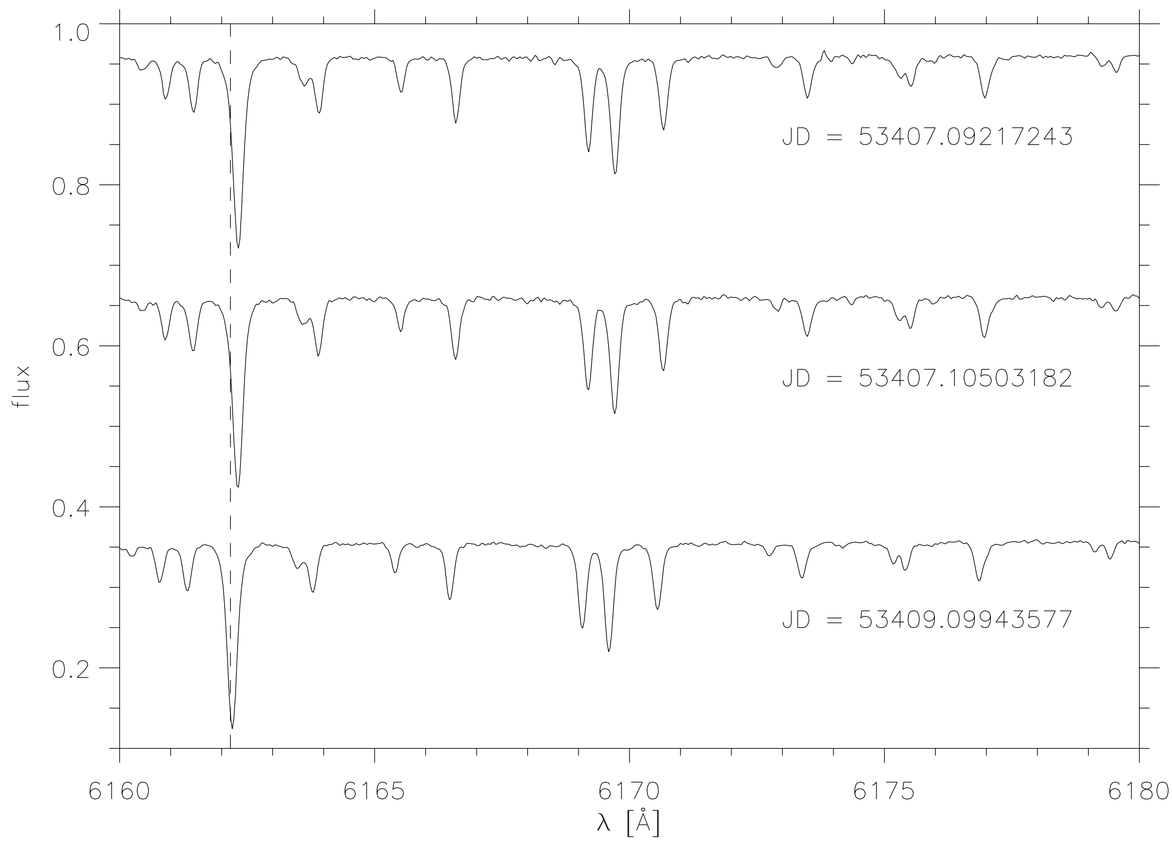

Figure 2. A part of the three spectra of XY Pic, including the 6162.173 Ca I line (dashed line).

Table 1: The atmospheric parameters and the derived abundances for XY Pic. Errors on abundances are rms around the mean for all lines used. n is the number of lines of each element. Abundances are given relative to solar values, i.e. $\mathrm{A(M)} = [\mathrm{M/H}] = \log N_{\mathrm{M}}/N_{\mathrm{H}} - (\log N_{\mathrm{M}}/N_{\mathrm{H}})_{\odot}$.

T_{eff}	6900 ± 100 K
$\log g$	3.80 ± 0.15
ξ_t	$1.6 \pm 0.2\ \mathrm{km\,s^{-1}}$
A(Fe)	$-0.05(10)$, $n = 236$
A(Ca)	$+0.04(6)$, $n = 12$
A(Cr)	$+0.18(18)$, $n = 38$
A(Ni)	$-0.17(11)$, $n = 47$
A(Ti)	$+0.10(11)$, $n = 24$

Using the procedures described in Dall et al. (2005a, 2005b) we performed an abundance analysis following the fitting of an atmospheric Kurucz (1993) model using 236 Fe I and Fe II lines. The results are listed in Table 1. Using the list of global stellar parameters by Gray (1992) we find that the atmospheric parameters correspond to a spectral type of F0III (SIMBAD quotes F0III/IV).

We propose that XY Pic may be a wide binary with an unseen lower-mass companion, and that the *HIPPARCOS* light curve can be explained by δ Scuti type pulsation, which would be consistent with the observed period, the amplitude of the variation and with the spectral type.

This example demonstrates that even the most careful light curve analysis is not enough to determine the true variability nature of an object, and that spectroscopy is needed to secure a positive identification.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5618

Konkoly Observatory
Budapest
23 March 2005

HU ISSN 0374 – 0676

GSC 4232.2830, AN ECLIPSING BINARY WITH ELLIPTICAL ORBIT

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[3] Crimean Astrophysical Observatory, Ukraine, visiting amateur astronomer

GSC 4232.2830 ($20^h01^m28^s.407$, $+61°10'17''.18$, 2000.0, v=$12^m.1$) was suspected to be variable by V.P.G. in the routine overview of photographic plates taken with 40-cm astrograph of SAI Crimean station. Two weakenings by $\approx 0^m.7$ with time difference of $8^d.1$ were observed in 1990 September, which suggested that this star was an Algol type variable star. However, no other eclipses were found in the SAI plate collection of this sky region including 95 plates taken in 83 nights in the time range JD 2444665–2449358. The analysis of SAI observations excluded the period $8^d.1$, and other possible periods with P=$8^d.1$/N (N = 2,3,4,...).

To define orbital elements of the binary, we searched for observations the Sonneberg Observatory plate collection, NSVS database (Wozniak et al., 2004), and carried out visual monitoring with a small telescope equipped with an electronic image tube, an analogue of a night vision device. Later, when we had found a preliminary solution, we carried out accurate CCD photometry to improve the orbital elements. A total of our efforts is reflected in the Table 1. We used the nearby star, GSC 4232.2395 as a comparison star for CCD photometry, measured its $UBVR_C$ magnitudes relative to V.M.Lyuty's standard near Cyg X-2 (Basko et al., 1976), and create the uniform standards for eye estimates. The photometric data for the comparison star, and for the eclipsing binary GSC 4232.2830 in maximum light are given in Table 2.

We should note, that the depths of eclipses in the NSVS database do not exceed $0^m.2$, what contradicts to other observations. We suppose that NSVS measurements concern to integral light of two stars, a variable star, and a nearby brighter star, GSC 4232.2395, due to low resolution of this survey, that is $72''$. The data given in Table 2 imply the integral V magnitude $11^m.22$, what is brighter than the NSVS value, $11^m.68$, by $0^m.46$. With this correction to NSVS magnitudes, and $V = 11^m.70$ for GSC 4232.2395, we extracted NSVS light curve of the eclipsing binary.

Using all the available observations, we found an orbital solution with an elliptical orbit and with the period of $11^d.6$. The center of the secondary mimimum occurs at the orbital phase $0^p.69835 \pm 0.00002$ or $8^d.1$ after the primary minimum. The improved ephemeris derived using accurate CCD observations is the following:

$$\text{HJD Min I} = 2453278.3185(2) + 11^d.628188(5) \times E.$$

Table 1. The observations of GSC 4232.2830

Source (J.D. range)	No. obs. (nights)	ptm system	No. eclip.	Telescope	Recording	Observer
Moscow SAI collection (2444665-2449358)	95 (83)	pg	2	40-cm, plates	eye estimates	V.P.G.
Sonneberg collection (2426091-2448771)	262 (183)	pg	4?	plates	eye estimates	S.Yu.Sh.
NSVS Database (2451274-2451630)	525 (142)	V	7	Canon lense	Thomson TH7899M CCD	Wozniak, et al.
Nizhny Arkhyz, SAO, home observatory (2452704-2453279)	443 (71)	r	3	25-cm + IP-10 image tube	eye estimates	V.P.G.
Crimean Observatory (2453278)	118 (1)	R_J	1	38-cm	Apogee-47 CCD	A.G.
Crimean Observatory (2453321)	370 (1)	BVR_J	1	38-cm	Apogee-47 CCD	S.Yu.Sh.
SAI Crimean station (2453243-2453244)	389 (2)	V	1	50-cm Maksutov	Meade Pictor-416 CCD	S.Yu.Sh.
SAI Moscow (2453263, 2453278)	792 (2)	BVR_J	1	70-cm	Apogee-7p CCD	S.Yu.Sh.
Special Astrophysical Observatory (2453321)	118 (1)	$UBVR_C$	1	100-cm	EEV42-40 CCD	V.P.G.

Table 2. $UBVR_C$ magnitudes of the nearby (comparison) star, and out-of-eclipse magnitudes of the eclipsing binary

Star	U	B	V	R_C
GSC 4232.2395	$11^{m}_{.}910$	$11^{m}_{.}956$	$11^{m}_{.}702$	$11^{m}_{.}77$
	±0.020	±0.021	±0.028	±0.03
GSC 4232.2830 (Max)	13.198	12.960	12.239	11.96
	±0.020	±0.018	±0.005	±0.02

Table 3. Times of Minima

JD hel. 2400000+	Min	$O-C$ day	Obs. set	JD hel. 2400000+	Min	$O-C$ day	Obs. set
31204.512:	II	0.0019	Sonneberg	51452.68	I	−0.0130	NSVS
31739.392:	II	−0.0148	Sonneberg	51487.60	I	0.0225	NSVS
37960.505	II	0.0176	Sonneberg	51603.95	I	0.0906	NSVS
38673.319	I	0.0046	Sonneberg	52906.303	I	0.0864	it
48150.318	I	0.0304	SAI	53150.41	I	0.0016	it
48158.427	II	0.0188	SAI	53193.413	II	−0.0006	it
51324.758	I	−0.0249	NSVS	53243.4335	I	−0.0004	CCD
51359.73	I	0.0625	NSVS	53263.1827	II	−0.0001	CCD
51382.86	I	−0.0639	NSVS	53278.3185	I	0.0000	CCD
51402.69	II	0.0225	NSVS	53321.3237	II	0.0000	CCD

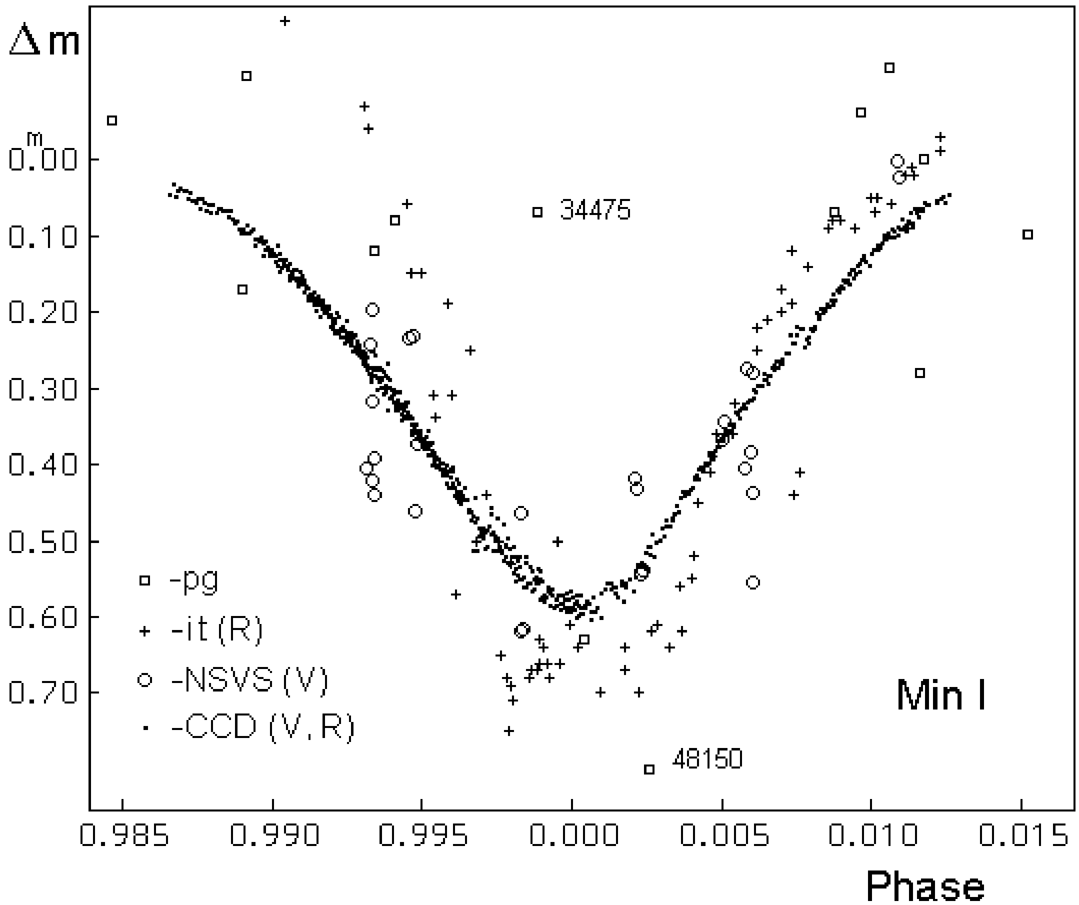

Figure 1. Observations of GSC 4232.2830 in the primary minima.

The moments of weakenings and mid-eclipses are given in Table 3. $O-C$ analysis does not show orbital period variations during the time interval of observations, or any evidence of the apsidal motion.

The results of all the observations are shown in Fig. 1 for Min I, and in Fig. 2 for Min II. The magnitudes in different filters are calculated relative to out-of-eclipse level, and combined together with small shifts along the magnitude axis, if needed.

The observations show that both eclipses have about equal depth, $\approx 0^{\mathrm{m}}_{.}60$, but essentially different duration, $0^{\mathrm{p}}_{.}028$ ($7^{\mathrm{h}}_{.}8$) for Min I, and $0^{\mathrm{p}}_{.}0175$ ($4^{\mathrm{h}}_{.}9$) for Min II. The eclipses are partial. Using the displacement of the secondary minimum and eclipse width ratio, we calculate the orbital eccentricity of 0.39, and $\omega = 322°$. CCD photometry gives mean colours $U-B = 0^{\mathrm{m}}_{.}238 \pm 0^{\mathrm{m}}_{.}027$, and $B-V = 0^{\mathrm{m}}_{.}721 \pm 0^{\mathrm{m}}_{.}019$ without notable colour variations in the eclipse phases. These colours suggest that the components of the system are solar type main sequence stars.

We used the same set and magnitudes of comparison stars to reduce the photographic eye estimates. The old Sonneberg photographic observations indicate that the eclipses were shallower in the middle of the past century than in the present time. There are some contradictions between observations marked in Fig. 1 and 2, when the observer does not notice weakening in the eclipse phases. One photographically traced eclipse, and 2-2 outstanding data points are marked with their Julian dates (JD−2400000) in these Figures.

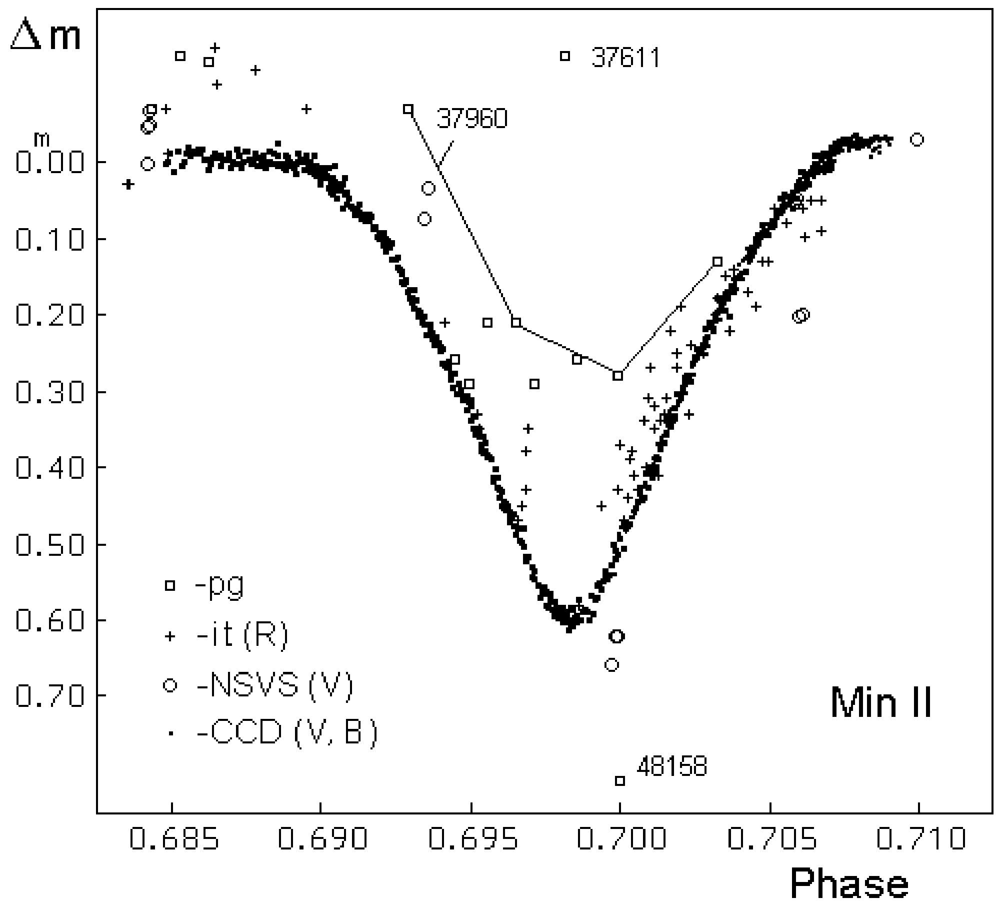

Figure 2. Observations of GSC 4232.2830 in the secondary minima

The contradictions may suggest that the depth of eclipses varied, as in the well known system SS Lac (Mossakovskaya, 1993; Milone et al, 2000; Torres and Stefanik, 2001). The eclipse depth variations should be verified with more precise observations taken during a longer time interval.

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Mossakovskaya, L.V., 1993, *Astron. Letters*, **19**, 35
Torres, G. & Stefanik, R.P., 2000, *AJ*, **119**, 1914
Wozniak, P.R., Vestrand, W.T., Akerlof, C.W., et al., 2004, *AJ*, **127**, 2436

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5619

Konkoly Observatory
Budapest
29 March 2005

HU ISSN 0374 – 0676

THERE IS NO THIRD BODY IN THE ECLIPSING BINARY SYSTEM HS HERCULIS

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HS Herculis (HD 174714, HIP 92478, BD+24°3552, $\alpha_{2000} = 18^h50^m50^s$, $\delta_{2000} = 24°43'12''$) is a detached eclipsing binary system with an Algol-type light curve and period of $1\overset{d}{.}637434$. It contains a B5-type primary and an A4-type secondary components. The variability of HS Herculis was first discovered by Martynov (1940) in 1934 and independently by Jacchia (1940) in 1940. The first spectroscopic study was published by Cesco & Sahade (1945). Hall & Hubbard (1971) published the first period analysis of HS Herculis and they found an apsidal motion with a period of 15.5 years in the system. Martynov & Lavrov (1972), Todoran (1992) and Khaliullina & Khaliullin (1992) confirmed the apsidal motion and computed the values of 110-130 years, 60 years, and 92 years for the period, respectively. On the basis of the same data as Todoran's, Bastian (1993) rejected the apsidal motion hypothesis and suggested a light-time effect with a period of 60 years. Todoran & Agerer (1994) confirmed the apsidal motion and rejected any assumption on the presence of a third body. Finally, Wolf et al. (2002) determined a period of 78 years for the apsidal motion and, in addition to that, they proposed a light-time effect with a period of about 85 years in the system.

The observations of HS Her were made with the 30 cm Maksutov telescope (equipped with a SSP-5A photometer containing a side-on R1414 Hamamatsu photomultiplier) of the Ankara University Observatory in 2002 and 2003. The observations are carried out using standard Johnson U, B and V filters. HD 343238 (HIP 92624) and HD 343123 (PPM 107921) are used as comparison and check stars, respectively.

New minimum times of HS Herculis are given in Table 1. Note that the standard errors are given in parenthesis.

Table 1. New minimum times of HS Herculis

Min time HJD	Type	Filter	Observers
2452472.3943 (9)	II	UBV	TÇ & ET
2452513.3223 (22)	II	BV	TÇ & ET
2452833.4343 (5)	I	UBV	OA & MY
2452842.4531 (16)	II	UBV	TÇ
2452856.3594 (5)	I	UBV	TÇ & GG

Observers: TÇ: T.Çolak, ET: M.E.Törün, GG: H.G.Gökay, OA: O.Aksu, MY: M.Yılmaz

On the basis of 101 minimum times (including 33 secondary minima), we analyzed the $O-C$ curve of HS Herculis. The corresponding $O-C$ differences refer to the following linear ephemeris:

$$\text{Min I} \;=\; \text{HJD } 2452856.3646 + 1\overset{\text{d}}{.}6374341 \text{ E} \qquad (1)$$

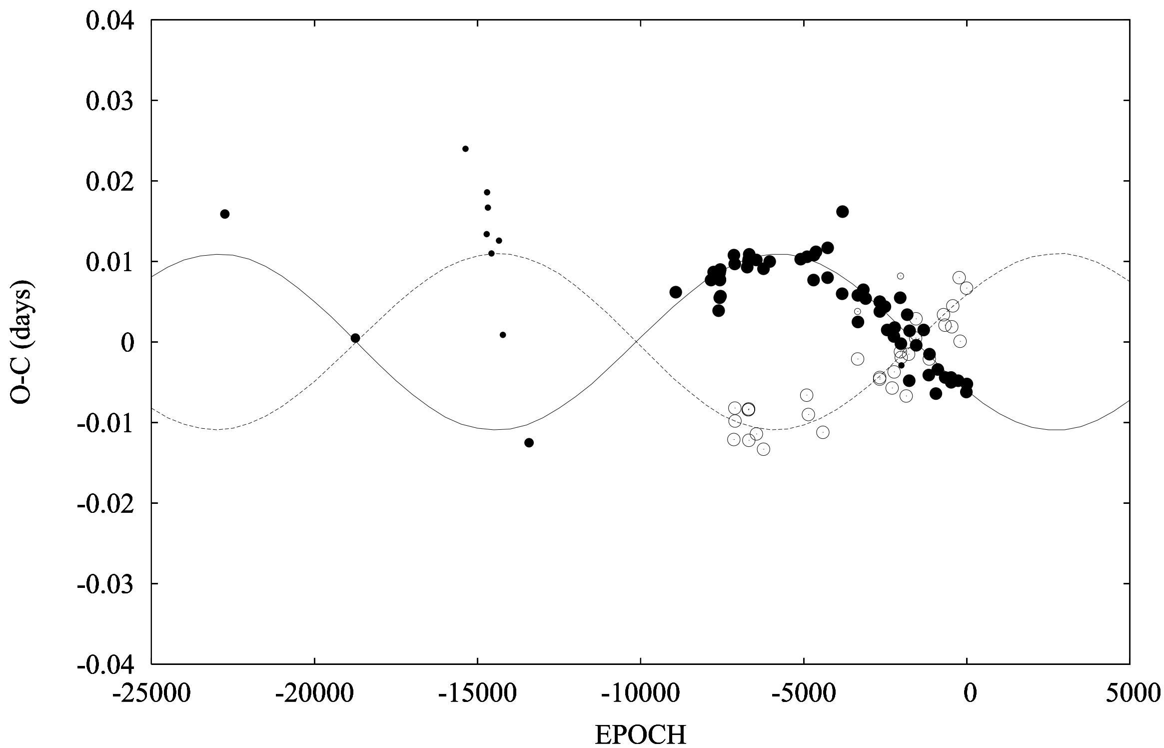

Figure 1. The $O-C$ diagram of HS Herculis.

The $O-C$ values for the minimum times and the $(O-C)_{II}$ residuals from apsidal motion analysis are shown in Fig. 1 and Fig. 2 respectively. Primary and secondary minima are plotted as filled dots and open circles respectively. Larger symbols correspond to more reliable points (CCD, photoelectric and photographic data), smaller symbols correspond to less reliable visual estimates and to some photoelectric observations that have probable systematic errors. The weights used in the calculations are 1.0 for CCD and photoelectric minima, 0.5 for photographic minima and 0.1 for visual estimates. The theoretical fit curves are determined by using the apsidal motion analysis method described by Giménez and García-Pelayo (1983) and on equations revised by Giménez and Bastero (1995). Apsidal motion elements are computed adopting the orbital inclination of $i = 88\overset{\circ}{.}7$ which is derived by Hall & Hubbard (1971) from light curve analysis. The full and dashed curves in Fig. 1 represent the fit curves of the primary and secondary minima, respectively.

All the points except seven minima (which are located between Epoch -15000 and -14000 in Fig. 1 and Fig. 2) correspond to the theoretical apsidal motion curve. It is clear that these seven points could not be represented by the fit curve. However, these minima were obtained from visual observations and they have very low weights in the calculations. Since we know that visual observations have major errors and show very

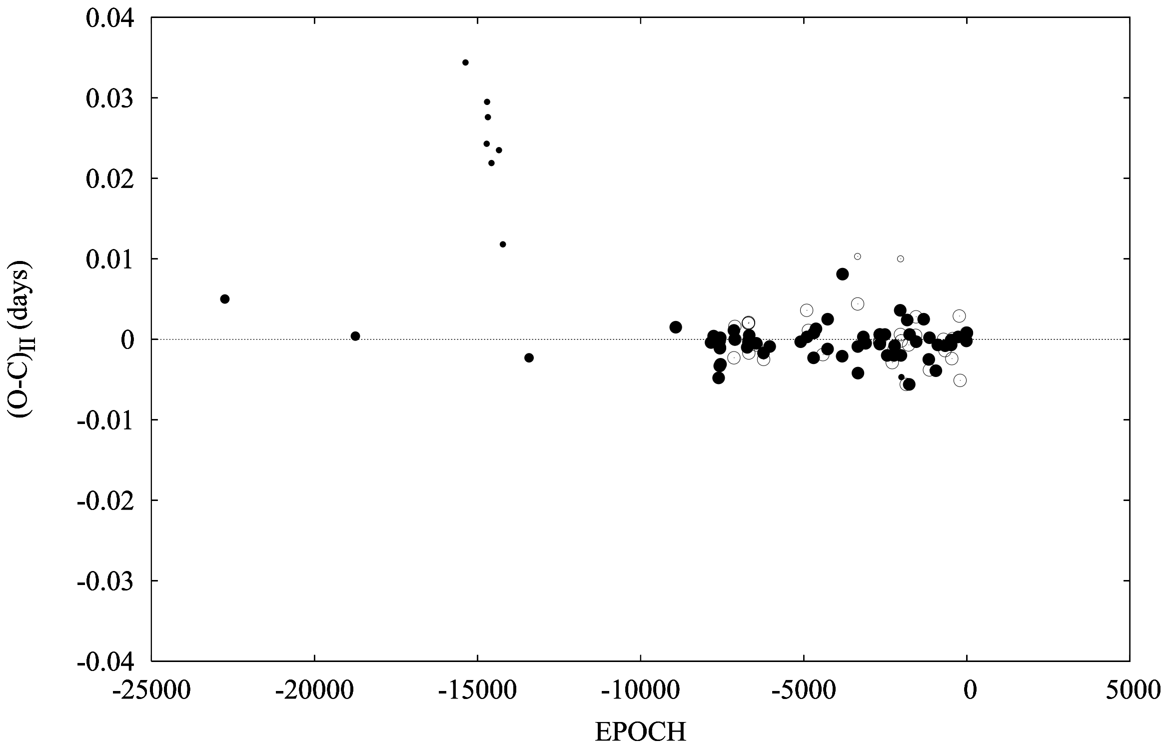

Figure 2. The $(O-C)_{II}$ diagram of HS Herculis.

large scatters in general, in our opinion, it won't be suitable to hypothesize a light-time effect in the system, on the basis of them. Furthermore, the first and second minima not used in previous studies of HS Her, clearly deny a light-time hypothesis. These two minima obtained from photographic observations are relatively more reliable points then the visual estimates. Note that these two minima are published by Jacchia (1940) and Martynov (1985), respectively, and the first minimum time is also available on Dieter Lichtenknecker's database which is maintained by Dr. Walter (Paschke 2004).
As a result we find that the mechanism of the period variability can be only an apsidal motion with a period of about 77 years and there is no evidence for presence of a third body in the system. Our results of apsidal motion analysis are given in Table 2.

Table 2. Apsidal motion parameters of HS Herculis

Parameters	Value
T_0 (HJD)	2452856.3646 $\pm$ 0.0002
P_s (days)	1.6374341 $\pm$ 0.0000001
e	0.0205 $\pm$ 0.0010
ω_0 (deg)	302.5 $\pm$ 4.0
$\dot{\omega}$ (deg/cycle)	0.0210 $\pm$ 0.0010
P_a (days)	1.6375296 $\pm$ 0.0000042
U (years)	76.9 $\pm$ 3.4

Acknowledgements: We are grateful to Dr. I. Ethem Derman for his supports on this research and we are thankful to Dr. Anton Paschke, Dr. Szilárd Csizmadia, Dr. Milos Zejda, Dr. Marek Wolf and Dr. Colin Scarfe for their help for collecting the data.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5620

Konkoly Observatory
Budapest
30 March 2005

HU ISSN 0374 – 0676

A NEW BRIGHT U Gem VARIABLE IDENTIFIED WITH THE X-RAY SOURCE 1RXS J053234.9+624755

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During a programme of optical identification of X-ray sources from the ROSAT all-sky survey bright source catalogue (Voges et al., 1999) with variable stars in the ROTSE1 database (Woźniak et al., 2004) it was found that the uncatalogued variable at $05^h32^m32\overset{s}{.}68$ $+62°47'54\overset{''}{.}7$ was coincident the X-ray source 1RXS J053234.9+624755. The ROTSE1 light curve is available from the Northern Sky Variability Survey (NSVS) website (see reference Woźniak et al., 2004) and is shown in Figure 1. ROTSE1 magnitudes are broadly equivalent to R. The data show two, or including the poor quality points, three large outbursts from magnitude $R \sim 16.0$ to 12.9. The last outburst is particularly well covered by the ROTSE1 data and is shown in more detail in Figure 2. This, and the rapid rise time of the second outburst argues against any other type of large variation suggesting that this star is a cataclysmic variable (CV) of the U Gem type with a recurrence time scale of ~ 133 days. The duration of the outbursts is very short, about 4 days in total, and the initial decline rate, $T_1 = 1.0$ days.

The ROTSE1 position lies almost exactly between two stars in the GSC 2.2, USNO and 2MASS catalogues, so its identification is not immediately obvious. The two stars are separated by 17″ and the preceding (west) component is the brighter, by approximately

Table 1: Photometry of the two sources close to the ROTSE1 position

	East						West					
Source	B	R	I	J	H	K	B	R	I	J	H	K
GSC 2.2	16.0	15.8					16.0	15.1				
USNO A2.0	16.3	16.4					15.8	15.1				
USNO B1.0	16.8	16.3	15.7				16.4	15.4	14.8			
	16.5	16.0					16.2	15.5				
2MASS				15.18	15.02	14.30				14.15	14.06	13.83

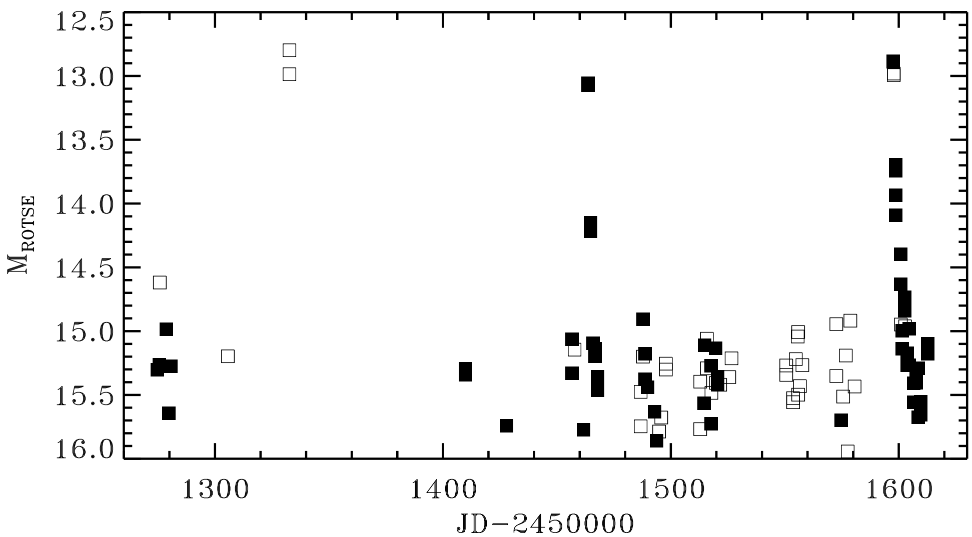

Figure 1. The ROTSE1 data showing the combined light of the two stars as discussed in the text. At quiescence the CV is below the detection threshold. The flagged data are shown as open squares.

one magnitude. The resolution element of the ROTSE1 survey is $\sim 14''$ so these stars are on the resolution limit.

The available photometry of these two stars has been collected in Table 1 and suggests that the brighter component is always above the ROTSE1 threshold of $R \sim 15.5$ while the fainter component is (usually) below it. The ROTSE1 position is derived from a combination of the two sources, the western component during CV quiescence, and the CV dominated position during outburst. All the photometric and astrometric evidence strongly suggests that the CV is the eastern component of this pair at $05^{h}32^{m}33\overset{s}{.}87$ $+62^{\circ}47'52\overset{''}{.}1$ and this is confirmed by recent observations.

In Figure 1 there are several measurements apparently showing the CV at quiescence but these are probably entirely due to the brighter companion. Even the brighter measurements will still have a significant contribution from the companion, and the CV will only begin to dominate at magnitudes above $R \sim 14.5$.

The colours of the CV are not well determined in the optical, but yield an average $B - R = 0.3$ which is consistent with this type of object. However, the 2MASS colours (Cutri et al., 2003), $J-H = 0.15$ and $H-K = 0.72$ suggest a very red object at the longest wavelengths, which contrasts with the blue object seen in the optical. This combination of colours has been seen before in CVs (Hoard et al., 2002). The 2MASS colours do not suggest any particular type of CV; most have colours similar to main-sequence stars and all types have objects with anomalous colours. It is obviously a recurrent object with a relatively short cycle and the statistics suggest weakly that it is a U Gem star rather than a magnetic CV.

The X-ray source 1RXS J053234.9+624755 from the ROSAT all-sky survey bright source catalogue (Voges et al., 1999) lies close by at $05^{h}32^{m}34\overset{s}{.}90$ $+62^{\circ}47'55\overset{''}{.}5$ with a nominal uncertainty of $8''$. The X-ray source lies $8''$ from the CV, within the error ellipse, and $24''$ (3σ) from the companion. The source was observed by the ROSAT PSPC with a count rate of $0.260 \pm 0.0270/s$ so assuming an optical magnitude, $V = 16.3$ this leads to

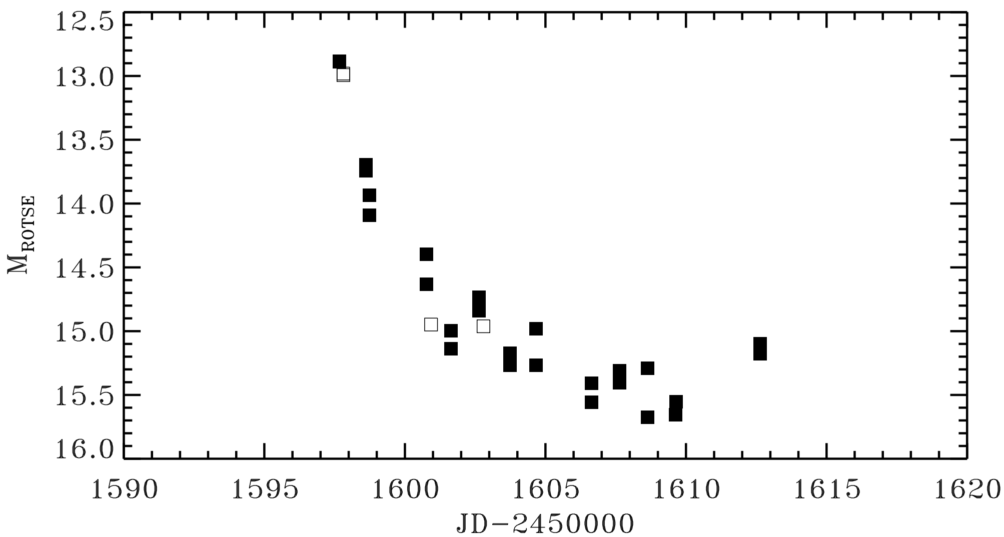

Figure 2. The detail of the last outburst from the ROTSE1 data.

$F_x/F_{opt} = 0.30$. For CVs in general F_x/F_{opt} is notoriously variable but this value is in the middle of the range. When combined with the hardness ratios, $HR1 = 0.15 \pm 0.10$ and $HR2 = 0.16 \pm 0.14$ this object lies on the lower edge of the group with higher F_x/F_{opt} ratios. In the hardness ratio plane this object lies in the central, more neutral group of CVs, as opposed to the 'hard' group or with the small number of very soft sources (see Motch et al., 1998).

In an effort to identify previous outbursts the Sonneberg Plate Archive was searched and estimates were made on 123 pg plates taken during JD 2448220 – 2451601 and 111 pv plates taken during JD 2447803 – 2451927. As a result four further outbursts were identified and together with the ROTSE1 data an outburst ephemeris was derived. Following a call for observations, which was kindly provided by the CVNET (`http://home.mindspring.com/ mikesimonsen/cvnet/index.html`) another outburst was detected on 16 March 2005 independently by four observers. These were by W. Kriebel (JD 2453446.309, mag 12.0), P. Schmeer (JD 2453446.319, mag 11.9) and W. Renz

Table 2: Outbursts of 1RXSJ053234.9+624755

HJD	mag	Cycle	$O-C$(d)	Source & remarks
2447975.312	11.6	0	−5.8	Sonneberg plate pv
2448650.344	12.4	5	+1.2	Sonneberg plate pv
2449058.306	13.7	8	+8.4	Sonneberg plate pg
2450097.427	13.6	16	−21.3	Sonneberg plate pg
2451332.672	12.79	25	+11.5	ROTSE *flag 8192
2451463.772	13.06	26	+9.0	ROTSE
2451597.676	12.89	27	+9.3	ROTSE
2453446.309	12.5	41	−12.4	Pietz, Kriebel, Schmeer & Renz

* flag 8192: High scatter of the corrections across the map larger than 0.1 mag

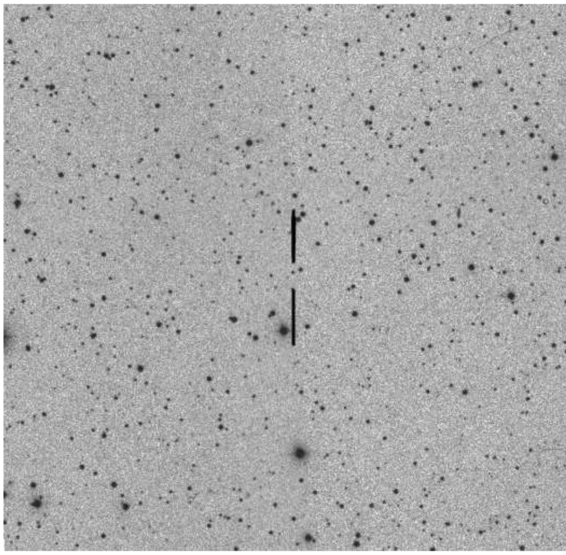

Figure 3. Finding chart from a POSS O plate showing a 20′ × 20′ field around the CV. North is up and east to the left.

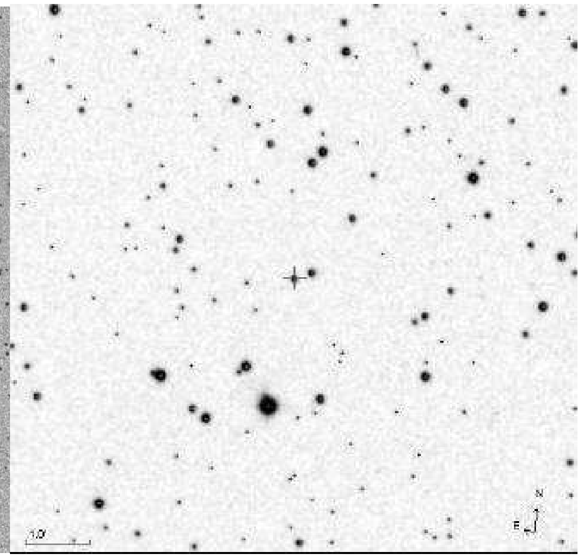

Figure 4. Finding chart from a POSS E plate showing a 10′ × 10′ field around the CV. The bar is 1 arc minute long.

(JD 2453446.323, mag 12.0) observing visually and J. Pietz with an unfiltered CCD SBIG ST-6 (JD 2453446.309, mag 12.5). All the times of outburst are collected in Table 2 and were fitted by least squares to derive an outburst ephemeris of,

$$\begin{aligned} \mathrm{HJD_{Max}} &= 2447981.1 + 133\overset{\mathrm{d}}{.}6 \times \mathrm{E} \\ &\quad\;\; \pm 8.0 \qquad \pm 0.4 \end{aligned}$$

The most recent observations suggest that this star is currently undergoing a superoutburst which is brighter and longer than seen in the ROTSE1 data. The only previous occasion when the star was observed this bright was on the first of the Sonneberg outbursts 5471 days earlier. There are several, as yet, unpublished reports of superhumps with a short period, so this star is a new short-period UGSU-type dwarf nova and will obviously receive considerable attention in the future.

Acknowledgements. It is a pleasure the acknowledge the use of the SIMBAD database, operated by the CDS at Strasbourg, France. This publication makes use of data products from the Two Micron All Sky Survey.

The authors further thank P. Schmeer and J. Pietz for their observations and Mike Simonsen and John Greaves for helpful comments.

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- ROTSE1 light curve `http://skydot.lanl.gov/nsvs/star.php?num=2224889`

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5621

Konkoly Observatory
Budapest
30 March 2005

HU ISSN 0374 – 0676

IL Lac: AN ECLIPSING BINARY WITH DISPLACED SECONDARY MINIMUM

BAV Mitteilungen Nr. 169

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This star (GSC 3617.1169 = VV318) was discovered to be variable by Miller and Wachmann (1971). The GCVS lists IL Lac as an eclipsing binary with only the epoch given. No period was published until today. Extensive photoelectric monitoring carried out by one of us (FA, 1998 - 2005, C8 with ST6 CCD camera attached) has confirmed the type of variability as well as unveiled the length of the period with approximately $7\overset{d}{.}4$ days. The secondary minimum was found to be displaced; its actual position is at $0\overset{p}{.}4365$. GSC 3617.1387 and GSC 3617.1181 were used as comparison star and check star resp.

To confirm the elements, photographic plates (1926 - 1991) taken with the Sonneberg Observatory 40cm Astrograph and several other cameras used for the Sonneberg Field Patrol were inspected by TB.

Individual data (photoelectric as well as photographic) are available upon request.

The elements listed below were obtained by means of a weighted least-squares solution. It was not possible to distinguish between primary and secondary eclipses on the basis of our data. Hence, the assignment was chosen to point with the original GCVS epoch towards a primary minimum. Further photometry and/or spectroscopy is needed to solve this problem.

$$\begin{array}{rcl} \text{Min I} = \text{HJD } 2453226.617 & + & 7\overset{d}{.}395656 \times E. \\ \pm 14 & & \pm 7 \end{array} \qquad (1)$$

$$\begin{array}{rcl} \text{Min II} = \text{HJD } 2453222.449 & + & 7\overset{d}{.}395665 \times E. \\ \pm 5 & & \pm 4 \end{array} \qquad (2)$$

This research made use of the SIMBAD data base, operated by the CDS at Strasbourg, France.

Reference:

Miller, W., Wachmann, A.A., 1971, *Ricerche Astron*, **8**, 12

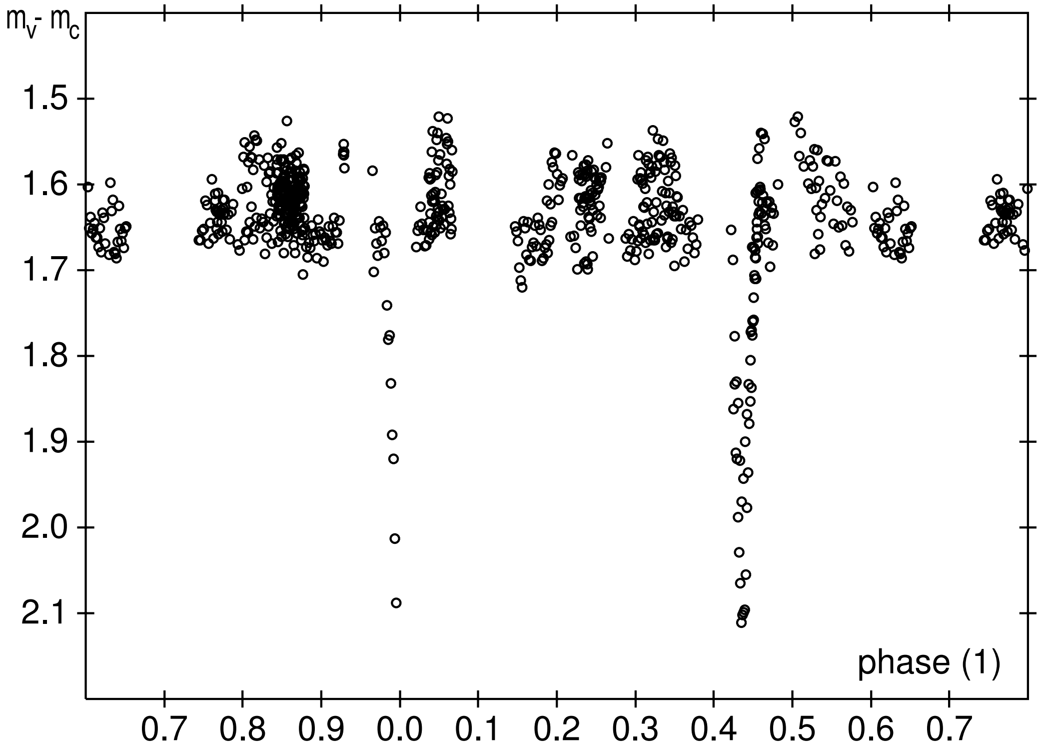

Figure 1. Unfiltered photoelectric observations folded with the ephemeris (1).

Table 1. Observed minima

Number	JD hel.	Weight	Epoch(1)	Epoch(2)	$(O-C)$	Source
1	24849.528	1	−3837		+0.043	[1]
2	25152.595	1	−3796		−0.112	[1]
3	25503.530	1		−3748	+0.034	[1]
4	25648.280	1	−3729		+0.064	[1]
5	25651.290	1		−3728	−0.119	[1]
6	29985.317	1		−3142	+0.048	[1]
7	33187.627	1		−2709	+0.035	[2]
8	33295.302	1	−2695		−0.022	[2]
9	33357.649	1		−2686	−0.043	[2]
10	34304.418	1		−2558	+0.081	[2]
11	34715.289	1	−2503		−0.001	[2]
12	47554.250	1	−767		+0.102	[1]
13	51780.291	5		−195	−0.003	[3]
14	51817.254	5		−190	−0.018	[3]
15	53222.4516	10		0	+0.0029	[3]
16	53226.609	10	0		−0.008	[3]
17	53259.4313	10		5	+0.0042	[3]

Sources: [1] Berthold (this paper), [2] Miller and Wachmann (1971), [3] Agerer (this paper)

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5622

Konkoly Observatory
Budapest
31 March 2005

HU ISSN 0374 – 0676

THE GEOS RR Lyr SURVEY

Second list of maxima of RR Lyr stars observed by the automated telescope TAROT

(GEOS Circular RR 24)

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We present here the second list of light maxima of RR Lyrae stars from the GEOS RR Lyr Survey, a GEOS program (`http://www.upv.es/geos/`) (Boninsegna et al., 2002) of automated observations of RR Lyr stars started in January 2004. We are using the 25cm automatic telescope TAROT (`http://tarot.obs-hp.fr`) (Boër et al., 2001, Bringer et al., 1999) located in Calern Observatory (Observatoire de la Côte d'Azur, Nice University, France). The aim of this legacy project for the study of period variations of RR Lyr stars is to monitor maxima of light of these stars in order to feed the GEOS RR Lyr web database (`http://www.ast.obs-mip.fr/people/leborgne/dbRR`).

The present list contains 101 maxima observed with no filter between July and December 2004 (Table 1). The maxima are determined by fitting a polynomial function on the data points. The uncertainties on individual maxima are estimated from the data sampling of each maximum. The nominal sampling (two consecutive measurements taken every 10 minutes on a time baseline of 2 hours centered around the predicted maximum time) may be altered by local events (weather or telescope operation). This results uncertainties from 0.002 to 0.010 day. For a well observed star, the mean uncertainty on maxima is about 0.003 day (4.3 minutes). All $O-C$'s are computed with the GCVS elements (Kholopov et al. 1985) and are displayed in table 2 in column "$O-C$ (1)". "$O-C$ (2)" are computed with elements which allow more precise predictions for scheduling observations from the BAV web site `http://www.var-mo.de` when available. For the star SW And (columns $O-C$(1),E(1)), we used the non-linear elements from GCVS: $2418132.7913 + 0.442279456\mathrm{E} - 1.22910^{-10}\ \mathrm{E}^2$.

Table 1: maxima of RR Lyrae stars

Variable	Maximum HJD 24...	$O-C$ (1) (days)	E (1)	$O-C$ (2) (days)	E (2)	ref (2)
SW And	53346.355±0.003	0.052	79620.	−0.003	10826.	1
SW And	53350.334±0.004	0.051	79629.	−0.004	10835.	1
XX And	53271.564±0.005	0.214	19625.	0.008	2899.	1
XX And	53326.490±0.008	0.212	19701.	0.005	2975.	1
ZZ And	53326.388±0.010	0.024	51391.			
AT And	53200.506±0.004	0.003	17599.			
AT And	53208.515±0.004	−0.008	17612.			
AT And	53232.587±0.005	0.004	17651.			
AT And	53269.592±0.005	−0.006	17711.			
AT And	53271.447±0.005	−0.001	17714.			
AT And	53295.506±0.010	−0.002	17753.			
DM And	53289.465±0.005	−0.059	27875.			
DM And	53296.409±0.010	−0.050	27885.			
DM And	53320.357±0.004	−0.056	27924.			
SW Aqr	53226.483±0.005	0.001	61243.			
SW Aqr	53254.505±0.005	0.006	61304.			
SX Aqr	53210.504±0.003	−0.106	25040.	−0.010	25040.	2
SX Aqr	53225.509±0.005	−0.101	25068.	−0.005	25068.	2
SX Aqr	53226.578±0.005	−0.103	25070.	−0.008	25070.	2
SX Aqr	53270.509±0.002	−0.101	25152.	−0.005	25152.	2
BR Aqr	53259.544±0.002	−0.140	32422.	−0.009	3833.	2
CP Aqr	53198.544±0.003	−0.096	33047.	−0.007	33047.	2
X Ari	53296.583±0.005	0.291	24131.	0.031	3273.	1
X Ari	53326.536±0.002	0.291	24177.	0.031	3319.	1
TZ Aur	53354.589±0.002	0.011	85408.			
BH Aur	53326.538±0.010	−0.002	23186.			
AH Cam	53325.442±0.002	−0.006	39584.			
SS Cnc	53357.566±0.003	0.047	82428.	−0.001	82428.	1
TT Cnc	53350.607±0.006	0.088	23793.	0.016	6579.	2
FP Cep	53286.481±0.007	−0.029	34555.			
UY Cyg	53207.498±0.003	0.050	54884.	0.004	25266.	2
UY Cyg	53249.549±0.004	0.048	54959.	0.002	25341.	2
UY Cyg	53267.494±0.002	0.050	54991.	0.004	25373.	2
UY Cyg	53276.468±0.005	0.053	55007.	0.007	25389.	2
XZ Cyg	53243.576±0.005	−0.182	19540.	0.004	10014.	3
DM Cyg	53201.557±0.005	0.052	25292.	0.001	25291.	1
DM Cyg	53269.572±0.002	0.050	25454.	−0.001	25454.	1
DM Cyg	53272.514±0.003	0.053	25461.	0.002	25461.	1
DM Cyg	53296.445±0.006	0.052	25518.	0.000	25518.	1

ref.: 1 `http://www.var-mo.de/rr-lyrae-sektion.htm`
2 `http://www.var-mo.de/st-daten.htm`
3 `Baldwin, Samolyk, 2003`

Table 1 (cont.): maxima of RR Lyrae stars

Variable	Maximum HJD 24...	$O-C$ (1) (days)	E (1)	$O-C$ (2) (days)	E (2)	ref (2)
DX Del	53197.569±0.003	0.046	29263.	−0.007	29263.	1
DX Del	53198.527±0.002	0.058	29265.	0.006	29265.	1
DX Del	53206.555±0.005	0.052	29282.	−0.001	29282.	1
DX Del	53207.499±0.002	0.051	29284.	−0.002	29284.	1
DX Del	53215.533±0.004	0.050	29301.	−0.003	29301.	1
DX Del	53223.574±0.003	0.057	29318.	0.004	29318.	1
DX Del	53232.554±0.004	0.057	29337.	0.004	29337.	1
DX Del	53233.497±0.002	0.055	29339.	0.002	29339.	1
DX Del	53259.487±0.002	0.051	29394.	−0.002	29394.	1
DX Del	53268.468±0.004	0.052	29413.	−0.001	29413.	1
RW Dra	53196.573±0.002	0.172	31200.	0.016	31200.	3
RW Dra	53204.548±0.004	0.174	31217.	0.018	31218.	3
RW Dra	53275.410±0.002	0.169	31377.	0.012	31378.	3
XZ Dra	53246.533±0.005	−0.074	23753.	−0.024	15480.	2
TW Her	53195.552±0.002	−0.008	79205.			
TW Her	53197.549±0.003	−0.009	79210.			
TW Her	53207.544±0.005	−0.004	79235.			
TW Her	53209.538±0.004	−0.008	79240.			
VX Her	53204.524±0.003	0.075	69073.	−0.026	3268.	1
VZ Her	53199.537±0.003	0.059	37269.	−0.005	29060.	2
DD Hya	53349.630±0.006	−0.123	23226.	0.033	7280.	2
DD Hya	53351.629±0.004	−0.131	23230.	0.025	7284.	2
RR Leo	53357.598±0.003	0.064	22242.	0.021	4692.	1
RR Leo	53362.575±0.002	0.065	22253.	0.021	4704.	1
TW Lyn	53349.530±0.004	0.049	17281.			
RZ Lyr	53216.545±0.005	0.009	23537.	0.008	3855.	2
RZ Lyr	53218.578±0.004	−0.003	23541.	−0.004	3859.	2
RZ Lyr	53238.508±0.002	−0.011	23580.	−0.012	3898.	2
RZ Lyr	53239.534±0.005	−0.008	23582.	−0.009	3900.	2
CN Lyr	53217.520±0.010	0.008	21223.			
CN Lyr	53224.526±0.005	0.020	21241.			
CN Lyr	53245.495±0.002	0.009	21292.			
AV Peg	53201.555±0.002	0.086	24108.	0.001	9066.	2
AV Peg	53210.537±0.002	0.089	24131.	0.004	9089.	2
AV Peg	53217.565±0.005	0.090	24149.	0.005	9107.	2
AV Peg	53224.590±0.002	0.089	24167.	0.003	9125.	2
AV Peg	53233.571±0.004	0.091	24190.	0.006	9148.	2
AV Peg	53242.548±0.002	0.089	24213.	0.004	9171.	2
AV Peg	53253.481±0.002	0.092	24241.	0.006	9199.	2
AV Peg	53258.553±0.002	0.089	24254.	0.003	9212.	2

ref.: 1 `http://www.var-mo.de/rr-lyrae-sektion.htm`
2 `http://www.var-mo.de/st-daten.htm`

Table 1 (cont.): maxima of RR Lyrae stars

Variable	Maximum HJD 24...	$O-C$ (1) (days)	E (1)	$O-C$ (2) (days)	E (2)	ref (2)
AV Peg	53267.533±0.002	0.090	24277.	0.005	9235.	2
AV Peg	53285.487±0.002	0.087	24322.	0.001	9281.	2
BH Peg	53212.550±0.004	−0.102	21603.	−0.008	3764.	2
BH Peg	53239.482±0.004	−0.091	21645.	0.002	3807.	2
BH Peg	53244.611±0.003	−0.090	21653.	0.004	3815.	2
BH Peg	53255.497±0.002	−0.101	21670.	−0.007	3832.	2
BH Peg	53289.479±0.005	−0.092	21723.	0.002	3885.	2
CG Peg	53200.582±0.003	−0.045	30180.	0.009	3038.	2
CG Peg	53201.520±0.005	−0.041	30182.	0.013	3040.	2
CG Peg	53207.594±0.004	−0.040	30195.	0.014	3053.	2
CG Peg	53208.528±0.005	−0.040	30197.	0.014	3055.	2
CG Peg	53215.538±0.005	−0.037	30212.	0.017	3070.	2
CG Peg	53230.479±0.004	−0.045	30243.	0.009	3102.	2
CG Peg	53237.493±0.002	−0.038	30259.	0.016	3117.	2
CG Peg	53244.491±0.002	−0.047	30274.	0.007	3132.	2
CG Peg	53258.509±0.002	−0.043	30304.	0.011	3162.	2
CG Peg	53272.525±0.004	−0.041	30334.	0.013	3192.	2
ES Peg	53287.502±0.008	0.139	28563.	−0.007	28563.	2
ET Peg	53294.399±0.010	−0.032	29170.			
AR Per	53277.590±0.005	0.057	61192.	0.010	3572.	1
AR Per	53324.395±0.006	0.052	61303.	0.005	3682.	1
SS Tau	53325.480±0.003	0.032	38636.	−0.026	4807.	2

ref.: 1 `http://www.var-mo.de/rr-lyrae-sektion.htm`
2 `http://www.var-mo.de/st-daten.htm`

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5623

Konkoly Observatory
Budapest
31 March 2005

HU ISSN 0374 – 0676

PHOTOELECTRIC MINIMA OF ECLIPSING BINARIES

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The following table contains the unpublished photoelectric times of minima of eclipsing binaries observed at Mt. Suhora Observatory of Cracow Pedagogical University. The observations were made using a double channel photometer (Kreiner et al. 1993) and the triple channel photometer, attached to the 0.6/7.5 m Cassegrain telescope. They were reduced in an usual way and left in the instrumental system (near to the UBVRI). The times of minima were determined using Kwee and van Woerden (1956) method.

The $O-C$ values were computed using elements given in the database (Kreiner, 2004), which can be accessed at the following web page: `http://www.as.ap.krakow.pl/ephem`. Entries in all columns are self-explanatory.

This work was supported by the Polish KBN grant 2-P03D-006-22.

Observers:

AB – Andrzej Baran; MD – Marek Dróżdż; DM – Dragomir Marchev;
WO – Waldemar Ogłoza; MS – Michał Siwak; GS – Grzegorz Stachowski
SZ – Stanisław Zoła.

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Times of minima

Star	Filters	HJD 2400000+	Error	$O-C$	Type	Observer
AB And	U,B,V,R	52901.4818	±0.0001	−0.0001	Sec.	AB
	U,B,V,R	52902.3114	±0.0001	−0.0002	Pri.	AB
	U,B,V,R	52902.4776	±0.0001	0.0001	Sec.	AB
BX And	B,V,R	52954.2701	±0.0002	0.0018	Pri.	MS
	B,V,R	52955.4887	±0.0001	0.0002	Pri.	MS
	B,V,R	52956.4056	±0.0002	0.0019	Sec.	MD
	B,V,R	52976.5368	±0.0003	−0.0006	Sec.	MD
	B,V,R	52993.3155	±0.0002	0.0000	Pri.	MD
CN And	B,V,R,I	52506.3661	±0.0004	−0.0026	Sec.	MD
	B,V,R,I	52516.5514	±0.0004	0.0014	Sec.	MD
	B,V,R,I	52521.4085	±0.0009	−0.0008	Pri.	MD
GZ And	V,R,I	52230.3337	±0.0001	−0.0004	Sec.	SZ
	V,R,I	52230.4869	±0.0004	0.0003	Pri.	SZ
V376 And	U,B,V,R	52697.3649	±0.0001	0.0014	Sec.	MD
	B,V,R,I	53304.3583	±0.0006	0.0049	Sec.	SZ
	B,V,R,I	53305.5504	±0.0002	−0.0010	Pri.	SZ
	B,V,R,I	53306.3455	±0.0002	−0.0045	Pri.	SZ
XY Boo	B,V,R	52044.4808	±0.0004	0.0020	Sec.	MD
	B,V,R	52046.5184	±0.0009	0.0014	Pri.	MD
	B,V,R	52055.4094	±0.0005	−0.0014	Pri.	MD
	B,V,R	52417.4621	±0.0008	−0.0007	Pri.	MD
EF Boo	B,V,R,I	52320.6642	±0.0003	−0.0016	Pri.	AB
	B,V,R,I	52382.4813	±0.0004	−0.0001	Pri.	MD
ET Boo	U,B,V,R	52622.5768	±0.0003	0.0008	Sec.	MD
	U,B,V,R	52658.6976	±0.0002	−0.0007	Sec.	DM
	U,B,V,R	52659.6590	±0.0010	−0.0069	Pri.	DM
	U,B,V,R	52660.6332	±0.0001	−0.0003	Sec.	DM
	U,B,V,R	52696.4321	±0.0003	−0.0012	Pri.	MD
	U,B,V,R	52767.3887	±0.0002	0.0009	Pri.	MD
AO Cam	B,V,R	52203.5230	±0.0002	0.0017	Pri.	SZ
	V,R,I	52271.4806	±0.0005	−0.0010	Pri.	AB
	B,V,R	52311.5656	±0.0005	0.0007	Sec.	MD
	B,V,R	52547.4491	±0.0002	0.0028	Sec.	SZ
	B,V,R	52547.6132	±0.0008	0.0019	Pri.	SZ
	B,V,R	52548.2730	±0.0005	0.0019	Pri.	SZ
	B,V,R	52548.6021	±0.0003	0.0011	Pri.	SZ
	B,V,R	52591.3246	±0.0004	0.0010	Sec.	SZ
DN Cam	B,V,R,I	52644.4279	±0.0007	0.0013	Pri.	AB
	B,V,R,I	52644.6770	±0.0002	0.0012	Sec.	AB
	B,V,R,I	52645.1754	±0.0007	0.0013	Sec.	AB
	B,V,R	52645.4229	±0.0006	−0.0004	Pri.	AB
	B,V,R,I	52645.6727	±0.0004	0.0003	Sec.	AB
FN Cam	U,B,V,R	53056.5149	±0.0002	0.0063	Sec.	WO
BH CMi	B,V,R,I	51242.3369	±0.0008	0.0033	Sec.	MD
	B,V,R,I	51256.3148	±0.0006	0.0000	Sec.	MD
	I	51556.6288	±0.0004	−0.0022	Sec.	MD
	B,V,R,I	51557.4683	±0.0006	−0.0016	Pri.	MD
YY Cnc	B,V,R	52720.3790	±0.0004	0.0038	Sec.	MD
DK Cyg	B,V,R	52145.5380	±0.0004	0.0013	Sec.	SZ
	B,V,R	52147.4211	±0.0003	0.0016	Sec.	WO
	B,V,R	52517.3871	±0.0005	0.0007	Sec.	MD
	B,V,R	52528.4468	±0.0003	−0.0009	Pri.	MD
	B,V,R	52531.5058	±0.0003	−0.0014	Sec.	MD
	B,V,R	52888.5307	±0.0001	0.0007	Pri.	MD
	U,B,V,R	52909.4757	±0.0001	−0.0003	Sec.	MD

Times of minima (cont.)

Star	Filters	HJD 2400000 +	Error	$O-C$	Type	Observer
V2150 Cyg	B,V,R	52137.4133	±0.0005	−0.0046	Sec.	SZ
	B,V,R,	52139.4956	±0.0005	0.0062	Pri.	SZ
	B,V,R,I	52182.3866	±0.0005	−0.0127	Sec.	AB
	B,V,R,I	52195.4146	±0.0002	−0.0056	Sec.	MD
	V,R	52477.4291	±0.0010	−0.0124	Pri.	DM, SZ
	V,R	52482.4624	±0.0010	−0.0099	Sec.	DM, SZ
LS Del	V,R	52134.4983	±0.0002	−0.0003	Sec.	SZ
	V,R	52136.5000	±0.0002	0.0003	Pri.	SZ
EF Dra	B,V,R	52509.4210	±0.0006	−0.0039	Sec.	MD
	B,V,R	52510.4854	±0.0009	0.0005	Pri.	MD
	B,V,R	52511.3349	±0.0005	0.0019	Pri.	MD
	B,V,R	52511.5439	±0.0006	−0.0011	Sec.	MD
FU Dra	B,V,R,I	52333.4576	±0.0002	−0.0009	Sec.	SZ
	B,V,R,I	52338.5190	±0.0003	−0.0003	Pri.	SZ
	B,V,R,I	52347.4142	±0.0003	0.0001	Pri.	SZ
	B,V,R,I	52347.5678	±0.0003	0.0004	Sec.	SZ
GM Dra	U,B,V,R	52776.4847	±0.0002	0.0169	Pri.	MS
	U,B,V,R	52784.4271	±0.0002	−0.0012	Sec.	MS
	U,B,V,R	52790.5250	±0.0002	−0.0008	Sec.	MS
	U,B,V,R	52793.4048	±0.0001	−0.0003	Pri.	MS
	U,B,V,R	52795.4361	±0.0001	−0.0015	Pri.	MD
	U,B,V,R	52803.4017	±0.0003	0.0035	Sec.	MD
QW Gem	B,V,R,I	51927.3928	±0.0004	−0.0008	Sec.	WO
	B,V,R,I	51927.5723	±0.0004	−0.0004	Pri.	WO
UX Her	B,V,R,I	51784.4029	±0.0003	−0.0014	Pri.	MD
V857 Her	B,V,R	53218.4940	±0.0003	−0.0005	Pri.	MD
V899 Her	B,V,R,I	52438.5093	±0.0009	−0.0029	Pri.	MD
FG Hya	B,V,R	53387.4199	±0.0001	0.0014	Sec.	MS
	B,V,R	53387.5812	±0.0002	−0.0012	Pri.	MS
	V	53410.5292	±0.0002	−0.0023	Pri.	WO
	V	53410.3672	±0.0002	−0.0004	Sec.	WO
SW Lac	U,B,V,R	52903.2835	±0.0002	0.0002	Pri.	AB
	U,B,V,R	52903.6037	±0.0001	−0.0003	Pri.	AB
	U,B,V,R	52904.4061	±0.0001	0.0003	Sec.	AB
	U,B,V,R	52904.5657	±0.0001	−0.0004	Pri.	AB
XY Leo	B,V,R,I	51968.2551	±0.0002	−0.0004	Pri.	WO
AP Leo	B,V,R,I	52003.5352	±0.0004	−0.0016	Pri.	MD
	B,V,R,I	52321.5705	±0.0002	0.0011	Pri.	AB
	B,V,R,I	52344.3796	±0.0005	0.0013	Pri.	MD
	B,V,R,I	52344.5932	±0.0005	−0.0002	Sec.	MD
	B,V,R,I	52345.4540	±0.0003	−0.0002	Sec.	MD
	B,V,R	52347.3933	±0.0003	0.0026	Pri.	AB
	B,R,I	52347.6042	±0.0004	−0.0017	Sec.	AB
	B,V,R,I	52351.4795	±0.0003	0.0004	Sec.	AB
	B,V,R,I	52364.3906	±0.0003	0.0008	Sec.	AB
EX Leo	U,B,V,R	52704.5261	±0.0003	−0.0025	Pri.	WO
	B,V,R	53431.4367	±0.0001	0.0039	Pri.	SZ
	B,V	53431.6400	±0.0025	0.0029	Sec.	SZ
	B,V,R	53432.4569	±0.0002	0.0026	Sec.	SZ
	B,V,R	53433.4799	±0.0002	0.0041	Pri.	WO
RT LMi	V	53411.6310	±0.0001	0.0027	Pri.	WO
	V	53411.4442	±0.0001	0.0033	Sec.	WO

Times of minima (cont.)

Star	Filters	HJD 2400000 +	Error	$O-C$	Type	Observer
UV Lyn	B,V,R,I	51979.4050	±0.0003	0.0015	Pri.	SZ
	B,V,R,I	51980.4435	±0.0002	0.0026	Sec.	SZ
	B,R,I	51999.3224	±0.0004	−0.0003	Pri.	AB
	B,V,R,I	52001.3976	±0.0004	0.0000	Pri.	AB
	U,B,V,R	53078.4872	±0.0002	−0.0014	Sec.	MD
	U,B,V,R	53095.5065	±0.0002	0.0036	Sec.	MD
	U,B,V,R	53096.3308	±0.0001	−0.0021	Sec.	MD
	U,B,V,R	53097.3700	±0.0001	−0.0004	Pri.	MD
	U,B,V,R	53098.4072	±0.0001	−0.0006	Sec.	MD
V753 Mon	B,V,R,I	52284.5531	±0.0003	−0.0001	Pri.	MD
	B,R	52291.3228	±0.0004	−0.0009	Pri.	GS
	B,V	52321.4517	±0.0004	−0.0004	Sec.	AB
BB Peg	V	52201.2508	±0.0001	0.0005	Sec.	SZ
	V	52201.4305	±0.0001	−0.0007	Pri.	SZ
	V	52203.2386	±0.0002	−0.0001	Pri.	SZ
	V	52203.4188	±0.0002	−0.0006	Sec.	SZ
	B,R,I	52207.3962	±0.0004	0.0003	Sec.	MD
	B,V,R	53284.3112	±0.0002	−0.0004	Sec.	MD
	B,V,R	53285.3957	±0.0002	−0.0004	Sec.	MD
KS Peg	B,V,R,I	53283.3193	±0.0008	0.0001	Pri.	MD
V357 Peg	U,B,V,R	52931.2500	±0.0002	0.0007	Pri.	MD
	U,B,V,R	52931.5379	±0.0002	−0.0006	Sec.	MD
V592 Per	B,V,R,I	53399.3395	±0.0003		Pri.	MD
OU Ser	U,B,V,R	52745.4867	±0.0001	−0.0031	Pri.	MS, AB
	U,B,V,R	52746.5306	±0.0002	0.0021	Sec.	MS, AB
	U,B,V,R	52764.4808	±0.0002	−0.0019	Pri.	AB
	U,B,V,R	52765.5212	±0.0001	−0.0002	Sec.	MD
	U,B,V,R	52766.4107	±0.0001	−0.0010	Sec.	MD
V1130 Tau	U,B,V,R	52620.4744	±0.0001	−0.0010	Sec.	MD
	U,B,V,R	52957.5984	±0.0001	0.0010	Sec.	MD
	U,B,V,R	52978.3678	±0.0002	−0.0001	Sec.	MD
W UMa	B,V,R,I	51952.3401	±0.0002	−0.0004	Pri.	DM
	B,V,R,I	51956.5122	±0.0002	0.0013	Sec.	DM
HN UMa	U,B,V,R	52292.6296	±0.0006	−0.0031	Sec.	AB
	U,B,V,R	52293.5934	±0.0002	0.0044	Pri.	AB
	U,B,V,R	52698.3003	±0.0002	−0.0006	Pri.	MD
	U,B,V,R	52698.4835	±0.0003	−0.0086	Sec.	MD
HX UMa	B,V,R,I	51966.4236	±0.0004	−0.0030	Sec.	WO
	B,V,R,I	51968.5070	±0.0003	−0.0049	Pri.	WO
II UMa	B,V,R	52649.7056	±0.0007	−0.0022	Sec.	AB
HT Vir	B,V,R	53140.5051	±0.0001	0.0007	Sec.	MD
ER Vul	B,V,R,I	51389.4743	±0.0002	−0.0005	Pri.	DM
	B,V,R,I	51390.5200	±0.0003	−0.0019	Sec.	DM

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5624

Konkoly Observatory
Budapest
8 April 2005

HU ISSN 0374 – 0676

THE FIRST CCD BVRI LIGHT CURVES OF THE NEAR-CONTACT BINARY V387 Cyg

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Name of the object:
V387 Cyg, TYC 2714-556-1

Equatorial coordinates:	**Equinox:**
R.A.= $21^{h}15^{m}37\overset{s}{.}4$ **DEC.=** $+37°29'52''$	2000

Observatory and telescope:
National Observatory of Athens Kryonerion Station, 1.22 m Cassegrain telescope

Detector:	PMIS CCD camera, Peltier & water cooled, 528 × 528 pixels binned to 264 × 264, 2.5′ × 2.5′ FOV.

Filter(s):	BVRI

Date(s) of the observation(s):
2004.05.12, 2004.05.13, 2004.06.28, 2004.06.29, 2004.06.30

Comparison star(s):	GSC 02714-00043

Check star(s):	Uncatalogued fainter star 25″ SSW of the comparison

Transformed to a standard system:	No

Availability of the data:
Available upon request

Type of variability:	EB

Remarks:

Three minima times were obtained, indicating period increase. The heights of the two maxima are equal in all bands, i.e. no O' Connell effect is present. However, a strong asymmetry of the light curve after $MinII$ is apparent, which is pronounced in B and V, but minimal to nonexistent in the R and I curves. The surface temperature of the members of this binary is low, theoretically allowing the presence of cool spots. Moreover, the large difference in the depths of minima suggests large surface temperature difference and, thus, a semi-detached configuration for the system. This fact and the evidence for period changes suggest episodes of mass transfer between the members. Indeed, a hot spot radiating at smaller wavelengths would explain the shoulder of the curves after $MinII$, followed by the effect of a cool spot best visible at phase 0.65, which again decreases light emitted at smaller wavelengths. However, this cool spot should contribute to at least a small O' Connell effect for phase 0.75.

Acknowledgements:

This research was included in the *PYTHAGORAS* project for the support of research groups in the universities, co-funded by the EPEAEK program and the European Social Fund (ESF).

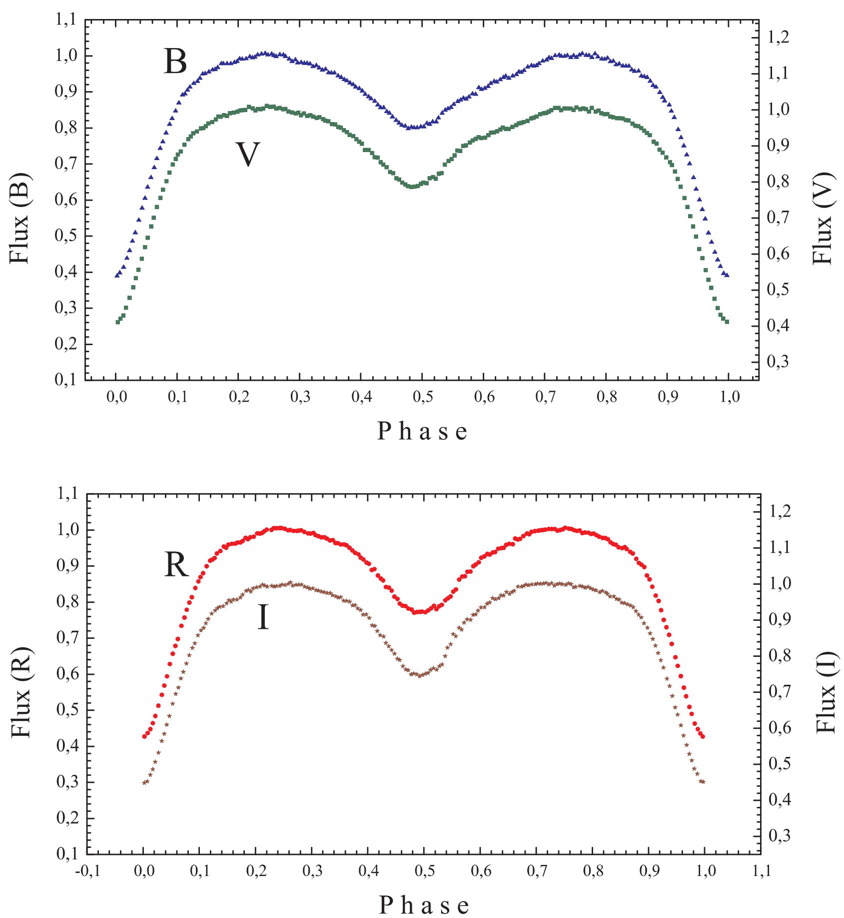

Figure 1. The complete $BVRI$ light curves of V387 Cyg

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5625

Konkoly Observatory
Budapest
24 May 2005

HU ISSN 0374 – 0676

GW CANCRI: A W-TYPE W UMa SYSTEM WITH COMPLETE ECLIPSES

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The variability of GW Cancri was reported by Takamizawa (2000) and the system is listed in the GCVS with an L: variability type. Khruslov (2005), using ASAS3 and ROTSE data, showed that the correct variability type was EW and that the period was 0.281415 days. Intrigued by the possibility of complete eclipses as seen in the ROTSE data, we began observing GW Cnc with BVI_c filters at the Sonoita Research Observatory. We used the 14″telescope equipped with a Santa Barbara Instrument Group Research 1001XE CCD camera. Calibration (bias, dark, flat) and aperture photometry were done with IRAF.

Observations were made on twenty nights in the period November 2004 to April 2005 with a total of 302 observations with the B filter, 838 with V and 380 with I_c. GSC 1399-1976 was used as the comparison star and GSC 1399-0895 was the check star. The standard deviation for comparison minus check observations was 0.02 magnitudes in B and 0.01 magnitudes in V and I_c. On several photometric nights we measured standard colors for the stars. During the total primary eclipse, we find $B-V = 0.68 \pm 0.02$ for GW Cnc and we find the same result at phase 0.75. There are indications that the system may be very slightly bluer at phase 0.25 with $B-V = 0.66 \pm 0.02$ but further observations would be required to confirm that result. Tycho data for the comparison star give $B-V = 0.58 \pm 0.19$ and we measure it to be $B-V = 0.50 \pm 0.01$. Tycho data for the check star give $B-V = 0.52 \pm 0.17$ and we find $B-V = 0.48 \pm 0.01$. The instrumental differential magnitudes for GW Cnc are available from the IBVS web site as 5625-t2.txt (B), 5625-t3.txt (V) and 5625-t4.txt (I_c).

We analyzed our observations with the 2003 version of the Wilson-Devinney program (WD; Wilson & Devinney, 1971; Wilson, 1979). We used mode 3, appropriate for overcontact binaries of this type, and adjusted the parameters shown in Table 1. We set the mean effective temperature of star 1 (the star eclipsed at primary minimum) equal to 5620 K based on our $B-V$ value and the calibration of Flower (1996). Unadjusted parameters such as the gravity darkening exponents and bolometric albedos were set to their theoretically expected values for convective envelopes. Figure 1 shows the fits to the observations.

Table 1. Adjusted Parameters for the Light Curve Solution

Parameter	Value	Std. Error[†]
i	$83\overset{\circ}{.}4$	$0\overset{\circ}{.}4$
T_2	5350 K	28 K
q	4.15	0.01
Ω_1	7.98	0.02
HJD_0	2451554.030	0.004
P	$0\overset{d}{.}281413$	$0\overset{d}{.}000003$
$L_1/(L_1+L_2)_B$	0.280	0.001
$L_1/(L_1+L_2)_V$	0.274	0.001
$L_1/(L_1+L_2)_{I_c}$	0.263	0.001
x_{1B}	0.76	0.09
x_{1V}	0.51	0.07
x_{1I_c}	0.27	0.06

Initially, we used the logarithmic limb darkening law with coefficients interpolated from the Van Hamme (1993) tables but we found that we could not fit the depth of the primary minimum in the I_c light curve during the simultaneous solution with the B and V data. Since the current version of the WD program cannot adjust both parameters in the logarithmic limb darkening law, we adopted the linear cosine law and adjusted the limb darkening coefficient for star 1 (x_1). The limb darkening coefficient for the B light curve was essentially identical to its expected theoretical value and the value for the V light curve was slightly lower although by only about 1.6σ. The limb darkening coefficient for the I_c curve was 0.27 ± 0.06 as opposed to the theoretical value of 0.46. The fits to the secondary eclipses using the theoretical limb darkening coefficients did not show any major problems and test runs, where we adjusted the coefficient for star 2, did not result in values significantly different from the theoretical values. These results may indicate that the theoretical treatments of limb darkening may be inadequate for the low mass companions in W UMa systems with large mass ratios, especially at longer wavelengths.

Using the period-color-luminosity calibration of Rucinski and Duerbeck (RD; 1997), we can roughly estimate the absolute dimensions of the system. The RD calibration predicts $M_V \approx 4.62$ for a system with the color and period that we have measured for GW Cnc. By adjusting the semi-major axis of the system we can determine the value at which the absolute V magnitude matches that of the RD prediction and the result is $2.32R_\odot$. This value results in masses $M_1 = 0.4M_\odot$ and $M_2 = 1.7M_\odot$ as well as radii $R_1 = 0.6R_\odot$ and $R_1 = 1.2R_\odot$. Given the large intrinsic errors in this calculation, these absolute parameters should be considered only very rough estimates.

Because of its total/annular eclipses and overcontact configuration, the photometric mass ratio we have determined is well-determined (viz. Terrell & Wilson, 2005). Therefore, even if only one component's spectral lines could be reliably measured, a full solution for the absolute parameters of the system could be performed. If the system is double-lined, then the radial velocities could provide a check on the mass ratio. Further photometric observations could also prove useful since the system shows the night-to-night variability that is common for W UMa systems.

[†]Formal errors from the differential corrections solution.

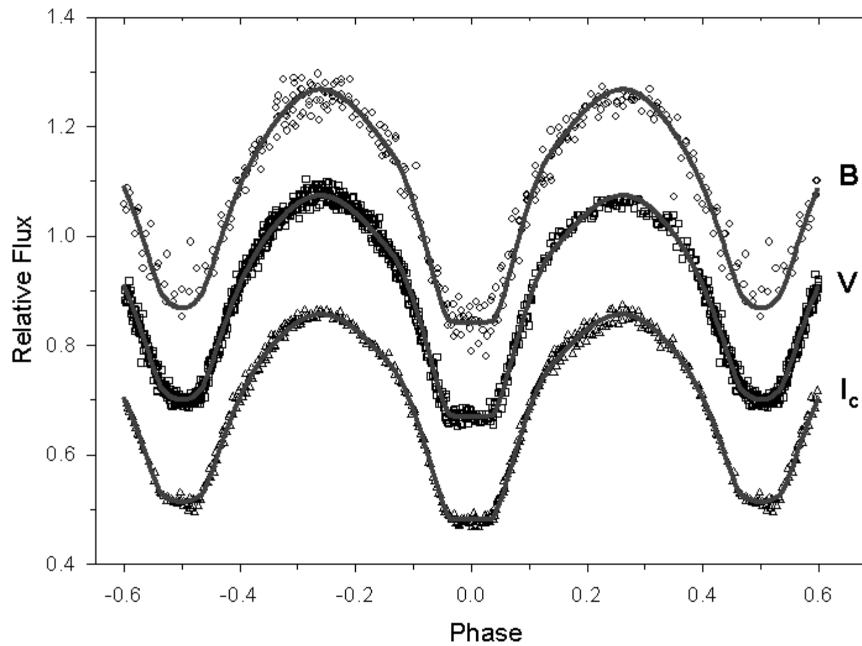

Figure 1. BVI_c light curves of GW Cnc and the fits from the Wilson-Devinney solution.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5626

Konkoly Observatory
Budapest
24 May 2005

HU ISSN 0374 – 0676

OUTBURST OF A BLACK HOLE X-RAY BINARY V4641 Sgr IN 2004 JULY

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V4641 Sgr is a close binary system containing a stellar-mass black hole and an intermediate mass secondary (Orosz et al. 2001). Its outburst behaviour is quite peculiar among other black hole X-ray binaries (Tanaka & Lewin 1995); it experienced a super-Eddington outburst in 1999 September, whose duration was only $\lesssim 1$ d in X-rays (Uemura et al. 2002; Revnivtsev et al. 2002). Radio observations spatially resolved relativistic jets associated with this outburst (Hjellming et al. 2000). The object again experienced an outburst in 2002 May, whose characteristics were, however, completely different from the last one. The X-ray flux during the 2002 outburst was 2 orders of magnitude smaller than that of the 1999 outburst. Optical light curves had many short flares having timescales of 10^{2-4} s (Uemura et al. 2004a). A similar outburst was again observed in 2003 August. Those two outbursts in 2002 and 2003 lasted for 7 d (Uemura et al. 2004b). Due to their short durations and rapid evolution of light curves, the detailed characteristics and time evolution of its short-term variability during outburst are still unclear.

Here, we report a new outburst of V4641 Sgr in 2004 July. Our photometric observations were performed with unfiltered CCD cameras attached to 30-cm class telescopes at Universidad de Concepción, Craigie, Bronberg Observatory, Concord, Kyoto University, Hida Observatory, Auburn, Saitama, and Mie. After correcting for the standard de-biasing

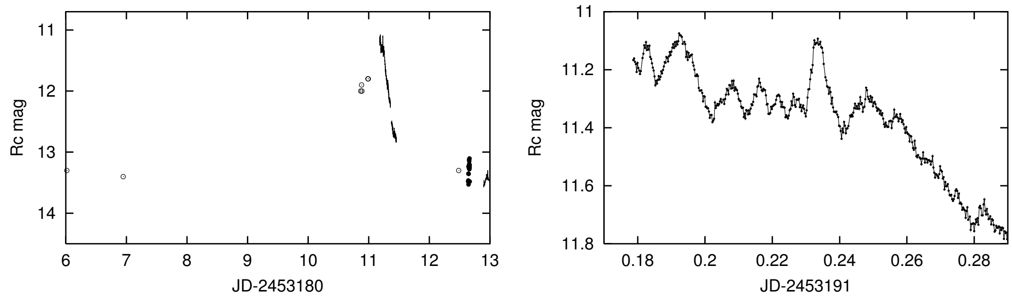

Figure 1. Optical light curves of the outburst of V4641 Sgr in 2004. The filled circles and solid lines are results from CCD photometric observations. The open circles are from visual observations.

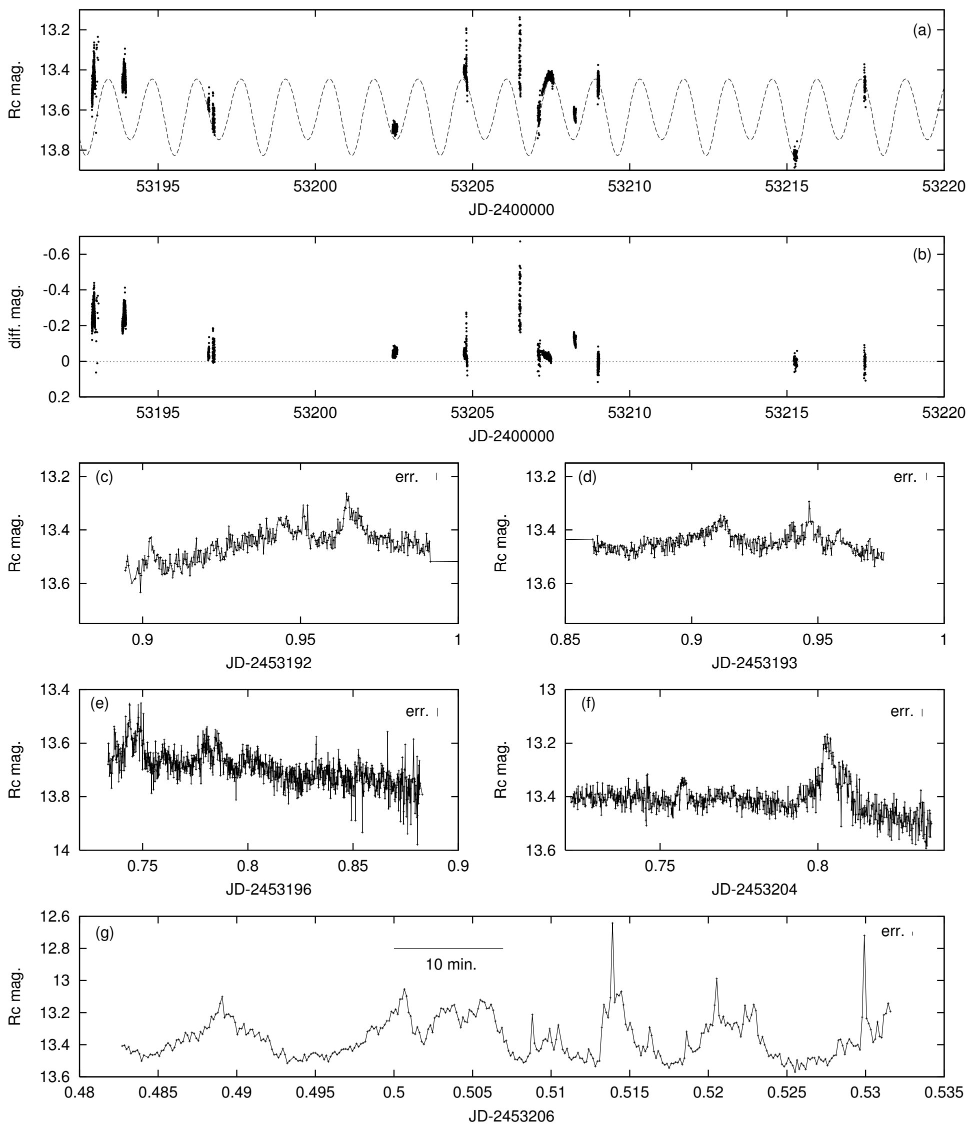

Figure 2. (a) Light curve of the post-outburst active phase in 2004. The dashed line indicates ellipsoidal modulations at quiescence. (b) Residual light curve from the ellipsoidal modulation. (c)–(g) Light curves for each night. Typical errors for the magnitude are indicated in each panel.

and flat fielding, we performed aperture photometry for obtained images. The differential magnitudes of the variable were measured against GSC 6848.3882 ($R_c = 13.19$[1]).

The outburst of V4641 Sgr in 2004 was discovered by a visual observation by one of our co-authors (RS) on 4.368 July (JD 2453190.868). It was then promptly confirmed by both visual and CCD observations. Light curves of the outburst are shown in Figure 1. As can be seen from the left panel of Figure 1, the object was at quiescence ($m_{\rm vis} = 13.4$) before 30 June (ex. 13.4 mag at JD2453185.002; 13.3 mag at JD2453186.016; 13.4 mag at JD2453186.947), about 4 day before the detection of the outburst. We succeeded in obtaining time-series data during the outburst. The resultant light curve is shown in the right panel of Figure 1. The light curve during the outburst was filled by short flares. These flares have durations of $\sim$ 10 min and amplitudes of 0.05–0.2 mag. Our observation detected an onset of a rapid fading at $\sim$ JD 2453191.26. We obtained simultaneous spectroscopic data with this photometric run, which is reported in Lindstrom et al. (2005, in prep.). The main outburst was terminated with this rapid fading (also see Revnivtsev et al. 2004). In conjunction with results from early visual observations (see the left panel of Figure 1), the duration of the main outburst was < 4 d.

The object remained active and showed flares even after the main outburst (cf. Bikmaev et al. 2004). Light curves during this post-outburst active phase are shown in Figure 2. The dashed line in the panel (a) indicates ellipsoidal modulations at quiescence (Uemura et al. 2005, in prep.). The panel (b) shows residual magnitudes from the ellipsoidal modulations. As can be seen in these figures, the object was recorded 0.05–0.4 mag brighter than the quiescent level until it finally returned to the quiescence on JD 2453209. The post-outburst active phase, hence, continued for 17 d after the main outburst.

We detected several short flares during the post-outburst active phase. Light curves of these flares are also shown in Figure 2 [panel (b)–(g)]. Contrary to the repetitive flares during the outburst (see the right panel of Figure 1), these flares are rather sporadic. On the other hand, their timescales are analogous to those during the outburst.

Most active phase was observed on JD 2453206, $\sim$ 2 d before it returned to the quiescent level. The light curve on JD 2453206 is shown in the panel (g) of Figure 2. In this figure, we can see several steep brightenings superimposed on the 10-min flares. Similar phenomena were also observed during the 2002 and 2003 outbursts, and we call them optical flashes. In Uemura et al. (2004b), we set a phenomenological definition of optical flashes as brightenings by $\sim$ 0.5 mag within $\sim$ 50 s. The light curve in the panel (g) includes two optical flashes with this criterion at JD 2453206.514 and 2453206.530. Several rapid flares with smaller amplitudes ($\sim$ 0.2 mag) are also seen between JD 2453206.51–53.

The outburst in 2004 was also detected by X-ray observations. Swank (2004) reported a reappearance of the object in X-rays at 8.2 mCrab (2-10 keV) on JD 2453189.996. This observation indicates that the object had already been active 1 d before the optical detection of the outburst. Radio activities were also reported, though spatially resolved jets were not detected (Rupen et al. 2004a; Trushkin 2004; Senkbeil & Sault 2004). Rupen et al. (2004b) reported that the last clear detection was on JD 2453206.7 at 2.0 mJy (4.86 GHz). We detected the optical flashes at the same day of this radio detection (JD 2453206.5). The radio flux returned to a quite low level in their next radio observation on JD 2453209, which is consistent with the optical behaviour.

The outbursts in 2002, 2003, and 2004 have several common characteristics. First, the X-ray flux was relatively low compared with the optical flux. Second, the object showed short flares having a timescale of 10 min. Assuming a flat spectrum in the optical range, we can calculate a ratio of the X-ray flux to the optical one, $F_{\rm X}/F_{\rm opt} \gtrsim 0.4$ from

[1]ftp://ftp.nofs.navy.mil/pub/outgoing/aah/sequence/v4641sgr.dat

8.2 mCrab (2-10 keV; Swank 2004) and $R_c = 11.3$ (maximum) during the outburst in 2004. On the other hand, in the case that the optical–X-ray flux is dominated by the thermal emission from a standard accretion disk, F_X/F_{opt} should be $\sim 10^3$. Such a low X-ray flux indicates that the object was in the "low/hard state" of black hole X-ray binaries, during which a strong synchrotron emission is dominant in the radio–infrared range, or possibly even in the optical range (Fender 2001). The apparent radio–optical correlation around JD 2453209, which we mentioned above, supports that the optical activity originated from the synchrotron emission.

Another noteworthy characteristic is the post-outburst active phase, which was observed for the first time since 2002 (Uemura et al. 2004a). Optical flashes were observed during both post-outburst active phases in 2002 and 2004. It is interesting to note that, in both cases, the object soon returned to quiescence after those strongly active phases with optical flashes (Uemura et al. 2004a).

These common characteristics suggest that the 2004 outburst has the same nature as those in 2002 and 2003, and it is different from the super-Eddington outburst in 1999. On the other hand, the duration of the post-outburst active phase in 2004 was shorter (17 d) than that in 2002 ($\gtrsim$ 40 d). As well as the post-outburst phase, the main outburst also had a shorter duration in 2004; the main outbursts in 2002 and 2003 lasted for 7 d, while that in 2004 for $<$ 4 d (Uemura et al. 2004a, b). The total amount of energy release, hence, decreased from the outburst in 2002 to that in 2004. We need to keep monitoring this object to confirm whether this decreasing trend is only temporary or not.

Part of this work is supported by a Research Fellowship of the Japan Society for the Promotion of Science for Young Scientists. RM acknowledges grant Fondecyt 1030707. This work is partly supported by a grant-in aid from the Japanese Ministry of Education, Culture, Sports, Science and Technology (No.s. 13640239, 15037205, 16340057).

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5627

Konkoly Observatory
Budapest
24 May 2005

HU ISSN 0374 – 0676

ON THE ORBITAL PERIOD OF KQ Mon

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KQ Mon was detected as a variable star by Hoffmeister (1943). It received a first classification as an irregular variable with the spectral type of a carbon star (Cameron & Nassau 1956), which was changed to a cataclysmic variable of UX UMa subtype by Sion & Guinan (1982) who discussed IUE spectra of this object. The latter authors also discuss parallel high speed photometry, which showed variation in the form of low amplitude flickering, but no apparent orbital modulation. This classification was later confirmed by Zwitter & Munari (1994) whose optical spectrum of KQ Mon shows a blue continuum and a strong Hα emission line. Hoard et al. (2002) identified the object in the 2MASS survey and found that it is a close visual triple star which was resolved in the 2MASS images. This might explain the earlier ambiguous spectral classification.

In the framework of the REU (Research Experiences for Undergraduates) observation campaign at CTIO (Cerro Tololo Inter-American Observatory) in February 2004, we performed time-resolved medium resolution spectroscopy of KQ Mon with the aim of obtaining its orbital period.

We observed the object in two nights with the R-C spectrograph at the 1.5 m telescope at CTIO, covering about 8.5 h in total (see Table 1 for details on the observations). Standard data reduction was performed with IRAF including bias and flatfield correction and wavelength calibration. The spectra have a FWHM resolution of 0.26 nm and a spectral range of 590–710 nm, thus including the Hα emission line. No flux calibration has been performed. All subsequent analysis of the data has been done using MIDAS.

We have averaged the individual spectra, for each pixel disregarding the ten values farthest from the median value. The resulting average spectrum of KQ Mon is plotted in Fig. 1. It mainly shows a narrow (FWHM = 1.068(2) nm) Hα emission line with an

Table 1: Observational details of the individual spectra.

Date & UT at start of first exposure		number of exposures	individual exposure time [s]
2004-02-08	01:18:38	5	600
2004-02-08	02:17:59	41	300
2004-02-11	00:19:49	23	300

equivalent width of -0.46(3) nm. Some absorption features might be due to the secondary star. No low excitation emission lines are found in the spectrum, thus confirming the previous classification as UX UMa type star.

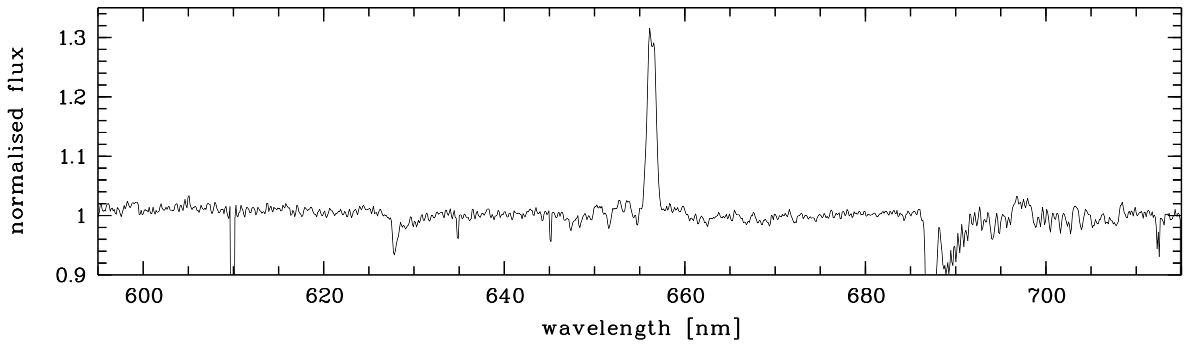

Figure 1. The average spectrum of KQ Mon.

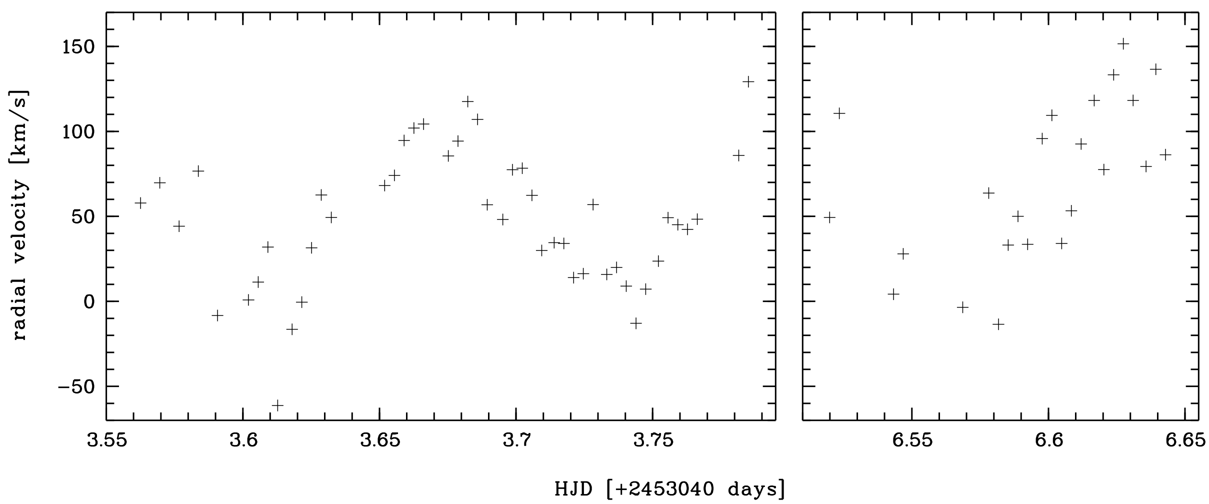

Figure 2. The radial velocities are plotted against the time of their observation.

The radial velocities have been determined by fitting a broad Gaussian to the Hα emission line in the individual spectra. They have been corrected for the motion of the observer towards the object. In Fig. 2 the radial velocities are plotted against the heliocentric Julian date. A clear sinusoidal variation is seen in the data.

We have used the Scargle algorithm (Scargle, 1982) and the analysis-of-variance method (Schwarzenberg-Czerny, 1989) as implemented in MIDAS, to find the period in the radial velocities. The resulting periodograms are plotted in Fig. 3. From these we derive four possible values for the orbital period at 2.83(4) h, 2.95(4) h, 3.08(4) h, and 3.22(5) h, the most probable alias being the period $P = 3.08(4)$ h.

Using this value for the orbital period and arbitrarily setting the first data point (HJD = 2453043.5626) to $\phi = 0$, we have derived the orbital phase for the time of the observations. In Fig. 4, the radial velocities are plotted against this orbital phase.

They were fitted using a minimum of variance method on the sinusoidal fitting function

$$v(\phi) = \gamma + K_1 \cdot \sin\left(2\pi\left(\phi + 0.5 - \phi_0\right)\right) \qquad (1)$$

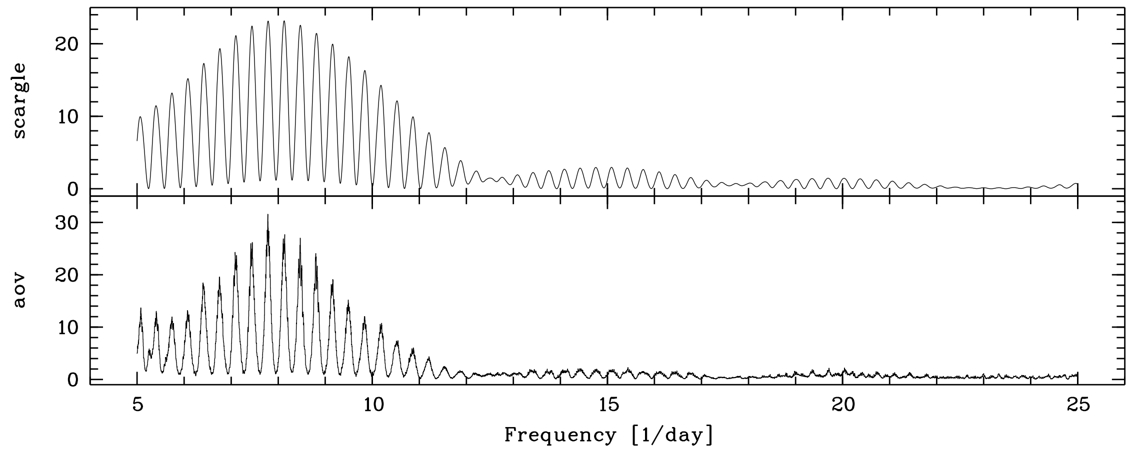

Figure 3. The periodograms of the radial velocities are calculated by Scargle and AOV method, see text for details.

where v is the measured radial velocity and ϕ the orbital phase as derived above. The fitting parameters are the system velocity γ, the semi-amplitude K_1 of the radial velocity, and the phase shift ϕ_0 for the red-to-blue crossing on the velocity curve which in the absence of discrete emission sources in the disc corresponds to the inferior conjunction of the secondary.

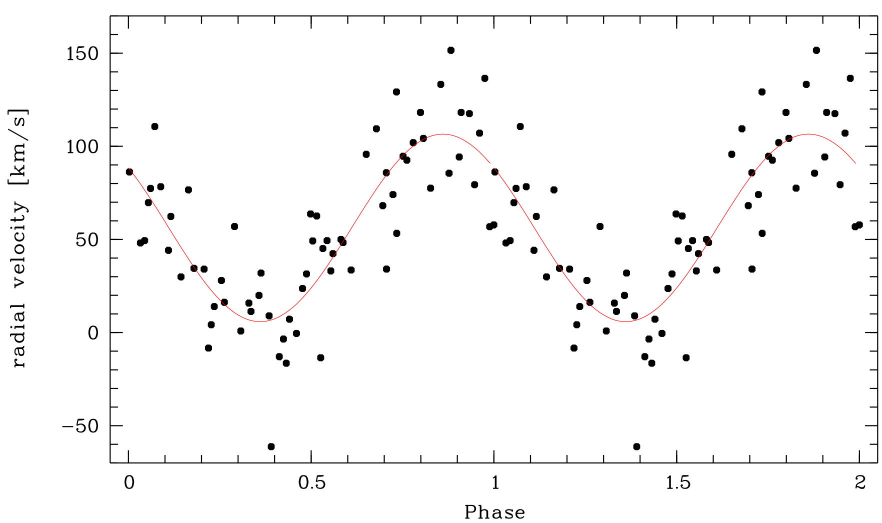

Figure 4. The radial velocities are plotted against the orbital phase with respect to the period $P = 3.08\,\mathrm{h}$, the first data point being arbitrarily set to phase zero. The best sinusoidal fit is overplotted.

The stability of the fit has been tested using Monte-Carlo simulations which also yield the uncertainties of the individual quantities. We thus derive the following parameters: $\gamma = 56 \pm 2\,\mathrm{km/s}$, $K_1 = 50 \pm 2\,\mathrm{km/s}$, and $\phi_0 = 0.111 \pm 0.008$.

An orbital period $P = 3.08\,\mathrm{h}$ would place KQ Mon at a position just above the period gap for cataclysmic variables. Novalike variables in this period bin tend to be strong candidates for being physical SW Sex type stars (Gänsicke, 2005; Rodríguez–Gil 2005). We did find some hints for variable high velocity wings in the individual spectra of KQ Mon which would confirm this classification, but the S/N is not sufficient for an unambiguous statement on the presence of this feature. Furthermore, the presence of absorption features in the average spectrum might hint towards KQ Mon being a magnetic system.

We conclude that further data are needed to a) confirm the present choice of the orbital period and b) to ascertain a possible magnetic and/or SW Sex type nature of KQ Mon.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5628

Konkoly Observatory
Budapest
24 May 2005

HU ISSN 0374 – 0676

DISCOVERY OF A SHORT-PERIODIC PULSATING COMPONENT IN THE ALGOL-TYPE ECLIPSING BINARY SYSTEM V346 Cyg

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[4] Astronomical Observatory, Odessa National University, Shevchenko Park, Odessa, 65014, Ukraine

Name of the object:
V346 Cyg

Observatory and telescope:
Mt. Lemmon Optical Astronomy Observatory in USA, 1.0m telescope[1]

Detector:	2K CCD camera
Filter(s):	Johnson *B*

Date(s) of the observation(s):
November 19, 20, 25, 26, 27, and 28, 2004

Comparison star(s):	2MASS 20193193+3620254
Check star(s):	2MASS 20191838+3621416
Transformed to a standard system:	No

Availability of the data:
Upon request

Method of data reduction:
Standard CCD-frame reduction using the IRAF/DAOPHOT[2] package

[1]Korea Astronomy & Space science Institute (*KASI*) had installed the telescope and has been operating it by remote control from Korea via a network connection.

[2]IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

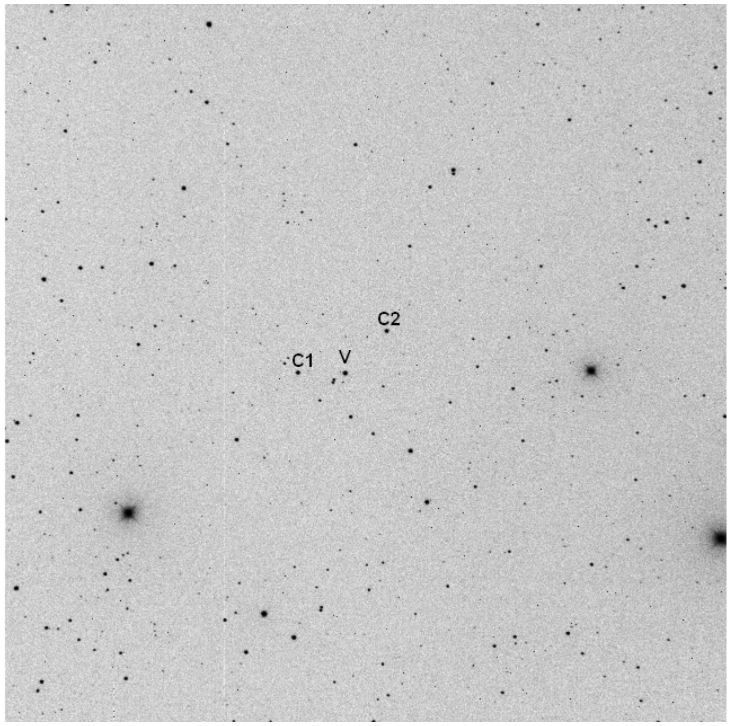

Figure 1. A B-band CCD image ($22.'2 \times 22.'2$) of the eclipsing binary V346 Cyg (V). North is up and east is to the left. Two stars of 2MASS 20193193+3620254 ($B = 12.^{m}354$, $V = 12.^{m}128$; Kharchenko 2001) and 2MASS 20191838+3621416 ($B = 12.^{m}357$, $V = 11.^{m}602$; Kharchenko 2001) were chosen as the comparison (C1) and check (C2) stars, respectively.

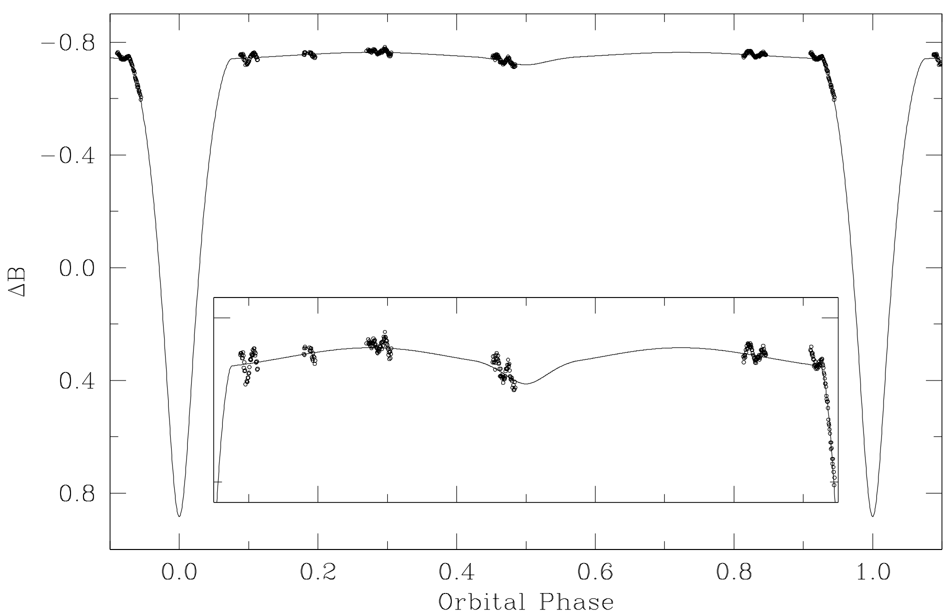

Figure 2. Phase diagram of V346 Cyg in B-passband. The line is a synthetic eclipsing light curve which derived from the 1998-version of Wilson & Devinney (1971) code, taking into consideration of the primary minimum depth of about $1.^{m}7$ (Samus et al. 2004) and light curve solution by Surkova & Svechnikov (2004). An enlarged graph for outside the primary eclipse is shown in the inner panel.

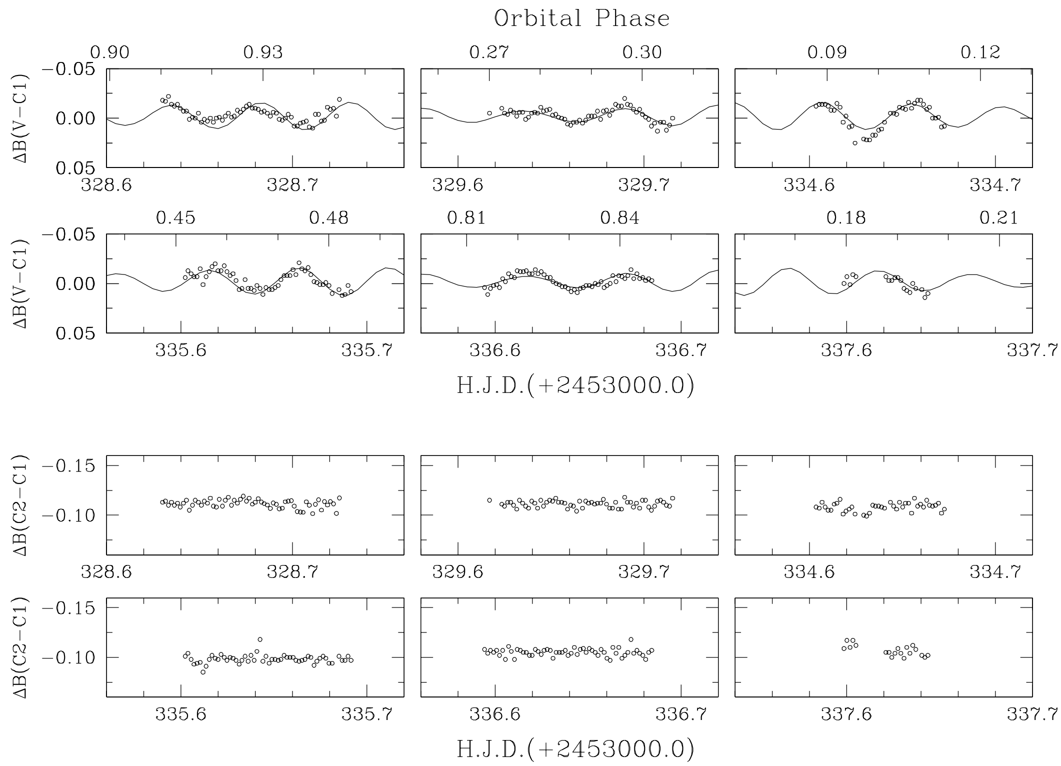

Figure 3. (Upper) Light variations of the residuals after subtracting the synthetic eclipsing light curve from the data. The lines are sinusoidal curves obtained from the multiple frequency analysis. (Lower) Differential magnitudes of the check star, ΔB(C2−C1), are displayed for comparison.

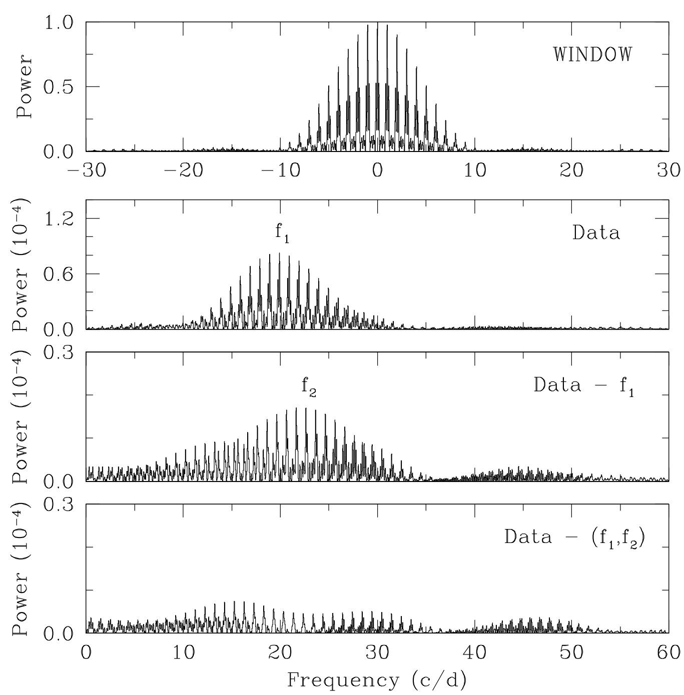

Figure 4. Power spectra of the residuals, except for the data around the primary minimum. The window spectrum is displayed in the top panel. We can detect two frequencies of f_1 = 19.912 c/d and f_2 = 22.636 c/d from the successive pre-whitening procedure (Kim & Lee 1996).

Remarks:

As a part of our photometric survey project to search for A-type pulsating components in eclipsing binary systems (Kim et al. 2003), we monitored the Algol-type semi-detached eclipsing binary V346 Cyg. The observations were performed for six nights in November 2004, about 2 hours per night, with a 2K CCD camera. Exposure time was typically 100 seconds in B-passband. Simple aperture photometry was applied to get instrumental magnitudes with an aperture radius of 8 pixels ($=5\farcs12$); seeing size was about $2\farcs5$ during the observing runs.

Phase diagram of V346 Cyg is shown in Figure 2, where orbital phases were calculated with the orbital period of 2.743305 day and the primary minimum epoch of $H.J.D.$2452500.398 (Kreiner 2004). We obtained residuals after subtracting a synthetic eclipsing light curve from the data. Amplitudes of their variations change from cycle to cycle (Figure 3), implying that the variable star has multiple periods. Power spectra of the residuals were obtained from the multiple frequency analysis (Kim & Lee 1996), displayed in Figure 4. We could detect two frequencies of f_1 = 19.912 c/d (cycles per day) and f_2 = 22.636 c/d from the successive pre-whitening procedure.

In conclusion, our observations show that the primary component of V346 Cyg has δ Scuti-type pulsational characteristics such as periods of about 1.2 hours, peak-to-peak amplitudes of about $0\fm03$ in B-passband, multi-periodicity, and spectral type of A5 (from the CDS). Considering these pulsational characteristics and the semi-detached binary configuration (Budding et al. 2004; Samus et al. 2004), we suggest that V346 Cyg is a new member of the oscillating EA (oEA) stars, a group of mass-accreting pulsating components in Algol-type semi-detached eclipsing binary systems (Mkrtichian et al. 2004); the oEA stars have different evolutionary stage from classical δ Scuti-type pulsators. Then the number of the oEA stars has increased seventeen (Mkrtichian et al. 2005; Kim et al. 2005).

Acknowledgements:

This research made use of the SIMBAD database, operated at CDS, Strasbourg, France

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5629

Konkoly Observatory
Budapest
7 June 2005

HU ISSN 0374 – 0676

DISCOVERY OF A SHORT-PERIODIC PULSATING COMPONENT IN THE ALGOL-TYPE ECLIPSING BINARY SYSTEM IU Per

and Two New δ Scuti-Type Variables in the Vicinity of IU Per

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Name of the object:
IU Per, GSC 02858-02449, GSC 02859-01458

Observatory and telescope:
Mt. Lemmon Optical Astronomy Observatory in USA, 1.0m telescope[1]

Detector:	2K CCD camera
Filter(s):	Johnson B

Date(s) of the observation(s):
December 16, 18, 19, 20, 21, and 22, 2004

Comparison star(s):	GSC 02859-00794
Check star(s):	GSC 02858-02003
Transformed to a standard system:	No

Availability of the data:
Upon request

Method of data reduction:
Standard CCD-frame reduction using the IRAF/DAOPHOT[2] package

[1]Korea Astronomy & Space science Institute (*KASI*) had installed the telescope and has been operating it by remote control from Korea via a network connection.

[2]IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

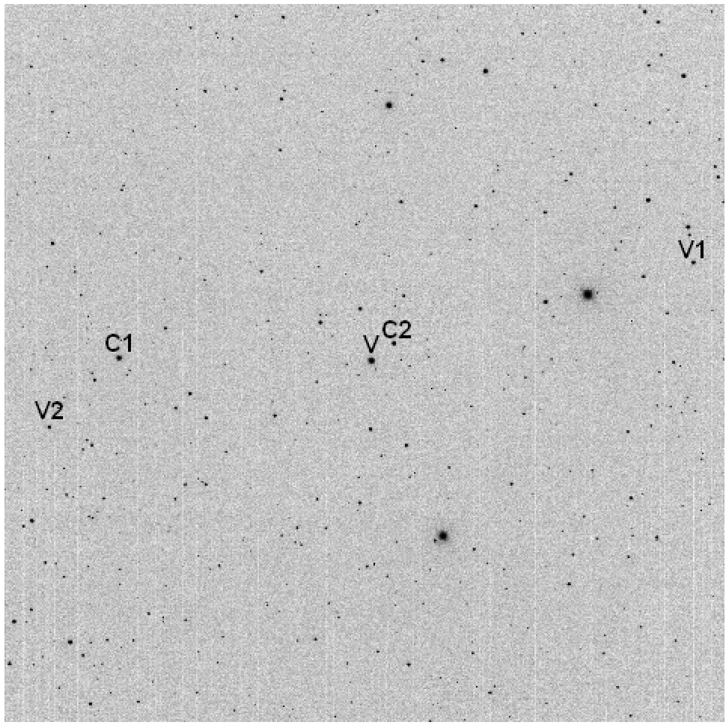

Figure 1. A B-band CCD image ($22\overset{\prime}{.}2 \times 22\overset{\prime}{.}2$) of the eclipsing binary IU Per (V). North is up and east is to the left. Two stars of GSC 02859-00794 ($B = 11\overset{\mathrm{m}}{.}85$, $V = 11\overset{\mathrm{m}}{.}36$; Kharchenko 2001) and GSC 02858-02003 ($B = 12\overset{\mathrm{m}}{.}24$, $V = 11\overset{\mathrm{m}}{.}88$; Kharchenko 2001) were chosen as the comparison (C1) and check (C2) stars, respectively. Two new variable stars, V1 = GSC 02858-02449 ($B = 13\overset{\mathrm{m}}{.}8$, $R = 13\overset{\mathrm{m}}{.}2$; Monet et al. 1998) and V2 = GSC 02859-01458 ($B = 13\overset{\mathrm{m}}{.}9$, $R = 13\overset{\mathrm{m}}{.}2$; Monet et al. 1998) are also marked.

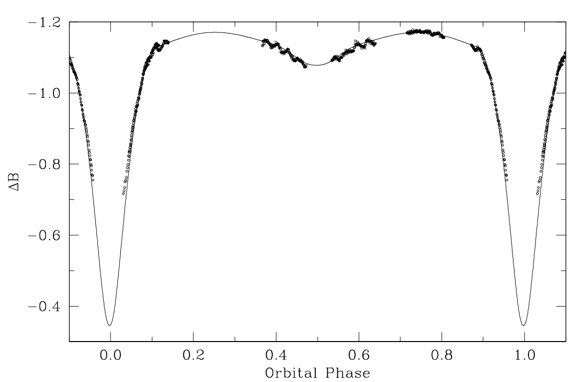

Figure 2. Phase diagram of IU Per in B-passband. The line is a synthetic eclipsing light curve which derived from the 1998-version of Wilson & Devinney (1971) code, taking into consideration of the light curve solution by Budding et al. (2004).

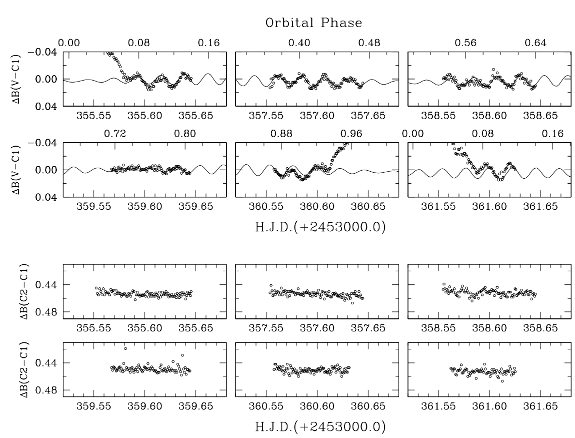

Figure 3. (Upper) Light variations of the residuals after subtracting the synthetic eclipsing light curve from the data. The lines are sinusoidal curves obtained from the multiple frequency analysis. (Lower) Differential magnitudes of the check star, ΔB(C2−C1), are displayed for comparison.

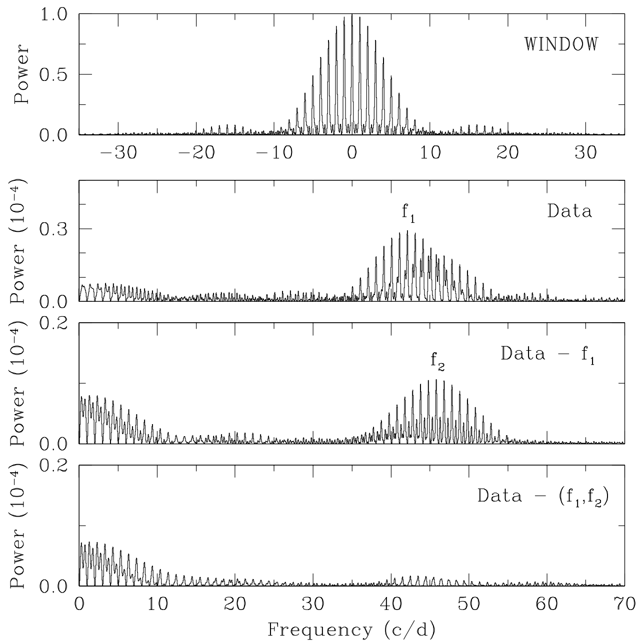

Figure 4. Power spectra of the residuals, except for the data around the primary minimum. The window spectrum is displayed in the top panel. We can detect two frequencies of $f_1 = 42.103$ c/d and $f_2 = 45.806$ c/d from the successive pre-whitening procedure (Kim & Lee 1996). Peaks at low-frequency less than 10.0 c/d may be originated from the incomplete fit of the synthetic eclipsing curve.

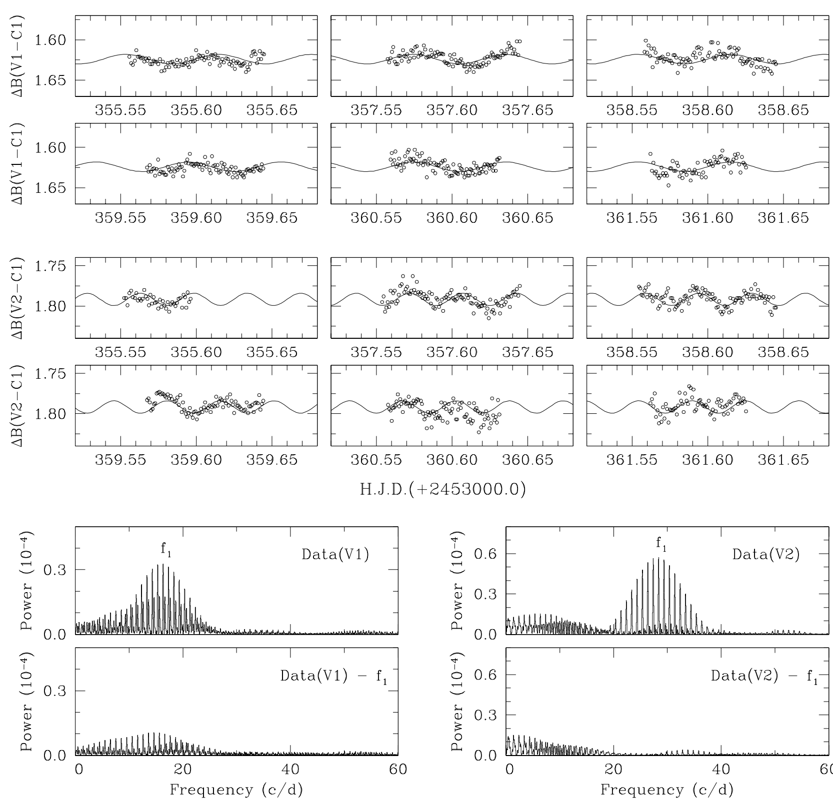

Figure 5. Light variations (upper) and power spectra (lower) of two new variable stars, V1 and V2. V1 has a dominant frequency of 16.332c/d and V2 of 28.375 c/d.

Remarks:

As a part of our photometric survey project to search for A-type pulsating components in eclipsing binary systems (Kim et al. 2003), we monitored the Algol-type semi-detached eclipsing binary IU Per. The observations were performed for six nights in December 2004, about 2 hours per night, with a 2K CCD camera. Simple aperture photometry was applied to get instrumental magnitudes with an aperture radius of 9 pixels (=5.″76); seeing size was about 2.″8 during the observing runs. We examined differential magnitudes of tens of stars in the observing field to check their variations. Phase diagram of IU Per is shown in Figure 2, where orbital phases were calculated with the orbital period of 0.8570257 day and the primary minimum epoch of $H.J.D.$2452500.214 (Kreiner 2004). We obtained residuals after subtracting a synthetic eclipsing light curve from the data. Amplitudes of their variations change from cycle to cycle (Figure 3), implying that the variable star has multiple periods. We applied the multiple frequency analysis (Kim & Lee 1996) to get power spectra of the residuals, displayed in Figure 4, and detected two frequencies f_1 = 42.103 c/d (cycles per day) and f_2 = 45.806 c/d.

Our observations show that the primary component of IU Per has δ Scuti-type pulsational characteristics such as periods of about 34 minutes, peak-to-peak amplitudes of about $0.^{m}02$ in B-passband, multi-periodicity, and spectral type of A4 (Samus et al. 2004). Considering these pulsational characteristics and the semi-detached binary configuration (Samus et al. 2004), we suggest that IU Per is a new member of the oscillating EA (oEA) stars, a group of mass-accreting pulsating components in Algol-type semi-detached eclipsing binary systems (Mkrtichian et al. 2004). Then the number of the oEA stars has increased eighteen (Mkrtichian et al. 2005; Kim et al. 2005).

We have also discovered two new variable stars, V1 = GSC 02858-02449 and V2 = GSC 02859-01458, in the observing field. Figure 5 shows their light variations and power spectra. Considering their short periods, small amplitudes, and color indexes, we suggest that these stars are δ Scuti-type pulsating variables.

Acknowledgements:

This research made use of the SIMBAD database, operated at CDS, Strasbourg, France

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Kim, S.-L., Lee, J.W., Kang, Y.B., et al., 2005, *IBVS*, 5628

Kreiner, J.M., 2004, *Acta Astronomica*, **54**, 207

Mkrtichian, D.E., Kusakin, A.V., Rodríguez, E., et al., 2004, *A&A*, **419**, 1015

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Wilson, R.E., Devinney, E.J., 1971, *ApJ*, **166**, 605

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5630

Konkoly Observatory
Budapest
22 June 2005

HU ISSN 0374 – 0676

NEW ELEMENTS FOR 80 ECLIPSING BINARIES VI.

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The ASAS-3 (Pojmanski, 2002), NSVS (Wozniak et al., 2004) and Hipparcos (Perryman et al., 1997) databases have been used to find new elements for a fifth set of 80 eclipsing binaries. NSVS, ASAS-3 and Hipparcos data have been combined to improve the period determinations. Unfiltered NSVS ROTSE1 magnitudes were shifted to match the V magnitude of the stars. When neither ASAS nor Hipparcos observations exist, the original ROTSE1 magnitudes have been given. Saturated data in ASAS-3 and flagged observations in the Hipparcos Epoch Photometry and the NSVS dataset were also discarded. Hipparcos observations have been transformed to V using a table by the author published electronically in IBVS No. 5482 (Otero, 2003). The candidate stars were selected from the Hipparcos Variability Annex and the NSV catalogue (Kukarkin and Kholopov, 1982) and its supplement (NSVS) (Kazarovets et al., 1998). Stars classified as eclipsing binaries and those showing mean Hp magnitudes close to the maximum Hp values in the Hipparcos Variability Annex were identified and their ASAS-3 and/or NSVS data subsequently obtained. Stars in the NSV catalogues that had no given classification or were classified as eclipsing binaries, S, L, I, CST or VAR with no spectral type published or spectral type K or earlier were also checked. Elements were found with AVE (Barberá, 1999).

Table 1 shows the list of variables. The first column gives the variable star designation according to the GCVS. The following columns give another identifier; the brightness range of the variable (*= ROTSE1 magnitudes), with the magnitude of secondary eclipse between brackets; the epoch of minimum light derived from all the data available; the period; the variability class and the spectral type with a note to the spectral type source.

Table 1. New elements for 80 eclipsing binary stars.

Star Name		Magnitude range	Epoch	Period		
Variable	Other ID	(V)	(HJD2440000+)	(days)	Type	Spectral type
NSV 00043*	GSC 4492 0986	11.05−11.42(11.40)*	11482.647	3.7659	EA	A3IV (45)
NSV 00856*	GSC 2332 0248	10.85−11.65(10.95)*	11521.683	13.620	EA	
NSV 00901	GSC 3296 0928	12.07−12.35 12.20)*	11452.702	1.8771	EA	A8 (14)
NSV 01217*	GSC 2359 0782	12.65−13.22(13.20)*	11536.724	0.366556	EW/KW	
NSV 01697*	GSC 0091 0830	9.51−10.06 (9.95)	11946.829	18.897	EA	G5(V) (17)
NSV 01978*	HD 294092	11.57−12.4:(12.1:)	13058.657	4.48716	EA	G4 (45)
NSV 01986	HD 035753	9.65−10.21 (9.71)	11579.808	2.29609	EA	A9V (4)
NSV 02403	GSC 0713 0562	12.95−13.6(13.45:)	12884.867	6.3650	EA	
NSV 02503*	GSC 1865 2657	10.15−10.75:(10.61)	13347.724	5.43077	EA	A3m (14)
NSV 02652*	GSC 6494 0241	11.45−12.2:(12.0:)	12634.783	10.6495	EA	
NSV 02895*	GSC 1315 1391	11.55−12.06(12.05)	11504.715	2.55156	EA	
NSV 02940*		13.47−14.7:(14.3:)	13399.565	1.59290	EA	
NSV 03014	GSC 0150 1044	12.70−13.2:(13.15:)	11565.855	2.44879	EA	
NSV 03210*	GSC 1893 0748	12.78−13.6:(13.2:)	13345.698	0.757285	EA	
NSV 03251*	GSC 5391 1022	12.07−13.08(12.17)	11920.655	2.3540	EA	
NSV 03300*	HD 267059	11.48−12.25 (12.1)	13045.632	1.69841	EA	A (33)
NSV 03346*	GSC 1348 1004	12.24−14.5:(12.35)	13465.450	3.30831	EA	
NSV 03450	GSC 1350 0117	12.33−13.6 (12.58)	11548.725	0.605946	EA	
NSV 03521	GSC 0767 0641	11.94−13.9:(12.05)	13113.570	0.99369	EA	
NSV 03637	GSC 0182 2516	11.88−12.65(12.18)	11560.719	5.04735	EA	
NSV 03654	GSC 5397 2526	12.95−14.35: (-)	12958.760	2.65361	EA	
NSV 03822	HD 065212	9.36−9.9: (9.6:)	12655.733	4.53022	EA	A1/2V (2)
NSV 03849	GSC 5994 3338	11.88−12.75:(12.15)	13053.678	1.75072	EA	
NSV 03878	GSC 2973 0339	9.73−10.1:(9.80)*	11497.820	2.2353	EA	A2 (14)
NSV 03951*	GSC 9201 0234	11.98−12.81(12.16:)	13461.716	1.92193	EA	
NSV 03975*	SAO 199009	9.61−9.91 (-)	13413.710	115.481	EA	F8 (57)
NSV 04095*	GSC 5440 1394	11.55−12.23(11.86)	11578.880	7.3089	EA	A (14)
NSV 04205	GSC 8938 1101	11.02−11.47(11.20)	12619.896	8.0758	EA	
NSV 04347	GSC 0817 2254	11.80−12.36(12.32)	11630.657	0.4216475	EW	
NSV 04408	HD 302103	10.96−11.82(11.35)	12690.713	3.13602	EA	A (9)
NSV 04476*	HD 304625	10.20−10.75:(10.60:)	13383.850	4‘.84493	EA	B8 (14)
NSV 05056*	GSC 7212 0360	11.52−12.24(12.24)	13447.705	3.59426	EA	
NSV 05584*	GSC 7241 0413	10.80−11.60(10.97)	12710.707	0.996386	EA	
NSV 05891*	HD 110544	9.56−9.78 (9.60)	12064.518	1.270335	EA	G8IVCNIII (3)
NSV 05987*	GSC 0291 0300	13.3−14.1 (13.8)	13392.858	0.352864	EB/KW	
NSV 06047	GSC 7253 1662	11.97−12.7 (12.26)	13133.814	1.069415	EA	
NSV 06078	HD 312256	9.68−10.22(10.13)	13153.621	5.97872	EA	B0V (56)
NSV 06226	GSC 7791 0774	11.70−13.8 (11.83)	13106.757	2.13185	EA	
NSV 06518*	GSC 9013 1470	11.30−11.70(11.36)	12720.688	1.44876	EA	
NSV 06584*	GSC 9013 1272	10.95−11.65(11.4:)	12652.828	2.32713	EA	
NSV 06595	GSC 6739 0897	13.25−13.8 (13.8)	13251.520	0.342528	EW	
NSV 06624*	GSC 7290 0768	11.77−12.76(12.05)	13063.822	2.582712	EA	
NSV 06925	GSC 9028 0849	12.30−14.3(12.33:)	12417.590	19.0017	EA	
NSV 07222	GSC 5605 0823	12.46−13.35(12.55)	13140.750	18.002	EA	
NSV 07274	HD 141329	9.85:−10.25(10.10)	12145.497	1.29838	EB	A2/3III/IV (2)
NSV 07283*	GSC 6190 0563	13.5−14.3 (14.3)	12755.914	0.351671	EW	
NSV 07991*	HD 151742	8.55−9.0: (8.79)	12192.575	61.874	EA	ApSi (2)
NSV 08020*	HD 152218	7.58−7.67 (7.59)	12468.620	5.604	EA	O9V (2)
NSV 08780*	GSC 0409 1742	12.50−13.2 (13.2)	12860.694	0.419892	EW	
NSV 09018*	HD 323569	11.21−11.60(11.52)	12117.565	5.54177	EA	A (9)
NSV 09234*	GSC 1000 1400	11.40−12.0 (-)	13122.835	3.46464	EA	
NSV 09677	GSC 8355 0356	12.25−13.3 (12.37)	12463.628	1.65552	EA	
NSV 09708*	HD 324381	10.40−11.00(10.92:)	12549.519	9.1066	EA	G0 (9)
NSV 09853*	GSC 1553 1077	12.65−14.1:(13.2:)	13229.608	2.467545	EA	
NSV 09919	GSC 0421 0745	12.83−13.85:(12.97)	13448.899	0.776761	EA	
NSV 10624*	GSC 6277 0816	11.95:−12.35:(12.3:)	12566.494	2.37999	EA	
NSV 10845	GSC 8371 2232	11.97−12.50(12.10)	12114.769	0.838637	EA	

Table 1. New elements for 80 eclipsing binary stars. (cont.)

Star Name		Magnitude range	Epoch	Period		
Variable	Other ID	(V)	(HJD2440000+)	(days)	Type	Spectral type
NSV 10870	GSC 1031 1766	12.50−13.0 (12.9)	11484.658	0.602937	EB/KE	
NSV 11391	GSC 7928 1244	11.08−12.0 (11.18)	12943.530	0.978382	EA	
NSV 12107	HD 183764	7.60−7.95 (7.76)	12055.777	1.43979	EA	B8V (3)
NSV 12514	GSC 1620 0078	12.20−12.55(12.48)	11482.654	0.41586	EW/KE:	
NSV 13016	HD 239379	9.86−10.65:(10.52)*	11492.835	0.311250	EW	F8 (24)
NSV 13663	GSC 0540 0826	11.44−11.72(11.66)	11356.700	5.4788	EA	
NSV 13853*	GSC 2201 1919	11.75−12.25(12.00)*	11486.805	0.78099	EB	
NSV 14193*	GSC 8449 0182	11.25−11.65:(11.6:)	13298.633	7.3334	EA	
NSV 14280*	GSC 4654 1090	13.10−13.85 (-)*	11353.855	2.91935	EA	
NSV 14315	GSC 9484 0472	13.3−14.4: (13.4)	12521.638	3.5088	EA	
NSV 15483*	HIP 010765	8.63−8.72 (8.65)	8674.823	1.87970	EA	F5V (3)
NSV 16154*	HIP 021955	8.78−8.93(8.93:)	7908.707	7.447126	EA	A2 (24)
NSV 17426	HD 057220	8.32−8.37 (8.34)	12946.797	3.5101	EB	B8/9III (3)
NSV 18655*	HD 306035	9.94−10.47(10.24)	12973.770	19.811	EA	B8 (9)
NSV 19280*	GSC 8978 0893	11.76−12.02(11.85:)	13043.798	1.72912	EA	
NSV 19643*	HIP 064327	8.63−8.80 (8.78)	13183.610	10.35420	EA/DM	B7V (1)
NSV 19913*	HIP 066751	8.66−8.80(8.73:)	8966.453	6.50404	EA	B6II/III (1)
NSV 20106	HIP 070566	8.29−8.34 (8.30)	8612.396	2.12408	EA	F3V (36)
NSV 20235*	HIP 073780	9.28−9.55 (9.53)	8681.670	7.55596	EA	G0IV/V (2)
NSV 26081*	HIP 115675	8.72−8.98 (-)	8635.393	21.66595	EA	F2V (4)
OZ Aps *	HIP 085849	8.57−8.90: (-)	8562.645	27.03726	EA	A1V (1)
V1373 Ori*	HIP 025681	8.69−8.80 (8.78)	12184.500	122.68	EB/GS	K4/5III (5)
WZ Vol *	HIP 042841	8.28−8.52(8.31:)	8715.90	226.25	EA/GS	G3III (1)

Sources of spectral type: (1) Houk and Cowley, 1975. (2) Houk, 1978. (3) Houk, 1982. (4) Houk and Smith-Moore, 1988. (5) Houk and Swift, 1999. (9) Nesterov et al., 1995. (14) Kholopov et al., 2003. (17) Buscombe, 1998. (24) Ochsenbein, 1980. (33) Cannon and Pickering, 1993. (36) Jaschek et al., 1964. (45) Skiff, 2003. (56) Buscombe and Foster, 1995. (57) Jackson and Stoy, 1954.

Notes on individual stars:

NSV 00043 = Eccentric system.
NSV 00856 = Missed BD star according to the NSV catalogue (BD+33°460). New identification is based on this being the only bright star in the area.
NSV 01217 = I-type in the NSV catalogue (Kholopov et al., 2004).
NSV 01697 = Changing O'Connell effect. LB-type in the NSV catalogue (Kholopov et al., 2004).
NSV 01978 = IN:-type in the NSV catalogue (Kholopov et al., 2004).
NSV 02503 = Eccentric system. L-type in the NSV catalogue (Kholopov et al., 2004).
NSV 02652 = Eccentric system.
NSV 02895 = Period might be half the value given. Primary eclipse might be the secondary.
NSV 02940 = USNO-A2.0 1050-03445213 = 2MASS J06225989+1639030.
NSV 03210 = NSVS amplitude is reduced by light from nearby stars. Visual binary. 14th mag. companion at 11″ (Worley and Douglass, 1997)
NSV 03251 = NSVS amplitude is reduced by light from nearby stars.
NSV 03300 = NSVS amplitude is reduced by light from nearby stars.
NSV 03346 = NSVS amplitude is strongly reduced by light from nearby stars.
NSV 03951 = S-type in the NSV catalogue (Kholopov et al., 2004).
NSV 03975 = Period might be twice the value given.
NSV 04095 = Eccentric system.
NSV 04476 = Eccentric system.

NSV 05056 = Eccentric system. Primary eclipse might be the secondary.
NSV 05584 = S-type in the NSV catalogue (Kholopov et al., 2004).
NSV 05891 = Visual binary. $A = 10^{\rm m}\!.3$; $B = 10^{\rm m}\!.6$ Vt. Sep. $0''\!.45$ (Fabricius et al., 2002).
NSV 05987 = EW-type in the NSV catalogue (Kholopov et al., 2004).
NSV 06518 = Discovered by Knigge (1973) who named it as BV 1549 and reported "many minima, but more maxima". It was classified as L-type in the NSV catalogue. The NSV star is the eclipsing binary. The infrared source IRAS 13581-6433 at $14^{\rm h}01^{\rm m}54^{\rm s}\!.88$ $-64^\circ48'24''\!.3$ (2MASS) is wrongly identified as NSV 6518 by Bidelman and MacConnell (1998) who give spectral type M8 and also by Buscombe (1999) who gives spectral type K0:II:. It was correctly identified by Cieslinski et al. (1997) who photoelectrically observed it at maximum at $V = 11^{\rm m}\!.3$; $U-B = 0.06$; $B-V = 0^{\rm m}\!.27$. However they give a G8-K2 spectral type (Cieslinski et al., 1998) inconsistent with their own colors that are for an F-type star.
NSV 06584 = Eccentric system.
NSV 06624 = S-type in the NSV catalogue (Kholopov et al., 2004).
NSV 07283 = Primary eclipse might be the secondary.
NSV 07991 = Eccentric system.
NSV 08020 = In NGC 6231. Spectroscopic period of 5.603979 days in Stickland et al. (1997).
NSV 08780 = NSVS amplitude is strongly reduced by light from nearby stars. Primary eclipse might be the secondary.
NSV 09018 = Eccentric system. I-type in the NSV catalogue (Kholopov et al., 2004).
NSV 09234 = Period might be twice the value given.
NSV 09708 = Eccentric system.
NSV 09853 = Eccentric system.
NSV 10624 = The NSV catalog (Kholopov et al., 2004) classifies it as E: with spectral type M6. It's a visual pair. The eclipsing binary ($J-K = 0^{\rm m}\!.45$) is 2MASS J18195776-2207149 at $18^{\rm h}19^{\rm m}57^{\rm s}\!.77$ $-22^\circ07'14''\!.9$ (2000.0). The red star ($J-K = 1^{\rm m}\!.7$) is 2MASS J18195750-2207090 at $18^{\rm h}19^{\rm m}57^{\rm s}\!.50$ $-22^\circ07'09''\!.1$ (2000.0). ASAS V-magnitude of the eclipsing binary is contaminated by nearby stars in this rich field. The red star is bright in the IR but too faint in V.
NSV 13853 = IS:-type in the NSV catalogue (Kholopov et al., 2004).
NSV 14193 = Eccentric system. Primary eclipse might be the secondary.
NSV 14280 = Period might be twice the value given.
NSV 15483 = Visual binary. $A = 9^{\rm m}\!.1$; $B = 10^{\rm m}\!.2$ Hp. Sep. $1''\!.67$ (Perryman et al., 1997) Component C (10.4 Vt) at $37''\!.4$ (Fabricius et al., 2002) contaminates ASAS data. ASAS V-magnitudes have been adjusted to V derived from Hipparcos.
NSV 16154 = Period might be half the value given. Primary eclipse might be the secondary. Visual binary. A= $9^{\rm m}\!.4$; B= $9^{\rm m}\!.9$ Hp. Sep. $0''\!.77$ (Perryman et al., 1997).
NSV 18655 = Eccentric system.
NSV 19280 = Discovered as a possible eclipsing binary by Caldwell et al. (1991). Caldwell's Ic observations have been shifted to the ASAS-V magnitude in the plot.
NSV 19643 = Slight apsidal motion. Secondary eclipse period is 10.35409 d.
NSV 19913 = Eccentric system.
NSV 20235 = Slightly eccentric system.
NSV 26081 = Period might be twice the value given.
OZ Aps = Period might be twice the value given.
V1373 Ori = Classified as a variable with a period of 61.60 days in the Hipparcos Catalogue. SRd variable in the GCVS.

WZ Vol = Total eclipse. Eclipse lasts less than 1 per cent of the cycle. Secondary eclipse at phase 0.29 (very eccentric system) is not confirmed. Period might be twice the value given with similar minima.

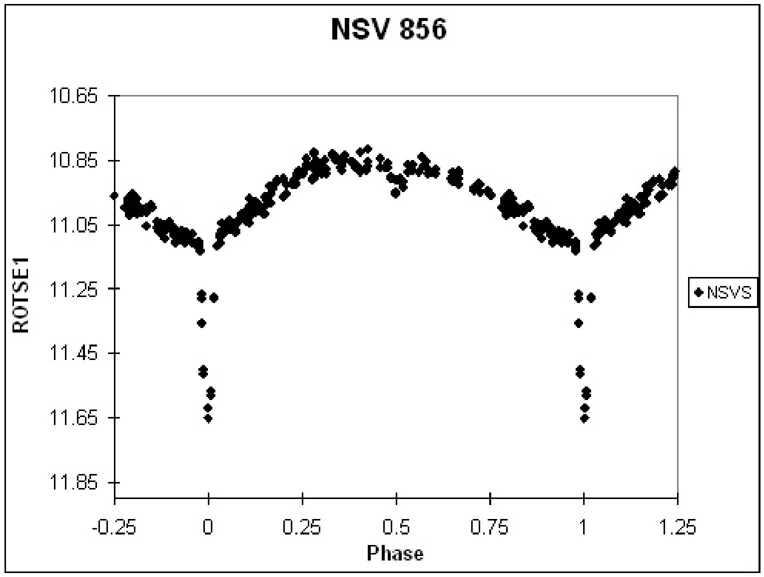

Figure 1. Light curve of NSV 00856 showing NSVS observations.

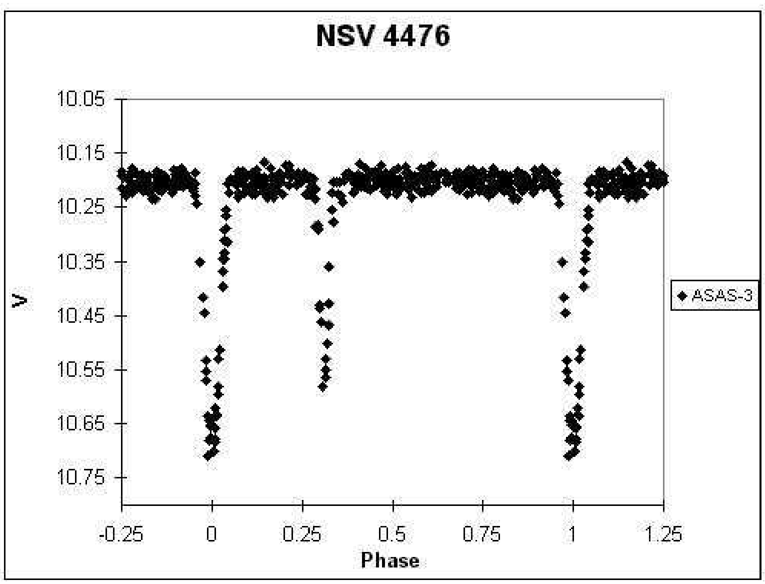

Figure 2. Light curve of NSV 04476 showing ASAS-3 observations.

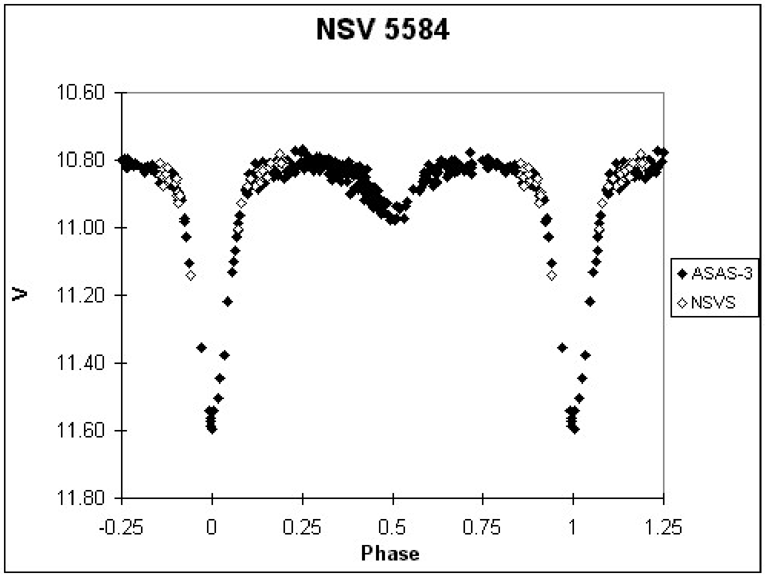

Figure 3. Light curve of NSV 05584 showing ASAS-3 and NSVS observations.

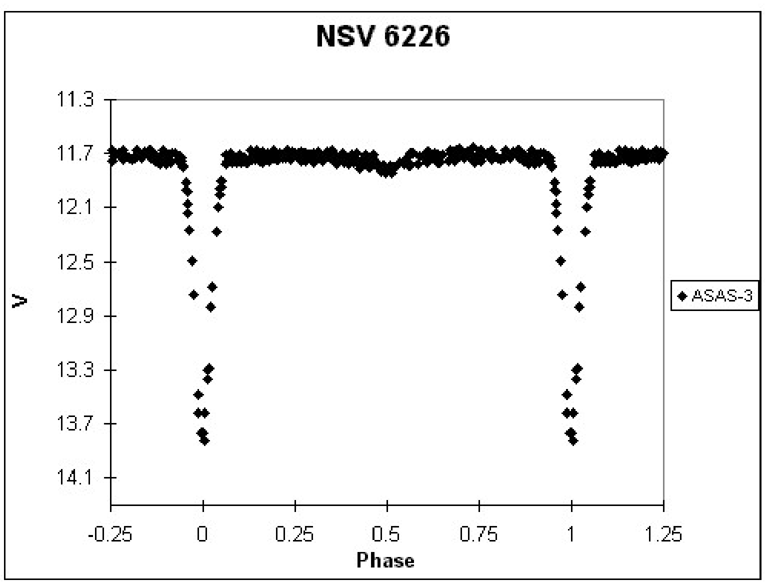

Figure 4. Light curve of NSV 06226 showing ASAS-3 observations.

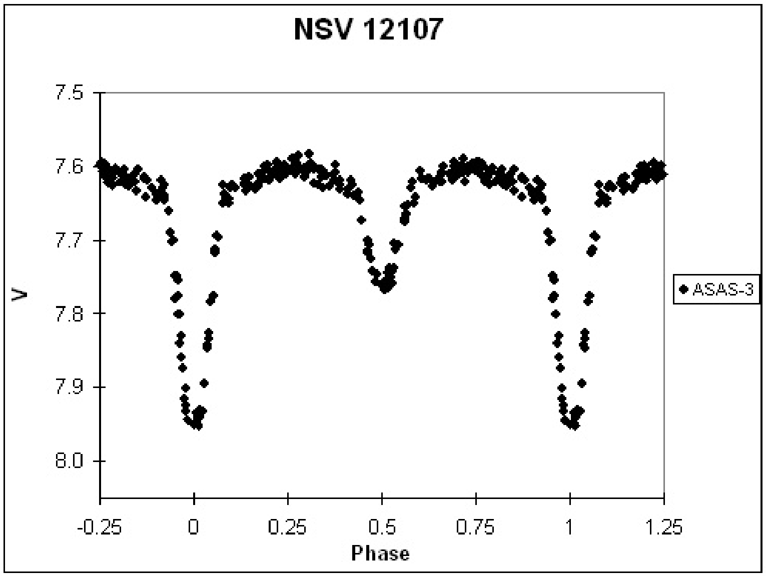

Figure 5. Light curve of NSV 12107 showing ASAS-3 observations.

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ERRATUM FOR IBVS 5586

The following information had been omitted from IBVS 5586:

Sources of spectral type (Table 1.): (1) Houk and Cowley, 1975. (2) Houk, 1978. (3) Houk, 1982. (5) Houk and Swift, 1999. (8) Kennedy, 1983. (9) Nesterov et al., 1995. (14) Kholopov et al., 2003. (17) Buscombe, 1998. (18) Buscombe, 1999. (24) Ochsenbein, 1980. (27) Grenier et al., 1999. (33) Cannon and Pickering, 1993. (36) Jaschek et al., 1964. (47) Jaschek, 1978. (48) Duflot et al., 1995. (50) Li and Hu, 1998.

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5631

Konkoly Observatory
Budapest
22 June 2005

HU ISSN 0374 – 0676

HIPPARCOS ECLIPSING BINARIES SHOWING APSIDAL MOTION II.

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Combination of the publicly available Hipparcos data (Perryman et al., 1997) from 1989-1993 with ASAS-3 (Pojmanski, 2002) and NSVS data (Wozniak et al., 2004) allows the detection of apsidal motion in ten eclipsing binaries discovered by the satellite. Table 1 lists the main parameters of the stars. The first column gives the variable star designation. The following columns show the HIP identifier, the V band range (with the secondary eclipse magnitude between brackets), the epoch and period of the primary and secondary eclipse respectively, the variable and spectral types and the source for spectral type following the numbering first adopted in Otero (2003).

Table 1.

Star	HIP identif	V magnitude	Epoch I	Period I	Epoch II	Period II	Type	Sp
KL CMa	HIP 031017	6.73−6.96(6.92:)	8170.261	1.762250	8171.228	1.762168	EA	B8V (4)
LT CMa	HIP 034080	7.43−7.59(7.57:)	8388.537	1.759535	8389.445	1.759503	EA	B5III (4)
MN TrA	HIP 078231	8.49−9.15 (8.99)	8006.360	2.379818	8007.426	2.379833	EA	B9V (1)
NSV 24512	HIP 091113	7.95−8.09 (8.09)	9038.828	2.259775	9039.972	2.259735	EA	B3V (45)
V0397 Pup	HIP 038167	5.94−6.11 (6.03)	8799.646	3.004449	8801.672	3.004390	EA	B9V (3)
V0399 Pup	HIP 038186	9.33−9.57:(9.47)	7889.738	3.91023	7891.862	3.91003	EA	B1Vnn (8)
V0493 Car	HIP 048832	8.87−9.22 (9.13)	7945.724	3.22943	7947.768	3.22937	EA	B9IV (1)
V0529 Car	HIP 054026	8.10−8.48 (8.36)	8157.209	4.74461	8159.970	4.74449	EA	B8V (1)
V0821 Cas	HIP 118223	8.22−8.66 (8.46)	7964.209	1.769754	7965.031	1.769720	EA	A0 (24)
V1081 Sco	HIP 085569	6.98−7.11 (7.05)	7920.528	2.513741	7921.858	2.513664	EA	O9.5V (24)

Sources of spectral type: (1) Houk and Cowley, 1975. (3) Houk, 1982. (4) Houk and Smith-Moore, 1988. (8) Kennedy, 1983. (24) Ochsenbein, 1980. (45) Skiff, 2003.

Notes on individual stars:

KL CMa = Visual binary (HJ 3864), B= 11.0 mag. Sep. $21''.6$ (Worley et al., 1997). The Hipparcos Catalogue gives a period of 1.7622 d. It is the one with the largest apsidal motion.
LT CMa = The Hipparcos Catalogue gives a period of 1.75955 d.
MN TrA = The Hipparcos Catalogue gives a period of 2.37983 d. This is the only case where the $O-C$ values for min II have grown positive.
NSV 24512 = HD 171491. Primary eclipse might be the secondary. Visual binary. A= $8^{m}.8$; B= $8^{m}.9$ Hp. Sep $0''.275$ (Perryman et al., 1997)
V0397 Pup = The Hipparcos Catalogue gives a period of 3.00455 d. Few times of minima in ASAS correspond to the time period November 2003 - October 2004 when the camera

focus and exposure time was changed allowing bright stars not to be saturated.
V0399 Pup = The Hipparcos Catalogue gives a period of 3.9102 d
V0493 Car = The Hipparcos Catalogue gives a period of 3.2294 d
V0529 Car = The Hipparcos Catalogue gives a period of 4.7445 d
V0821 Cas = The Hipparcos Catalogue gives a period of 1.76975 d

Hipparcos observations have been transformed to V using a table by the author (Otero, 2003b). The observation regime for both surveys, specially ASAS, implies that times of minima are often based on a single datapoint so they are approximate. Only single observations closer than 0.05 magnitudes to the mideclipse magnitude and closer than 0.05 days to the phase 0 of the folded lightcurve have been used as times of minima to get a sigma in the order of 0.03 days or less depending on the quality and quantity of the observations. On the other hand, the epochs have been determined applying the method of bisected chords on the whole datasets and are very accurate due to the long time span of the observations (1989-2005). Wrong observations (random datapoints deviating >0.05 mag. from the mean folded lightcurve) were discarded before any analysis was made.

Table 2 shows times of minima and residuals for all the stars based on the primary eclipse period to make the phase shift of the secondary eclipse evident.

Table 2.

Star	HJD+2440000	$O-C$	Min	Source*
KL CMa	8171.256	0.028	II	H
	8304.198	0.006	I	H
	8532.505	0.016	II	H
	8652.310	−0.012	II	H
	8661.146	0.013	II	H
	8698.920	−0.016	I	H
	8747.506	0.022	II	H
	12197.796	−0.173	II	A
	12235.747	−0.025	I	A
	12924.839	0.028	I	A
	12997.823	−0.208	II	A
	13043.628	−0.221	II	A
	13256.857	−0.225	II	A
	13294.885	0.001	I	A
	13399.597	−0.227	II	A
	13414.705	−0.012	I	A
	13436.603	−0.228	II	A
LT CMa	8323.409	−0.025	I	H
	8389.416	−0.029	II	H
	8402.644	0.031	I	H
	8590.861	−0.023	I	H
	11980.586	−0.070	II	A
	12250.740	0.024	I	A
	12623.723	−0.015	I	A
	12645.688	−0.072	II	A
	12727.562	0.012	I	A
	13018.677	−0.105	II	A
	13115.503	−0.053	II	A
	13251.900	0.008	I	A
	13362.719	−0.023	I	A
	13444.538	−0.051	II	A
	13466.550	−0.005	I	A

*H = Hipparcos; A = ASAS-3; N = NSVS

Table 2. (cont.)

Star	HJD+2440000	$O-C$	Min	Source*
MN TrA	8006.362	0.002	I	H
	8566.687	0.004	II	H
	8568.021	0.024	I	H
	8680.933	0.019	II	H
	11950.811	0.027	II	A
	12437.605	0.024	I	A
	12790.893	0.033	II	A
	12826.585	0.028	II	A
	12839.748	−0.022	I	A
	13059.824	0.044	II	A
	13391.866	−0.022	I	A
	13454.849	0.020	II	A
NSV 24512	8168.808	−0.007	I	H
	9038.822	−0.006	I	H
	11996.852	−0.021	I	A
	12030.811	0.041	I	A
	12701.902	−0.021	I	A
	12736.870	−0.094	II	A
	12804.694	−0.063	II	A
	13092.868	0.004	I	A
	13127.811	−0.094	II	A
	13290.521	−0.088	II	A
	13298.522	0.018	I	A
	13492.864	0.019	I	A
V0397 Pup	7979.456	0.008	I	H
	8655.450	0.015	I	H
	8697.493	−0.004	I	H
	8801.699	0.027	II	H
	12971.749	−0.098	II	A
	12974.781	−0.071	II	A
	12980.773	−0.088	II	A
V0399 Pup	7891.838	−0.024	II	H
	8116.550	0.019	I	H
	8153.949	0.102	II	H
	8550.550	−0.017	I	H
	8976.765	−0.017	I	H
	11948.581	0.024	I	A
	12239.767	−0.271	II	A
	12720.718	−0.278	II	A
	12724.630	−0.276	II	A
	12730.616	0.013	I	A
	12884.896	−0.330	II	A
	13469.625	−0.011	I	A
	13520.473	0.004	I	A
V0493 Car	7947.738	−0.030	II	H
	7971.541	−0.018	I	H
	8067.253	−0.004	II	H
	8210.531	−0.006	I	H
	8288.026	−0.018	I	H
	8629.140	−0.038	II	H
	8992.019	−0.040	I	H
	11903.721	−0.099	II	A
	11958.656	−0.064	II	A

*H = Hipparcos; A = ASAS-3; N = NSVS

Table 2. (cont.)

Star	HJD+2440000	$O-C$	Min	Source*
	12198.869	−0.014	I	A
	12255.764	−0.064	II	A
	12552.864	−0.071	II	A
	12647.766	−0.008	I	A
	12649.750	−0.068	II	A
	12854.469	0.011	I	A
	12946.819	−0.107	II	A
	12957.832	0.033	I	A
	13382.792	−0.107	II	A
	13450.638	−0.079	II	A
	13474.513	0.005	I	A
V0529 Car	8159.997	0.027	II	H
	8261.618	0.028	I	H
	9015.943	−0.040	I	H
	11938.694	0.031	I	A
	12752.655	−0.097	II	A
	12754.752	0.016	I	A
	12809.545	−0.143	II	A
	13008.784	−0.177	II	A
	13167.536	0.019	I	A
	13385.781	0.012	I	A
	13454.799	−0.156	II	A
	13480.686	0.025	I	A
V0821 Cas	8224.368	0.005	I	H
	8357.091	−0.003	I	H
	8363.224	−0.002	II	H
	8561.413	−0.025	II	H
	8777.324	−0.024	II	H
	9040.219	0.000	I	H
	11417.694	−0.127	II	N
	11450.603	−0.021	I	N
	11479.637	−0.125	II	N
V1081 Sco	8184.452	−0.019	I	H
	8838.078	0.035	I	H
	11963.858	−0.096	II	A
	12432.681	−0.012	I	A
	12466.594	−0.108	II	A
	13504.728	−0.149	II	A

*H = Hipparcos; A = ASAS-3; N = NSVS

Acknowledgements: This research has made use of the SIMBAD and VizieR databases operated at the Centre de Données Astronomiques (Strasbourg) in France.

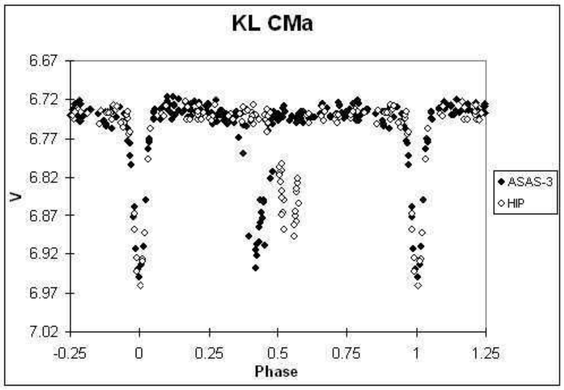

Figure 1. Light curve of KL CMa showing Hipparcos and ASAS-3 observations.

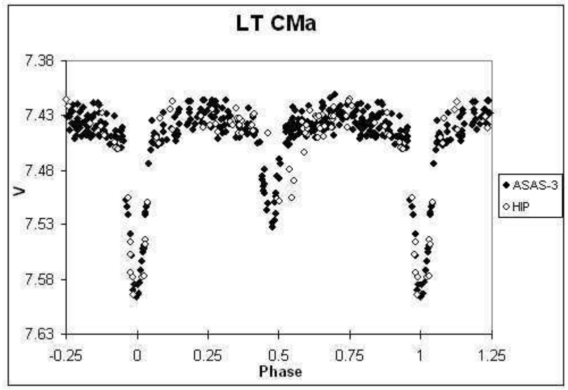

Figure 2. Light curve of LT CMa showing Hipparcos and ASAS-3 observations.

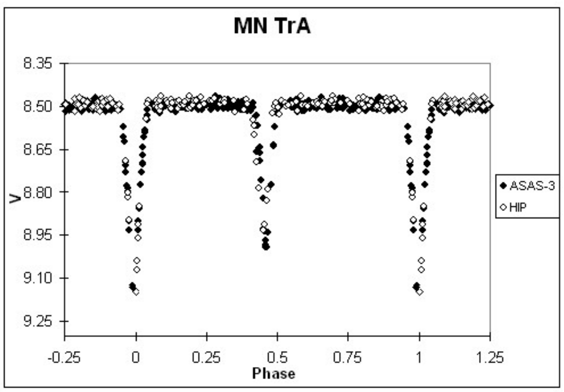

Figure 3. Light curve of MN TrA showing Hipparcos and ASAS-3 observations.

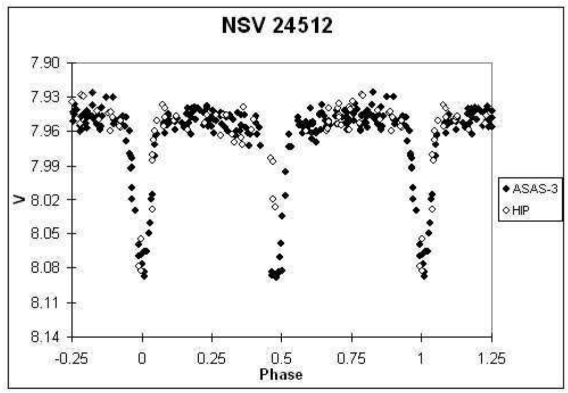

Figure 4. Light curve of NSV 24512 showing Hipparcos and ASAS-3 observations.

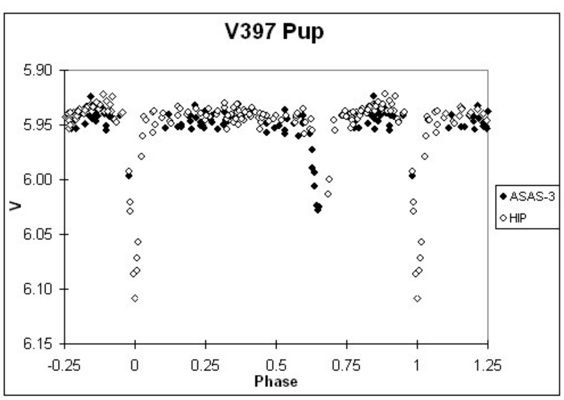

Figure 5. Light curve of V397 Pup showing Hipparcos and ASAS-3 observations.

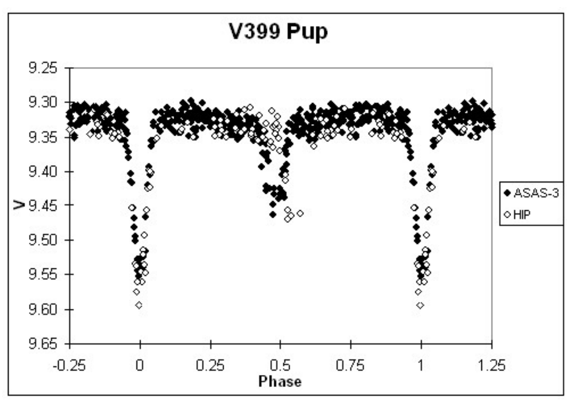

Figure 6. Light curve of V0399 Pup showing Hipparcos and ASAS-3 observations.

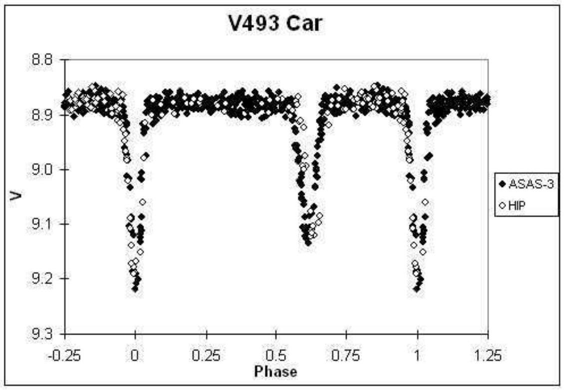

Figure 7. Light curve of V493 Car showing Hipparcos and ASAS-3 observations.

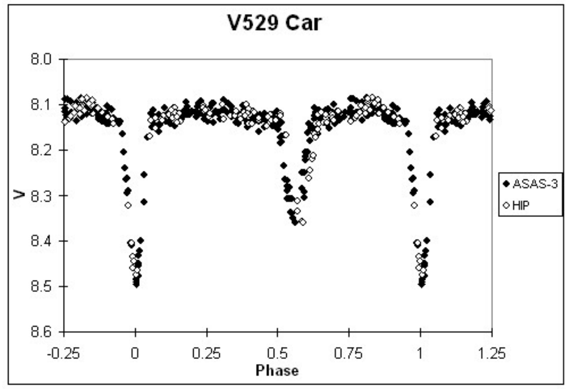

Figure 8. Light curve of V529 Car showing Hipparcos and ASAS-3 observations.

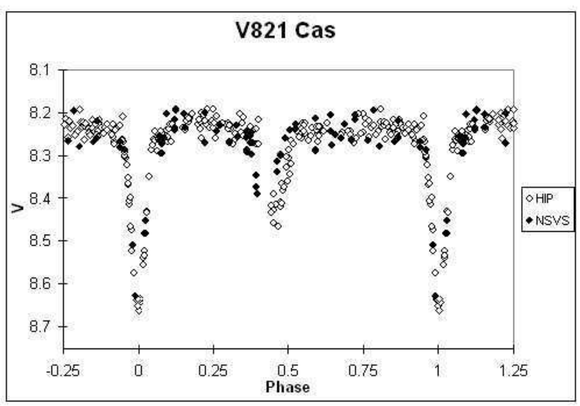

Figure 9. Light curve of V821 Cas showing Hipparcos and NSVS observations.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5632

Konkoly Observatory
Budapest
4 July 2005

HU ISSN 0374 – 0676

ASAS 081933-2358.2: RRc-TYPE VARIABLE WITH TWO CLOSELY SPACED FREQUENCIES

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According to the ASAS3 list of new variables (Pojmanski, 2003), ASAS 081933-2358.2 (= TYC 6556 609 1 = CPD−23°3633 = CD−23°7130) is an RRc-type variable with the period of 0.285668 days. However, this star deserves a more careful investigation because of the exceptionally large scatter of its phased light curve. The classification of variable stars in the ASAS3 project is good enough in general, but in some cases important details are lost. For example, a circumspect analysis of ASAS3 data led to the discovery of four new double-mode Cepheids (Wils & Otero, 2004).

The results of the frequency analysis of ASAS3 observations of ASAS 081933-2358.2 are presented in Fig. 1. It is found, that the scatter of the light curve can be explained by the superposition of two close frequencies corresponding to the following light elements:

$$JD_{max} = 2453440.665 + 0\overset{d}{.}285665 \times E \text{ and}$$

$$JD_{max} = 2453015.749 + 0\overset{d}{.}296111 \times E.$$

The phased light curves are shown in Fig. 2. Folded curves of the deviations from the mean light curve of the other oscillation are plotted in the bottom panels.

After prewhitening the data with the two main frequencies the residual spectrum (bottom panel in Fig. 1) indicates that the combination frequency ($f_1 + f_2$) also appears in the spectrum. The existence of nonlinear interaction between the oscillations rules out the possibility that two RRc-type variables in the same line of sight (i.e., a blend) are observed. According to the duplicity flag of the Tycho data no indication of duplicity was found, which also strengthens our solution.

Closely spaced frequency components of three RRc stars in the globular cluster M55 were first discovered by Olech et al. (1999). This type of variation (showing frequency doublets in the Fourier spectrum) was classified as ν_1 variables by Alcock et al., (2000) utilizing the discovery of 24 additional similar objects in the LMC. Based on the large frequency ratio of the components (larger than 0.9 in every case) the most plausible explanation of the phenomenon is the excitation of a nonradial mode pulsation in the vicinity of the radial mode frequency.

Up to now, no galactic field RRc stars showing similar behaviour has been discovered. This gives an unique opportunity, that by studying this relatively close object we could learn much more about this interesting type of stars.

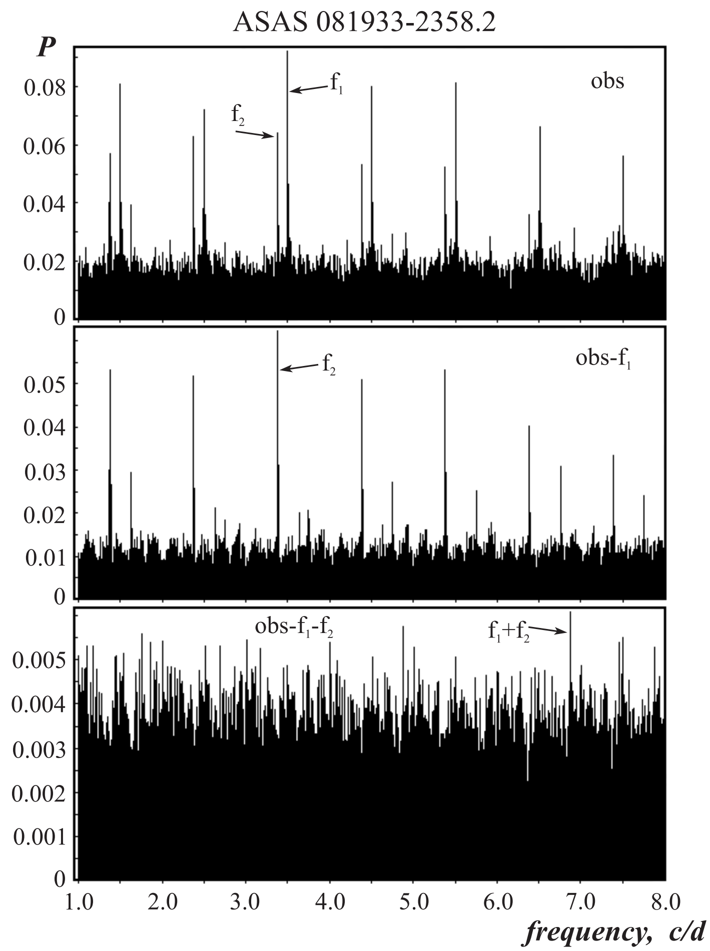

Figure 1. The power spectra.

Acknowledgements: The authors acknowledge the use Dr. G. Pojmanski's ASAS3 observations. One of the authors (S. Antipin) is grateful to the Russian Foundation of Basic Research (grant No. 05-02-16688) for partial support of this research. J. Jurcsik acknowledges the support of the Hungarian OTKA Grant No 43504.

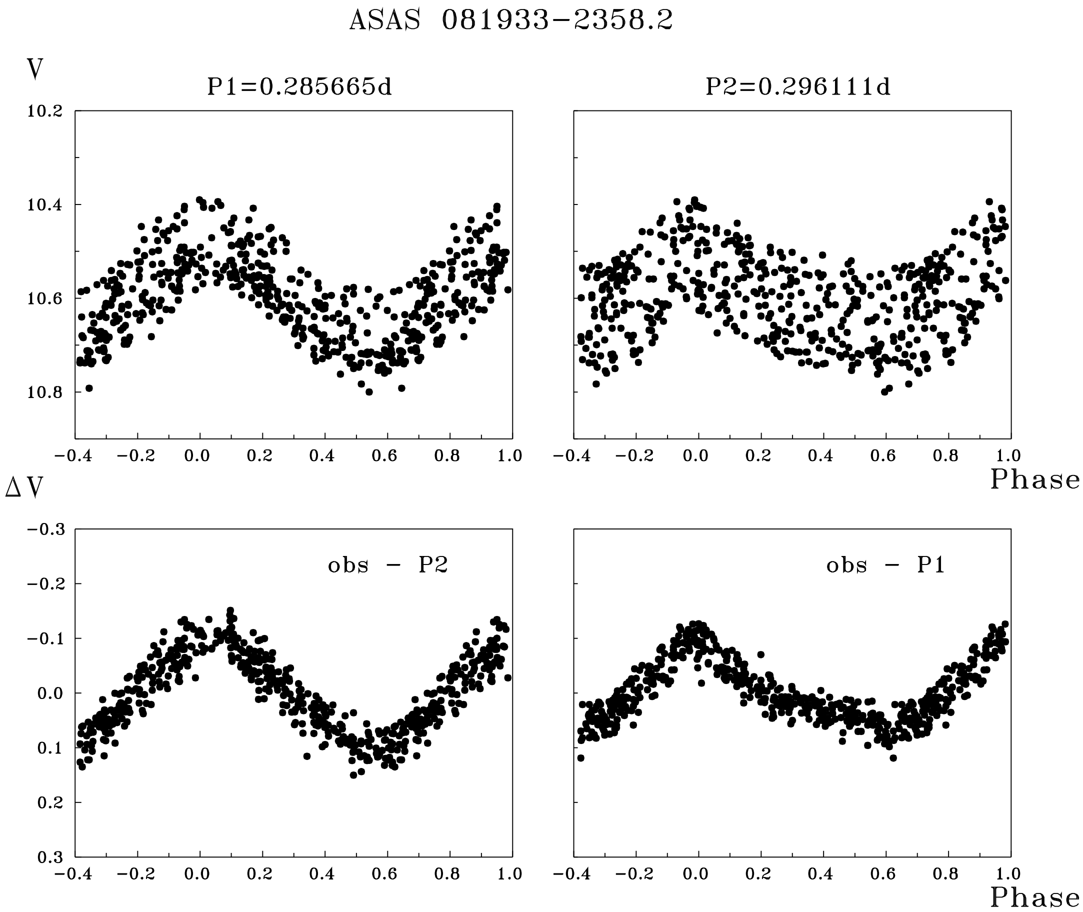

Figure 2. ASAS 081933-2358.2. The phased light curves based on ASAS3 observations.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5633

Konkoly Observatory
Budapest
4 July 2005

HU ISSN 0374 – 0676

PERIODS OF 54 KNOWN MIRAS AND OF 16 NEW ONES IN SCORPIUS

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An area covering 3.85 square degrees centred at $l = 353^{\circ}\!.0$ and $b = +3^{\circ}\!.0$ and extending in RA from $17^{\rm h}11^{\rm m}$ to $17^{\rm h}19^{\rm m}$ and in Dec from $-32^{\circ}00'$ to $-34^{\circ}18'$ (epoch 2000.0) has been searched for faint Mira type stars and their periods of light variations. An important feature of this field is its low foreground obscuration and the uniform areal distribution of the obscuring matter as shown by earlier investigations at the Lund Observatory concerning the local galactic structure in this region (Roslund, 1966). The purpose of the present investigation has been to enquire into the potentiality of studying with medium sized telescopes the spheroidal halo of Pop II stars around the galactic centre with the help of faint Mira type variables in low foreground obscuration fields like ours. 16 new Mira variables were detected in the field and their periods of light variations determined together with 54 stars already known to be variable.

The search was made by using Kodak l03a-E plates photographed in red light through a Schott RG 1 filter with the 50/65 cm Uppsala-Schmidt telescope at Mount Stromlo Observatory in Australia at intervals of about 30 days during an observing season of usually seven months a year from April to October. The observations span five seasons from April 1967 to October 1971 and cover a total length of 1634 days. Altogether 30 red search plates were obtained.

Each plate was calibrated using R magnitudes in the $UBVRI$ system (Johnson, 1964) measured photoelectrically for forty stars of spectral class M with the 1 metre ESO photometric telescope at La Silla in Chile.

The limiting magnitude of the plates is about $R = 14.5$ before the effect of the seeing causes the photographic calibration curve to level off. For a star to be assigned a Mira type variable, its light curve must be known for a minimum of one and a half magnitudes, setting the limiting magnitude at maximum light for this search of faint Mira type stars at $R = 13.0$. This magnitude should correspond to about $V = 14.5$ for Mira type variables of early spectral class M and to $V = 15.5$ for those of late spectral class, not taking into account any interstellar reddening beyond that encountered in the local spiral arm.

The stars that vary in brightness were found by blinking sixteen plates arranged in fourteen pairs. As only variables with large light variations were looked for, a simple blinking device was invented. It consisted of two reading projectors for microfilm adjusted to project the same field of two plates on the same screen so that their stellar images overlapped. The blinking effect was obtained by alternatively switching the light off and on between the two projectors in quick succession. By this means, approximately 150 variables with amplitudes larger than about two magnitudes were detected. Seventy of these stars showed regular or nearly regular light variations with periods longer than 150 days. They are here referred to as Mira type variables and are listed with their main characteristics in the Catalogue at the end of the article. 16 of the stars in the Catalogue have not been known to be variable.

For stars with image sizes larger than the seeing diameter, their apparent magnitudes were obtained by moving the plate with a micrometer screw a distance corresponding to the image diameter of the stars seen projected on the screen. This method was felt to be superior to the iris photometer method as most star images in this densly populated field were seriously disturbed by neighbouring stars. A mean error of 0.2 magnitude in one measurement was estimated from measurements on several plates of stars of constant brightness.

This procedure could not be adapted to stars just above the limiting magnitude of the plates as the image size of these stars is practically the same as the seeing diameter over a wide range of magnitudes. Their magnitudes had instead to be derived from the visible character of the stellar images which depends on a number of factors as the focusing and guiding of the telescope, the atmospheric seeing, extinction and sky glow and photographic processing. These factors change from plate to plate and can, if not controlled, cause an ordinary star of constant brightness to be mistaken for a variable star. The factors can to some extent be controlled by monitoring the appearance of the photometric standard stars. However, the eye has a tendency to set up its own rules for judging the magnitudes of faint stars, making their magnitudes liable to large errors.

A lot of attention was paid to the problem of getting reliable magnitudes for the faint stars. To be sure that the photometric plates had about the same limiting magnitude, we ascertained that almost the same number of stars considered to be Mira type variables appeared on each plate.

In order to get information on spectral types of the Mira variables, three long-exposures in the near infrared on Kodak I-N plates behind a Schott RG5 filter were obtained on widely separated occasions with the 50/65 cm Uppsala-Schmidt telescope equipped with an objective prism giving a dispersion of 2200 Å/mm at the atmospheric A band. The classification of the spectra followed the criteria described by Nassau and Velghe (Nassau and Velghe, 1964) but the spectra were then transformed to the Mount Wilson classification system (Adams et al., 1926) by means of the relation established by Blanco (Blanco, 1964). As the objective prism plates in this study only reach stars down to about $I = 10.5$, the faintest Mira type variables found of early spectral class M cannot be expected to leave a classifiable spectrum even at maximum light.

The spectral type was determined only for those Mira type variables which happened to have an established maximum within a time interval of ten per cent of their period of light variations from the date of exposure of one of the three objective prism plates. Some of these stars could not, however, be classified because their spectra were severely distorted by those of brighter stars in this congested star field. As a consequence, spectral classes could only be assigned to one half of the Mira variables found in the studied area.

Only ten stars in the Catalogue were bright enough to show up on the photometric plates at minimum light – Table 1. The mean amplitude of the light variations for the five brightest stars is 3.4 magnitudes in red light, but it should be remembered that all the stars at their minima are just above the sensitivity for the plates to produce an image, resulting in large errors in determining the amplitude.

Table 1. Mira type variables with observed minima.

No	R (mag)	ΔR (mag)	P (day)	Sp
27	10.9 – 13.8	2.9	175	M3
39	11.2 – 14.6	3.4	185	M6
19	11.2 – 14.8	3.6	230	M4
25	11.2 – 14.8	3.6	205	–
14	11.3 – 14.8	3.5	310	M5
01	11.5 – 14.8	3.3	225	M7
07	11.6 – 14.8	3.2	160	–
23	12.1 – 14.8	2.7	340	–
34	12.1 – 15.0	2.9	180	–
10	12.3 – 14.6	2.3	330	–

The periods of the light variations of the Mira type variables are estimated to be correct within 5 days and the epoch of maximum light within 10 days. As the photometric plates were only exposed at intervals of about a month, they were not appropriate for establishing light curves for short-period variables. Therefore, variables with periods shorter than 150 days were excluded from the search. Figure 1 shows the obtained distribution of faint Mira type variables as function of their periods. It should be noted that some of the variables assigned a period close to a year may in fact have a period half of that given in the Catalogue, if they happened to have another maximum that fell outside the observing season. On the other hand, stars with a period close to a year and with maxima solely outside the observing season may have been missed altogether.

There is an indication in the Catalogue that Mira type variables of spectral classes M3 and M4 are confined to stars with periods shorter than 250 days. This might, however, be a misleading conclusion due to the small sample of stars of these two classes.

This project was completed in 1973 but its publication was delayed for various reasons. A. Terzan and his colleagues at the Lyon Observatory published in 1997 (Terzan et al., 1997) their results of an ambitious search for very faint variables in a field covering 100 square degrees in the direction of the galactic centre that included our field. Their photometric plates had been obtained with the 48 inch Mount Palomar Schmidt and the 1 metre ESO Schmidt, both with a scale of 67 arcsec/mm, being far superior for this kind of work to the Uppsala-Schmidt with its scale of 120 arcsec/mm.

By comparing the equatorial coordinates for the variables in our Catalogue with those in the lists of Terzan et al. (1997 and 1982) we could identify 54 of our variables in their star lists. All the remaining 16 stars might not be new discoveries as our coordinates had been obtained with a simple unpretentious plate measuring machine of unproven accuracy. With a bit more effort, a few more stars might be identified. Some of our stars may erroneously have been classified by us as variables or assigned inaccurate coordinates, although two persons were always present when identifying the stars on the plates, estimating their magnitudes or measuring their coordinates.

Far more serious is the fact that our magnitude scale at its faint end appears more contracted than the one Terzan et al. used. Already at $R_{\rm max} = 11.5$, our stars are systematically listed half a magnitude brighter than the same stars in Terzan's 1997 list and at $R_{\rm max} = 12.5$ a whole magnitude brighter. No reason for this discrepancy is suggested.

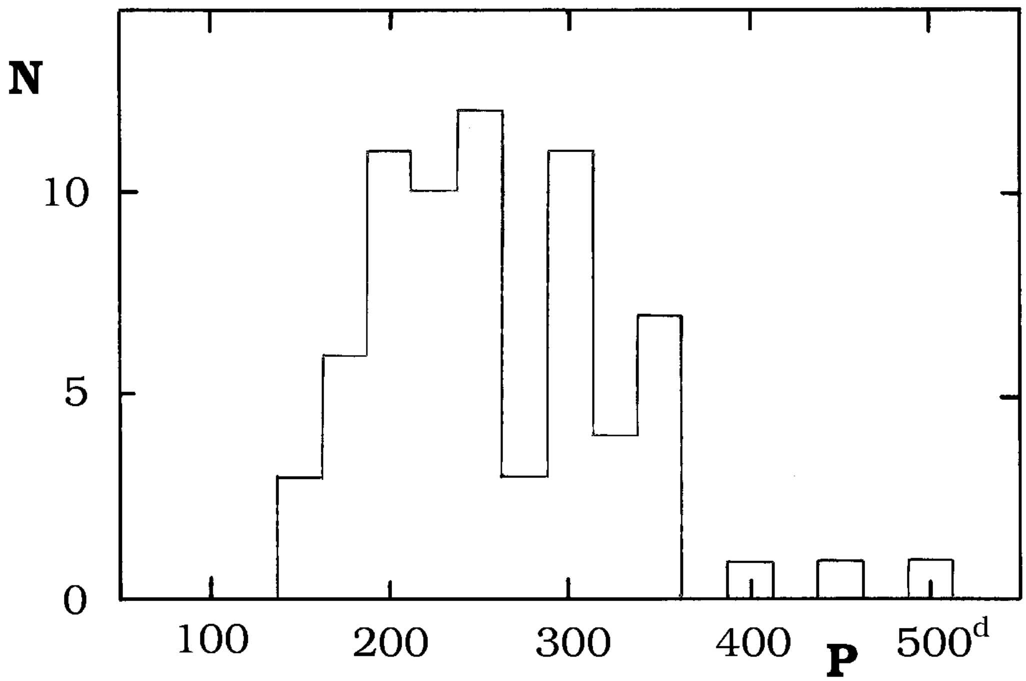

Figure 1. Observed distribution in 25 day intervals of periods of light variations of faint Mira type variables.

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Catalogue of faint Mira type variables

Column 1. Star number for stars in this Catalogue.
Column 2. Terzan star number.
Columns 3 and 4. Equatorial coordinates at the epoch 2000.0.
Columns 5 and 6. Galactic coordinates.
Column 7. Apparent red magnitude at maximum light.
Column 8. Julian date of the epoch of maximum light.
Column 9. Mean period in days of light variations.
Column 10. Spectral class at maximum light.

No	Terzan	α_{2000} (^{h} ^{m} ^{s})	δ_{2000} (° ′ ″)	l (°)	b (°)	R_{max} (mag)	E	P (day)	Sp
01	3689	17 11 02.4	−34 02 56	351.66	+3.30	11.5	2439700	225	M7
02	3701	17 11 15.6	−32 38 08	352.83	+4.09	12.5	2441180	285	M6
03	3703	17 11 16.4	−33 59 04	351.74	+3.30	12.2	2439675	210	–
04	3709	17 11 19.1	−32 26 31	353.00	+4.20	12.0	2440030	150	–
05	3716	17 11 27.3	−32 56 26	352.61	+3.88	12.5	2440700	395	M6
06	3721	17 11 31.8	−32 25 05	353.04	+4.17	12.5	2440090	235	–
07	3722	17 11 32.2	−32 29 18	352.98	+4.13	11.6	2440110	160	–
08		17 11 33.2	−32 12 34	353.21	+4.29	12.5	2440485	335	–
09	3729	17 11 41.8	−33 27 45	352.22	+3.53	12.6	2440690	340	M6
10		17 11 43.0	−33 28 03	352.21	+3.53	12.3	2440490	330	–
11		17 11 43.3	−33 17 36	352.36	+3.63	12.9	2440095	290	–
12		17 11 50.0	−32 34 59	352.95	+4.03	13.0	2440095	155	M7:
13	3737	17 11 51.5	−32 51 59	352.72	+3.86	11.4	2440090	260	M7
14	3739	17 11 53.0	−33 00 59	352.60	+3.76	11.3	2440380	310	M5
15		17 11 53.2	−33 19 55	352.34	+3.58	11.8	2440360	235	M6
16	3740	17 11 53.5	−32 59 53	352.62	+3.77	12.3	2439750	250	M3
17	3733	17 11 55.8	−32 58 00	352.65	+3.78	11.0	2440030	345	M5
18	3753	17 12 05.2	−32 13 47	353.26	+4.19	12.9	2440670	335	M7:
19	3754	17 12 05.9	−32 17 13	353.22	+4.15	11.2	2440690	230	M4
20		17 12 13.5	−32 18 54	353.21	+4.12	12.7	2440080	350	–
21	3761	17 12 15.1	−33 15 18	352.45	+3.56	12.7	2440505	295	–
22	3773	17 12 22.9	−34 06 53	351.77	+3.03	11.5	2439700	200	M5:
23		17 12 31.5	−32 48 49	352.84	+3.77	12.1	2440440	340	–
24	3792	17 12 40.9	−32 04 57	353.46	+4.17	11.9	2439690	225	–
25	3801	17 12 53.8	−32 14 26	353.36	+4.05	11.2	2440040	205	–
26	3805	17 13 01.2	−33 41 45	352.19	+3.17	12.2	2440380	260	M5
27	3806	17 13 03.1	−33 36 20	352.27	+3.22	10.9	2440480	175	M3
28		17 13 10.5	−32 39 23	353.05	+3.75	12.1	2439660	195	M7
29	3820	17 13 10.8	−32 49 19	352.92	+3.66	12.9	2439720	290	M7
30	3822	17 13 14.9	−32 07 32	353.49	+4.05	13.0	2440720	185	–
31	3837	17 13 23.9	−32 12 03	353.45	+3.98	13.1	2441090	350	–
32	3843	17 13 33.0	−32 56 59	352.86	+3.52	13.1	2440095	240	–
33	3849	17 13 37.6	−33 08 27	352.71	+3.39	12.7	2440690	300	–
34	3875	17 13 53.8	−32 54 11	352.94	+3.49	12.1	2440450	180	–
35	3877	17 13 56.4	−34 01 42	352.03	+2.82	12.0	2439715	215	–

No	Terzan	α_{2000} (^{h} ^{m} ^{s})	δ_{2000} (° ′ ″)	l (°)	b (°)	R_{max} (mag)	E	P (day)	Sp
36	3879	17 13 59.2	−32 27 03	353.32	+3.74	12.1	2440680	490	M7:
37	3880	17 13 59.8	−32 03 24	353.64	+3.96	12.7	2440500	300	M7
38		17 14 00.2	−32 52 09	352.98	+3.49	11.7	2439730	210	–
39	3883	17 14 03.2	−32 00 37	353.69	+3.98	11.2	2440695	185	M6
40		17 14 03.7	−32 21 59	353.40	+3.77	12.6	2439700	270	M6
41	3887	17 14 06.0	−32 04 42	353.64	+3.93	13.3	2440700	300	–
42		17 14 06.5	−32 03 33	353.65	+3.94	12.9	2440690	300	–
43	3893	17 14 09.6	−33 08 05	352.78	+3.31	12.9	2440345	280	–
44	3899	17 14 22.5	−32 27 29	353.36	+3.66	12.5	2439715	185	M3
45	3915	17 14 35.3	−33 40 40	352.39	+2.92	13.0	2440700	220	–
46	3921	17 14 38.3	−32 25 12	353.42	+3.64	12.1	2439705	210	M4:
47	3923	17 14 40.2	−32 26 08	353.42	+3.63	12.5	2440680	355	M6
48	3925	17 14 41.7	−32 09 17	353.65	+3.79	11.6	2440060	240	M6
49	3927	17 14 43.5	−32 10 23	353.64	+3.77	12.2	2439800	305	–
50	3937	17 14 48.3	−32 41 26	353.22	+3.46	12.3	2440740	230	M7
51	3943	17 14 53.3	−32 06 27	353.71	+3.78	13.2	2440695	355	–
52		17 15 15.0	−33 25 28	352.68	+2.95	12.9	2440370	200	–
53		17 15 21.8	−32 20 47	353.57	+3.56	12.3	2440400	250	M7
54	3975	17 15 22.6	−32 36 08	353.37	+3.41	12.9	2439630	295	M7
55	3977	17 15 24.3	−32 28 23	353.48	+3.48	12.3	2440030	250	M6
56	3980	17 15 25.9	−32 26 53	353.50	+3.49	12.3	2441180	240	–
57	3985	17 15 28.9	−32 14 28	353.67	+3.60	12.4	2440090	240	–
58		17 15 33.1	−32 46 34	353.25	+3.28	12.8	2440110	220	–
59	4042	17 16 30.1	−33 36 27	352.68	+2.63	13.4	2439730	305	M7
60		17 16 34.0	−32 39 04	353.47	+3.18	12.0	2440380	260	M5
61	4051	17 16 38.5	−32 40 05	353.47	+3.15	12.9	2439705	465	–
62	4060	17 16 52.3	−33 00 35	353.22	+2.92	13.1	2440485	240	–
63	1	17 17 00.5	−32 06 22	353.97	+3.42	12.2	2439660	200	–
64	3	17 17 02.9	−32 03 59	354.01	+3.43	12.2	2440040	205	M6:
65	4080	17 17 09.6	−34 15 57	352.22	+2.14	11.9	2440675	205	M5
66		17 17 16.5	−32 45 59	353.46	+2.99	12.9	2439700	195	–
67	4093	17 17 22.3	−32 17 37	353.86	+3.24	12.6	2441060	225	–
68	4118	17 17 58.4	−34 13 21	352.36	+2.03	12.2	2440370	250	M6
69	4131	17 18 05.3	−32 47 43	353.54	+2.83	12.2	2439700	180	–
70	4145	17 18 33.9	−32 07 44	354.14	+3.13	12.9	2440090	335	–

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5634

Konkoly Observatory
Budapest
21 July 2005

HU ISSN 0374 – 0676

TIME-RESOLVED Hα MONITORING OF THE HERBIG Ae/Be STAR HD 200775

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Many Herbig Ae/Be stars demonstrate strong variability in the structure of their spectral-line profiles that can be interpreted as resulting from disk accretion and variable stellar wind. According to different studies, these variations are caused by longitudinal stratification of the star-wind zones, i.e. by the presence of inhomogeneous dense fragments of clouds in the circumstellar environment, interacting with the star's shell (Beskrovnaya et al., 1994; Grinin and Rastopchina, 1996; Pogodin et al., 2000). Thus, we can expect to observe rapid variations of the spectrum and brightness for such stars. In this paper, we present the results of our time-resolved spectral variability monitoring of the Herbig Ae/Be star HD 200775 = V380 Cep.

Our observations used the echelle spectrometer in the Cassegrain focus of the 2 m telescope with a 580×530-pixel CCD. In 1998–2003, this system was in use in the Coude focus (Aliyev and Ismailov, 2000), and then it was adapted, on the base of a UAGS spectrograph, for the Cassegrain focus (Mikailov et al., 2005). The spectral range was $\lambda\lambda 4400 - 6800$ ÅÅ, the spectral resolution was $R = 14000$. We selected 38 orders from orders 70–140, each of them about 100 Å wide, with linear dispersions between 11 and 6 Å/mm. The readout and reductions of the spectra were performed using software developed at the Special Astrophysical Observatory of the Russian Academy of Sciences (Galazutdinov, 1992). The observations we report on here were acquired in June – August, 2004. Each night, the variable star was continuously observed for 1.5–2.5 hours, with short intervals between exposures. For the signal-to-noise ratio $S/N = 150 - 200$, the average exposure time was $5 - 7$ minutes. The observing nights are summarized in Table 1, where the Julian dates correspond to the middles of each observing period. A total of about 150 spectrograms were obtained for the variable and the standard stars. The mean uncertainty of our radial-velocity measurements for standard stars was within 2 km/s, that for the equivalent widths was about 4-5%, and that for the central residual intensities, 0.6%.

The H_α line in the spectrum of HD 200775 is known to have a double-peaked emission structure with small absorption at the centre of the line. We measured the line parameters using the method described by us earlier (Ismailov, 2003). To remove the influence of the terrestrial-atmosphere water lines, we used the standard software option of dividing the observed spectrum by the spectrum of an early-type standard star. After such a procedure, we used the rectified spectra to derive equivalent widths and relative intensities. The following parameters of the line have been measured: Va, the radial velocity of the central absorption; $V1$ and $V2$, respectively the radial velocities of the blue and red emission components of the line; W(Å), the emission's full equivalent width; and $W1$ and

$W2$, the equivalent widths respectively of the blue and red components. Besides, the line's profile variations were looked for during all the series as well as for individual observing dates. Our observations during 9 nights revealed no obvious changes of the measured H_α parameters within any of the nightly series. Significant differences of the line parameters were found from night to night. These variations are summarized in Table 2.

Table 1. The spectroscopic observations of HD 200775

Night No.	JD 2453000+	Series duration (minutes)	No. of spectrograms	Mean exposure (minutes)
1	202.348	70	12	5
2	203.342	90	22	5
3	216.325	20	4	5
4	217.342	81	12	5
5	220.315	25	5	5
6	233.279	72	7	8
7	236.367	126	15	7
8	238.307	105	18	5
9	239.297	65	8	7

Table 2. Nightly-mean $H\alpha$ radial velocities and equivalent widths

No.	$V1$, km/s	Va, km/s	$V2$, km/s	$W1$, Å	$W2$, Å	W, Å
1	−55.1	−2.8	59.7	31.9	27.7	58.4
2	−52.9	−2.6	57.8	30.0	26.8	56.8
3	−54.3	−16.6	48.2	26.5	22.1	48.6
4	−53.5	−19.0	45.7	31.7	26.2	58.0
5	−53.6	−19.4	41.7	30.5	24.8	55.3
6	−57.8	−18.3	44.6	48.5	44.6	93.1
7	−65.2	−23.8	35.5	32.5	28.8	61.1
8	−47.2	−4.3	55.0	34.3	30.3	64.5
9	−46.6	−4.5	53.6	34.7	31.1	65.7

Figure 1 (top panel) displays radial velocities of the H_α components in the spectra for each observing series. Each data point is for one of the series listed in Table 1. The relative equivalent widths, $W1/W2$, for each series, are presented in the bottom panel. This graph makes it possible to follow the displacements of individual line components. It appears from Fig. 1 that, beginning with series 3, a displacement of the line components to the blue is observed on JD 2453216–JD2453236 (series 3–7). The largest displacement, almost 20 km/s for all the components, was observed for series 7 on JD2453236. Besides, there is an increase of the equivalent width of the H_α emission's violet component compared to that of the red one; as a result, the relative equivalent widths of the line's emission components also increase synchronously with the radial velocities. Some of the emission components changed their equivalent widths by more than 20%. Figure 1 shows that the radial velocities of the individual components vary from night to night. While the velocities of the absorption component (Va) and of the red emission component ($V2$) vary almost synchronously, the velocity of the blue component ($V1$) changes irregularly. The difference between displacements of the components can be as high as 10 km/s for the series 3–6, in a significant variance with the series 1 and 2, when all the components showed nearly equal shifts. The displacements of the red and blue emission components become practically the same in the series 7 and then do not vary with respect of each other. The series 7 also reveals an interesting abrupt increase of the full and relative equivalent widths of the emission components, due to the increased strength of the red component. In the series 8 and 9, the absorption is redshifted by +10 km/s, whereas both emission components show identical, almost zero, relative displacements. This figure clearly shows the presence of considerable dynamic variations in the circumstellar environment and in the star's atmosphere during approximately 20 days.

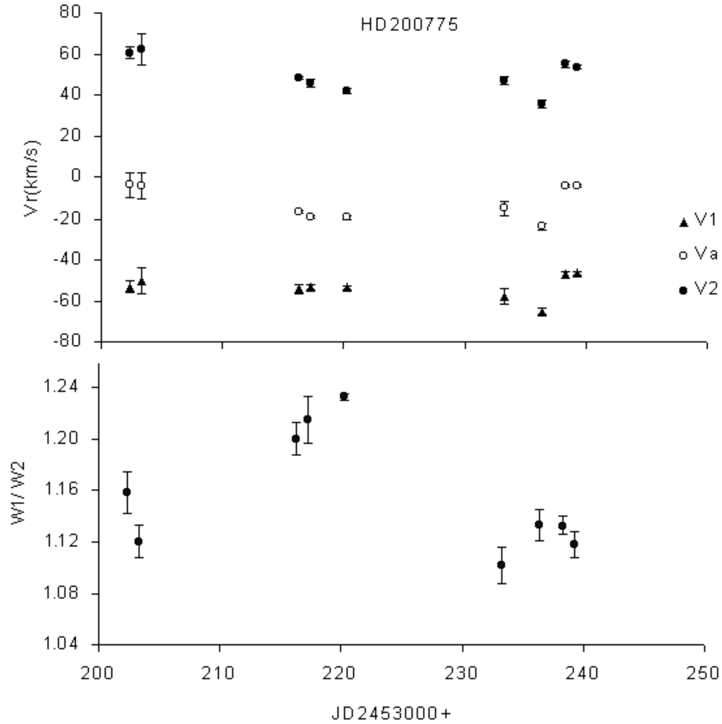

Figure 1. Variations of the H_α-line parameters for HD 200775. Top: Radial velocities of individual line components. Triangles: $V1$; filled circles: $V2$; open circles: Va. Each data point corresponds to one of the series listed in Table 1. Bottom: Relative equivalent widths, $W1/W2$, for each series.

Figure 2 shows the H_α profiles from three different nights. The general structure of the lines does not appear to change from night to night.

Thus, our study is the first one to present time-resolved monitoring of the structure and main details of the H_α emission profile. It allows to follow displacements of the individual emission components and the central absorption, continuously for times from one hour to several days. Our observations span about 2 months. Within 1–2.5 hours, we find no rapid changes in the structure or in the parameters of the H_α line. However, there is significant variability from night to night, especially on JD 2453216–2453236. During this time interval, approximately for 20 days, systematic displacements to the blue, up to 10–20 km/s, were observed for individual components of the H_α line.

The star's rotational velocity is $v \sin i$ = 103 km/s (Ruusalepp, 1987) or 40 km/s (Bohm & Catala, 1995). From Watt et al. (1986), the star's orbital inclination is $i = 70°$. For the spectral type B3IV (Altamore et al., 1980) and radius $R_* = 4.5\ R_\odot$, the primary component's longest possible axial-rotation period is $5^{\rm d}\!.4$. This period is nearly 4 times shorter than the H_α activity time scale found by us. Thus, the systematic change we have observed in the H_α line cannot be explained by the existence of relatively stable local inhomogeneous clouds in the atmosphere, observable because of modulation by the star's axial rotation. Ismailov (2003) found the star to be a spectroscopic binary, with the orbital period $P = 1180^{\rm d}$. Later, Pogodin et al. (2004) confirmed the system's binarity and derived the orbital period $P = 1341^{\rm d}$. The orbital phases for the dates of observations from our study computed with the elements from Ismailov (2003) are $0^{\rm P}\!.88$–$0^{\rm P}\!.92$, the phases with the elements from Pogodin et al. (2004) are $0^{\rm P}\!.02$–$0^{\rm P}\!.03$, so we observed the very minimum of the binary's radial velocity curves. The two radial velocity curves in the cited papers, based on independent data, show that a radial-velocity change just of the size we have found is possible at these phases. Thus, the observed variations of the H_α line can be partially due to the system's orbital motion.

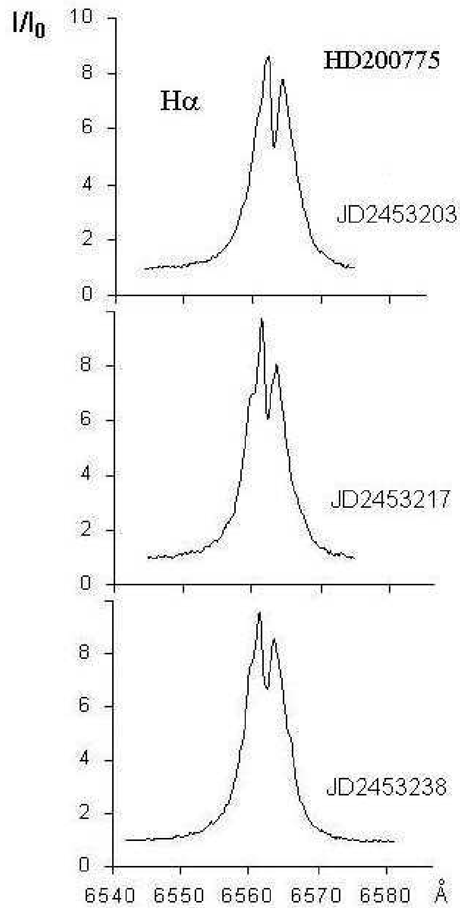

Figure 2. H_α profiles for three individual nights.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5635

Konkoly Observatory
Budapest
21 July 2005

HU ISSN 0374 – 0676

2004 UBVR PHOTOMETRY OF THE ECLIPSING BINARY KR Cyg

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Equatorial coordinates:	**Equinox:**
R.A.= $20^h09^m17\overset{s}{.}6$ **DEC.=** $+30°33'55''$	2005.0

Observatory and telescope:
Ege University Observatory, 48 cm Cassegrain telescope.

Detector:	High Speed Three-Channel Photon counting photometer (HSTCP).

Filter(s):	UBVR

Date(s) of the observation(s):
2004.06.25 - 2004.07.08

Comparison star(s):	HD 191398

Check star(s):	HD 333664

Transformed to a standard system:	Yes
Standard stars (field) used:	HD 185025 (from Landolt, 1992)

Availability of the data:
upon request

Type of variability:	EB

Remarks:

Using the latest published minima taken from Taş et al. (2004) with the minima times in Table II of Sipahi and Gülmen (2004), the light elements are improved using the linear least squares method and expressed in the following equation with the probable errors:

$$\text{HJD Min I} = 2429106.3987(14) + 0.84515252(7) \times E$$

The O-C's were computed according to Vetesnik (1965). In this study the UBVR light curves of the system obtained in the year 2004 is presented. The light curves obtained in four colours are shown in Figure 1. The first U-B colour curve of KR Cyg in the literature is observed and is plotted together with the other colour index curves in Figure 2. The amplitudes of primary minima for U, B, V, R bands are $0\overset{m}{.}882$, $0\overset{m}{.}878$, $0\overset{m}{.}833$ and $0\overset{m}{.}800$ magnitudes, respectively. The asymmetrical shape of the lowest part of the primary minimum is rather a striking feature. Similar effect appears in the light curve of some Algols and β Lyr type systems like BL And, V1425 Cyg and of Algol itself. It is generally accepted that this asymmetry is caused by the presence of the gaseous stream or by an accretion disc. In Fig. 2 another striking feature appears: the $B-V$ and $V-R$ colour curves become redder in primary minimum, while they get bluer in secondary minimum. This would indicate that primary eclipse is an occultation: the radiation from hotter, bluer star is being blocked by the secondary. On the other hand, $U-B$ colour curve gets bluer during both minima. This interesting behaviour of colour curves of KR Cyg will be investigated in an other study.

Acknowledgements:

I am grateful to Dr. G. Taş for her comments.

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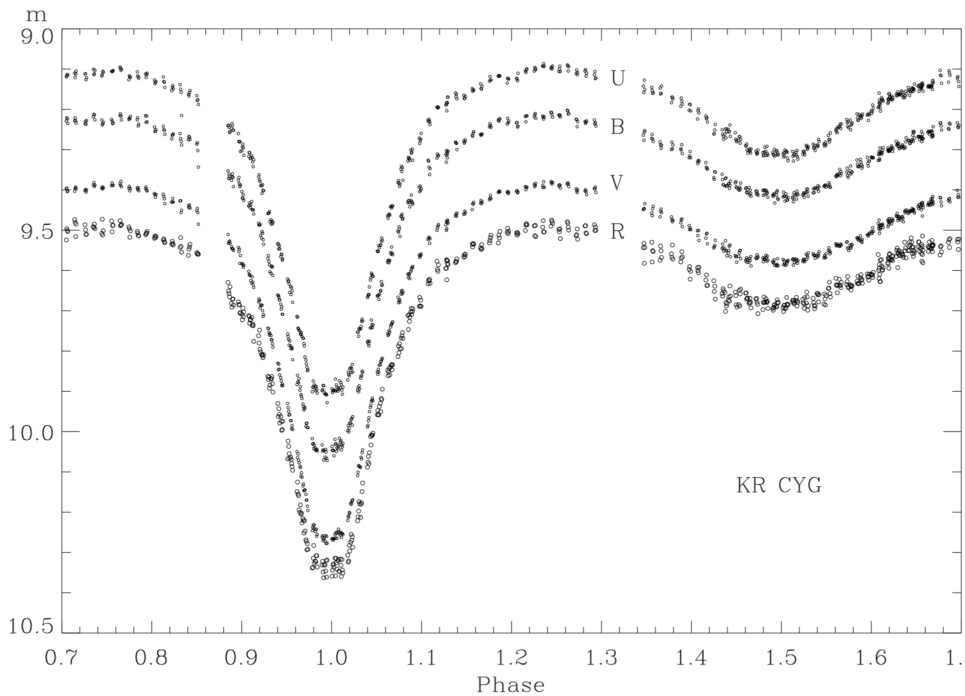

Figure 1. The UBVR light curves of KR Cyg.

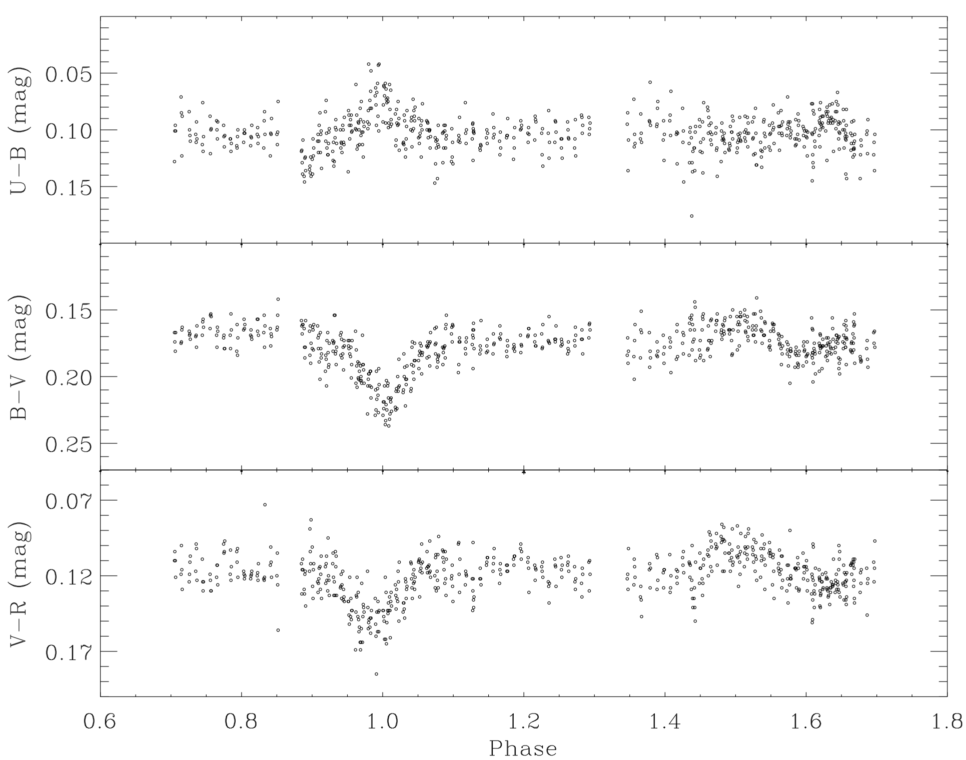

Figure 2. The colour curves of KR Cyg.

ERRATUM FOR IBVS 5549

There is a typographical error in the GSC identification of V3886 Sgr as listed in IBVS 5549. The article identified the variable as GSC 7492 3038. The correct identification is GSC 7942 3038.

Shawn Dvorak

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5636

Konkoly Observatory
Budapest
21 July 2005

HU ISSN 0374 – 0676

CCD OBSERVATIONS OF TIMES OF MINIMA OF ECLIPSING BINARIES

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Observatory and telescope:
37cm f/14 Rigel[1] telescope at Winer Observatory

Detector:	FLI IMG-1024 CCD camera, Peltier cooling, SITe-003 sensor, $17' \times 17'$ FOV, $0.98''$ per pixel, 1024×1024 format

Method of data reduction:
Reduction of the CCD frames was made with the Talon[2]image analysis package

Method of minimum determination:
The minima timings were computed using a folded light curve method.

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	$O-C$ [day]	Rem.
AB And	52933.6761	0.0005	I	R	0.0014	
	53022.6227	0.0003	I	R	0.0009	
	53292.7828	0.0005	I	R	0.0008	
	53293.7783	0.0003	I	R	0.0007	
	53297.7609	0.0004	I	R	0.0006	
RT And	53529.9077	0.0005	I	R	−0.0057	
	53553.8059	0.0006	I	R	−0.0068	
WZ And	52935.7186	0.0003	I	R	−0.0010	
	53022.6763	0.0006	I	R	0.0008	
	53282.8547	0.0007	I	R	0.0011	
	53294.6803	0.0008	I	R	0.0004	
	53547.9021	0.0014	I	R	0.0006	
XZ And	52934.8526	0.00025	I	R	−0.0010	
	53318.9701	0.0003	I	R	−0.0032	
	53329.8282	0.0002	I	R	−0.0036	
	53348.8308	0.0003	I	R	−0.0034	

[1]See http://phobos.physics.uiowa.edu/tech/rigel.html

[2]Talon is a custom telescope control and image analysis software suite developed by Elwood Downey of the Clear Sky Institute. (see http://phobos.physics.uiowa.edu/tech/software.html)

Times of minima:						
Star name	Time of min. HJD 2400000+	Error	Type	Filter	$O-C$ [day]	Rem.
V0343 Aql	53531.8183	0.0008	I	R	0.0052	
V0346 Aql	53530.7595	0.0005	I	R	0.0004	
	53531.8659	0.0005	I	R	0.0004	
	53540.7170	0.0014	I	R	0.0006	
	53552.8892	0.0007	I	R	0.0029	
AL Cam	53433.7815	0.0003	I	R	−0.0027	
	53530.7541	0.0015	I	R	0.0016	
	53538.7198	0.0008	I	R	−0.0027	
IR Cas	53525.9444	0.0012	I	R	−0.0019	
	53538.8781	0.0004	I	R	−0.0012	
	53553.8519	0.0011	I	R	−0.0024	
	53555.8946	0.0013	I	R	−0.0017	
IV Cas	53552.7830	0.0007	I	R	−0.0021	
	53553.7816	0.0008	I	R	−0.0020	
	53553.7780	0.0005	I	R	−0.0026	
EG Cep	53529.8576	0.0007	I	R	0.0006	
	53530.9467	0.0004	I	R	0.0005	
	53540.7501	0.0015	I	R	0.0007	
	53547.8307	0.0007	I	R	0.0012	
	53548.9197	0.0005	I	R	0.0010	
	53553.8222	0.0012	I	R	0.0019	
ZZ Cep	53552.9370	0.0028	I	R	−0.0022	
RW Com	53486.6738	0.0003	II	R	0.0126	
	53494.7403	0.0007	II	R	0.0094	
	53525.7168	0.0009	I	R	0.0123	
	53529.7518	0.0004	I	R	0.0125	
	53531.7688	0.0007	II	R	0.0120	
	53538.7710	0.0010	I	R	0.0125	
	53540.6702	0.0005	I	R	0.0130	
	53548.7398	0.0010	I	R	0.0128	
	53553.7239	0.0005	I	R	0.0127	
W Crv	53547.6724	0.0012	I	R	0.0003	
BR Cyg	53525.8806	0.0007	I	R	−0.0007	
	53529.8795	0.0006	I	R	0.0005	
CG Cyg	53529.9148	0.0006	I	R	0.0019	
	53548.8489	0.0004	I	R	0.0017	
	53555.7921	0.0004	I	R	0.0023	
V0346 Cyg	53531.8979	0.0007	I	R	0.0172	
	53553.8434	0.0008	I	R	0.0163	
V0387 Cyg	53529.8980	0.0005	I	R	−0.0048	
	53531.8191	0.0003	I	R	−0.0055	
	53538.8655	0.0005	I	R	−0.0057	
	53540.7871	0.0005	I	R	−0.0059	
	53547.8337	0.0005	I	R	−0.0053	
WW Cyg	53532.8989	0.0004	I	R	0.0060	
	53552.8060	0.0008	I	R	0.0062	

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	$O-C$ [day]	Rem.
ZZ Cyg	53528.7504	0.0012	I	R	0.0033	
	53538.8085	0.0005	I	R	0.0036	
	53540.6954	0.0004	I	R	0.0047	
	53548.8676	0.0005	I	R	0.0050	
	53553.8966	0.0006	I	R	0.0051	
	53555.7831	0.0015	I	R	0.0057	
TY Del	53531.9321	0.0006	I	R	0.0016	
	53555.7547	0.0006	I	R	0.0017	
W Del	53555.9487	0.0005	I	R	0.0164	
YY Del	53525.8905	0.0007	I	R	0.0013	
	53529.8549	0.0005	I	R	0.0003	
	53548.8894	0.0004	I	R	0.0005	
	53552.8533	0.0007	I	R	−0.0010	
RZ Dra	53529.7827	0.0007	I	R	0.0004	
	53530.8851	0.0003	I	R	0.0010	
	53539.6974	0.0003	I	R	−0.0007	
	53540.8003	0.0005	I	R	0.0004	
	53547.6885	0.0026	II	R	0.0027	
	53547.9570	0.0006	I	R	−0.0043	
	53552.9192	0.0014	I	R	0.0001	
UZ Dra	53532.7430	0.0026	I	R	0.0023	
YY Eri	52935.9390	0.0020	I	R	0.0015	
	53014.7012	0.0020	I	C	−0.0034	
	53281.8696	0.0006	I	R	0.0001	
	53282.0311	0.0008	II	R	0.0009	
	53290.8715	0.0004	I	R	0.0001	
	53297.9447	0.0006	I	R	0.0003	
CT Her	53528.7871	0.0016	I	R	−0.0015	
	53553.7973	0.0017	I	R	−0.0006	
SZ Her	53528.7309	0.0003	I	R	0.0076	
	53532.8209	0.0005	I	R	0.0071	
	53555.7288	0.0004	I	R	0.0083	
TU Her	53548.7018	0.0004	I	R	0.0047	
SW Lac	53552.8936	0.0006	I	R	−0.0023	
	53553.8554	0.0006	I	R	−0.0026	
FL Lyr	53531.7977	0.0006	I	R	−0.0016	
	53555.7555	0.0005	I	R	−0.0035	
SX Oph	53547.7158	0.0007	I	R	−0.0023	
U Peg	53548.9386	0.0010	I	R	−0.0040	
V0505 Sgr	53525.8969	0.0025	I	R	−0.0201	
EQ Tau	52939.7935	0.0004	I	R	0.0024	
	53014.8898	0.0008	I	C	0.0023	
	53017.6207	0.0004	I	C	0.0024	
	53017.7923	0.0005	II	C	0.0034	
	53292.7474	0.0005	I	R	0.0034	
	53294.7958	0.0010	I	R	0.0037	
	53297.8676	0.0005	I	R	0.0034	

Times of minima:						
Star name	Time of min. HJD 2400000+	Error	Type	Filter	$O-C$ [day]	Rem.
RV Tri	52937.6240	0.0012	I	R	0.0004	
X Tri	53011.7607	0.0003	I	C	0.0019	
W UMa	53462.7047	0.0007	I	R	−0.0010	
	53467.7092	0.0010	I	R	−0.0010	
RU UMi	53525.7965	0.0006	I	R	−0.0021	
	53555.7186	0.0017	I	R	−0.0008	
BU Vul	52934.6546	0.0006	I	R	−0.0053	
	53293.6883	0.0004	I	R	−0.0081	
	53297.6723	0.0009	I	R	−0.0071	
	53301.6547	0.0004	I	R	−0.0077	
	53525.8389	0.0005	I	R	−0.0079	
	53529.8209	0.0004	I	R	−0.0089	
	53538.9245	0.0006	I	R	−0.0092	

Acknowledgements:

This work was partly supported by NSF grant DUE-9952594

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5637

Konkoly Observatory
Budapest
21 July 2005

HU ISSN 0374 – 0676

ELEMENTS FOR 7 ECLIPSING BINARIES IN OPHIUCHUS

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The discovery of the variability of these stars has been reported by Hoffmeister (1949, 1965, 1967, 1968). Except for V987 Oph and V2056 Oph, no further observations or ephemeris were published until today. Photographic plates of a field centered around 67 Oph, taken with the Sonneberg Observatory 40cm Astrograph during three intervals spread over the years from 1938-1994, were used to check the behaviour of these objects (see Table 1).

The given elements were obtained by means of least-squares solutions. Photographic amplitudes were derived with respect to magnitudes of the comparison stars given in Table 2. Individual data are available upon request.

Remarks:

V987 Oph

Period varies; ephemeris valid for J.D. 2429100-2442000 and J.D. 2442000-2449500 resp. First elements were found by Gavrjushov; his published times of minimum as well as those found by Götz were included in our analysis.

V1080 Oph

Period probably varies. Further investigation needed.

V2056 Oph

The period value derived and published in the GCVS by Tsessevich, has been found to be doubled.

This research made use of the SIMBAD data base, operated by the CDS at Strasbourg, France.

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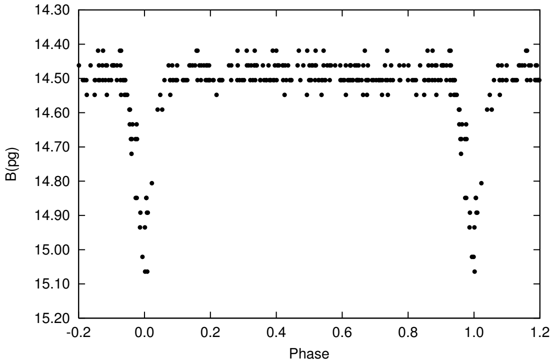

Figure 1. Composite light curve of V987 Oph

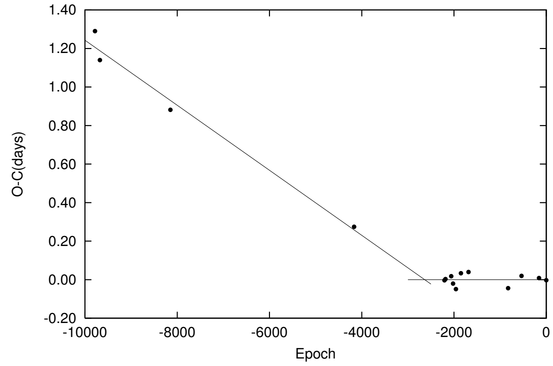

Figure 2. (O−C) diagram for V987 Oph

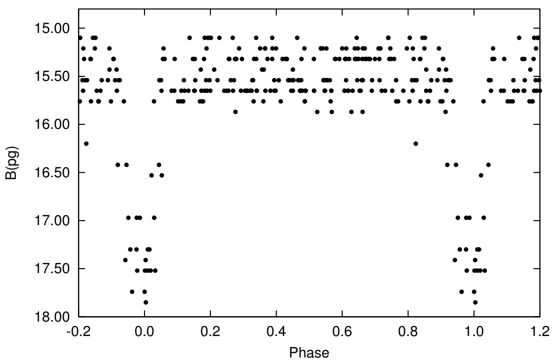

Figure 3. Light curve of V1080 Oph

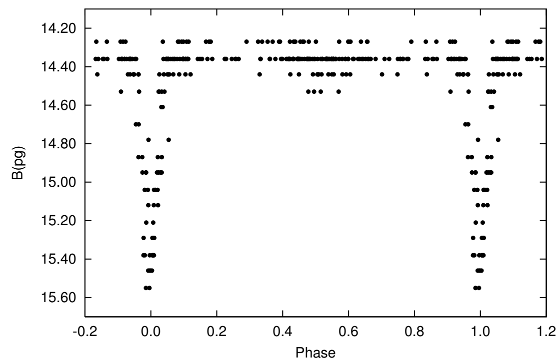

Figure 4. Light curve of V2037 Oph

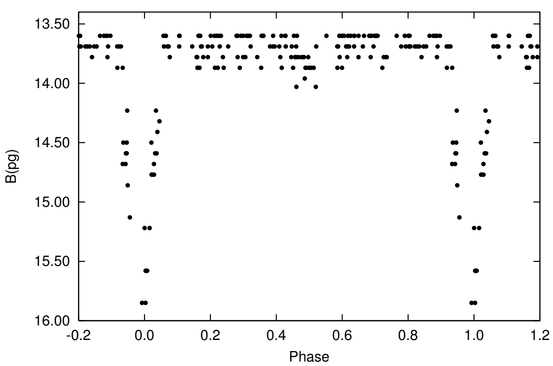

Figure 5. Light curve of V2056 Oph

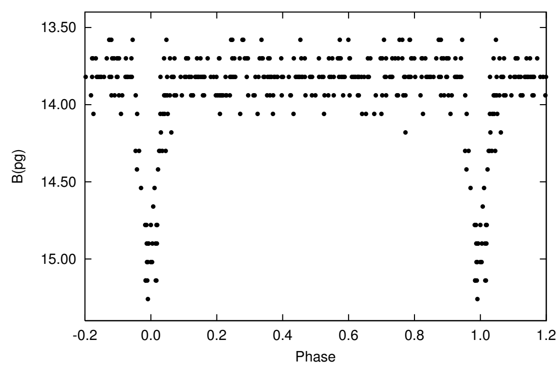

Figure 6. Light curve of NSV 9905

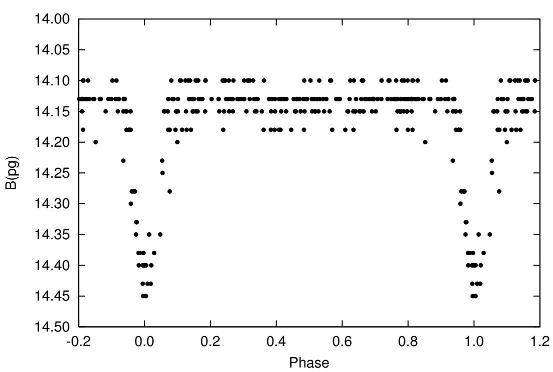

Figure 7. Light curve of NSV 9995

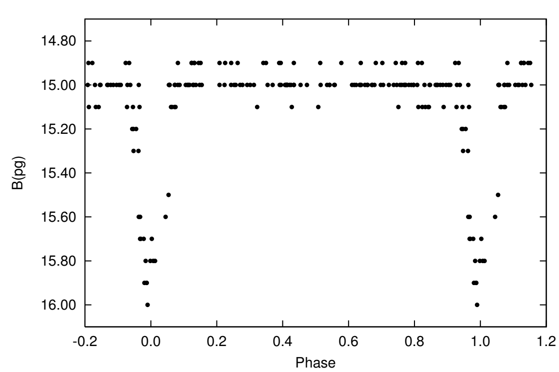

Figure 8. Light curve of NSV 10072

Table 1. Summary of this paper

Star	Type	Epoch 2400000+	Period (day)	Max.	Min.I	Min. II	D	No. of Plates
V987 Oph (1)	EA	29788.560 ±39	2.202681 ±17	$14\overset{\mathrm{m}}{.}45$	$15\overset{\mathrm{m}}{.}05$		$0\overset{\mathrm{p}}{.}15$	125
V987 Oph (2)		47736.450 ±18	2.202850 ±11					131
V1080 Oph	E	48862.362 ±64	4.873579 ±26	$15\overset{\mathrm{m}}{.}4$	$17\overset{\mathrm{m}}{.}8$		$0\overset{\mathrm{p}}{.}12$	252
V2037 Oph	EA	47591.725 ±8	2.0051041 ±15	$14\overset{\mathrm{m}}{.}3$	$15\overset{\mathrm{m}}{.}5$		$0\overset{\mathrm{p}}{.}12$	267
V2056 Oph	EA	47368.456 ±16	4.2549086 ±80	$13\overset{\mathrm{m}}{.}7$	$15\overset{\mathrm{m}}{.}9$	$13\overset{\mathrm{m}}{.}9$	$0\overset{\mathrm{p}}{.}13$	179
NSV 9905	EA	49215.433 ±11	1.7105330 ±12	$13\overset{\mathrm{m}}{.}7$	$15\overset{\mathrm{m}}{.}2$		$0\overset{\mathrm{p}}{.}10$	295
NSV 9995	EA	47380.420 ±7	1.2061988 ±9	$14\overset{\mathrm{m}}{.}15$	$14\overset{\mathrm{m}}{.}45$		$0\overset{\mathrm{p}}{.}15$	264
NSV 10072	EA	48839.388 ±15	1.4057497 ±23	$15\overset{\mathrm{m}}{.}0$	$15\overset{\mathrm{m}}{.}9$		$0\overset{\mathrm{p}}{.}13$	155

Table 2. Comparison stars and cross references

	V987 Oph S 4216 USNO 0900-12115145		V1080 Oph S 9267 USNO 0900-11003998	
Comp. No.	GSC	m*	USNO	m*
1	0900-12117555	$14\overset{\mathrm{m}}{.}2$	0900-11008666	$15\overset{\mathrm{m}}{.}4$
2	0900-12113655	$14\overset{\mathrm{m}}{.}8$	0900-11004175	$15\overset{\mathrm{m}}{.}9$
3	0900-12109715	$15\overset{\mathrm{m}}{.}0$	0900-10998821	$16\overset{\mathrm{m}}{.}2$
4	0900-12112607	$15\overset{\mathrm{m}}{.}1$	0900-11009519	$17\overset{\mathrm{m}}{.}1$

	V2037 Oph S 10361 USNO 0900-11940451		V2056 Oph S 4172 USNO 0825-10985914	
Comp. No.	USNO	m*	USNO	m*
1	0900-11939540	$13\overset{\mathrm{m}}{.}9$	0825-10985246	$13\overset{\mathrm{m}}{.}9$
2	0900-11934509	$14\overset{\mathrm{m}}{.}9$	0825-10987644	$14\overset{\mathrm{m}}{.}5$
3	0900-11941412	$15\overset{\mathrm{m}}{.}2$	0825-10984805	$15\overset{\mathrm{m}}{.}2$
4	0900-11923365	$15\overset{\mathrm{m}}{.}5$	0825-10982872	$16\overset{\mathrm{m}}{.}1$

	NSV 9905 S 9847 USNO 0900-11052470		NSV 9995 S 9280 USNO 0900-11264720	
Comp. No.	USNO	m*	USNO	m*
1	0900-11050194	$13\overset{\mathrm{m}}{.}1$	0900-11265139	$14\overset{\mathrm{m}}{.}2$
2	0900-11047354	$13\overset{\mathrm{m}}{.}8$	0900-11277123	$14\overset{\mathrm{m}}{.}5$
3	0900-11054226	$15\overset{\mathrm{m}}{.}2$		

	NSV 10072 S 10358 USNO 0975-10288226	
Comp. No.	USNO	m*
1	0975-10285318	$14\overset{\mathrm{m}}{.}7$
2	0975-10284764	$15\overset{\mathrm{m}}{.}2$
3	0975-10291701	$15\overset{\mathrm{m}}{.}9$

* Magnitudes refer to the B values of the USNO−A2.0 catalogue

Table 3. Heliocentric times of newly found minima and $O-C$ values according to the elements derived in this paper

Star	JD (min.*)	Epoch	$O-C$	Star	JD (min.*)	Epoch	$O-C$
V987 Oph (2)	38557.449	−4167	0.274	NSV 9905	25707.563	−13743	−0.015
	44022.485	−1686	0.040		25743.528	−13722	0.028
	45912.446	−828	−0.044		25880.321	−13642	−0.021
	46553.539	−537	0.019		26073.605	−13529	−0.028
	47388.408	−158	0.008		29785.495	−11359	0.006
	47736.447	0	−0.003		29845.389	−11324	0.031
V1080 Oph	25498.354	−4794	−0.069		35197.588	−8195	−0.027
	29816.433	−3908	0.019		36675.563	−7331	0.047
	29845.473	−3902	−0.183		39263.536	−5818	−0.016
	36673.565	−2501	0.025		45486.458	−2180	−0.013
	38530.529	−2120	0.155		46290.421	−1710	−0.001
	38910.520	−2042	0.007		46507.630	−1583	−0.030
	39597.572	−1901	−0.116		47744.399	−860	0.024
	39651.484	−1890	0.187		48801.513	−242	0.028
	39685.503	−1883	0.091		49215.413	0	−0.020
	40382.460	−1740	0.126	NSV 9995	29790.429	−14583	0.006
	46976.423	−387	0.136		29843.474	−14539	−0.022
	47736.457	−231	−0.108		38530.533	−7337	−0.007
	48862.378	0	0.016		38910.515	−7022	0.023
	49154.493	60	−0.284		39618.528	−6435	−0.003
V2037 Oph	29786.410	−8880	0.010		39682.484	−6382	0.024
	29808.450	−8869	−0.006		39711.401	−6358	−0.007
	29812.458	−8867	−0.009		40419.450	−5771	0.003
	29816.461	−8865	−0.016		43303.469	−3380	0.001
	38883.550	−4343	−0.008		44069.410	−2745	0.005
	40417.483	−3578	0.021		44484.340	−2401	0.003
	40419.482	−3577	0.015		46608.449	−640	−0.004
	40798.439	−3388	0.007		47380.399	0	−0.021
	41179.418	−3198	0.016	NSV 10072	29812.530	−13535	−0.036
	45905.451	−841	0.019		29843.474	−13513	−0.018
	45913.470	−837	0.017		38553.515	−7317	−0.002
	46288.406	−650	−0.001		39270.525	−6807	0.075
	46290.421	−649	0.009		39620.544	−6558	0.063
	46298.403	−645	−0.030		44484.348	−3098	−0.027
	47591.680	0	−0.045		46272.507	−1826	0.018
V2056 Oph	29808.450	−4127	0.001		46289.368	−1814	0.010
	46266.403	−259	−0.032		46296.356	−1809	−0.031
	46649.390	−169	0.013		46508.637	−1658	−0.018
	47368.474	0	0.018		46608.449	−1587	−0.014
NSV 9905	25442.427	−13898	−0.019		46646.396	−1560	−0.023
	25502.340	−13863	0.025		48839.392	0	0.004

* Mid-exposure times of plates with brightest observations

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5638

Konkoly Observatory
Budapest
26 July 2005

HU ISSN 0374 – 0676

ABSOLUTE SPECTROPHOTOMETRY AND LIGHT CURVE OF NOVA PUPPIS 2004 (= V574 Pup)

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Only scanty information are available on Nova Puppis 2004 (α=07$^{\rm h}$41$^{\rm m}$53$^{\rm s}$.76, δ=−27°06′36″.9 [2000]; l=243°, b=−2°). It was discovered in outburst by A. Tago and Y. Sakurai on Nov. 20.8 (2004 cf IAUC 8443), and spectroscopically confirmed as a nova by Ayani (2004), who reported for Nov 21.75 (4.3 days before maximum) Balmer and FeII lines in emission, P-Cyg profiles for hydrogen lines, ∼ 650 km/s as the FWHM of Hα emission component (uncorrected for instrumental PSF) and the P-Cyg absorption component blue-shifted by 860 km/s with respect to the emission peak. A near-IR spectrum by Ashok and Banerjee (2004) secured five days later on Nov. 26.9, showed strong hydrogen emission lines of Paschen β and γ, Brackett γ and Brackett 11 to 17, and in addition emission lines of OI, NI and CI.

Soon after the announcement of the discovery we began obtaining visual estimates of Nova Puppis 2004 from Nelson (NZ) with a 0.32m reflector and the comparison sequence prepared for RASNZ-VSS by M. Morel (electonically available as 5638-f3). The estimates are collected in Table 1 and the resulting light curve is plotted in Figure 1. According to data from AAVSO website (`http://www.aavso.org`), the maximum optical brightness was reached by the nova on t_0 ∼2453335.6 at V∼8.0 (represented by the open circle in Figure 1). Our first estimate was collected before the optical maximum, all others were uniformly distributed along the decline phase until seasonal conjunction with the Sun prevented further observations. From the light curve in Figure 1 it results that a decline of 2 mag required t_2=13 days, which qualifies Nova Puppis 2004 as a quite fast nova (cf Warner 1995), of absolute magnitude M_V=−8.5 following t_2-M_V relation by Della Valle (2002) or M_V=−8.0 according to Cohen (1988) calibration. The following decline was slowed down by a plateau phase that lasted ∼20 days in late December/early January, so that the decline by 3 mag from maximum took t_3=58 days. The light curve in Figure 1 shows that Nova Pup 2004 did not go through a dust condensation phase, contrary to several fast novae that displayed such a phase which generally starts when the nova has declined by 3.5 mag from maximum.

We obtained absolute fluxed spectra of Nova Pup 2004 on Nov 26.17 UT (within a few hours of maximum optical brightness of the outburst) and on Dec 12.15, 2004 UT (when the nova had declined by ΔV∼2.1 mag) with the B&C spectrograph attached to the 1.22m telescope of the Asiago Astrophysical Observatory of the University of Padova. The detector was a 4-stage Peltier cooled Wright Instruments camera with a TK512CB1-1 CCD, 512×512 pixels of 27 μm size. The adopted 300 ln/mm grating blazed at 5000 Å, provided a scale of 4.5 Å/pix. To cover the 3500-7000 Å wavelength range, two exposures with different instrument set-ups where necessary. Flux standards located on the sky close to Nova Pup 2004 were selected from the Asiago Database of Spectroscopic Databases (ADSD, Sordo and Munari 2003). Given the latitude of the Asiago Observatory (+45°52′), Nova Pup 2004 reached at culmination an elevation over the geometrical horizon not exceeding 17°. To calibrate the spectra into good absolute fluxes, such low an elevation required excellent sky photometric conditions, orientation of the slit along the instantaneous parallactic angle and observation of spectrophotometric standards close on the sky to Nova Pup 2004 and well distributed in elevation in the range 15°to 25°so as to derive accurate local extinction coefficients. The data reduction was carried out with IRAF software and involved standard corrections for bias, flat and dark frames obtained each night and separately for both the blue and red wavelength set-ups required to cover the whole 3500-7000 Å wavelength range.

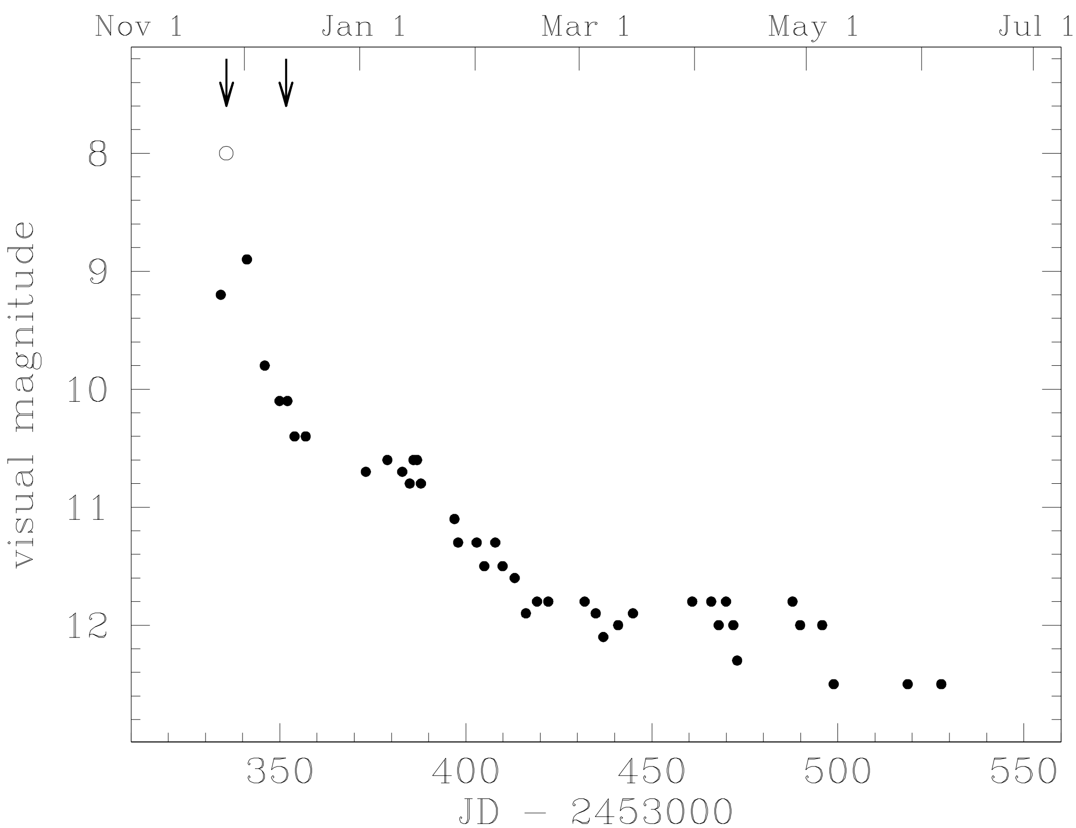

Figure 1. Light curve of Nova Pup 2004 (= V574 Pup) from the visual estimates reported in Table 1. The open circle represents the light curve maximum according to AAVSO database. The arrows points to the dates of the spectra presented in Figure 2.

The spectra are characterized by a high S/N for $\lambda \geq 4200$ Å and are presented in Figure 2, with logarithmic ordinates to emphasize visibility of weaker features. The spectra are available in electronic form from the IBVS web site as `5638-t4.txt` and 5638-t5.txt. Integrating the B and V magnitudes over the fluxed spectra – adopting the Buser (1978) band transmission profiles – results in B=8.30, V=8.03 for the Nov 26 spectrum, and B=9.84 and V=9.83 for the Dec 12 spectrum. The expected accuracy of the broad-band magnitudes derived from the spectra is ∼0.03 mag. The spectral resolution can be assessed directly on the spectra from the width of the telluric O_2 absorption B band at

6875 Å, which is 7.29 Å (1.6 pixels) in both spectra.

JD	V	JD	V	JD	V	JD	V	JD	V
334.117	9.2	382.922	10.7	407.909	11.3	440.937	12.0	489.872	12.0
341.139	8.9	384.907	10.8	409.889	11.5	444.919	11.9	495.805	12.0
345.941	9.8	385.926	10.6	413.122	11.6	460.863	11.8	498.903	12.5
349.931	10.1	386.904	10.6	416.152	11.9	465.970	11.8	518.791	12.5
352.058	10.1	387.914	10.8	419.137	11.8	467.971	12.0	527.813	12.5
353.958	10.4	396.935	11.1	422.165	11.8	469.942	11.8		
356.943	10.4	397.924	11.3	431.938	11.8	471.903	12.0		
373.117	10.7	402.910	11.3	434.923	11.9	472.939	12.3		
378.908	10.6	404.950	11.5	436.954	12.1	487.818	11.8		

Table 1: Visual estimates of Nova Pup 2004 obtained by A.F.J. with a 0.32m reflector from Nelson (NZ).

JD	Date	Hα				Hβ			
	2004	Flux	Em (km/s)	P-Cyg (km/s)	Abs (km/s)	Flux	Em (km/s)	P-Cyg (km/s)	Abs (km/s)
2453335.664	Nov 26.17	5.0(−10)	2830	−1910	840	2.0(−10)	2180	−1650	710
2453351.648	Dec 12.15	7.5(−10)	2810	−1930	830	2.0(−10)	2170	−1650	720

Table 2: Hα and Hβ on the spectra of Figure 2. *flux* is the flux in erg cm^{-1} s^{-1} integrated on the whole profile of the emission component. *em* is the FWHM of the emission component. *P-Cyg* is the blue-shift of the center of the P-Cyg absorption component with respect to the flux barycenter of the emission component. *abs* is the FWHM of the absorption component.

The continuum slope on the spectra indicate a marked bluing of the nova, with a large increase in the emission line contrast on the background continuum, while their integrated flux remained essentially constant (cf. Table 2). The spectra at both epochs are dominated by Balmer hydrogen and FeII emission lines. The basic Hα and Hβ parameters are summarized in Table 2. At the time of Dec 12 spectrum, no nebular lines had yet appeared.

At time t_2 the mean intrinsic color of novae is $(B-V)_0$=−0.02±0.04 with a dispersion on σ=0.12 mag (Warner 1995). When the Dec 12 spectrum was secured, the nova had declined by ~2.1 mag, and the color integrated over the spectrum is $B-V$=+0.01, which argue in favor of a negligible reddening affecting the nova, of the order of a mere $E_{B-V}\sim$0.03. Typical color of novae at maximum is $(B-V)_0$=+0.23±0.06 with a dispersion on σ=0.16 mag (Warner 1995). The color of the nova on the Nov 26 spectrum – secured right at maximum brightness – is $B-V$=+0.27, again supporting a negligible reddening of the order of a mere $E_{B-V}\sim$0.04. There is a high convergence of both methods to indicate that the nova is essentially un-reddened ($E_{B-V}\leq$0.05 mag). This is however in sharp contrast with the high reddening expected from the large distance to the nova and its low galactic latitude (b=2°). With V=8.0 at maximum and M$_V$=−8.6 estimated above from t_2, the distance to the nova is d=20 kpc with a height above the galactic plane of z=0.7 kpc, reducing to d=15 kpc and z=0.5 kpc for M$_V$=−8.0. In both cases, the reddening maps of Neckel and Klare (1980) would support a $E_{B-V}\geq$1.0 for distances ≥3 kpc. A high resolution spectrum in the NaI and KI resonance line wavelength regions would have greatly helped in measuring the extinction objectively and free of assumptions using the Munari and Zwitter (1997) calibration into reddening of the equivalent widths of these strong interstellar lines. A E_{B-V}=0.5 reddening would have produced an equivalent width for an unblended interstellar NaI doublet of 1.2 Å. On both our low resolution spectra the equivalent width of the absorption feature located at the expected NaI D spectra is far lower (∼0.5 Å), to which could furthermore contribute the absorption component of the P-Cyg profile of the NaI from the nova expanding ejecta.

There is no obvious pre-outburst counterpart to the nova, even if reported astrometry in IAUC 8443 could be stretched to agree with position of a 18 mag nearby field star visible on Palomar II plates. This sets the outburst amplitude to at least $\Delta V \geq 10$ mag, which is in agreement with a typical outburst amplitude of 11 to 14 mag – depending on the system orbital inclination – for novae characterized by t_2=13 days (Warner 1995).

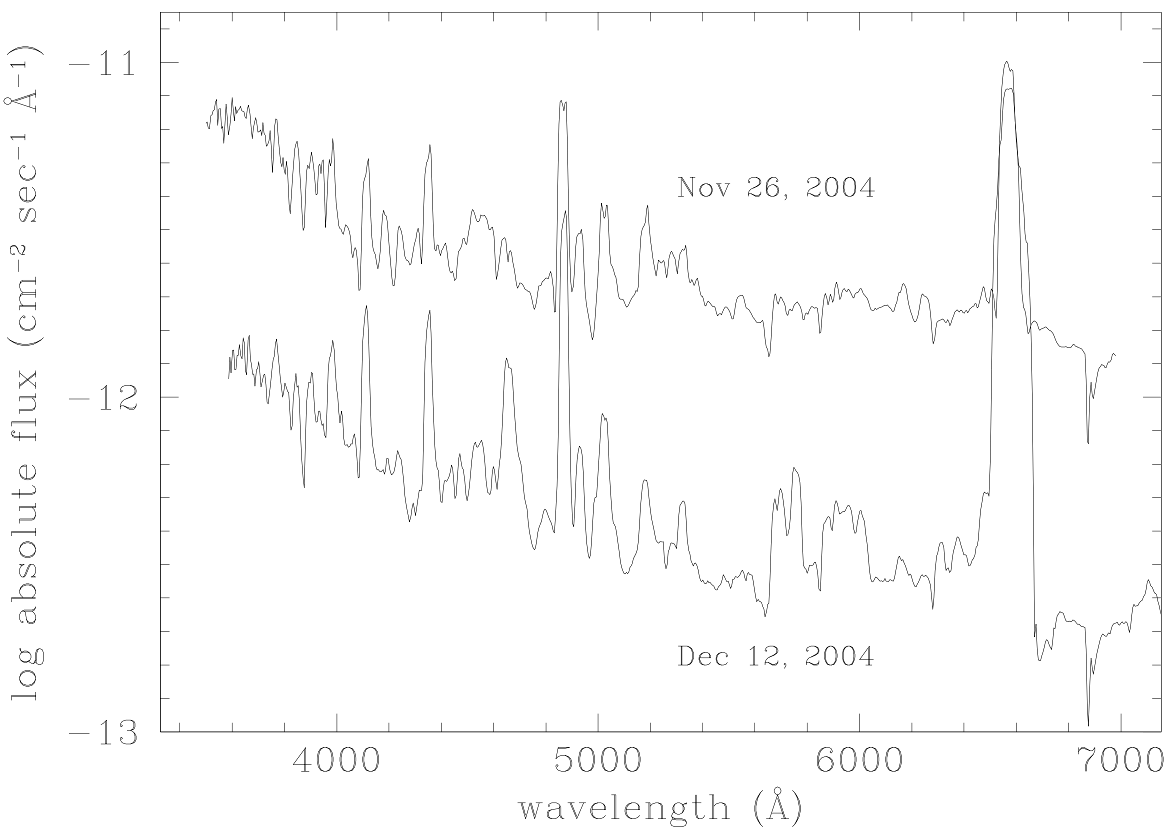

Figure 2. Absolute fluxed spectra of Nova Pup 2004 (= V574 Pup) for the two dates marked by arrows in Figure 1.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5639

Konkoly Observatory
Budapest
2 August 2005

HU ISSN 0374 – 0676

DISCOVERY OF A NEW PULSATING STAR: SAO 29875

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Name of the object:
SAO 29875, HD 238549, BD+56 1883

Equatorial coordinates:	**Equinox:**
R.A.= $16^h17^m36\overset{s}{.}7$ **DEC.=** $+56°14'19\overset{''}{.}9$	2000

Observatory and telescope:
Mt. Suhora Observatory, 60 cm Cassegrain telescope

Detector:	photometer: three channel, Hamamatsu R1463P PMTs

Filter(s):	BVR

Date(s) of the observation(s):
2005.03.20/21, 2005.03.21/22, 2005.04.02/3

Comparison star(s):	PG1618+563 used in March, anonymous star in April

Check star(s):	none

Transformed to a standard system:	No

Availability of the data:
Available at the IBVS website as `5639-t1.txt`

Type of variability:	λ Boo/δ Sct

Remarks:

We report discovery of pulsations of SAO 29875 (V=$9^{m}.8$, A0 spectral type listed in the HD catalogue). In Fig. 1 we show the collected light curves in all filters. Variability with an amplitude of about $0^{m}.05$ in B filter is clearly seen in the data collected in March. Although the April data have been gathered in non-photometric conditions, the light changes are obvious in all filters. SAO 29875 seems to have more than one periodicity as the observations taken during the first night show an increase of amplitude of pulsations towards the end of the run. We performed a Fourier analysis in order to search for periodicities. Deeming's (1975) algorithm modified by Kurtz (1985) was applied. In Fig. 2 we present the periodogram for all available data taken in the B filter. Using the FOUR-M code (Andronov 1994), the value of the dominant period has been found: P=0.063656±0.000003 d. This dominant period is well seen every night. A longer-period peak of 0.315 d may have arisen as an artefact corresponding to the lengths of the runs (about 8 hours each night).

The period and semi-amplitude properties of SAO 29875 may indicate either a δ Sct-type or λ Boo-type pulsations. The A0 early spectral type may give a hint that SAO 29875 is a new λ Boo-type pulsator. The final classification can be made after deriving the metal abundances of this star (Gray 1988, Paunzen 2005).

Acknowledgements:

N.O. would like to acknowledge the support from the Krolowa Jadwiga Jagiellonian University Fund.

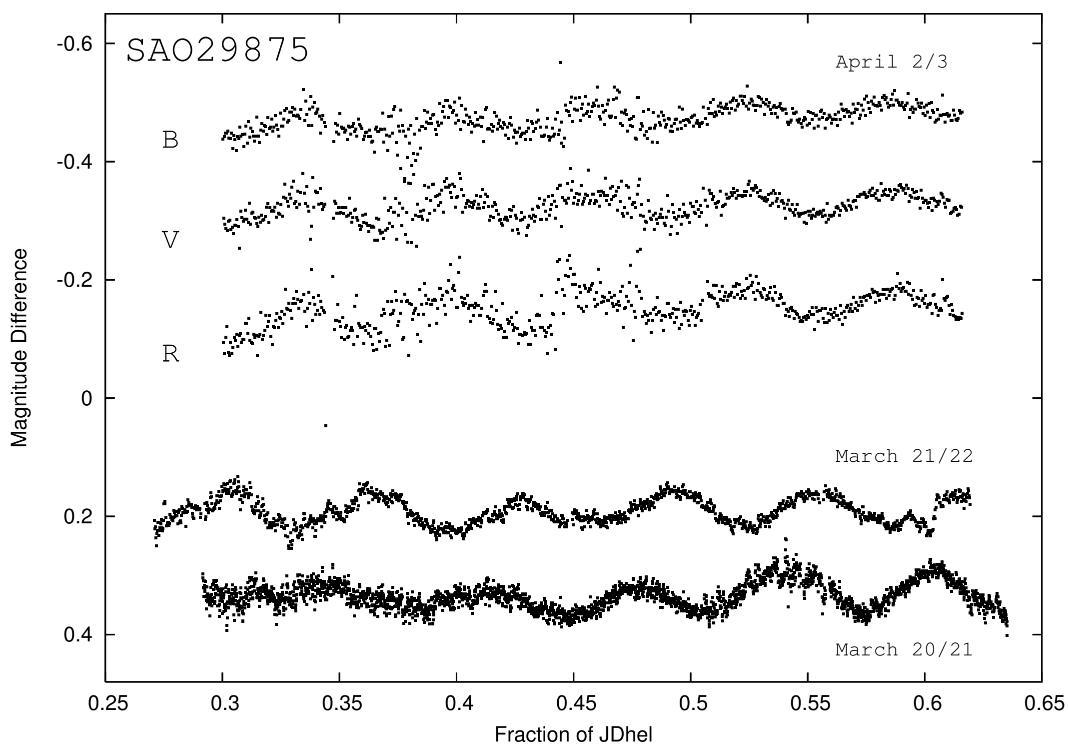

Figure 1. Light curve of SAO 29875

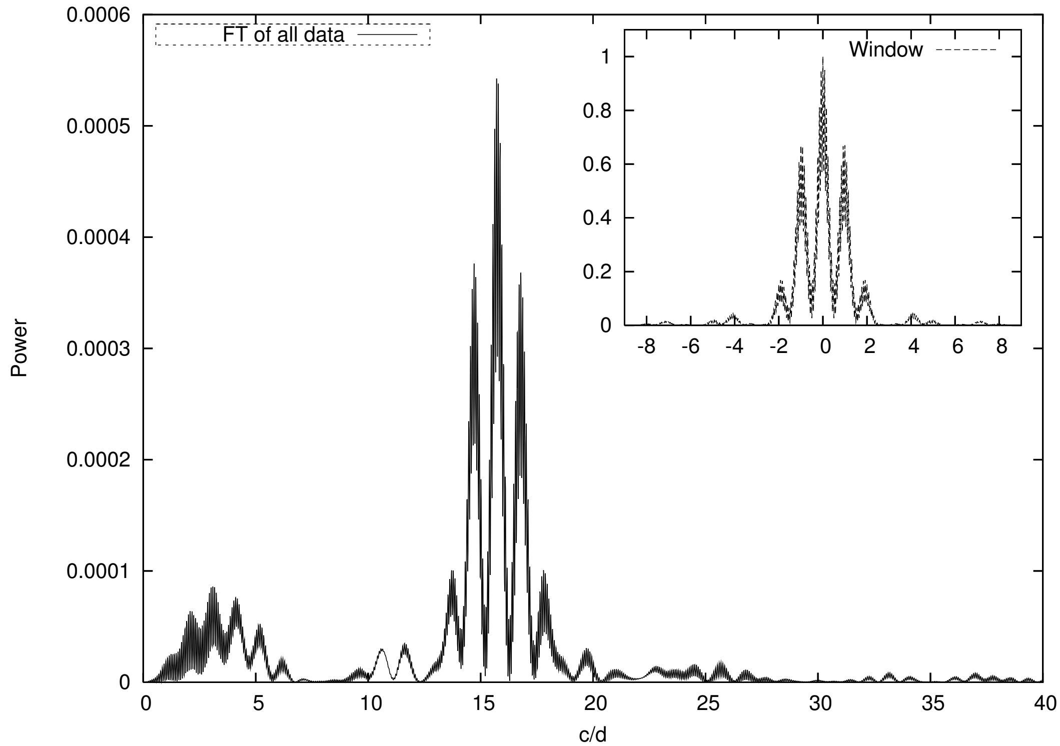

Figure 2. The periodogram of all data

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5640

Konkoly Observatory
Budapest
3 August 2005

HU ISSN 0374 – 0676

NEWLY DISCOVERED VARIABLE STARS IN THE GLOBULAR CLUSTERS NGC 5634, ARP 2 AND TERZAN 8

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Cosmological arguments suggest that dwarf galaxies may constitute the fundamental building block of larger galaxies. Therefore, comparing the oldest stellar components of giant galaxies with those of their surrounding dwarf satellite galaxies may provide us with an excellent opportunity to empirically constrain the extent to which the dwarfs may have played a role in assembling the giants. Unmistakably old and easy to identify in relatively nearby systems, RR Lyrae variables may prove of vital importance in this regard (Catelan 2004; Kinman, Saha, & Pier 2004).

In the case of our own Milky Way, several previously unknown dwarf galaxies have recently been reported on in the literature, some of which clearly in the process of being engulfed by the Milky Way. A particularly striking example is provided by the Sagittarius dwarf spheroidal galaxy (Ibata, Lewis, & Gilmore 1994). An important question one must ask is whether the ongoing Sagittarius merger is representative of the process that led to the formation of the Milky Way. In this sense, comparing the RR Lyrae variables in the globular clusters which have been suggested to be associated with Sagittarius (e.g., Da Costa & Armandroff 1995; Dinescu et al. 2000; Bellazzini et al. 2002) and those in the Galaxy's halo may shed light on whether the Galactic halo globular cluster system originated from Sagittarius-like mergers. In the present note, we focus on four Sagittarius-related globulars, namely: Arp 2, Terzan 8, Palomar 12, and NGC 5634.

NGC 5634 had seven previously known variables (Baade 1945), while Pal 12 had three reported variables (Kinman & Rosino 1962). Neither Arp 2 nor Terzan 8 have variable stars listed in the Clement et al. (2001) catalog.

Our search for variable stars in these clusters is based on images acquired on the Danish 1.54m telescope in La Silla, Chile, over four consecutive nights, from June 27 to June 30, 2003. In the course of these nights, the seeing conditions varied from 0.9 to 1.5 arcsec. The 2048×2048 RINGO CCD was used. With a pixel scale of $0\farcs395$, the total observed field was $13\farcm5 \times 13\farcm5$.

The total set of images consists in 32 B, V pairs for NGC 5634, 37 pairs for Arp 2, 27 pairs for Ter 8, and 34 pairs for Pal 12. In this note we shall restrict ourselves to relative-flux light curves based on the B-band images.

Table 1. Locations and tentative periods for new variable stars in NGC 5634.

Variable	$x('')$	$y('')$	Period (d)	Type
V8	55.3	−43.4	0.330	RRc
V9	0.4	−4.7	0.583	RRab
V10	13.0	−0.8	0.646	RRab
V11	10.7	7.9	0.660	RRab
V12	−2.4	9.5	0.624	RRab
V13	−14.2	12.6	0.645	RRab
V14	21.3	18.6	0.720	RRab
V15	7.9	18.6	0.852	RRab
V16	9.9	31.6	0.670	RRab
V17	−0.4	43.1	0.289	RRc
V18	−20.9	−38.3	0.325	RRc
V19	0.8	−26.1	0.296	RRc
V20	−7.9	0.0	0.648	RRab
V21	−30.8	−28.0	0.0666	SX Phe

Table 2. Locations and tentative periods for new variable stars in Arp 2.

Variable	$x('')$	$y('')$	Period (d)	Type	Note
V1	−101.1	27.6	0.568	RRab	Valenti's V4
V2	−58.1	73.5	0.821	RRab	Valenti's V5
V3	160.4	−27.6	0.565	RRab	Valenti's V25
V4	223.2	1.2	0.458	RRab	Valenti's V28
V5	128.8	−327.5	0.763	RRab	
V6	−190.8	−100.7	0.445	RRab	
V7	289.1	288.0	0.530	RRab	
V8	4.0	−40.0	0.292	RRc	
V9	97.6	−63.6	0.517	RRab	
V10	90.1	−125.2	0.0473	SX Phe	
V11	20.9	68.3	0.0611	SX Phe	
V12	−43.8	−237.0	0.0604	SX Phe	

Table 3. Locations and tentative periods for new variable stars in Terzan 8.

Variable	$x('')$	$y('')$	Period (d)	Type	Note
V1	−113.4	−187.6	0.686	RRab	Montegriffo's 117
V2	124.0	−23.3	0.392	RRc	Montegriffo's 1350
V3	−179.0	−193.2	0.601	RRab	
V4	95.6	37.1	0.0616	SX Phe	

Using the image subtraction technique (ISIS v2.1; Alard 2000), we were able to rediscover six of the seven known variables in NGC 5634, and to discover 14 new variables in the cluster. In Arp 2, we discovered 8 new variables and confirmed 4 previously reported ones (Valenti 2001). Other variables reported by Valenti were not found to be variable in our data. In Ter 8 two new variables were found and a two more previously suspected variables (Montegriffo et al. 1998) were confirmed. We do not confirm the variable status of stars V1, V2, and V3 that had previously been reported in Pal 12 (Kinman & Rosino 1962).

The location, classification and tentative periods for the new variables in NGC 5634, Arp 2, and Ter 8 are given in Tables 1, 2, and 3, respectively. In these tables, the x and y coordinates are in arcseconds with respect to the cluster centers, as given in the online Clement et al. (2001) catalog. Because the time coverage was not extensive, the periods are probably good only to the third decimal place, and some may actually be aliases of the correct period. Light curves based on the reported periods are shown in Figure 1 for NGC 5634, and in Figure 2 for Arp 2 (first three rows) and Ter 8 (bottom row).

Finding charts for the newly discovered variable stars in the three clusters are provided in Figures 3 (NGC 5634), Figure 4 (Arp 2), and Figure 5 (Ter 8).

One of the variables found by Baade (1945) in NGC 5634, V7, could not be confirmed by our analysis. Likewise, the variable was not present in the Liller & Sawyer-Hogg (1976) analysis, although in their case this was due to blending. Since Alard's (2000) image subtraction technique is particularly powerful in the center of concentrated clusters, we conclude that V7 is not a variable. For V2 in NGC 5634, we find that the period given by Liller & Sawyer-Hogg ($P = 0.605148$ d) does not give us a clean light curve; $P = 0.601$ d provides a better solution. For the remainder of the variables, the periods that we found are the same as in Liller & Sawyer-Hogg's study. Of the twelve variables discovered in Arp 2, four (NV1-NV4) had previously been found by Valenti (2001). Two of the Ter 8 variables (NV1-NV2) were previously identified by Montegriffo et al. (1998). Since their studies were based on very few datapoints, our periods represent a significant improvement over the ones previously reported.

Note that we detect candidate SX Phoenicis variables in NGC 5634, Arp 2, and Ter 8. Although their light curves tend to be a bit noisy, they are all located in the blue straggler region in their respective clusters' color-magnitude diagrams (Salinas et al. 2005, in preparation); together with their short periods, this suggests to us that their SX Phe classification is reliable.

In a future paper, we will attempt to incorporate additional data into our analysis, calibrate the light curves into standard magnitudes, construct Bailey diagrams and analyze the Sagittarius globular cluster system in the context of the Oosterhoff dichotomy and the formation history of the Milky Way (Catelan 2004, 2005).

Acknowledgement: We thank C. Cacciari and E. Valenti for interesting discussions. R.S. acknowledges support by FONDAP 15010003. M.C. acknowledges support by Proyecto FONDECYT Regular No. 1030954. H.A.S. acknowledges the NSF for support under grant AST 02-05813.

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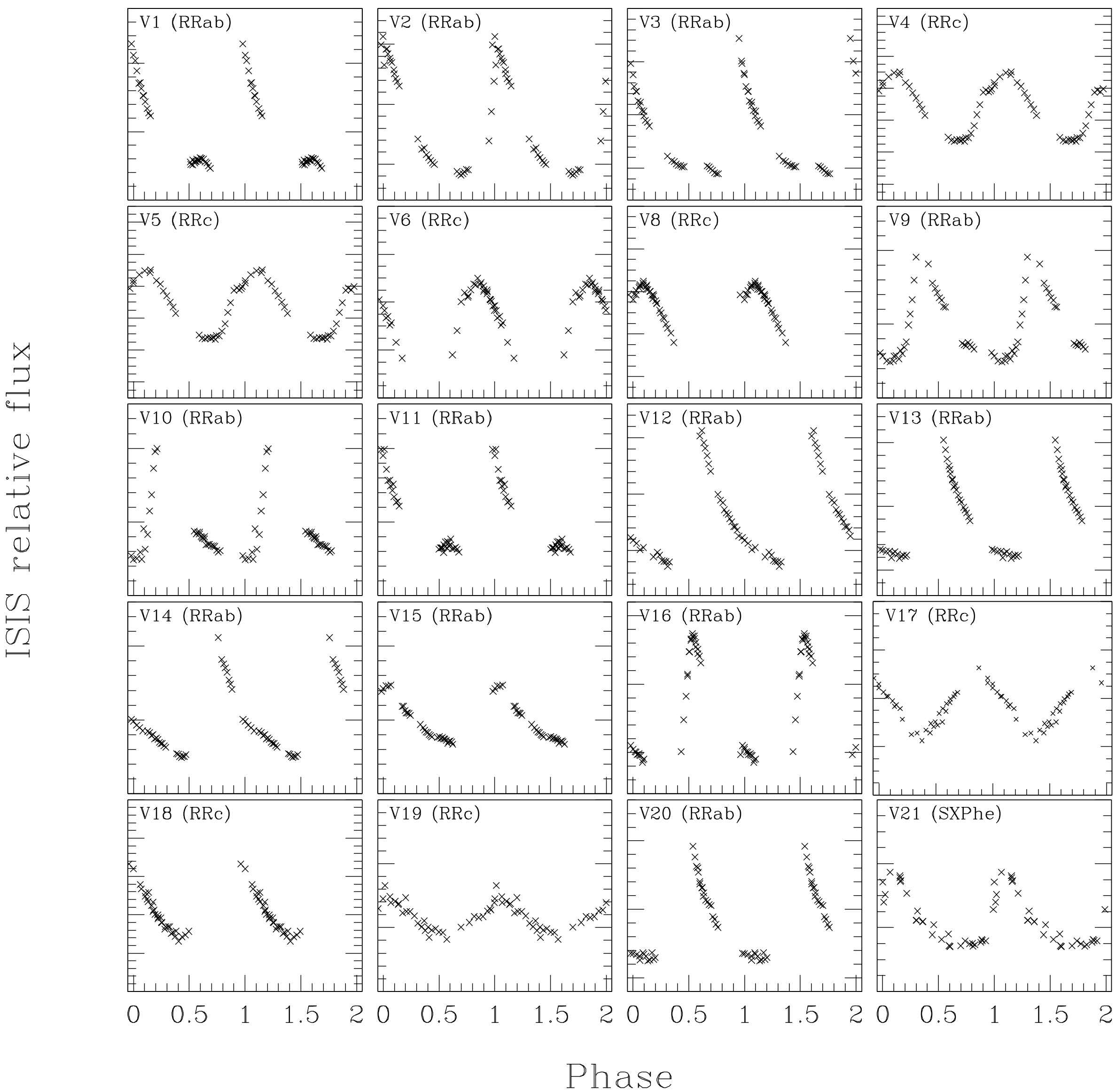

Figure 1. *B*-band differential light curves for six previously known RR Lyrae variables and fourteen newly discovered variables in NGC 5634.

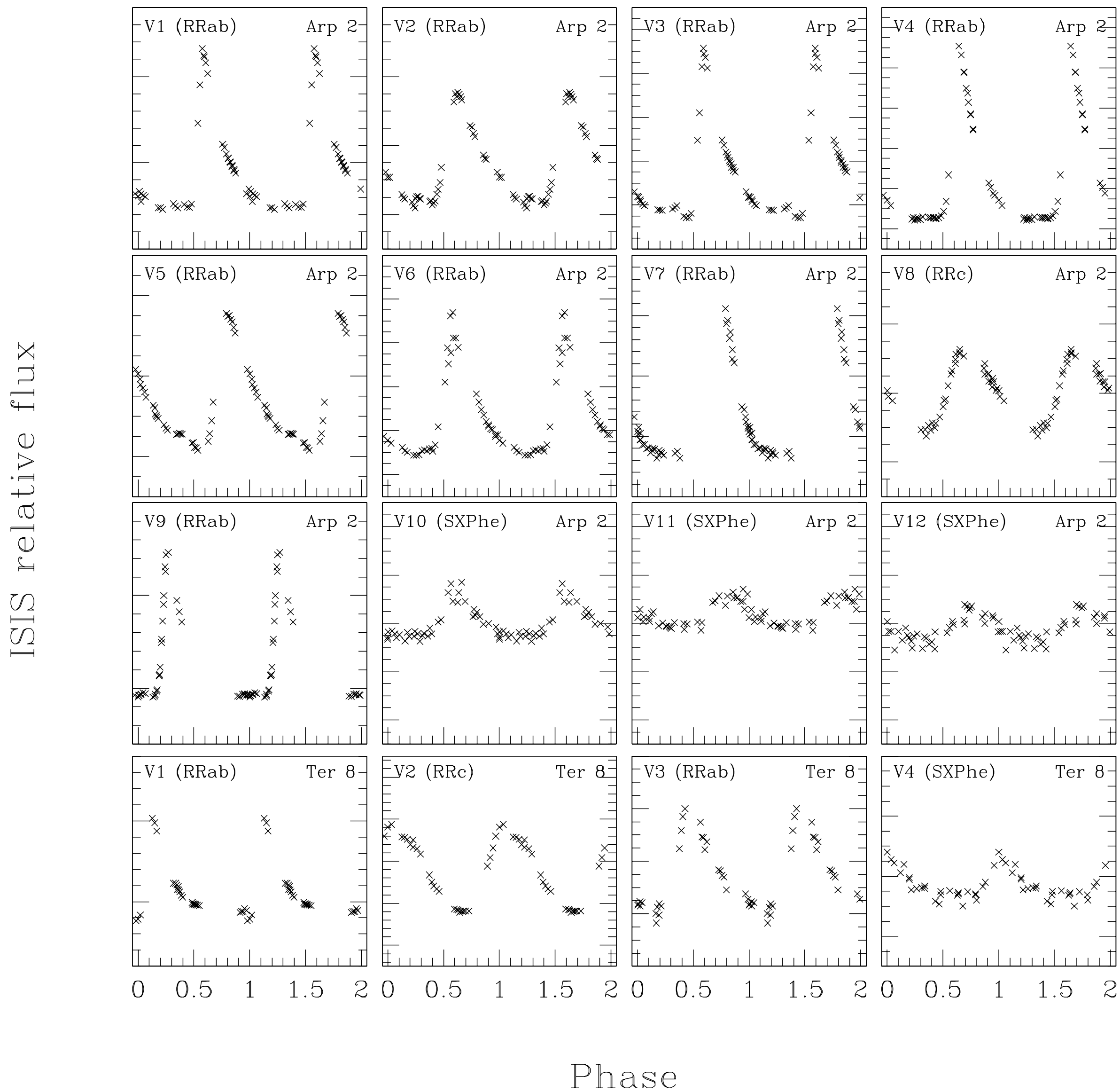

Figure 2. *B*-band differential light curves for the twelve variables detected in Arp 2 and four variables in Terzan 8 (last row).

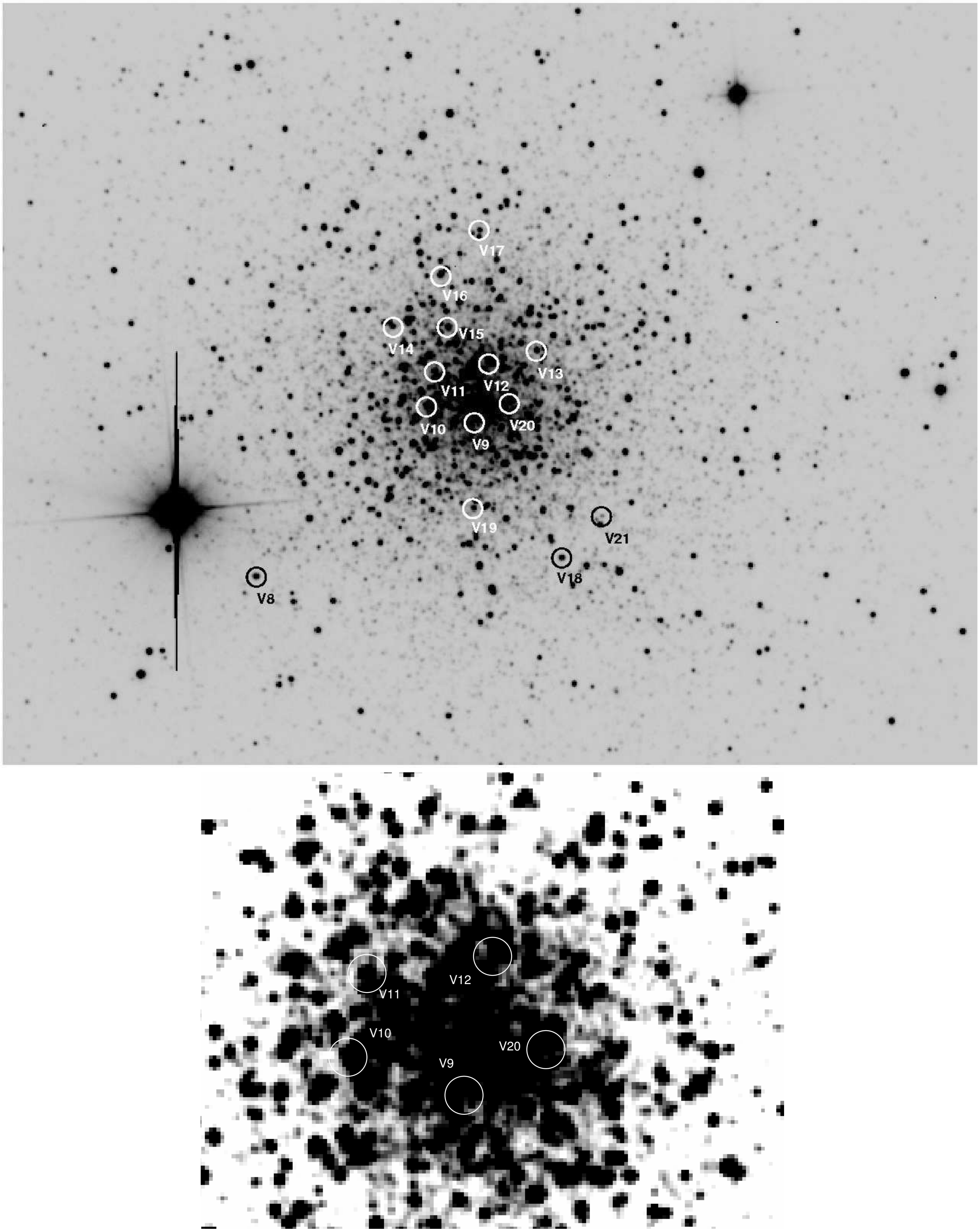

Figure 3. *Top*: Finding chart for newly discovered variable stars in NGC 5634. The field size is approximately $4' \times 3'$. North is up and East to the left.
Bottom: Same as the upper plot, but zooming in on a central region of approximately $1' \times 1'$ in size. This plot illustrates the power of ISIS to reliably detect and perform relative photometry for variable stars in extremely crowded fields.

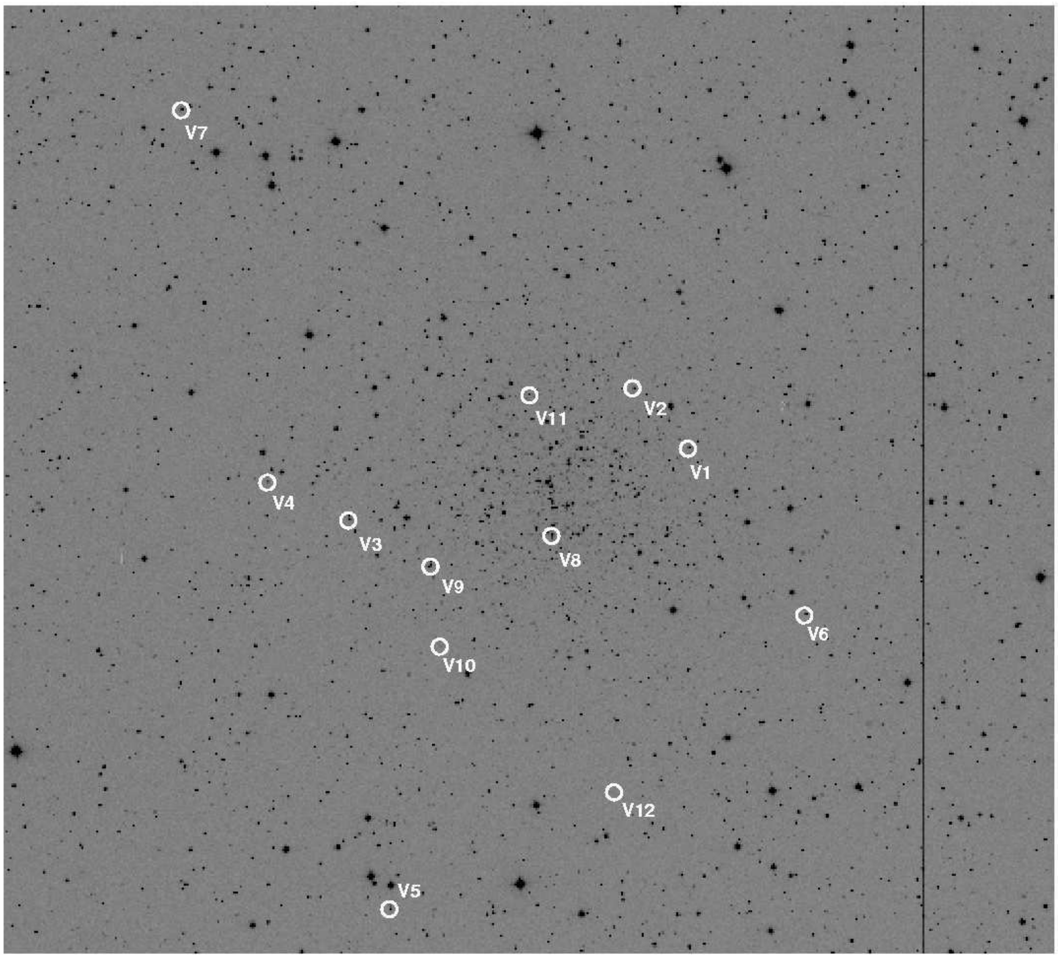

Figure 4. Finding chart for newly discovered variable stars in Arp 2.The field size is approximately $13' \times 13'$. North is up and East to the left.

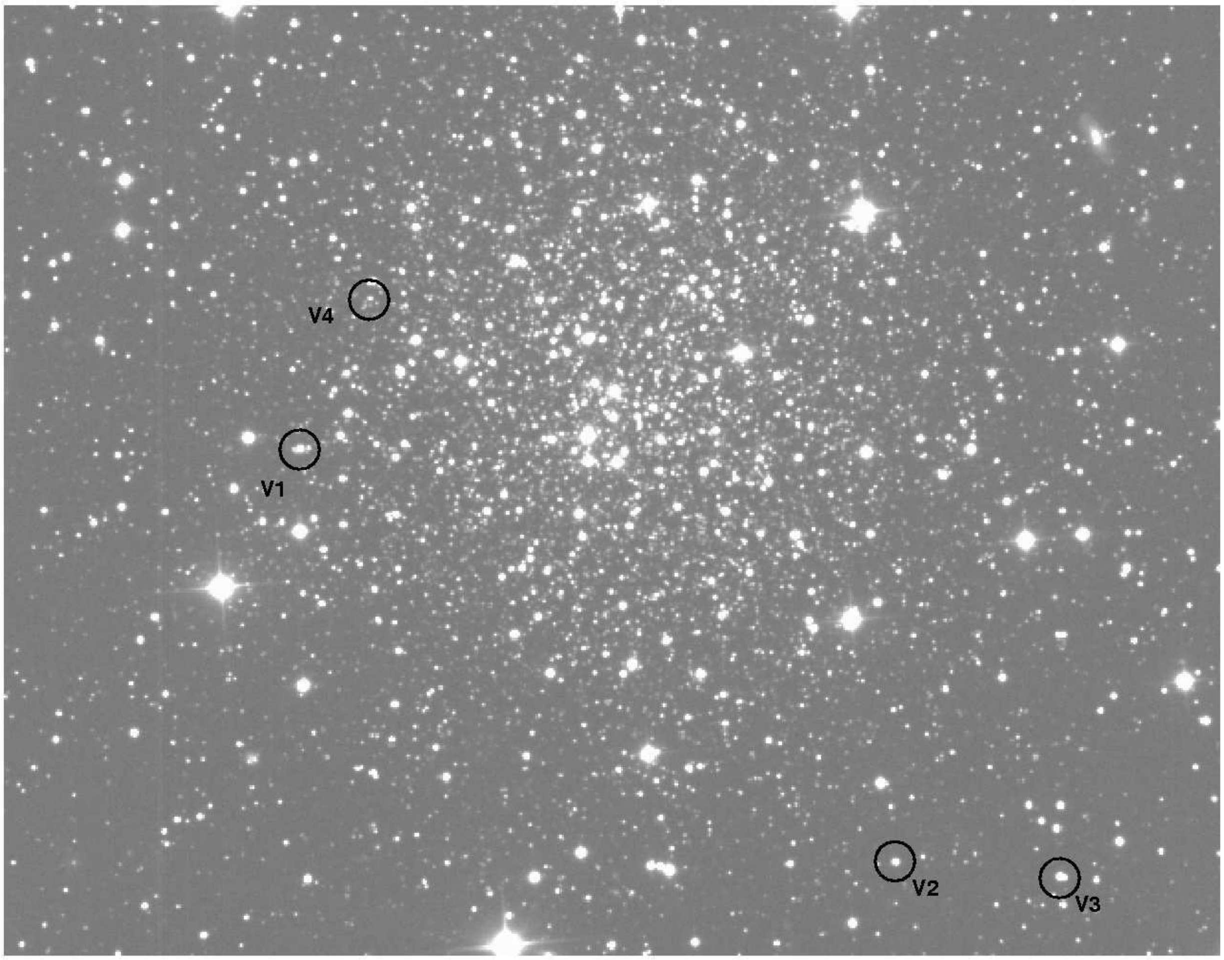

Figure 5. Finding chart for newly discovered variables in Terzan 8. The field size is approximately $8' \times 6'$. North is up and East to the left.

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5641

Konkoly Observatory
Budapest
4 August 2005

HU ISSN 0374 – 0676

REVISION OF THE LIST OF GALACTIC FIELD RRab STARS WITH KNOWN BLAZHKO PERIODS

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The first comprehensive list of galactic field RR Lyrae stars showing Blazhko effect was published by Szeidl (1988). Most of these RR Lyrae stars were identified as Blazhko variables on the grounds of visual or photographic observations and some of the investigations utilized only $O - C$ data. The compilation of Blazhko stars was modified and complemented with recent, well established data by Smith (1995) and Jurcsik et al. (2005b).

In Jurcsik et al. (2005a) it has been found that RR Gem, listed with a 37 d Blazhko period in Szeidl (1988) based on photographic observations of Detre (1970), is actually a very small modulation amplitude Blazhko star with a modulation period of 7.2 d. Some doubts may also arise about results which were based on e.g., exclusively visual data. These facts led us to decide to check the validity of the Blazhko status and period of the stars included in Szeidl's list.

Utilizing all the available data of the stars (the original datasets that the announcement of the Blazhko status was based on, recent photometric data e.g., ROTSE[1] (Wozniak et al., 2004), ASAS[2] (Pojmanski, 2002), and the GEOS light maxima database[3]) and using powerful computer-aided analysing technique we have found 9 variables of which the Blazhko periods are definitely wrong, and even their Blazhko status can be questioned.

The accuracy of the data sets a limit to our conclusions. Keeping also in mind that small amplitude modulation might be quite frequent (RR Gem: Jurcsik et al., 2005a; SS Cnc: Jurcsik et al., 2005c) we cannot decide for sure whether these stars show modulation characteristics or not. To reach definite conclusion about their modulation properties more accurate and extended photometric observations were needed. Without this, the aim of our investigation could be only to check whether the available data consistently show the modulation period appearing in the literature.

The Blazhko period of the following stars do not fit all the available data, consequently without further observations their modulation behaviour has to be taken with suspect.

MW Lyrae

No observations of this star can be found in the ROTSE database, only two (photographic and visual) observation sets of MW Lyr are available. The modulation was found by Mandel (1970) based on his visual observations. In these data the variability of

[1] http://skydot.lanl.gov/nsvs/nsvs.php
[2] http://archive.princeton.edu/~asas/
[3] http://webast.ast.obs-mip.fr/people/leborgne/dbRR/

maximum light shows the 33.3 d periodicity, indeed, although the light curve has a very strange shape even for a Blazhko star (see fig. 5 in Mandel, 1970). Earlier photographic observations were taken by Gessner (1966). These 7 light maxima cover epochs of different phases of the 33.3 d modulation without showing any significant scatter at maximum light contradicting Mandel's result.

DM Cyg

Light curve modulation was found by Lysova & Firmanyuk (1980) based on their visual observations of 29 light maxima. They found a periodic oscillation in the times of light maxima with a period of 26.01 d and with an amplitude of about 0.006 d. Fourier analysis of their data shows this periodicity, nevertheless the resultant 0.006 d amplitude ($\sim$ 10 min) if compared to the accuracy of visual observations hints some suspect about the result. The ROTSE data show the light curve to be stable within the uncertainty, without any appearance of modulation frequency peaks in the Fourier spectrum in the vicinity of the pulsation frequency. There are 206 times of maxima of DM Cyg in the GEOS $O-C$ database which primarily show a steady period increase. After the removal of this long term trend and Fourier analysing either the entire dataset or its shorter segments, no convincing evidence of a 26.01 d periodicity in the $O-C$ data was found.

TU Com

The modulation and its period were determined from the photographic measurements of Ureche (1965). Though the photometric data show modulation in the brightness and phase of maxima, the Fourier analysis of the light curve does not support the published $\sim$ 75 d modulation period. No unambiguous modulation period from these data can be determined, indicating that maybe observational error mimics modulation. Schmidt & Seth (1996) show a bit scarce folded light curve of TU Com without any sign of modulation. The ROTSE data do not show modulation, but due to the faintness of the star these data show quite large scatter.

SW Boo

Blazhko modulation was found by Taylor (1977) based on the unpublished visual observations of Baldwin (AAVSO). An anomalously large amplitude modulation (pulsation amplitude varied between 0.7 mag and 2.6 mag) with 13 d periodicity was determined. The ROTSE data unambiguously confute this result, showing no modulation at all. CCD observations of Husar (2004) also contradict the large amplitude modulation of SW Boo.

V434 Her

There are 35 published times of maxima of this variable (Hoffmeister, 1960) among them 19 are from visual and 16 are from photographic observations. Based on this data Rozhavski (1964) found this variable to be phase modulated with a period of 26.06 d and an amplitude of about 0.06 d. Fourier analysis does not show any significant periodicity in the original $O-C$ data given by Hoffmeister. The same is true if the visual and pg data are treated separately. ROTSE data have large uncertainties.

SW Psc

Phase modulation with 34.5 d periodicity and 0.013 d amplitude was found by Ureche (1971) on the basis of 15 photographic observations of light maxima from two seasons. Fourier analysis of these data shows the mentioned periodicity. Earlier $O-C$ data are scarce and show no significant periodicity but random noise. The ROTSE light curve indicates no modulation with this periodicity.

V788 Oph and *V829 Oph*

These variables were observed by Mandel (1969) visually and photographically, but only visual data were published. These data indicate some modulation, but the Fourier spectra of the light curves do not support the Blazhko periods given by Mandel (115 d for V788 Oph and 165 d for V829 Oph). The observed light maxima are too few in number for determining the modulation period unambiguously. Due to their faintness, the ROTSE data of these stars indicate neither evidence nor refutation of the modulation, because of the large uncertainties.

AD UMa

Hoffmeister (1958) found variability in the magnitude of light maxima with about $35-40$ d period and 0.25 mag amplitude from visual observations. The original photometric data are not available. Only two folded light curves are given (see Fig. 2 and Fig. 3 in Hoffmeister, 1958) corresponding to the brighter and fainter maxima. Taking into account the uncertainties of the visual observations and the faintness of AD UMa (15 mag at light maximum), the 0.25 mag modulation found by Hoffmeister is suspicious to arise from observational errors. No ROTSE data are available.

WY Dra

It was found to be modulated by Chis et al. (1975). They reported a significant variation in the shape of the light curve and in the height of maxima of about 0.6 mag with 24.3 d periodicity. Reanalysing their $O-C$ and maximum magnitude data, no evidence of this periodicity emerges. The ROTSE data show no variation in the maximum light within its uncertainty, which is by far less than 0.6 mag.

Acknowledgements: We would like to thank Béla Szeidl for the useful suggestions and valuable comments. The financial support of OTKA grants T-043504 and T-048961 id acknowledged. This research has made use of the SIMBAD database, operated at CDS-Strasbourg, France.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5642

Konkoly Observatory
Budapest
10 August 2005

HU ISSN 0374 – 0676

PHOTOMETRIC VARIABILITY IN THE STRONGLY INTERACTING BINARY DK CANUM VENATICORUM

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The variability of DK Canum Venaticorum ($\alpha = 12^{\rm h}33^{\rm m}09\overset{\rm s}{.}33$ and $\delta = +37^\circ58'20\overset{''}{.}3$ J2000, $V = 13.2$) was discovered by the Robotic Optical Transient Search Experiment (Akerlof et al., 2000) and Diethelm (2001) noted that the star showed a "pronounced reflection effect". Our initial observations in 2002 showed that the distortion in the light curve was not due to the reflection effect but looked rather like that in V361 Lyrae (Hilditch et al., 1997) wherein a mass transfer stream impacts the secondary component and creates a hot spot. Figure 1 shows $UBVR_cI_c$ data of DK CVn from 2002 with a pronounced distortion around phase 0.25 that is larger at shorter wavelengths, indicating a high temperature source, perhaps a hot spot.

Observations in 2003 showed dramatically different light curves from those of 2002. As seen in Figure 2, the amplitude of the light curve distortion had decreased noticeably. By 2004, the distortion had largely disappeared and the light curve of the system looked relatively clean and similar to the light curve of a short-period Algol. Figure 3 shows the 2004 R_c light curve compared to the one from 2003.

Given the large changes between observing seasons, we observed DK CVn more frequently in 2005 to see if noticeable changes occurred on shorter timescales. Figure 4 shows that significant changes occur on monthly timescales. We also observed several flare events, the largest of which occurred at HJD 2453395.0028, lasting about 30 minutes, and had an amplitude of about 0.5 magnitudes in B. This flare is shown in Figure 5.

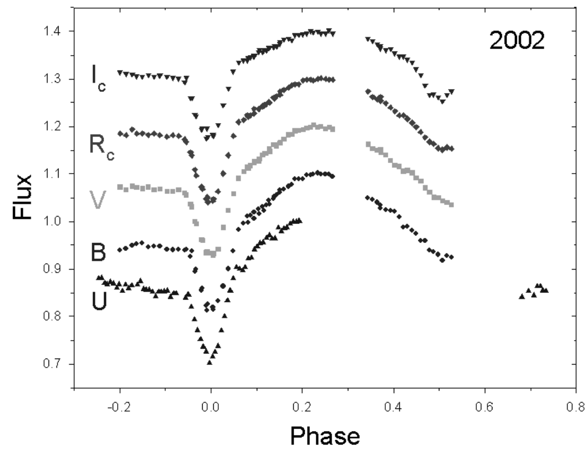

Figure 1. $UBVR_cI_c$ light curves of DK CVn from 2002.

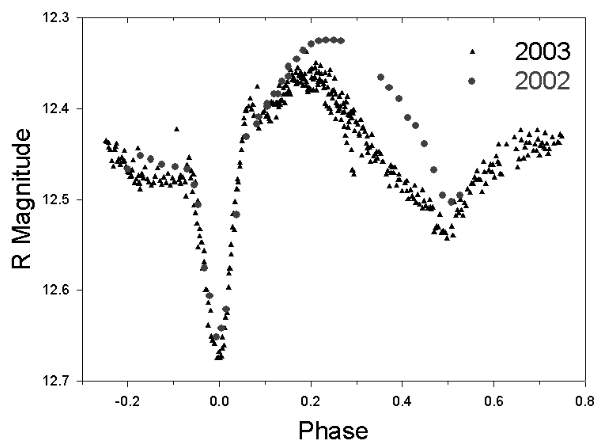

Figure 2. R_c light curve of DK CVn in 2003 compared with the 2002 light curve.

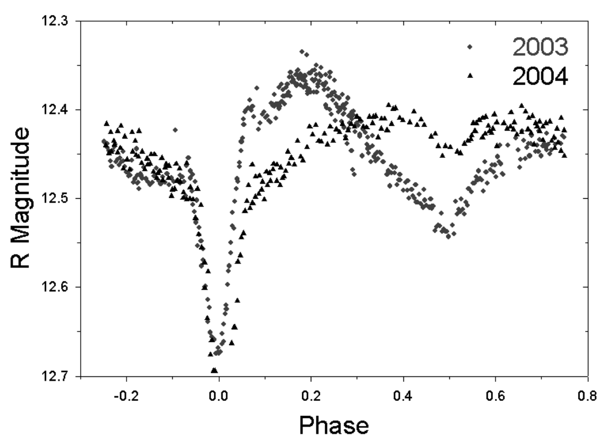

Figure 3. R_c light curve of DK CVn in 2004 compared with the 2003 light curve.

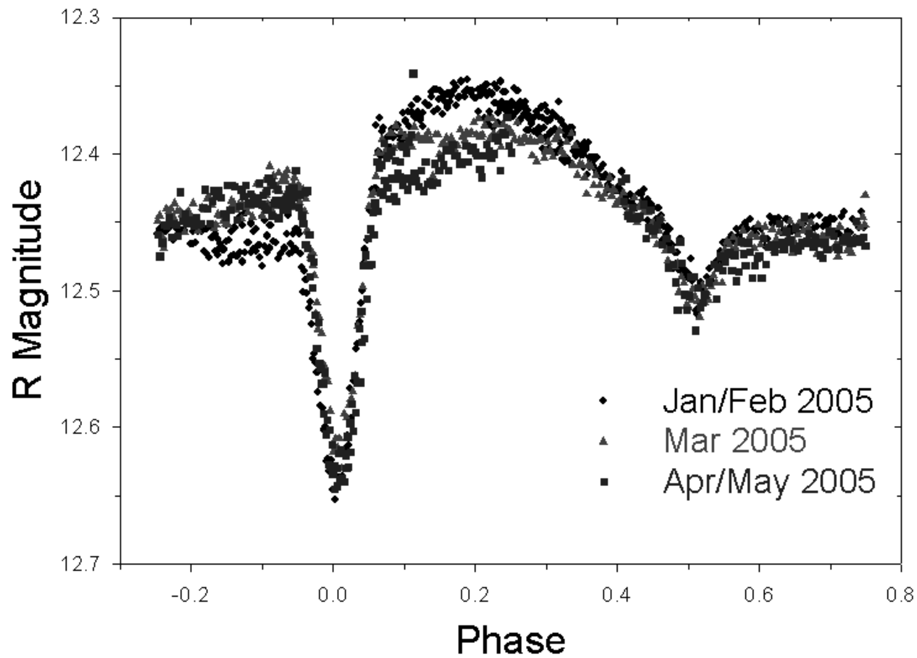

Figure 4. R_c light curve of DK CVn showing variability on monthly timescales in 2005.

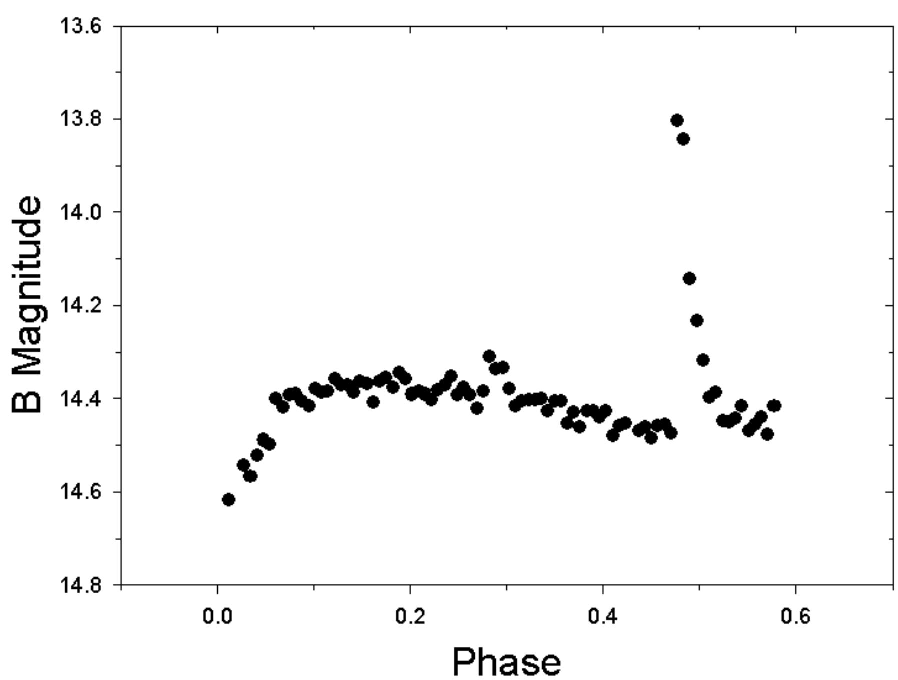

Figure 5. DK CVn flare event on HJD 2453395.

From the nearly 10,000 photometric observations we have obtained of DK CVn over four observing seasons, we have determined 38 times of primary minimum. We used the AVE[1] software which implements the Kwee-van Woerden method. The times of minimum are listed in Table 1 along with the standard errors. The errors are probably optimistic given the often quite distorted nature of the primary minimum but they do provide some estimate of the relative errors of the minima. A linear fit to the times of minimum yields the ephemeris for primary minima: 2453094.8234(2) + 0.4949631(2)×E where the numbers in parentheses are the standard errors in the last digits of the parameters. No evidence for period changes is seen in the time of minimum analysis.

Table 1. Times of primary minimum for DK CVn

HJD	Error (days)	Filter	HJD	Error (days)	Filter
2452361.7820	0.0008	R	2452363.7604	0.0006	I
2452363.7618	0.0008	R	2452363.7623	0.0019	V
2452408.8049	0.0001	U	2452712.7104	0.0003	R
2452713.7008	0.0002	R	2453083.9362	0.0007	R
2453085.9135	0.0005	V	2453094.8234	0.0002	V
2453108.6837	0.0008	I	2453109.6731	0.0005	B
2453383.8786	0.0002	V	2453383.8798	0.0003	R
2453383.8788	0.0004	V	2453385.8600	0.0005	V
2453388.8299	0.0002	R	2453389.8191	0.0004	R
2453390.8090	0.0004	R	2453420.0139	0.0009	B
2453421.9926	0.0013	B	2453422.9834	0.0058	B
2453426.9420	0.0013	B	2453427.9322	0.0007	B
2453430.9040	0.0002	V	2453430.9043	0.0005	B
2453432.8825	0.0005	B	2453432.8840	0.0005	V
2453433.8726	0.0004	B	2453443.7712	0.0005	V
2453445.7507	0.0005	B	2453448.7210	0.0008	B
2453451.6915	0.0004	V	2453456.6409	0.0002	R
2453457.6302	0.0003	B	2453478.9140	0.0002	R
2453479.9051	0.0010	B	2453496.7330	0.0001	R

We obtained a low resolution spectrum of DK CVn in March 2005 with the B&C+CCD spectrograph at the 1.22m telescope operated in Asiago by the Univ. of Padova, and we classify the primary component as a K7 V star. From the relative depths of the eclipses in the I_c light curve, we estimate that the secondary component is a late M-type star. Radial velocities will be necessary to estimate the physical parameters of the system and we plan to obtain high resolution spectra during the next observing season.

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Hilditch, R.W., Bell, S.A., Hill, G. and Harries, T.J., 1997, *MNRAS*, **291**, 749

[1]AVE is written by Rafael Barbera and the software can be obtained from `http://www.astrogea.org/soft/ave/introave.htm`

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5643

Konkoly Observatory
Budapest
10 August 2005

HU ISSN 0374 – 0676

PHOTOELECTRIC MINIMA OF SELECTED ECLIPSING BINARIES AND MAXIMA OF PULSATING STARS

(BAV MITTEILUNGEN NO. 172)

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In this 52nd compilation of BAV results, photoelectric observations obtained in the years 2003 till 2004 are presented on 486 variable stars giving 1046 minima and maxima. All moments of minima and maxima are heliocentric. The errors are tabulated in column '±'. The values in column '$O-C$' are determined without incorporation of non-linear terms. The references are given in the section 'Remarks'. All information about photometers and filters are specified in the column 'Rem'. The observations were made at private observatories. The photoelectric measurements and all the light curves with evaluations can be obtained from the office of the BAV for inspection.

Table 1: Eclipsing binaries

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
RT And	52950.6630	.0013	SCI	−0.0066		GCVS 85		3)
	52983.366 :	.000	JU	−0.008		GCVS 85		3)
WZ And	52913.4568	.0001	MS FR	+0.0294		GCVS 85		7)
XZ And	52940.2820	.0005	SCI	+0.1353		GCVS 85		3)
AB And	52898.4941	.0035	PC	−0.0155	s	GCVS 85	-Ir	8)
	52930.3574	.0008	SCI	−0.0139	s	GCVS 85		3)
	52930.5216	.0012	SCI	−0.0156		GCVS 85		3)
	52930.6922	.0015	SCI	−0.0110	s	GCVS 85		3)
	52981.3029	.0020	PC	−0.0138		GCVS 85	-Ir	8)
	52982.2978	.0014	PC	−0.0146		GCVS 85	-Ir	8)
	52983.2957	.0032	PC	−0.0124		GCVS 85	-Ir	8)
AD And	52587.4894	.0004	RAT RCR	+0.1907		GCVS 85	-Ir	1)
	52930.4716	.0005	RAT RCR	−0.0233		GCVS 85	-Ir	1)
BL And	52856.5122	.0002	RAT RCR	−0.0026		GCVS 85	-Ir	1)
	52953.3112	.0005	MS FR	−0.0020		GCVS 85		7)
EP And	52886.5523	.0003	RAT RCR	+0.0649	s	GCVS 85	-Ir	1)
GZ And	52896.4900	.0004	RAT RCR	−0.0019	s	GCVS 85	-Ir	1)
HS And	52931.3726	.0005	MS FR					7)
DD Aqr	52902.3099	.0002	AG	−0.1555		GCVS 85		1)
GV Aqr	52908.3139	.0019	AG					1)
	52908.4875	.0009	AG					1)
	52930.3761	.0019	AG					1)
GZ Aqr	52907.3462	.0007	AG					1)
	52908.4174	.0012	AG					1)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
GZ Aqr	52912.3423	.0007	AG					1)
	52930.3613	.0003	AG					1)
OO Aql	52813.4599	.0002	QU	+0.0245		GCVS 85	V	4)
	52815.4857		SE	+0.0231		GCVS 85	-Ir	17)
V346 Aql	52913.4095	.0002	QU	−0.0100		GCVS 85	V	4)
V415 Aql	52800.5152	.0004	RAT RCR	+0.0012		BAVM 69	-Ir	1)
	52874.3986	.0025	AG	+0.0022		BAVM 69	-Ir	1)
V956 Aql	52855.4550	.0005	FR					13)
V1353 Aql	52835.5561	.0042	AG	+0.0120		BAV Rbf. 44, 62		1)
	52874.4637	.0026	AG	+0.0126	s	BAV Rbf. 44, 62	-Ir	1)
	52913.3706	.0014	JU	+0.0125		BAV Rbf. 44, 62		3)
V1355 Aql	52835.4089	.0003	AG					1)
V1490 Aql	52856.4380	.0010	QU				V	4)
V1542 Aql	52816.5262	.0028	SCI	+0.0017		IBVS 5161 BAVM 138		3)
	52834.4814	.0003	QU	+0.0028		IBVS 5161 BAVM 138	V	4)
SS Ari	52908.5026	.0002	RAT RCR	−0.0016		GCVS 85	-Ir	1)
	52992.3382	.0010	JU	−0.0037	s	GCVS 85		3)
	53003.2999	.0006	JU	−0.0038	s	GCVS 85		3)
AP Aur	52745.4319	.0007	RAT RCR	+0.0374		IBVS 3942 BAVM 67	-Ir	1)
BC Aur	52940.4962	.0041	FR	−0.6391	s	GCVS 85		13)
CG Aur	50014.6062	.0011	MS	−0.0018		GCVS 85		1)
	50016.4104	.0012	MS	−0.0025		GCVS 85		1)
DO Aur	52912.4261	.0009	FR					13)
	52963.3054	.0031	FR					13)
EM Aur	52912.4984	.0017	FR	+0.0294		SAC 73		13)
	52983.5659	.0045	SCI	+0.0417		SAC 73		3)
EP Aur	52717.4002	.0001	RAT RCR	+0.0077		GCVS 85	-Ir	1)
	52746.3607	.0002	RAT RCR	+0.0088		GCVS 85	-Ir	1)
	52948.4799	.0006	AG	+0.0033		GCVS 85		1)
	53082.3552	.0028	AG	+0.0153	s	GCVS 85	-Ir	1)
FO Aur	52947.2994	.0011	AG	+0.0097		GCVS 85		1)
	52947.6103	.0061	AG	+0.0156	s	GCVS 85		1)
FP Aur	52947.3694	.0009	AG	−0.0663		GCVS 85		1)
FR Aur	52940.4847	.0009	FR	+0.9209		GCVS 85		13)
GX Aur	52681.5239	.0004	RAT RCR	+0.0054		BAVM 69	-Ir	1)
	52684.3908	.0007	RAT RCR	+0.0142	s	BAVM 69	-Ir	1)
HL Aur	52680.4959	.0001	RAT RCR	−0.0060		GCVS 85	-Ir	1)
IU Aur	52689.312 :	.001	FR	−0.007	s	GCVS 85		13)
IZ Aur	52953.4892	.0013	MS FR					7)
KU Aur	52691.4194	.0001	RAT RCR	+0.0227		GCVS 85	-Ir	1)
	52992.2833	.0016	SCI	+0.0231		GCVS 85		3)
MT Aur	52948.5892	.0006	AG					1)
V426 Aur	52925.5394	.0005	FR					13)
V523 Aur	53097.4809	.0010	AG				-Ir	1)
	53098.3096		AG				-Ir	1)
TU Boo	52792.5026	.0002	RAT RCR	+0.0568		GCVS 85	-Ir	1)
	53076.5738	.0015	AG	+0.0528		GCVS 85	-Ir	1)
TY Boo	52729.5031	.0001	RAT RCR	−0.0104		BAVM 68	-Ir	1)
	52784.5279	.0005	AG	−0.0112	s	BAVM 68		1)
	52791.5047	.0002	RAT RCR	−0.0117	s	BAVM 68	-Ir	1)
	52793.4077	.0014	AG	−0.0116	s	BAVM 68		1)
	52794.5218	.0031	PC	−0.0076		BAVM 68	-Ir	8)
	52820.5263	.0002	AG	−0.0094		BAVM 68		1)
	52827.5030	.0005	AG	−0.0100		BAVM 68		1)
	52834.4799	.0005	AG	−0.0105		BAVM 68		1)
	52854.4601	.0002	AG	−0.0108		BAVM 68		1)
	52858.4249	.0002	AG	−0.0103	s	BAVM 68		1)
	53069.6471	.0021	PC	−0.0106	s	BAVM 68	-Ir	8)
	53097.3960	.0007	AG	−0.0123		BAVM 68		1)
	53097.5538	.0007	AG	−0.0131	s	BAVM 68		1)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
TY Boo	53106.5933	.0017	PC	−0.0124		BAVM 68	-Ir	8)
	53143.3821	.0001	WTR	−0.0131		BAVM 68		15)
TZ Boo	51920.7205	.0044	HSR PC	+0.0643		BAVM 68		11)
	52715.4803	.0004	RAT RCR	−0.0699		BAVM 68	-Ir	1)
	52719.4947	.0006	MS FR	−0.0672	s	BAVM 68		7)
	52784.4222	.0005	AG	−0.0684		BAVM 68		1)
	52793.4857	.0015	AG	−0.0682	s	BAVM 68		1)
	52834.4928	.0006	AG	−0.0687	s	BAVM 68		1)
	52858.4154	.0006	AG	−0.0672		BAVM 68		1)
	53096.584 :	.002	PC	−0.070	s	BAVM 68	-Ir	8)
	53097.3231	.0014	AG	−0.0734		BAVM 68		1)
	53111.5958	.0056	PC	−0.0643		BAVM 68	-Ir	8)
UW Boo	52794.4234	.0003	RAT RCR	−0.0040		GCVS 85	-Ir	1)
VW Boo	52696.4933	.0006	RAT RCR	−0.0358		BAV Rbf. 32,122ff	-Ir	1)
XY Boo	52685.5740	.0003	RAT RCR	+0.0002		GCVS 85	-Ir	1)
	53106.5478	.0026	PC	+0.0331		GCVS 85	-Ir	8)
AC Boo	52793.5425	.0002	RAT RCR	+0.0476	s	GCVS 85	-Ir	1)
	53110.567 :	.002	PC	+0.062		GCVS 85	-Ir	8)
CV Boo	52767.3640	.0007	JU	−0.0105		BAV Rbf. 49,117		3)
	52858.4159	.0003	QU	−0.0104	s	BAV Rbf. 49,117	V	4)
	53143.4277	.0002	QU	−0.0119		BAV Rbf. 49,117	V	4)
EW Boo	53097.5119	.0012	AG					1)
GN Boo	52689.4974	.0002	MS FR					7)
SV Cam	52747.4244	.0008	JU	+0.0447		GCVS 85		3)
	52928.3103	.0003	BRN STK	+0.0443		GCVS 85	V	4)
	53056.4147		PTT	+0.0456		GCVS 85	-Ir	9)
	53094.3773	.0053	PC	+0.0517		GCVS 85	-Ir	8)
AY Cam	53090.4278	.0062	PC	+0.0058		GCVS 85	-Ir	8)
AZ Cam	53106.3633	.0062	PC	+0.0291		GCVS 85	-Ir	8)
TX Cnc	52685.3588	.0009	RAT RCR	+0.0330		GCVS 85	-Ir	1)
WW Cnc	52712.4806	.0001	RAT RCR	−0.0561		BAV Rbf. 32, 36ff	-Ir	1)
	53106.4148	.0024	PC	−0.0561		BAV Rbf. 32, 36ff	-Ir	8)
WX Cnc	52681.3449	.0002	RAT RCR	+0.0046		GCVS 85	-Ir	1)
WY Cnc	52696.5140	.0008	ATB	−0.0229		GCVS 85		1)
	53110.3665	.0026	PC	−0.0267		GCVS 85	-Ir	8)
FF Cnc	53082.4426	.0002	FR	−0.1251	s	IBVS 3859 BAVM 65	-Ir	13)
GSC1927.862 Cnc	52706.4480	.0006	FR					13)
	52730.3233	.0010	FR					13)
	52753.3850	.0019	FR					13)
VZ CVn	53081.5351	.0050	AG	−0.4210		GCVS 85	-Ir	1)
	53095.4304	.0004	AG	−0.0051		GCVS 85	-Ir	1)
YZ CVn	52721.4044	.0004	RAT RCR				-Ir	1)
	52741.3882	.0004	RAT RCR				-Ir	1)
BI CVn	52693.5265	.0002	RAT RCR	+0.0722		GCVS 85	-Ir	1)
	53080.6175	.0006	AG	−0.0701		GCVS 85	-Ir	1)
DF CVn	53080.4498	.0005	AG				-Ir	1)
	53080.6155	.0009	AG				-Ir	1)
AG CMi	52692.3056	.0001	MS FR	−0.0899		GCVS 85		7)
GSV5749.1622 Cap	52908.3368	.0030	FR					13)
	52909.3842	.0005	FR					13)
TV Cas	52813.4952	.0021	SCI	−0.0163		GCVS 85		3)
TW Cas	52619.3918	.0007	PRK	−0.0145		GCVS 85		1)
AB Cas	52956.5250		BRN STK	+0.0769		GCVS 85	V	4)
AL Cas	51834.5131	.0015	HSR	−0.0080		GCVS 85		11)
	51835.5135	.0032	HSR	−0.0087		GCVS 85		11)
BH Cas	52856.4966	.0006	AG				-Ir	1)
	52983.3429	.0005	AG				-Ir	1)
	52983.5446	.0004	AG				-Ir	1)
BS Cas	49528.4367	.0005	MS	+0.0016		IBVS 4778 BAVM 123		1)
	49563.4562	.0008	MS	+0.0038	s	IBVS 4778 BAVM 123		1)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
BS Cas	49565.4372	.0010	MS	+0.0027		IBVS 4778 BAVM 123		1)
	49568.5209	.0002	MS	+0.0031		IBVS 4778 BAVM 123		1)
	49569.4014	.0001	MS	+0.0026		IBVS 4778 BAVM 123		1)
	49574.4659	.0003	MS	+0.0017	s	IBVS 4778 BAVM 123		1)
	49578.4300	.0002	MS	+0.0016	s	IBVS 4778 BAVM 123		1)
	50440.2095	.0031	MS	+0.0018		IBVS 4778 BAVM 123		1)
	50676.5214	.0007	MS	+0.0016	s	IBVS 4778 BAVM 123		1)
	51487.4219	.0001	RAT RCR	−0.0030	s	IBVS 4778 BAVM 123		1)
	51510.3250	.0005	HSR	−0.0044	s	IBVS 4778 BAVM 123		3)
	51834.5095	.0026	HSR	−0.0057	s	IBVS 4778 BAVM 123		11)
	52188.4256	.0002	MS FR	−0.0072		IBVS 4778 BAVM 123		7)
EG Cas	49571.5326	.0008	MS	−0.1064		GCVS 85		1)
	50706.3751	.0042	MS	−0.1247		GCVS 85		1)
	51471.2945	.0020	HSR	−0.1357		GCVS 85		3)
	51834.4919	.0003	RAT RCR	−0.1427		GCVS 85		1)
EN Cas	52954.3547	.0010	MS FR	+0.2684		GCVS 85		7)
EY Cas	52931.5010	.0007	AG	−0.0184	s	GCVS 85	-Ir	1)
GK Cas	50113.2673	.0004	AG					1)
	50319.4502	.0009	AG					1)
	51768.4715	.0011	AG					1)
GU Cas	52982.4562	.0080	PC	−0.2885		GCVS 85	-Ir	8)
IL Cas	52874.5225	.0030	JU	−0.0037		BAV Rbf. 51, 1		3)
	52981.5300	.0069	SCI	+0.0002		BAV Rbf. 51, 1		3)
IT Cas	52929.4378	.0053	PC	−0.0009		SAC 69	-Ir	8)
OX Cas	52872.4518	.0023	JU	−0.0100		GCVS 85		3)
	52877.4269	.0045	SCI	−0.0136		GCVS 85		3)
	53121.3954	.0049	SCI	−0.0007		GCVS 85		3)
PV Cas	52833.4072	.0014	SCI	+0.0178	s	SAC 73		3)
	52931.4366	.0016	JU	+0.0221	s	SAC 73		3)
V357 Cas	51834.5965	.0052	HSR	−0.0493		GCVS 85		11)
V360 Cas	52956.3211	.0052	PC				-Ir	8)
	52983.3329	.0005	QU				V	4)
V361 Cas	52948.4595	.0009	QU	−0.1853		GCVS 85	V	4)
V381 Cas	52839.5019	.0013	JU	−0.0085		BAV Rbf. 32, 36ff		3)
V387 Cas	52981.3901	.0012	RAT RCR	+0.0498		GCVS 85	-Ir	1)
V389 Cas	52649.4621	.0006	RAT RCR	+0.1827		GCVS 85	-Ir	1)
V459 Cas	52929.3766	.0013	JU	−0.0079		IBVS 4737		3)
V471 Cas	51867.5352	.0009	AG	−0.0766		GCVS 85		1)
	52135.5612	.0003	AG	−0.0090	s	GCVS 85		1)
	52171.4456	.0013	AG	−0.0764	s	GCVS 85		1)
	52179.4634	.0004	AG	+0.0455		GCVS 85		1)
	52183.4713	.0011	AG	+0.0214		GCVS 85		1)
	52193.4961	.0016	AG	−0.0337		GCVS 85		1)
	52205.3236	.0006	AG	+0.0338		GCVS 85		1)
	52224.5688	.0008	AG	−0.0409	s	GCVS 85		1)
	52308.3646	.0007	AG	−0.0766		GCVS 85	-Ir	1)
V473 Cas	52898.4452	.0015	AG	−0.0107	s	IBVS 4669 BAVM 115	-Ir	1)
V520 Cas	51874.2577	.0020	HSR	−0.1058	s	GCVS 85		11)
V523 Cas	52854.5350	.0001	RAT RCR	+0.0577	s	GCVS 85	-Ir	1)
	52929.3175	.0002	RAT RCR	+0.0592	s	GCVS 85	-Ir	1)
	52981.3129	.0014	PC	+0.0584		GCVS 85	-Ir	8)
	52982.3666	.0002	RAT RCR	+0.0605	s	GCVS 85	-Ir	1)
	52984.3520	.0020	PC	+0.0596		GCVS 85	-Ir	8)
	52984.4684	.0015	PC	+0.0591	s	GCVS 85	-Ir	8)
V651 Cas	52931.5078	.0008	AG	+0.0013		IBVS 3554 BAVM 55	-Ir	1)
VW Cep	52908.3141		SG	−0.0058	s	GCVS 85	V	4)
WZ Cep	52981.2990	.0038	PC	−0.0514		GCVS 85	-Ir	8)
ZZ Cep	52835.4329	.0004	QU	−0.0103		GCVS 85	V	4)
CW Cep	52901.3528	.0067	JU	−1.3630		GCVS 85		3)
KP Cep	51874.2847	.0046	HSR					11)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
KV Cep	52928.5582	.0005	AG					1)
MT Cep	52928.5168	.0010	AG					1)
NR Cep	52878.4561	.0004	RAT RCR	−0.0368		GCVS 85	-Ir	1)
NW Cep	52928.5654	.0012	AG	−0.3999		GCVS 85		1)
PX Cep	52946.3555	.0004	AG					1)
TX Cet	53003.2399	.0008	RAT RCR	+0.0138		GCVS 85	-Ir	1)
RW Com	52694.5256	.0001	RAT RCR	−0.0256		GCVS 85	-Ir	1)
	53095.4063	.0059	AG	−0.0222		GCVS 85		1)
	53095.5202	.0062	AG	−0.0269	s	GCVS 85		1)
	53110.3566	.0002	WTR	−0.0247		GCVS 85		15)
	53110.4758	.0026	PC	−0.0241	s	GCVS 85	-Ir	8)
RZ Com	52684.5105	.0014	RAT RCR	+0.0368		GCVS 85	-Ir	1)
	52742.3945	.0002	RAT RCR	+0.0362		GCVS 85	-Ir	1)
	53095.4593	.0028	AG	+0.0392		GCVS 85		1)
	53096.4738	.0022	PC	+0.0382		GCVS 85	-Ir	8)
	53106.4595	.0022	PC	+0.0380	s	GCVS 85	-Ir	8)
CC Com	53068.5921	.0018	PC	−0.0115	s	GCVS 85	-Ir	8)
	53093.4195	.0017	AG	−0.0113		GCVS 85	-Ir	1)
	53093.5298	.0011	AG	−0.0113	s	GCVS 85	-Ir	1)
	53122.3280	.0001	WTR	−0.0127		GCVS 85		15)
EK Com	52722.4269	.0003	RAT RCR				-Ir	1)
	53095.5145	.0030	AG					1)
EQ Com	52694.5540	.0024	MS FR					7)
LL Com	53081.5944	.0013	AG				-Ir	1)
	53095.4294	.0009	AG				-Ir	1)
LO Com	53095.4678	.0015	AG					1)
	53095.6114	.0003	AG					1)
LP Com	53095.5201	.0011	AG					1)
RT CrB	52743.4680	.0008	RAT RCR	−0.0293		GCVS 85	-Ir	1)
TW CrB	52721.5164	.0013	RAT RCR				-Ir	1)
	52741.5387	.0001	RAT RCR				-Ir	1)
YY CrB	52764.5075	.0023	AG				-Ir	1)
	52793.5035	.0021	AG				-Ir	1)
SW Cyg	52829.4051	.0116	AG	−0.2147		GCVS 85	-Ir	1)
VV Cyg	52864.4494	.0004	AG	+0.0035		GCVS 85		1)
	52867.4027	.0003	AG	+0.0027		GCVS 85		1)
	52898.4215	.0004	AG	+0.0035		GCVS 85		1)
	52901.3754	.0010	AG	+0.0033		GCVS 85	-Ir	1)
	52912.4503	.0054	AG	−0.7382		GCVS 85	-Ir	1)
ZZ Cyg	52829.4133:	.0043	AG	−0.0472	s	GCVS 85	-Ir	1)
	52834.4524	.0026	AG	−0.0370	s	GCVS 85	-Ir	1)
	52835.3901	.0009	FR	−0.0422		GCVS 85		13)
	52840.4205	.0002	AG	−0.0407		GCVS 85		1)
	52867.4493	.0004	AG	−0.0424		GCVS 85	-Ir	1)
	52868.3919	.0020	AG	−0.0428	s	GCVS 85	-Ir	1)
	52946.3360	.0005	AG	−0.0471	s	GCVS 85	-Ir	1)
BO Cyg	52853.5193	.0017	SCI	+0.0797		GCVS 85		3)
BR Cyg	53151.4293	.0001	QU	−0.0001		GCVS 85	V	4)
CG Cyg	52930.3272	.0002	DIE	+0.0499		GCVS 85		14)
CV Cyg	52834.5451	.0069	SCI	−0.0096	s	SAC 68		3)
	52871.4353	.0003	FR	+0.0027		SAC 68		13)
DK Cyg	52950.4229	.0006	RAT RCR	+0.0355	s	BAV Rbf. 35, 1ff	-Ir	1)
DX Cyg	52877.4371	.0030	FR					13)
GV Cyg	52876.5170	.0005	AG				-Ir	1)
KR Cyg	51443.3488	.0019	FR	−0.0011	s	GCVS 85		12)
	52815.4619	.0008	QU	+0.0083		GCVS 85	V	4)
	52861.4936	.0024	FR	−0.0208	s	GCVS 85		13)
	52864.4790	.0003	FR	+0.0066		GCVS 85		13)
	52955.3517	.0016	FR	+0.0255	s	GCVS 85		13)
LO Cyg	52854.4269	.0011	AG				-Ir	1)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
V345 Cyg	52862.4595	.0020	FR	+0.3007	s	IBVS 5016 BAVM 132		13)
V401 Cyg	52898.3813	.0004	PRK	+0.0470		GCVS 85		1)
V454 Cyg	52794.5151	.0011	FR					13)
V456 Cyg	52835.4255	.0014	AG	+0.0371	s	GCVS 85	-Ir	1)
	52955.2922	.0001	RAT RCR	+0.0384		GCVS 85	-Ir	1)
V466 Cyg	52887.4556	.0002	PRK	+0.0059		GCVS 85		1)
	52901.3703	.0012	AG	+0.0050		GCVS 85		1)
V469 Cyg	52869.4405	.0060	FR					13)
V488 Cyg	52840.4579	.0007	FR	+0.0863	s	GCVS 85		13)
	52862.5947	.0022	FR	+0.0828		GCVS 85		13)
	52875.4811	.0020	FR	+0.0774		GCVS 85		13)
	52904.3596	.0004	PRK	+0.0895	s	GCVS 85		1)
V505 Cyg	52829.4290	.0023	AG	+0.0998		GCVS 85		1)
V509 Cyg	52868.4904	.0010	AG				-Ir	1)
V513 Cyg	52831.3947	.0001	MS FR	−0.3158		GCVS 85		7)
V525 Cyg	52867.4763	.0026	AG					1)
	52903.5233	.0007	AG				-Ir	1)
V526 Cyg	52864.4480	.0004	AG	−0.5657		GCVS 85		1)
V534 Cyg	52864.5216	.0005	AG					1)
	52899.6313	.0002	AG				-Ir	1)
	52902.4840	.0012	AG				-Ir	1)
	52903.6022	.0014	AG				-Ir	1)
	52907.5609	.0006	AG				-Ir	1)
V635 Cyg	52886.5002	.0038	AG				-Ir	1)
V680 Cyg	52835.5255	.0003	RAT RCR	+0.0177		BAV Rbf. 32, 36ff	-Ir	1)
V700 Cyg	52835.4106	.0005	AG	−0.0357	s	GCVS 85	-Ir	1)
	52846.4544	.0015	AG	−0.0434		GCVS 85	-Ir	1)
	52897.4606	.0043	RAT RCR	−0.0441		GCVS 85	-Ir	1)
	52981.3083	.0003	RAT RCR	−0.0177	s	GCVS 85	-Ir	1)
V704 Cyg	52831.3911	.0005	AG	+0.0319		GCVS 85		1)
	52854.5048	.0019	AG	+0.0321	s	GCVS 85	-Ir	1)
	52864.4930	.0012	AG	+0.0330		GCVS 85		1)
	52868.4866	.0061	AG	+0.0317		GCVS 85		1)
	52886.4680	.0010	AG	+0.0359	s	GCVS 85		1)
	52907.5822	.0008	AG	+0.0340	s	GCVS 85	-Ir	1)
	52912.4309	.0012	AG	+0.0318		GCVS 85	-Ir	1)
	52930.4072	.0005	RAT RCR	+0.0309	s	GCVS 85	-Ir	1)
V711 Cyg	52886.5305	.0008	AG				-Ir	1)
V725 Cyg	52931.4027	.0018	FR	+0.2362		GCVS 85		13)
V787 Cyg	52802.4572	.0005	AG	+0.0012		GCVS 85	-Ir	1)
	52831.4998	.0008	AG	+0.0020		GCVS 85	-Ir	1)
V822 Cyg	52816.5049	.0021	MS FR	−0.1318		GCVS 85		7)
V842 Cyg	52815.4978	.0006	MS FR					7)
V856 Cyg	52877.5005	.0018	FR					13)
V859 Cyg	52877.5348	.0018	FR	−0.0238		GCVS 85		13)
	52878.5500	.0014	FR	−0.0211	s	GCVS 85		13)
	52879.3594	.0005	FR	−0.0217	s	GCVS 85		13)
	52903.4603	.0008	FR	−0.0184		GCVS 85		13)
	52904.4745	.0003	FR	−0.0167	s	GCVS 85		13)
	52928.3693	.0005	FR	−0.0169	s	GCVS 85		13)
	52929.3811	.0017	FR	−0.0176		GCVS 85		13)
	52941.3297	.0007	FR	−0.0166	s	GCVS 85		13)
	52982.2330	.0013	FR	−0.0184	s	GCVS 85	-Ir	13)
V866 Cyg	52929.4224	.0020	FR					13)
V877 Cyg	52807.4359	.0004	MS FR	+0.0264		GCVS 85		7)
V931 Cyg	51799.3686	.0007	AG	+0.0244	s	GCVS 85		1)
	51799.5411	.0015	AG	+0.0262		GCVS 85		1)
	52463.4391	.0005	AG	+0.0646		GCVS 85		1)
	52876.4951	.0004	AG	−0.0842		GCVS 85		1)
V961 Cyg	52839.4486	.0011	FR	+0.9471		GCVS 85		13)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
V963 Cyg	52807.4995	.0002	RAT RCR	+0.0006		GCVS 85	-Ir	1)
V964 Cyg	52839.4576	.0029	FR					13)
V979 Cyg	50671.5194	.0004	FR	+0.0675		GCVS 85		12)
	51704.4360	.0008	FR	+0.0578		GCVS 85		12)
	51713.4059	.0002	FR	+0.0587		GCVS 85		12)
	51714.5319	.0012	FR	+0.0636		GCVS 85		12)
	51757.5048	.0018	FR	+0.0602		GCVS 85		12)
	51758.4369	.0004	QU	+0.0580	s	GCVS 85		3)
	51758.4398	.0006	FR	+0.0609	s	GCVS 85		12)
	51776.3741	.0010	FR	+0.0573	s	GCVS 85		12)
	51780.4884	.0020	FR	+0.0608	s	GCVS 85		12)
	51782.5400	.0016	FR	+0.0570		GCVS 85		12)
	51783.4753	.0009	FR	+0.0580	s	GCVS 85		12)
	51796.3671	.0004	QU	+0.0569		GCVS 85		3)
	51796.5565	.0004	QU	+0.0595	s	GCVS 85	V	3)
	51798.4224	.0004	QU	+0.0568	s	GCVS 85		3)
	51799.3561	.0003	QU	+0.0563		GCVS 85		3)
	51806.4585	.0004	QU	+0.0582		GCVS 85		3)
	51807.3922	.0007	QU	+0.0577	s	GCVS 85		3)
	51811.3126	.0005	FR	+0.0542		GCVS 85		12)
	51811.5029	.0009	FR	+0.0576	s	GCVS 85		12)
	51812.4343	.0010	FR	+0.0547		GCVS 85		12)
	51817.2924	.0007	FR	+0.0546		GCVS 85		12)
	51817.4851	.0009	FR	+0.0605	s	GCVS 85		12)
	52042.4500	.0007	FR	+0.0537	s	GCVS 85		12)
	52085.4250	.0003	FR	+0.0524	s	GCVS 85		12)
	52086.5476	.0007	FR	+0.0539	s	GCVS 85		12)
	52096.4521	.0004	FR	+0.0551		GCVS 85		12)
	52100.5611	.0005	FR	+0.0534		GCVS 85		12)
	52116.4439	.0007	QU	+0.0536	s	GCVS 85		4)
	52133.4504	.0007	FR	+0.0565		GCVS 85		12)
	52137.3729	.0008	FR	+0.0550	s	GCVS 85		12)
	52503.4140	.0010	FR	+0.0501		GCVS 85		12)
	52546.3889	.0007	FR	+0.0486		GCVS 85		12)
	52548.4420	.0007	FR	+0.0464	s	GCVS 85		12)
	52549.3796	.0007	FR	+0.0497		GCVS 85		12)
	52596.2790	.0010	QU	+0.0489	s	GCVS 85		4)
	52896.3611	.0010	QU	+0.0442	s	GCVS 85		4)
	52901.4057	.0009	AG	+0.0437		GCVS 85		1)
	52901.5904	.0054	AG	+0.0416	s	GCVS 85		1)
	52908.3200	.0010	QU	+0.0444	s	GCVS 85		4)
	52908.5012	.0010	QU	+0.0388		GCVS 85		4)
V1004 Cyg	52901.5887	.0002	AG	−0.1239		GCVS 85		1)
V1009 Cyg	52789.4882	.0009	RAT RCR				-Ir	1)
V1013 Cyg	52901.5863	.0020	AG					1)
V1034 Cyg	52804.4800	.0003	RAT RCR	−0.0052		GCVS 85	-Ir	1)
	52864.5540	.0014	FR	−0.0124	s	GCVS 85		13)
V1036 Cyg	52694.6233	.0006	MS FR	−0.0050	s	BAVM 141		7)
	52804.4760	.0001	MS FR	−0.0004		BAVM 141		7)
V1147 Cyg	52863.4038	.0006	FR					13)
V1191 Cyg	52901.5459	.0003	RAT RCR	+0.0408	s	GCVS 85	-Ir	1)
V1321 Cyg	52802.5448	.0007	RAT RCR				-Ir	1)
V1345 Cyg	52941.3401	.0010	FR					13)
V1411 Cyg	52886.4099	.0007	AG	+0.1995		GCVS 85	-Ir	1)
V1414 Cyg	52886.5111	.0019	AG				-Ir	1)
V1457 Cyg	52901.3379	.0006	AG					1)
V1901 Cyg	52876.4117	.0009	FR					13)
V2181 Cyg	52815.4588	.0010	QU	+0.0192	s	BAV Rbf. 50, 45f	V	4)
	52829.4984	.0007	AG	+0.0085		BAV Rbf. 50, 45f		1)
	52864.4809	.0006	FR	+0.0086		BAV Rbf. 50, 45f		13)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
V2181 Cyg	52953.3706	.0012	FR	+0.0087		BAV Rbf. 50, 45f		13)
	52955.3817	.0013	FR	+0.0126	s	BAV Rbf. 50, 45f		13)
V2239 Cyg	52835.4431	.0014	AG				-Ir	1)
	52846.4344	.0003	AG				-Ir	1)
	52868.4173	.0010	FR					13)
V2240 Cyg	52846.4815	.0015	AG				-Ir	1)
	52868.5067	.0004	FR					13)
RZ Dra	52900.4052	.0005	RAT RCR	+0.0385	s	GCVS 85	-Ir	1)
UZ Dra	52836.4543	.0002	QU	+0.0022	s	GCVS 85	V	4)
AX Dra	53065.6800	.0019	PC	−0.0015		BAV Rbf. 32, 36ff	-Ir	8)
	53069.6560	.0025	PC	−0.0026		BAV Rbf. 32, 36ff	-Ir	8)
BE Dra	52835.5216	.0038	PC	+0.1200		GCVS 85	-Ir	8)
BW Dra	53065.6737	.0042	PC				-Ir	8)
EF Dra	52835.5067	.0036	PC	+0.0301	s	IBVS 3811 BAVM 63	-Ir	8)
AI Gem	53007.5348	.0024	AG				-Ir	1)
	53055.3307	.0017	AG				-Ir	1)
AL Gem	53056.3329	.0005	DIE	+0.0996		GCVS 85		14)
AZ Gem	53055.3950	.0007	AG	+0.0794	s	GCVS 85	-Ir	1)
BD Gem	53028.3130	.0003	AG	−0.0249		GCVS 85	-Ir	1)
	53070.3483	.0002	AG	−0.0245		GCVS 85	-Ir	1)
CP Gem	53056.4651	.0035	FR				-Ir	13)
FG Gem	53070.3946	.0005	AG	−0.0330		GCVS 85	-Ir	1)
FT Gem	52279.5373	.0010	AG	−0.0196		GCVS 85	-Ir	1)
	52707.3210	.0028	AG	−0.0174		GCVS 85		1)
GX Gem	52718.3536	.0009	RAT RCR	+0.0737		GCVS 85	-Ir	1)
KQ Gem	53028.4231	.0009	AG				-Ir	1)
	53055.3534	.0014	AG				-Ir	1)
	53055.5506	.0028	AG				-Ir	1)
KV Gem	52735.3752	.0021	ATB	−0.0011	s	BAV Rbf. 52, 95ff		1)
	52982.5765	.0072	PC	−0.0021		BAV Rbf. 52, 95ff	-Ir	8)
	52984.5488	.0046	PC	−0.0016	s	BAV Rbf. 52, 95ff	-Ir	8)
	53007.4936	.0009	AG	−0.0024	s	BAV Rbf. 52, 95ff	-Ir	1)
	53028.2880	.0013	AG	−0.0024	s	BAV Rbf. 52, 95ff	-Ir	1)
	53055.3562	.0009	AG	−0.0027		BAV Rbf. 52, 95ff	-Ir	1)
	53055.5348	.0011	AG	−0.0034	s	BAV Rbf. 52, 95ff	-Ir	1)
	53070.4141	.0006	AG	−0.0028		BAV Rbf. 52, 95ff	-Ir	1)
	53081.3499	.0006	QU	−0.0020	s	BAV Rbf. 52, 95ff	V	4)
	53082.4263	.0010	QU	−0.0012	s	BAV Rbf. 52, 95ff	V	4)
MU Gem	52279.5550	.0008	AG	+0.0136		GCVS 85	-Ir	1)
RX Her	53121.5357	.0017	SCI	+0.0018	s	GCVS 85		3)
LV Her	53154.4210	.0017	SCI	−0.0176		GCVS 85		3)
	53154.4212	.0015	JU	−0.0174		GCVS 85		3)
MS Her	52859.5030	.0011	AG	+0.0162	s	GCVS 85	-Ir	1)
V842 Her	52830.4176	.0004	JU	−0.0119		BAV Rbf. 49,180		3)
	53143.4378	.0015	JU	−0.0151		BAV Rbf. 49,180		3)
UW Hya	53094.3520	.0006	AG					1)
AV Hya	52694.3970	.0003	RAT RCR	−0.0705		GCVS 85	-Ir	1)
DF Hya	50177.2993	.0003	KI	−0.0590		GCVS 85		1)
	50859.4938	.0002	KI	−0.0531	s	GCVS 85		1)
	51641.3744	.0004	KI	−0.0363	s	GCVS 85	-Ir	1)
	51926.5227	.0003	KI	−0.0286		GCVS 85	-Ir	1)
FG Hya	53094.3444	.0020	AG	−0.0677	s	GCVS 85		1)
SW Lac	52939.5243	.0002	FR	+0.0696	s	GCVS 85		13)
TW Lac	52930.5466	.0005	FR	+0.2124		GCVS 85		13)
VY Lac	52954.3243	.0002	RAT RCR	−0.1514		GCVS 85	-Ir	1)
AG Lac	52855.4583	.0007	AG				-Ir	1)
	52878.4009	.0012	AG				-Ir	1)
AU Lac	52876.4103	.0010	AG				-Ir	1)
AW Lac	52858.4856	.0011	AG	+0.0244		BAV Rbf. 35, 1ff	-Ir	1)
	52981.3538	.0024	AG	+0.0357	s	BAV Rbf. 35, 1ff	-Ir	1)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
CM Lac	52855.4288	.0002	QU	−0.0032		GCVS 85	V	4)
CN Lac	52835.3913	.0003	MS FR	+0.0225	s	GCVS 85		7)
	52876.4965	.0020	AG	+0.0170		GCVS 85	-Ir	1)
CO Lac	52835.5136	.0007	JU	−0.0036		SAC 74		3)
EM Lac	52928.3677	.0003	AG	+0.0499		GCVS 85		1)
	52928.5644	.0004	AG	+0.0520	s	GCVS 85		1)
	52981.2938	.0013	AG	+0.0539		GCVS 85	-Ir	1)
IM Lac	52875.5028	.0017	AG	−0.1652	s	GCVS 85	-Ir	1)
IP Lac	52875.4857	.0026	AG				-Ir	1)
	52878.4677	.0026	AG				-Ir	1)
LY Lac	49270.511 :	.003	AG	+0.171		GCVS 85		1)
	49624.3539	.0005	AG	+0.1739		GCVS 85		1)
	51767.5080	.0004	AG	+0.1997		GCVS 85		1)
	51798.4125	.0008	AG	+0.2011		GCVS 85		1)
MZ Lac	52981.2854	.0013	AG	+0.1404		GCVS 85	-Ir	1)
PP Lac	52981.4081	.0009	AG	−0.0425	s	GCVS 85	-Ir	1)
V342 Lac	52855.4258	.0025	AG				-Ir	1)
	52875.3891	.0006	AG				-Ir	1)
	52878.5499	.0006	AG				-Ir	1)
V344 Lac	52878.4734	.0006	AG				-Ir	1)
	52941.4260	.0003	RAT RCR				-Ir	1)
V345 Lac	52928.5439	.0013	AG	+0.0825		Hartha Mitt. 13		1)
	52928.5459	.0030	JU	+0.0845		Hartha Mitt. 13		3)
V364 Lac	52939.4932	.0004	FR	−0.0061		BAV Rbf. 47, 33f		13)
Y Leo	53096.4222	.0031	PC	+0.0098		GCVS 85	-Ir	8)
UV Leo	53095.4225	.0014	PC	+0.0017		IBVS 5338	-Ir	8)
	53110.4251	.0003	JU	+0.0021		IBVS 5338		3)
	53110.4294	.0022	PC	+0.0064		IBVS 5338	-Ir	8)
UX Leo	52618.6858	.0001	MS	+0.0284		BAVM 68		7)
UZ Leo	53105.397 :	.010	PC	+0.107	s	GCVS 85	-Ir	8)
VZ Leo	52648.4832	.0003	RAT RCR	−0.0599		GCVS 85	-Ir	1)
	52719.3293	.0006	MS FR	−0.0577		GCVS 85		7)
	53095.3432	.0069	PC	−0.0613		GCVS 85	-Ir	8)
WZ Leo	53093.3989	.0001	AG	−0.2098		GCVS 85		1)
XY Leo	53040.4390	.0025	AG	+0.0134	s	GCVS 85	-Ir	1)
	53040.5820	.0009	AG	+0.0143		GCVS 85	-Ir	1)
	53079.5044	.0005	AG	+0.0154		GCVS 85	-Ir	1)
XZ Leo	52680.3927	.0001	RAT RCR	+0.0323		GCVS 85	-Ir	1)
	53040.5894	.0010	AG	+0.0366	s	GCVS 85	-Ir	1)
	53079.6099	.0005	AG	+0.0383	s	GCVS 85	-Ir	1)
AL Leo	53079.4736	.0004	AG	+0.0103		IBVS 3401 BAVM 53	-Ir	1)
AM Leo	53111.3944	.0028	PC	+0.0043		GCVS 85	-Ir	8)
BL Leo	53093.4012	.0010	AG				-Ir	1)
	53093.5433	.0004	AG				-Ir	1)
BW Leo	52691.4319	.0006	MS FR					7)
CE Leo	52712.3451	.0001	RAT RCR				-Ir	1)
	53093.4524	.0009	AG				-Ir	1)
	53093.6024	.0010	AG				-Ir	1)
GSC1419.91 Leo	52754.4598	.0013	FR					13)
T LMi	52717.5056	.0004	RAT RCR	−0.0636		GCVS 85	-Ir	1)
RT LMi	52715.4104	.0006	RAT RCR	−0.0049	s	GCVS 85	-Ir	1)
	53070.4538	.0040	PC	−0.0088	s	GCVS 85	-Ir	8)
	53110.3863	.0025	PC	−0.0051		GCVS 85	-Ir	8)
RY Lyn	52695.5459	.0001	RAT RCR	−0.0401		GCVS 85	-Ir	1)
	52744.3342	.0002	RAT RCR	−0.0414		GCVS 85	-Ir	1)
SW Lyn	52691.5396	.0001	RAT RCR	+0.0396		GCVS 85	-Ir	1)
SX Lyn	53094.4729	.0005	AG	−0.0057		GCVS 85	-Ir	1)
UU Lyn	52901.6086	.0002	MS FR	−0.0053		GCVS 85		7)
	53105.3859	.0031	PC	−0.0082		GCVS 85	-Ir	8)
UV Lyn	52746.5022	.0014	ATB	+0.0513	s	GCVS 85		1)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
BG Lyn	53097.3715	.0029	AG				-Ir	1)
DE Lyn	53094.4220	.0005	AG				-Ir	1)
NY Lyr	52795.5737	.0010	RAT RCR	+0.0839	s	GCVS 85	-Ir	1)
PY Lyr	52695.6931	.0003	MS FR					7)
QU Lyr	52950.2516	.0008	RAT RCR	−0.0019		GCVS 85	-Ir	1)
VX Mon	52619.3941	.0002	MS					7)
AQ Mon	53056.3602	.0007	WTR	−0.0775		GCVS 85		15)
GU Mon	52693.3766	.0003	MS FR	+0.0368		GCVS 87		7)
HM Mon	53060.4221	.0014	AG	−0.0013		GCVS 85	-Ir	1)
NS Mon	52648.3484	.0003	RAT RCR	+0.0058		BAVM 76	-Ir	1)
	53056.3140	.0008	AG	+0.0087	s	BAVM 76	-Ir	1)
V384 Mon	52694.2992	.0008	MS FR	−0.0359		GCVS 87		7)
V453 Mon	52690.2955	.0001	MS FR	−0.1620	s	GCVS 87		7)
V464 Mon	52695.3233	.0003	MS FR	−0.1047		GCVS 85		7)
V514 Mon	52689.3259	.0002	MS FR	−0.0118	s	GCVS 85		7)
V527 Mon	52617.5178	.0003	MS	−0.0214		GCVS 85		7)
	53060.3128	.0016	AG	−0.0228		GCVS 85	-Ir	1)
V508 Oph	52750.5436	.0001	RAT RCR	−0.0040	s	GCVS 85	-Ir	1)
V509 Oph	52784.5154	.0005	RAT RCR				-Ir	1)
V2536 Oph	52792.4862	.0007	MS FR	−0.3485	s	BAVM 119		7)
V392 Ori	52647.3672	.0002	RAT RCR	+0.0028		GCVS 85	-Ir	1)
V1626 Ori	52618.3953	.0003	MS	−0.0013		BAVM 144		7)
GSC1296.975 Ori	53094.3519	.0006	QU				V	4)
U Peg	52876.3960	.0021	SCI	−0.0123		BAV Rbf. 45, 3		3)
	52931.4959	.0014	ATB	−0.0047		BAV Rbf. 45, 3		1)
VW Peg	52984.3148	.0015	ATB	+0.0012		BAVM 129		1)
ZZ Peg	49580.4289		MS	+0.1286	s	GCVS 87		1)
	50741.3099		MS	+0.1369		GCVS 87		1)
	51433.3576	.0020	HSR	+0.1322		GCVS 87		2)
	51459.3829	.0002	AG	+0.1305		GCVS 87		1)
	51467.3918	.0007	KI	+0.1311		GCVS 87	-Ir	1)
	52853.4877	.0004	RAT RCR	+0.1203		GCVS 87	-Ir	1)
	52887.5278	.0007	AG	+0.1250		GCVS 87	-Ir	1)
AT Peg	52850.4449	.0002	QU	+0.0120		GCVS 87	V	4)
	52928.3787	.0017	SCI	+0.0126		GCVS 87		3)
BB Peg	52852.4956	.0002	RAT RCR	−0.0006		GCVS 87	-Ir	1)
BX Peg	52887.3756	.0031	AG	−0.0648	s	GCVS 87		1)
	52887.5149	.0005	AG	−0.0657		GCVS 87		1)
	52902.3758	.0006	PRK	−0.0671		GCVS 87		1)
	52929.4367	.0047	AG	−0.0668	s	GCVS 87		1)
	52929.5793	.0006	AG	−0.0645		GCVS 87		1)
BY Peg	52878.4928	.0005	AG					1)
	52887.3837	.0011	AG					1)
	52887.5536	.0006	AG					1)
	52929.4431	.0008	AG					1)
CC Peg	52484.4524	.0006	MS	+0.0030	s	IBVS 5017 BAVM 133		7)
	52834.4936	.0013	RAT RCR	+0.0056	s	IBVS 5017 BAVM 133	-Ir	1)
	52878.3915	.0005	AG	−0.0027		IBVS 5017 BAVM 133		1)
	52887.4741	.0011	AG	−0.0041		IBVS 5017 BAVM 133		1)
CE Peg	52929.4523		AG					1)
CF Peg	52878.4716	.0007	AG					1)
	52887.3613	.0011	AG					1)
	52887.5687	.0007	AG					1)
	52929.5405	.0013	AG					1)
DI Peg	52903.3083	.0004	DIE	−0.0202		GCVS 87		14)
	52908.2924	.0001	DIE	−0.0189		GCVS 87		14)
	52950.2871	.0004	SE	−0.0213		GCVS 87	-Ir	17)
DK Peg	52901.4398	.0056	SCI	+0.0804		GCVS 87		3)
EU Peg	52913.3646	.0002	MS FR	+0.0338		GCVS 87		7)
KW Peg	52878.5966	.0004	AG					1)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
KW Peg	52887.5769	.0014	AG					1)
V396 Peg	52940.3432	.0018	JU	−0.0014		BAVM 139		3)
GSC1127.1808 Peg	52938.3406	.0005	FR					13)
Z Per	52948.3553	.0072	SCI	−0.1809		GCVS 87		3)
RT Per	52913.5914	.0012	AG	−0.3731		GCVS 87		1)
ST Per	52982.3559	.0003	QU	+0.1776		GCVS 87	V	4)
BP Per	52913.5601	.0005	AG	−0.0196		GCVS 87		1)
HW Per	52619.3259	.0004	MS FR	+0.0229		GCVS 87		7)
IU Per	52931.2940	.0009	DIE	+0.0066		GCVS 87		14)
	52937.3019	.0010	DIE	+0.0154		GCVS 87		14)
KN Per	52683.5317	.0056	ATB	+0.0048	s	BAV Rbf. 52, 93ff		1)
	52694.3516	.0035	ATB	−0.0061		BAV Rbf. 52, 93ff		1)
	52697.3936	.0035	ATB	+0.0033	s	BAV Rbf. 52, 93ff		1)
KR Per	52983.5074	.0003	RAT RCR	−0.0152		GCVS 87	-Ir	1)
KW Per	52901.4946	.0001	MS FR	+0.0130		GCVS 87		7)
NZ Per	52931.5399	.0004	RAT RCR	+0.0349		GCVS 87	-Ir	1)
QT Per	52913.4837	.0004	AG					1)
	52927.5327	.0003	MS FR					7)
QU Per	52903.5370	.0008	RAT RCR				-Ir	1)
V432 Per	52902.5124	.0001	RAT RCR	−0.0099		IBVS 3797 BAVM 61	-Ir	1)
	52981.4757	.0004	RAT RCR	−0.0089		IBVS 3797 BAVM 61	-Ir	1)
V450 Per	51434.5780	.0015	MS	+0.0505		GCVS 87		7)
	52913.5659	.0005	RAT RCR	+0.0681		GCVS 87	-Ir	1)
RV Psc	52992.3706	.0005	DIE	+0.0021		GCVS 87		14)
V Sge	52817.4834	.0004	RAT RCR	−0.0270		GCVS 87	-Ir	1)
CU Sge	52835.4080	.0011	AG	+0.0164	s	GCVS 87		1)
AU Ser	52714.6513	.0001	RAT RCR				-Ir	1)
Y Sex	53094.3761	.0005	WTR	+0.0095		BAV Rbf. 32, 36ff		15)
SV Tau	53035.2837	.0012	AG	−0.0133		GCVS 87	-Ir	1)
AH Tau	52929.4800	.0001	RAT RCR				-Ir	1)
CR Tau	52648.2725	.0002	RAT RCR	−0.0024		IBVS 4778 BAVM 123	-Ir	1)
EN Tau	53035.3314	.0025	AG	+0.0059		BAV Rbf. 52, 49ff	-Ir	1)
	53056.3912	.0007	PRK	+0.0022	s	BAV Rbf. 52, 49ff		1)
EQ Tau	52618.2442	.0002	MS	−0.0259		GCVS 87		7)
	52956.5186	.0024	PC	−0.0279		GCVS 87	-Ir	8)
	52982.4622	.0024	PC	−0.0267		GCVS 87	-Ir	8)
	52983.4854	.0020	PC	−0.0276		GCVS 87	-Ir	8)
GR Tau	52712.3372	.0021	ATB	−0.0270		BAV Rbf. 35, 1ff		1)
V781 Tau	53035.3703	.0115	AG	−0.0484		GCVS 87	-Ir	1)
V1094 Tau	52997.3708	.0027	JU	+1.3844	s	IBVS 4544		3)
GSC1830.1432 Tau	52717.3339	.0012	PRK					1)
	52902.5747	.0008	PRK					1)
	52904.6151	.0012	PRK					1)
	52948.3813	.0009	PRK					1)
V Tri	52902.4272	.0001	RAT RCR	−0.0003		GCVS 87	-Ir	1)
X Tri	52618.2925		SE	−0.0530		GCVS 87	-Ir	17)
	52925.2946		SG	−0.0560		GCVS 87	V	4)
RV Tri	52907.4786	.0001	RAT RCR	−0.0214		GCVS 87	-Ir	1)
	52982.4686	.0008	RAT RCR	−0.0212	s	GCVS 87	-Ir	1)
W UMa	53096.3742	.0039	PC	−0.0054		BAV Rbf. 44,156ff	-Ir	8)
	53096.5408	.0042	PC	−0.0056	s	BAV Rbf. 44,156ff	-Ir	8)
	53105.3843	.0035	PC	−0.0035		BAV Rbf. 44,156ff	-Ir	8)
TY UMa	52752.5492	.0002	RAT RCR	+0.0170		GCVS 87	-Ir	1)
	52764.4262	.0001	RAT RCR	+0.0170	s	GCVS 87	-Ir	1)
	53110.4686	.0031	PC	+0.0297	s	GCVS 87	-Ir	8)
UY UMa	53028.5463	.0002	AG	+0.0857		GCVS 87		1)
	53110.5203	.0042	PC	+0.0882		GCVS 87	-Ir	8)
	53116.5376	.0099	PC	+0.0893		GCVS 87	-Ir	8)
VV UMa	52723.4528	.0001	RAT RCR	−0.0527		GCVS 87	-Ir	1)
	53106.4463	.0020	PC	+0.0701		GCVS 87	-Ir	8)

Table 1: Eclipsing binaries (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
VV UMa	53110.4480	.0036	PC	−0.0524		GCVS 87	-Ir	8)
XY UMa	53096.4334	.0027	PC	+0.0224		GCVS 87	-Ir	8)
XZ UMa	52744.4398	.0002	RAT RCR	−0.0678		GCVS 87	-Ir	1)
ZZ UMa	53069.4722	.0030	PC	−0.0025		GCVS 87	-Ir	8)
AA UMa	52742.5568	.0003	RAT RCR	+0.0256		GCVS 87	-Ir	1)
	53003.5390	.0002	RAT RCR	+0.0278	s	GCVS 87	-Ir	1)
	53096.4618	.0036	PC	+0.0277		GCVS 87	-Ir	8)
BG UMa	52746.4116	.0020	AG				-Ir	1)
W UMi	52927.3830	.0012	BRN STK	−0.1359		GCVS 87	V	4)
RU UMi	53110.5843	.0026	PC	−0.0080		GCVS 87	-Ir	8)
AG Vir	53111.4484	.0041	PC	+0.0000		GCVS 87	-Ir	8)
AH Vir	53112.4308	.0014	SCI	−0.0440	s	GCVS 87		3)
AW Vir	52738.3754	.0001	RAT RCR	+0.0129		GCVS 87	-Ir	1)
HW Vir	52764.4249		PRK					6)
GSC4992.663 Vir	53094.5055	.0002	FR				-Ir	13)
	53094.6264	.0001	FR				-Ir	13)
	53095.4739	.0001	FR				-Ir	13)
	53095.5948	.0002	FR				-Ir	13)
BK Vul	52831.4314	.0003	RAT RCR	+0.0602	s	GCVS 87	-Ir	1)
	52833.4738	.0003	MS FR	+0.0620		GCVS 87		7)
BM Vul	52929.4695	.0019	AG					1)
DR Vul	52840.4178	.0015	JU	−0.0392		SAC 73		3)
	52850.5049	.0020	JU	−0.0813	s	SAC 73		3)
	52912.4457	.0024	JU	−0.0405		SAC 73		3)
FM Vul	49544.5030		MS	+0.0149		GCVS 87		1)
	49546.4658		MS	+0.0161	s	GCVS 87		1)
	51355.4575	.0003	AG	+0.0187		GCVS 87		1)
	52426.4934	.0003	AG	+0.0200		GCVS 87		1)
	52948.2799	.0007	FR	+0.0205		GCVS 87		13)
FR Vul	52898.3675	.0007	RAT RCR	−0.0078		GCVS 87	-Ir	1)
GI Vul	52767.4933	.0003	MS FR					7)
	52876.5562	.0017	AG					1)
KN Vul	49546.4241	.0004	AG	−0.0579		GCVS 87		1)
	50673.4297	.0003	AG	−0.0790		GCVS 87		1)
	52073.4380	.0003	AG	+0.0792	s	GCVS 87		1)
	52094.5214	.0002	AG	+0.0800	s	GCVS 87		1)
	52876.5320	.0016	AG	+0.0684		GCVS 87		1)
NO Vul	52789.4615	.0002	MS FR					7)

Table 2: Pulsating stars

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
SW And	52959.3706	.0024	SCI	−0.0311	IBVS 4143 BAVM 76		3)
XX And	52940.5499	.0028	SCI	+0.0178	BAV Rbf. 48,189		3)
AT And	52983.3543	.0049	ATB	+0.0051	GCVS 85		1)
CC And	52991.3999	.0024	JU	+0.0137	GCVS 85		3)
DK And	52927.4472	.0097	PC	−0.0420	GCVS 85	-Ir	8)
	52956.5330	.0064	PC	+0.0488	GCVS 85	-Ir	8)
	52996.4249	.0084	PC	−0.0187	GCVS 85	-Ir	8)
GP And	52983.3046	.0003	JU	+0.0034	GCVS 85		3)
	52983.4604	.0008	MZ	+0.0019	GCVS 85	-Ir	10)
OV And	52983.4265	.0028	SCI	−0.0134	MVS 11,133		3)
UW Aps	52397.4560	.0050	PS				2)
	52402.5103	.0050	PS				2)
SW Aqr	52853.5298	.0030	PS	+0.0023	GCVS 85		18)
	52929.314 :	.001	PC	+0.001	GCVS 85	-Ir	8)
FH Aqr	52930.404	.003	AG				1)
HH Aqr	52899.442	.005	AG				1)
	52930.454	.003	AG				1)

Table 2: Pulsating stars (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
V341 Aql	52858.4162		SE	+0.0057	BAV Rbf. 45, 74	-Ir	17)
X Ari	52983.3759	.0030	MZ	+0.0392	BAV Rbf. 48,189	-Ir	10)
TZ Aur	51898.7360	.0026	HSR	+0.0126	GCVS 85		11)
	52949.5942	.0007	QU	+0.0078	GCVS 85	V	4)
	53069.4545	.0021	PC	+0.0157	GCVS 85	-Ir	8)
	53098.438	.005	AG	+0.015	GCVS 85	-Ir	1)
BH Aur	52941.5975	.0020	PC			-Ir	8)
	52983.5603	.0029	PC			-Ir	8)
MV Aur	52948.529	.001	AG				1)
RS Boo	52754.4509	.0005	JU	+0.0135	BAV Rbf. 36,157ff		3)
	53111.4125	.0008	MZ	+0.0128	BAV Rbf. 36,157ff	-Ir	10)
	53117.4524	.0005	JU	+0.0153	BAV Rbf. 36,157ff		3)
ST Boo	52834.446	.003	AG	+0.020	BAV Rbf. 49,105		1)
SW Boo	52362.4028	.0020	HSR				6)
	52363.4329	.0030	HSR				6)
	52368.5714	.0020	HSR				6)
	52385.5157	.0040	HSR				6)
	53142.4903	.0014	JU				3)
SZ Boo	52789.4308	.0010	MZ			-Ir	10)
	52800.4133	.0035	PC			-Ir	8)
	53069.6742	.0041	PC			-Ir	8)
TV Boo	53069.6883	.0050	PC			-Ir	8)
	53111.5629	.0044	PC			-Ir	8)
	53116.5620	.0074	PC			-Ir	8)
TW Boo	52730.4279	.0008	JU	−0.0161	BAV Rbf. 48,189		3)
	52763.4285	.0008	JU	−0.0164	BAV Rbf. 48,189		3)
	52813.4646	.0026	PC	−0.0139	BAV Rbf. 48,189	-Ir	8)
	53111.5359	.0040	PC	−0.0151	BAV Rbf. 48,189	-Ir	8)
UU Boo	52784.546	.004	AG	+0.149	GCVS 85		1)
	52807.3986	.0028	PC	+0.1552	GCVS 85	-Ir	8)
	52827.501	.005	AG	+0.153	GCVS 85		1)
	53069.678 :	.002	PC	+0.163	GCVS 85	-Ir	8)
	53096.634 :	.002	PC	+0.160	GCVS 85	-Ir	8)
	53097.546	.002	AG	+0.158	GCVS 85		1)
UY Boo	52717.6444	.0040	PS	+0.0420	BAV Rbf. 48,121		18)
	52807.4708	.0101	PC	+0.0416	BAV Rbf. 48,121	-Ir	8)
	53049.6120	.0050	PS	+0.0409	BAV Rbf. 48,121		18)
	53137.4585	.0013	JU	+0.0134	BAV Rbf. 48,121		3)
	53137.4613	.0017	SCI	+0.0162	BAV Rbf. 48,121		3)
XX Boo	52770.4120	.0050	MZ	+0.0260	GCVS 85	-Ir	10)
	52813.4255	.0038	PC	+0.0158	GCVS 85	-Ir	8)
	53068.6650	.0063	PC	+0.0200	GCVS 85	-Ir	8)
	53096.577 :	.009	PC	+0.024	GCVS 85	-Ir	8)
YZ Boo	52737.4654	.0004	JU	+0.0028	GCVS 85		3)
	53105.4295	.0005	JU	+0.0032	GCVS 85		3)
AE Boo	53110.579 :	.008	PC	+0.077	GCVS 85	-Ir	8)
	53116.5738	.0051	PC	+0.0888	GCVS 85	-Ir	8)
CM Boo	52764.4598		BRN STK	−0.0691	GCVS 85	-Ir	4)
	53096.3968	.0010	QU	−0.0807	GCVS 85	V	4)
	53116.4985	.0033	PC	−0.0786	GCVS 85	-Ir	8)
CQ Boo	53110.575 :		PC	−0.022	BAV Rbf. 48,189	-Ir	8)
	53155.4067	.0050	JU	−0.0092	BAV Rbf. 48,189		3)
	53164.4245	.0021	SCI	−0.0117	BAV Rbf. 48,189		3)
CS Boo	53068.6384	.0030	PC	−0.0114	IBVS 2855	-Ir	8)
	53097.4245	.0005	QU	−0.0014	IBVS 2855	V	4)
UY Cam	53068.4348	.0114	PC	+0.0412	BAV Rbf. 49, 41	-Ir	8)
	53094.344 :	.102	PC	+0.047	BAV Rbf. 49, 41	-Ir	8)
RW Cnc	52737.4344	.0050	ATB	+0.1909	GCVS 85		1)
	53068.5004	.0073	PC	+0.2015	GCVS 85	-Ir	8)
SS Cnc	53096.3864	.0015	PC	−0.0143	BAV Rbf. 49, 41	-Ir	8)

Table 2: Pulsating stars (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
TT Cnc	52982.6647	.0038	PC	+0.0071	BAV Rbf. 47, 67	-Ir	8)
	53069.4219	.0051	PC	−0.0072	BAV Rbf. 47, 67	-Ir	8)
	53095.361 :	.008	PC	+0.013	BAV Rbf. 47, 67	-Ir	8)
VZ Cnc	53056.3838	.0010	SCI	−0.0014	GCVS 85		3)
	53064.4091	.0021	JU	−0.0025	GCVS 85		3)
AQ Cnc	53069.4076	.0079	PC	−0.0628	GCVS 85	-Ir	8)
EZ Cnc	53110.3665	.0042	PC			-Ir	8)
W CVn	52749.4110	.0011	JU	−0.0123	SAC 70		3)
	52813.4154	.0026	PC	−0.0117	SAC 70	-Ir	8)
	53091.4984	.0020	MZ	−0.0141	SAC 70	-Ir	10)
	53112.4621	.0007	JU	−0.0171	SAC 70		3)
Z CVn	52764.4223	.0008	JU	+0.2027	GCVS 85		3)
	52815.4242	.0015	JU	+0.2067	GCVS 85		3)
	53151.5135	.0024	SCI	+0.2331	GCVS 85		3)
	53155.4311	.0024	SCI	+0.2278	GCVS 85		3)
RR CVn	53110.5183	.0026	PC			-Ir	8)
RZ CVn	52807.4148	.0042	PC	+0.0640	BAV Rbf. 48,189	-Ir	8)
	53065.583	.001	PC	+0.065	BAV Rbf. 48,189	-Ir	8)
	53111.5615	.0062	PC	+0.0845	BAV Rbf. 48,189	-Ir	8)
	53165.4481	.0014	SCI	+0.0681	BAV Rbf. 48,189		3)
SS CVn	53096.5349	.0057	PC			-Ir	8)
	53110.4698	.0044	PC			-Ir	8)
ST CVn	53116.5621	.1080	PC	−0.0771	BAV Rbf. 49,105	-Ir	8)
SW CVn	53068.5572	.0795	PC			-Ir	8)
UV CVn	52802.4400	.0083	PC	+0.0303	GCVS 85	-Ir	8)
	53069.615 :	.006	PC	+0.039	GCVS 85	-Ir	8)
UZ CVn	53069.6649	.0029	PC	−0.0160	BAV Rbf. 49, 41	-Ir	8)
	53111.5291	.0044	PC	−0.0196	BAV Rbf. 49, 41	-Ir	8)
XY CVn	53076.572	.005	AG	+0.044	GCVS 85	-Ir	1)
	53081.577	.005	AG	+0.047	GCVS 85	-Ir	1)
	53098.361	.003	AG	+0.039	GCVS 85		1)
XZ CVn	53081.529	.005	AG	+0.067	GCVS 85	-Ir	1)
BN CVn	53106.4989	.0059	PC	+0.0535	BAVM 75	-Ir	8)
SY CMi	52285.5435	.0080	PS				20)
AD CMi	52984.598 :	.002	PC	−0.001	GCVS 85	-Ir	8)
	53028.5055	.0008	MZ	+0.0042	GCVS 85	-Ir	10)
AH CMi	53094.3398	.0010	MZ			-Ir	10)
AL CMi	53081.4043	.0020	MZ	−0.0136	BAV Rbf. 49, 41	-Ir	10)
AS CMi	52283.5285	.0070	PS				20)
	52287.4705	.0050	PS				20)
V470 Cas	52898.547	.010	AG	+0.183	IBVS 4332 BAVM 87	-Ir	1)
RZ Cep	52898.4679	.0100	PC	−0.0750	GCVS 85	-Ir	8)
	52929.6428	.0100	PC	−0.0773	GCVS 85	-Ir	8)
	52956.4872	.0073	PC	−0.0885	GCVS 85	-Ir	8)
AQ Cep	52840.4272	.0040	MZ			-Ir	10)
EZ Cep	52941.5459	.0017	PC			-Ir	8)
	52982.4810	.0033	PC			-Ir	8)
FP Cep	52901.4218	.0001	MZ			V	10)
RR Cet	52929.4915	.0027	PC	+0.0056	GCVS 85	-Ir	8)
S Com	53121.3633	.0007	JU	+0.0049	SAC 73		3)
U Com	53096.521 :	.009	PC	−0.010	BAV Rbf. 49, 41	-Ir	8)
	53097.4142	.0040	MZ	+0.0051	BAV Rbf. 49, 41	-Ir	10)
V Com	53106.4790	.0029	PC	+0.0287	GCVS 85	-Ir	8)
ST Com	52759.4269	.0015	JU	+0.0006	BAV Rbf. 47, 67		3)
UW Com	53095.526	.003	AG			-Ir	1)
CZ Com	53095.582	.005	AG				1)
RV CrB	52802.560 :	.004	PC	−0.101	GCVS 85	-Ir	8)
	52807.538 :	.006	PC	−0.096	GCVS 85	-Ir	8)
	52813.5012	.0051	PC	−0.1011	GCVS 85	-Ir	8)
SU CrB	52856.448	.005	AG				1)

Table 2: Pulsating stars (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
SZ CrB	53111.624 :	.004	PC	+0.005	BAV Rbf. 49, 41	-Ir	8)
	53116.5529	.0033	PC	−0.0018	BAV Rbf. 49, 41	-Ir	8)
WX CrB	52793.506 :	.005	AG				1)
	52841.512	.010	AG			-Ir	1)
	52855.478	.003	AG				1)
	52856.441	.005	AG				1)
	53082.566	.003	AG			-Ir	1)
UY Cyg	52925.4653	.0030	ATB	+0.0517	GCVS 85		1)
XX Cyg	52840.5025	.0017	PC	+0.0045	GCVS 85	-Ir	8)
	52876.3725	.0002	WTR	+0.0003	GCVS 85		15)
	52931.4030	.0021	PC	+0.0059	GCVS 85	-Ir	8)
XZ Cyg	52839.4970	.0010	SCI	+0.0169	BAV Rbf. 48,189		3)
	52840.4352	.0024	PC	+0.0219	BAV Rbf. 48,189	-Ir	8)
	52854.4248		SE	+0.0137	BAV Rbf. 48,189	-Ir	17)
	52867.4882	.0028	SCI	+0.0124	BAV Rbf. 48,189		3)
	52874.4979		SE	+0.0232	BAV Rbf. 48,189	-Ir	17)
	52897.3575	.0100	PC	+0.0196	BAV Rbf. 48,189	-Ir	8)
	52925.3461		SE	+0.0125	BAV Rbf. 48,189	-Ir	17)
	52941.2334	.0049	PC	+0.0356	BAV Rbf. 48,189	-Ir	8)
DM Cyg	52856.4259		SE	−0.0050	BAV Rbf. 51, 98ff	-Ir	17)
	52885.3939	.0014	SCI	−0.0076	BAV Rbf. 51, 98ff		3)
	52898.4148	.0028	PC	−0.0024	BAV Rbf. 51, 98ff	-Ir	8)
	52909.3240	.0007	WTR	−0.0097	BAV Rbf. 51, 98ff		15)
	52927.3892	.0021	PC	+0.0014	BAV Rbf. 51, 98ff	-Ir	8)
	52930.3274	.0028	PC	+0.0005	BAV Rbf. 51, 98ff	-Ir	8)
	52983.2243	.0014	ATB	−0.0053	BAV Rbf. 51, 98ff		1)
V357 Cyg	52876.3770	.0010	FR				13)
V881 Cyg	52941.3243	.0005	FR				13)
V882 Cyg	52941.2809	.0010	FR				13)
V894 Cyg	52836.5754	.0039	PC	+0.0016	BAV Rbf. 49, 41	-Ir	8)
V939 Cyg	52802.451 :	.010	AG	+0.036	BAVM 92		1)
V1815 Cyg	52956.4490	.0091	PC			-Ir	8)
AX Del	52941.2827	.0069	ATB				1)
DX Del	52907.3878	.0011	JU	+0.0036	Monthly Notices		3)
	52925.3524	.0035	ATB	+0.0087	Monthly Notices		1)
VW Dor	53107.440	.002	HND				16)
RW Dra	52812.5393	.0024	PC	+0.1469	GCVS 85	-Ir	8)
	52840.4381	.0010	SCI	+0.1420	GCVS 85		3)
	52844.4233	.0008	JU	+0.1409	GCVS 85		3)
	52852.3976	.0021	SCI	+0.1427	GCVS 85		3)
	52855.5107	.0007	JU	+0.1554	GCVS 85		3)
	52878.5402	.0010	SCI	+0.1532	GCVS 85		3)
	52887.3658	.0017	SCI	+0.1205	GCVS 85		3)
	52898.4755	.0010	SCI	+0.1572	GCVS 85		3)
	52903.3562	.0009	SCI	+0.1659	GCVS 85		3)
	52929.4603	.0019	SCI	+0.1379	GCVS 85		3)
	52949.4371	.0013	SCI	+0.1834	GCVS 85		3)
	52981.3001	.0014	SCI	+0.1564	GCVS 85		3)
	53150.5151	.0016	SCI	+0.1771	GCVS 85		3)
SU Dra	52744.4495	.0010	JU	+0.0393	GCVS 85		3)
	52746.4320	.0013	JU	+0.0405	GCVS 85		3)
	52773.509 :	.004	JU	+0.041	GCVS 85		3)
	52950.5016		BRN STK	+0.0404	GCVS 85	V	4)
	53028.4332	.0010	JU	+0.0424	GCVS 85		3)
	53096.4583	.0049	PC	+0.0442	GCVS 85	-Ir	8)
SW Dra	52936.4670		BRN STK	+0.0100	BAV Rbf. 47, 67	V	4)
	53068.6323	.0041	PC	+0.0113	BAV Rbf. 47, 67	-Ir	8)
	53096.5417	.0044	PC	+0.0068	BAV Rbf. 47, 67	-Ir	8)
	53116.4844	.0045	PC	+0.0110	BAV Rbf. 47, 67	-Ir	8)
VZ Dra	52813.3998	.0093	PC	−0.1079	GCVS 85	-Ir	8)

Table 2: Pulsating stars (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
VZ Dra	52836.5132	.0083	SCI	−0.1088	GCVS 85		3)
	52927.3388	.0032	SCI	−0.1349	GCVS 85		3)
	52929.2829	.0003	BRN STK	−0.1169	GCVS 85	V	4)
XZ Dra	52903.4550	.0011	JU	−0.0744	GCVS 85		3)
BT Dra	53096.582 :	.003	PC			-Ir	8)
DD Dra	52804.4501	.0045	SCI	+0.0086	BAV Rbf. 49, 6		3)
	52819.4670	.0021	SCI	−0.0070	BAV Rbf. 49, 6		3)
	52819.4733	.0040	JU	−0.0007	BAV Rbf. 49, 6		3)
	52820.4544	.0019	JU	+0.0000	BAV Rbf. 49, 6		3)
RR Gem	51956.4068		BRN STK	+0.0110	BAV Rbf. 47, 67	-Ir	4)
	52751.3845	.0016	ATB	+0.0066	BAV Rbf. 47, 67		1)
	52982.6122	.0025	PC	+0.0101	BAV Rbf. 47, 67	-Ir	8)
	52984.5940	.0019	PC	+0.0055	BAV Rbf. 47, 67	-Ir	8)
	52996.515 :	.002	PC	+0.007	BAV Rbf. 47, 67	-Ir	8)
	53056.5014	.0010	SCI	+0.0029	BAV Rbf. 47, 67		3)
	53068.4173	.0019	PC	+0.0001	BAV Rbf. 47, 67	-Ir	8)
	53070.4033	.0019	PC	−0.0004	BAV Rbf. 47, 67	-Ir	8)
	53074.3829	.0007	JU	+0.0063	BAV Rbf. 47, 67		3)
SZ Gem	52717.3673		BRN STK	+0.0068	BAV Rbf. 48, 65	-Ir	4)
	52981.4634	.0010	QU	+0.0062	BAV Rbf. 48, 65	V	4)
GI Gem	52721.3938	.0021	ATB	−0.0041	BAV Rbf. 51, 40ff		1)
TW Her	52813.5358	.0016	PC	−0.0067	GCVS 85	-Ir	8)
VX Her	52802.4471	.0016	PC	+0.0918	GCVS 85	-Ir	8)
	52807.4563		SE	+0.0919	GCVS 85	-Ir	17)
	52807.4577	.0031	PC	+0.0933	GCVS 85	-Ir	8)
	52812.4658		SE	+0.0923	GCVS 85	-Ir	17)
	52827.4886	.0005	JU	+0.0878	GCVS 85		3)
	52843.4265	.0008	JU	+0.0877	GCVS 85		3)
VZ Her	52812.4874	.0007	SCI	+0.0575	GCVS 85		3)
	52812.4895	.0010	JU	+0.0596	GCVS 85		3)
	52812.4912	.0025	PC	+0.0613	GCVS 85	-Ir	8)
	52816.4521	.0005	JU	+0.0592	GCVS 85		3)
	52831.4223		SE	+0.0583	GCVS 85	-Ir	4)
	52868.4122		SE	+0.0606	GCVS 85	-Ir	17)
AF Her	53082.517	.003	AG	−0.027	BAV Rbf. 49,105	-Ir	1)
AR Her	52834.5023	.0010	JU	+0.0183	BAV Rbf. 52, 3ff		3)
	53148.4676	.0010	JU	+0.0339	BAV Rbf. 52, 3ff		3)
	53163.4769	.0028	SCI	+0.0037	BAV Rbf. 52, 3ff		3)
DL Her	52813.3998	.0093	PC	+0.0462	GCVS 85	-Ir	8)
DY Her	53145.4558	.0015	JU	−0.0024	BAV Rbf. 48,189		3)
EP Her	52928.2930	.0021	ATB				1)
IP Her	52931.2971	.0035	ATB				1)
V448 Her	53082.562	.003	AG			-Ir	1)
V734 Her	52797.4472	.0002	MZ			V	19)
SZ Hya	53051.3868	.0015	HND	−0.1302	GCVS 85		17)
CQ Lac	52949.4255	.0028	ATB				1)
CZ Lac	52836.4477	.0016	JU	−0.0012	BAV Rbf. 53, 12f		3)
	52855.469	.005	AG	+0.004	BAV Rbf. 53, 12f	-Ir	1)
	52878.363	.003	AG	−0.008	BAV Rbf. 53, 12f	-Ir	1)
	52903.4402	.0009	WTR	+0.0028	BAV Rbf. 53, 12f		15)
	52910.3508	.0009	WTR	−0.0015	BAV Rbf. 53, 12f		15)
	52929.3722	.0015	SE	+0.0038	BAV Rbf. 53, 12f	-Ir	17)
	52929.3780	.0038	PC	+0.0096	BAV Rbf. 53, 12f	-Ir	8)
	52984.2631	.0043	PC	+0.0073	BAV Rbf. 53, 12f	-Ir	8)
DE Lac	53010.2844	.0035	ATB	+0.0284	GCVS 85		1)
PW Lac	52902.4132	.0006	MZ	+0.0370	BAVM 75	V	10)
	52926.4984	.0021	ATB	+0.0408	BAVM 75		1)
	52928.5491	.0021	ATB	+0.0421	BAVM 75		1)
	52981.3182	.0040	MZ	+0.0372	BAVM 75	-Ir	10)
RR Leo	52717.4548		BRN STK	+0.0255	BAV Rbf. 47, 67	-Ir	4)

Table 2: Pulsating stars (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
RR Leo	53068.5139	.0017	PC	+0.0256	BAV Rbf. 47, 67	-Ir	8)
	53145.4225	.0007	QU	+0.0269	BAV Rbf. 47, 67	V	4)
AA Leo	53082.5028	.0020	MZ	+0.0044	BAV Rbf. 49, 41	-Ir	10)
DL Leo	53110.4120	.0030	MZ	+0.0348	IBVS 2533	-Ir	10)
DM Leo	52726.4079	.0014	MZ			-Ir	10)
	52736.4540	.0007	MZ			-Ir	10)
	52745.4412	.0005	MZ			-Ir	10)
	52753.3844	.0100	MZ			-Ir	10)
	52763.4168	.0023	MZ			-Ir	10)
V LMi	53069.4821	.0033	PC			-Ir	8)
	53070.5680	.0050	PC			-Ir	8)
	53105.3789	.0018	PC			-Ir	8)
	53111.3641	.0045	PC			-Ir	8)
RW Lyn	52721.5165	.0014	ATB	+0.0042	BAV Rbf. 47, 35		1)
SZ Lyn	53052.4285	.0004	JU	+0.0215	GCVS 85		3)
	53070.3860	.0038	PC	+0.0193	GCVS 85	-Ir	8)
	53090.3992	.0052	PC	+0.0237	GCVS 85	-Ir	8)
	53094.3780	.0015	PC	+0.0248	GCVS 85	-Ir	8)
	53096.4229	.0004	JU	+0.0206	GCVS 85		3)
	53099.4361	.0004	JU	+0.0205	GCVS 85		3)
TT Lyn	52747.4078	.0040	ATB				1)
TV Lyn	53068.4542	.0042	PC	+0.0228	GCVS 85	-Ir	8)
	53069.4104	.0086	PC	+0.0164	GCVS 85	-Ir	8)
	53095.4104	.0056	PC	+0.0261	GCVS 85	-Ir	8)
TW Lyn	53097.519	.003	AG	+0.051	GCVS 85	-Ir	1)
AN Lyn	53070.4680	.0039	PC			-Ir	8)
	53090.4117	.0021	PC			-Ir	8)
BE Lyn	53056.4841	.0010	JU	+0.0045	Rev Mex 20,37		3)
	53056.5813	.0010	JU	+0.0058	Rev Mex 20,37		3)
	53094.3704	.0068	PC	+0.0223	Rev Mex 20,37	-Ir	8)
	53111.3227	.0024	PC	+0.0057	Rev Mex 20,37	-Ir	8)
	53111.4184	.0026	PC	+0.0056	Rev Mex 20,37	-Ir	8)
	53111.5164	.0032	PC	+0.0077	Rev Mex 20,37	-Ir	8)
RR Lyr	52850.4053	.0024	SCI	+0.0122	SAC 73		3)
RZ Lyr	52849.4607	.0014	SCI	−0.0037	BAV Rbf. 48,189		3)
	52849.4648	.0011	JU	+0.0004	BAV Rbf. 48,189		3)
	52868.3633	.0040	WTR	−0.0171	BAV Rbf. 48,189		15)
	52956.3154	.0035	ATB	+0.0013	BAV Rbf. 48,189		1)
EX Lyr	52796.4458	.0006	MZ	+0.1572	GCVS 85	V	10)
EZ Lyr	52846.4413	.0007	WTR	+0.0204	BAV Rbf. 34,145ff		15)
IO Lyr	52949.2847	.0021	ATB	−0.0288	GCVS 85		1)
KX Lyr	52926.3384	.0024	ATB				1)
NQ Lyr	52930.3097	.0035	ATB	−0.0013	GCVS 85		1)
V462 Lyr	52929.3890	.0056	ATB	+0.0866	GCVS 85		1)
V785 Oph	52835.4467	.0026	PC	−0.0098	GCVS 85	-Ir	8)
CM Ori	52983.5754	.0100	PC	+0.0131	BAV Rbf. 49,105	-Ir	8)
V964 Ori	53028.4255	.0006	MZ	−0.0254	BAV Rbf. 49,105	-Ir	10)
VV Peg	52908.4898	.0010	SCI	−0.0275	GCVS 87		3)
AV Peg	52897.4542	.0028	PC	+0.0214	BAV Rbf. 47, 67	-Ir	8)
	52904.4793	.0010	SCI	+0.0196	BAV Rbf. 47, 67		3)
	52908.3807	.0005	JU	+0.0173	BAV Rbf. 47, 67		3)
	52931.4143	.0017	PC	+0.0186	BAV Rbf. 47, 67	-Ir	8)
	52940.3916	.0014	PC	+0.0172	BAV Rbf. 47, 67	-Ir	8)
BF Peg	52928.4663	.0028	ATB	+0.0389	BAV Rbf. 49, 41		1)
	52940.3691	.0033	PC	+0.0425	BAV Rbf. 49, 41	-Ir	8)
BH Peg	52855.5151	.0038	SCI	−0.0125	BAV Rbf. 47, 67		3)
	52862.5516	.0024	SCI	−0.0268	BAV Rbf. 47, 67		3)
	52864.4888	.0056	SCI	−0.0126	BAV Rbf. 47, 67		3)
	52887.5768	.0038	SCI	−0.0001	BAV Rbf. 47, 67		3)
	52896.6097	.0049	SCI	+0.0589	BAV Rbf. 47, 67		3)

Table 2: Pulsating stars (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
BH Peg	52900.4218	.0049	SCI	+0.0251	BAV Rbf. 47, 67		3)
	52907.4774	.0056	SCI	+0.0298	BAV Rbf. 47, 67		3)
	52950.4066	.0026	SCI	+0.0129	BAV Rbf. 47, 67		3)
BP Peg	52897.4085	.0028	PC	−0.0052	BAV Rbf. 48,189	-Ir	8)
	52898.3927	.0024	PC	−0.0069	BAV Rbf. 48,189	-Ir	8)
	52930.3797	.0026	PC	−0.0068	BAV Rbf. 48,189	-Ir	8)
BT Peg	52887.529	.002	AG	+0.066	BAV Rbf. 49,105		1)
	52901.4458	.0006	MZ	+0.0635	BAV Rbf. 49,105	V	10)
	52936.5319	.0069	ATB	+0.0738	BAV Rbf. 49,105		1)
CG Peg	52897.4196	.0030	PC	−0.0135	SAC 72	-Ir	8)
	52904.4218	.0012	JU	−0.0184	SAC 72		3)
	52941.3275	.0030	PC	−0.0166	SAC 72	-Ir	8)
	52956.2761	.0024	PC	−0.0164	SAC 72	-Ir	8)
CV Peg	52930.2980	.0004	MZ			V	10)
DH Peg	52897.483 :	.007	PC	+0.024	GCVS 87	-Ir	8)
	52898.5039	.0088	PC	+0.0236	GCVS 87	-Ir	8)
ET Peg	52930.4417	.0021	ATB				1)
AN Per	52913.414	.003	AG				1)
AR Per	52970.3349	.0010	JU	+0.0483	GCVS 87		3)
	52983.5303	.0030	PC	+0.0516	GCVS 87	-Ir	8)
V433 Per	52913.434	.003	AG				1)
RU Psc	52941.4802	.0056	PC	−0.0300	BAV Rbf. 47, 67	-Ir	8)
	52981.340 :	.006	PC	+0.009	BAV Rbf. 47, 67	-Ir	8)
SS Psc	52929.4634	.0049	PC	+0.0014	BAV Rbf. 47, 67	-Ir	8)
	52980.4000	.0056	ATB	−0.0005	BAV Rbf. 47, 67		1)
SY Psc	52982.3851	.0020	MZ	+0.0868	GCVS 87	-Ir	10)
RU Scl	51870.5180	.0050	PS				20) red
	52994.3474	.0020	HND				17)
	52995.3728	.0030	HND				17)
	52997.3407	.0020	HND				17)
AN Ser	52802.4301	.0046	PC	+0.0023	GCVS 87	-Ir	8)
U Tri	52929.5156	.0039	PC	−0.0060	BAV Rbf. 49,105	-Ir	8)
UX Tri	52925.5927	.0027	ATB				1)
	52983.4705	.0017	ATB				1)
	52984.4040	.0021	ATB				1)
	52984.4060	.0042	PC			-Ir	8)
RV UMa	52956.327		BRN STK	+0.003	BAV Rbf. 48,189	V	4)
	53068.6616	.0020	PC	+0.0020	BAV Rbf. 48,189	-Ir	8)
	53094.4053	.0020	JU	+0.0022	BAV Rbf. 48,189		3)
	53106.5806	.0024	PC	+0.0078	BAV Rbf. 48,189	-Ir	8)
SX UMa	53068.667 :	.003	PC			-Ir	8)
	53096.6320	.0032	PC			-Ir	8)
	53116.5939	.0054	PC			-Ir	8)
TU UMa	52744.4123		BRN STK	−0.0234	GCVS 87	-Ir	4)
	53150.3853	.0005	QU	−0.0260	GCVS 87	V	4)
AE UMa	52745.4702	.0004	JU	−0.0003	BAV Rbf. 48,189		3)
	53003.5231	.0004	SCI	+0.0014	BAV Rbf. 48,189		3)
	53028.2942	.0006	SCI	−0.0004	BAV Rbf. 48,189		3)
	53028.3871	.0010	SCI	+0.0065	BAV Rbf. 48,189		3)
	53028.4705	.0005	SCI	+0.0039	BAV Rbf. 48,189		3)
	53028.5522	.0006	SCI	−0.0004	BAV Rbf. 48,189		3)
	53028.6420	.0011	SCI	+0.0034	BAV Rbf. 48,189		3)
	53069.4119	.0016	PC	+0.0012	BAV Rbf. 48,189	-Ir	8)
	53069.5029	.0018	PC	+0.0062	BAV Rbf. 48,189	-Ir	8)
	53070.4493	.0013	PC	+0.0064	BAV Rbf. 48,189	-Ir	8)
	53070.532 :	.002	PC	+0.003	BAV Rbf. 48,189	-Ir	8)
	53090.4053	.0027	PC	+0.0064	BAV Rbf. 48,189	-Ir	8)
	53094.3575	.0010	PC	+0.0018	BAV Rbf. 48,189	-Ir	8)
EX UMa	53094.563	.005	AG			-Ir	1)
UZ Vir	53069.5537	.0043	PC			-Ir	8)

Table 2: Pulsating stars (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
DO Vir	53094.5605	.0020	FR			-Ir	13)
	53095.6251	.0013	FR			-Ir	13)
FU Vir	52722.415 :	.002	MS FR	+0.057	BAV Rbf. 49,105		7)
BN Vul	52836.4572	.0004	MZ	−0.0201	SAC 73	-Ir	10)
	52867.3492	.0007	WTR	−0.0232	SAC 73		15)
	52889.3344	.0005	WTR	−0.0210	SAC 73		15)
FH Vul	52875.3333	.0007	WTR	−0.0466	BAV Rbf. 49, 41		15)

Remarks:

AG :	Agerer, F., Tiefenbach	ATB:	Achterberg, Dr. H., Norderstedt
BRN:	Brauner, B., Herford	DIE:	Dietrich, M., Radebeul
FR :	Frank, P., Velden	HND:	Hund, F., Windhoek (Namibia)
HSR:	Husar, Dr. D., Hamburg	JU :	Jungbluth, Dr. H., Karlsruhe
KI :	Kleikamp, W., Marl	MS :	Moschner, W., Lennestadt
MZ :	Maintz, G., Bonn	PC :	Poschinger, K., Hamburg
PRK:	Proksch, W., Winhöring	PS :	Paschke, A., Rüti
PTT:	Petter, Dr. G., Liegau	QU :	Quester, W., Esslingen
RAT:	Rätz, M. Herges-Hallenberg	RCR:	Rätz, Ch. Herges-Hallenberg
SCI:	Schmidt, U. Karlsruhe	SE :	Schlereth, B., Hassfurth
SG :	Sterzinger, Dr. P, Wien (A)	STK:	Strunk, J., Leopoldshöhe
WTR:	Walter, F., München		

:	= uncertain
s	= secondary minimum
E	= CCD- or photoelectric observation
red	= reduced results
1)	= photometer ST-6 chip 375*242 uncoated
2)	= photometer ST-7
3)	= photometer ST-7 chip KAF0400
4)	= photometer ST-7E
5)	= photometer ST-8E
6)	= photometer ST-8E chip KAF1602E
7)	= photometer ST-9 chip 512*512
8)	= photometer ST-10 XMR/XME
9)	= photometer Alpha Maxi chip KAF401e
10)	= photometer AlphaMini
11)	= photometer AP7 chip SITe502AB
12)	= photometer OES-LcCCD11
13)	= photometer OES-LcCCD12
14)	= photometer Pictor 1616XT
15)	= photometer Pictor 416XT
16)	= photometer starlight Xpress chip 510*256
17)	= photometer starlight Xpress chip 752*580
18)	= photometer Cryocam 80A
19)	= photometer holicam
20)	= photometer hisis 22
GCVS *yy*	= General Catalogue of Variable Stars, 4th ed. 19*yy*
IBVS *nnnn*	= Information Bulletin on Variable Stars No. *nnnn*
SAC *vv*	= Rocznik Astronomiczny No. *vv*, Krakow (SAC)
MVS vv,ppp	= Mitteilungen über Veränderl. Sterne; volume,pages
BAVM *nnn*	= BAV Mitteilungen No. *nnn*
BAV Rbf.	= BAV Rundbrief

ERRATUM FOR IBVS 5484

(BAVM 158)

VW Peg	52547.5689 FR	correct time: 52547.5272
KQ Gem	52690.3810 AG	correct name: KV Gem
	52690.5576 AG	
	52691.2757 AG	
	52691.4562 AG	
	52692.3516 AG	
	52692.5310 AG	
	52694.3242 AG	
	52694.5028 AG	
	52697.3714 AG	

ERRATUM FOR IBVS 5643

Erratum - Corrections to this paper (BAVM 172)

AD And	52587.4894 RAT RCR	correct time: 52857.4894
SW CVn	53068.5572 PC	must be deleted

ERRATUM FOR IBVS 5643

Correction to BAVM 172

RU Scl	52994.3474 HND	correct time: 52994.384

ERRATUM FOR IBVS 5643 (BAVM 172)

SY CMi	52285.538 PS	has to be deleted

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5644

Konkoly Observatory
Budapest
18 August 2005

HU ISSN 0374 – 0676

NEW ELEMENTS FOR 80 ECLIPSING BINARIES VII.

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The ASAS-3 (Pojmanski, 2002), NSVS (Wozniak et al., 2004) and Hipparcos (Perryman et al., 1997) databases have been used to find new elements for a seventh set of 80 eclipsing binaries. NSVS, ASAS-3 and Hipparcos data have been combined to improve the period determinations. Unfiltered NSVS ROTSE1 magnitudes were shifted to match the V magnitude of the stars. When neither ASAS nor Hipparcos observations exist, the original ROTSE1 magnitudes have been given. Saturated data in ASAS-3 and flagged observations in the Hipparcos Epoch Photometry and the NSVS dataset were also discarded. Hipparcos observations have been transformed to V using a table by the author published electronically in IBVS No. 5482 (Otero, 2003). The candidate stars were selected from the Hipparcos Variability Annex and the NSV catalogue (Kukarkin and Kholopov, 1982) and its supplement (NSVS) (Kazarovets et al., 1998). Stars showing mean Hp magnitudes close to the maximum Hp values in the Hipparcos Variability Annex were identified and their ASAS-3 and/or NSVS data subsequently obtained. Stars in the NSV catalogues that had no given classification or were classified as eclipsing binaries, S, L, I, CST or VAR with no spectral type published or spectral type K or earlier were also checked. The method of bisected chords was used to determine times of minima. The accuracy depends on the quantity and quality of the observations. Elements were found with AVE (Barberá, 1999) and a Microsoft Excel period search utility.

Table 1 shows the list of variables. The first column gives the variable star designation according to the GCVS. The following columns give another identifier; the brightness range of the variable (*= ROTSE1 magnitudes), with the magnitude of secondary eclipse between brackets; the epoch of minimum light derived from all the data available; the period; the variability class and the spectral type with a note to the spectral type source.

Table 1. New elements for 80 eclipsing binary stars.

Star Name		Magnitude range	Epoch	Period	Type	Spectral
Variable	Other ID	(V)	(HJD2440000+)	(days)		type
AL Dor*	HIP 022229	7.72−8.15:(8.1:)	8665.345	14.90532	EA/DM	F8V (1)
FV Vel*	GSC 7705 2098	10.81−12.20(10.89)	13418.774	1.52110	EA	
*	GSC 7705 1501	10.13−10.58(10.47)	12842.444	1.95847	EA	F5 (15)
NSV 00353*	HD 005513	9.51−9.92 (9.9:)*	11482.637	2.398	EA	A2V (36)
NSV 00651	GSC 3684 1954	12.24−12.7:(12.5:)*	11589.596	0.7961	EB	
NSV 00733	GSC 3289 0109	9.97−10.22(10.07:)*	11478.588	8.8695	EA	A0 (24)
NSV 01114*	GSC 3324 0639	11.32−11.80(11.8:)*	11455.805	4.50655	EA	B9 (14)
NSV 01652	GSC 4742 0018	13.23−14.2: (13.9)	13043.615	0.396604	EW/KW	
NSV 01668*	GSC 0094 0935	13.32−14.15(14.05:)	11609.717	1.188245	EA	
NSV 01677*	GSC 1830 0503	12.55−13.30(13.3:)	12661.589	2.04093	EA	
NSV 01687	GSC 8512 0414	11.45−12.12(11.7:)	13470.550	0.785242	EA	
NSV 02826*	HIP 028836	8.01−8.62 (8.16)	12939.825	10.3160	EA	A3(m)A7-A7 (3)
NSV 02850*	HD 042107	9.68−9.98:(9.97:)*	11464.843	1.9614	EA	A0 (33)
NSV 02889*		13.15−14.0:(13.9:)	11613.752	0.336611	EW:	
NSV 02962*	HD 288671	10.58−10.93(10.93)	12653.650	3.19669	EA	G0 (45)
NSV 03371	HD 053595	9.13−9.65: (9.14)	12776.580	123.21	EA	B5Vn (47)
NSV 03710*	GSC 0191 1523	12.86−13.45(13.45)	11629.654	4.01732	EA	
NSV 03754*	GSC 4531 0265	10.76−11.25(11.18)*	11589.757	0.255885	EW/KW	
NSV 04067*	GSC 6573 4986	11.73−13.0 (11.85)	13438.563	0.885933	EA	
NSV 04322	GSC 1950 1411	12.82−13.6 (13.5)	11603.767	2.35439	EA	
NSV 04537	GSC 6605 1593	13.55−14.6:(13.75)	11553.950	0.654531	EA	
NSV 04629*	HD 084482	9.14−9.7:(9.20)*	11284.615	3.28935	EA	G (24)
NSV 04881*	HIP 051425	6.19−6.36 (6.35)	8175.220	16.9330	EA	B4V (1)
NSV 04996*	GSC 8970 1236	10.90−11.30(11.3:)	11888.780	15.509	EA	
NSV 05154*	GSC 7206 1459	11.05−11.56(11.53:)	12406.540	4.67017	EA	
NSV 05435	HD 104649	8.09−8.18 (8.14)	12861.524	4.7470	EB	O9.5V (55)
NSV 05488*	GSC 7240 0891	12.85−13.5 (13.5:)	13068.750	3.10366	EA	
NSV 05504*	GSC 7236 0806	12.22−13.15:(12.3)	13108.757	2.34751	EA	
NSV 05648*	GSC 9412 0116	13.45−14.2 (−)	12638.790	3.0341	EA	
NSV 05849	GSC 7255 0127	13.65−14.3:(14.2:)	12736.810	0.51104	EB:	
NSV 06303*	GSC 3463 0561	10.92−11.40:(11.4:)*	11338.725	6.33448	EA	F7 (14)
NSV 06956*	HD 133766	7.80−8.30 (8.26:)	12705.750	28.877	EA	A9III/IV (1)
NSV 06989*	GSC 6178 0419	11.58−12.1 (11.63)	12095.567	2.44206	EA	
NSV 07164	GSC 6785 0001	13.1−13.7 (13.45)	13449.847	0.590394	EA	
NSV 07445*		13.4−14.5: (13.6)	12535.580	2.1315	EA	
NSV 07638	GSC 7344 0280	13.45−15.0:(13.65)	12521.630	3.35345	EA	
NSV 07730*	GSC 5626 0289	13.15−13.75:(13.35)	12749.804	0.424074	EB/KW	
NSV 07855	GSC 9278 0161	11.72−12.75(11.85)	12439.601	1.92834	EA	
NSV 07907*	GSC 9443 3629	12.31−12.64(12.45:)	13523.692	0.820805	EA:	
NSV 07931	GSC 5637 0258	13.75−14.35(14.35)	11352.790	0.479238	EW	
NSV 08010*	GSC 7371 0561	10.40−¡11.2(¡10.5)	11995.070	50.007	EA	
NSV 08017*	HD 152219	7.57−7.80 (7.73)	13182.567	4.24038	EA	O9.5IV (2)
NSV 08125*		13.37−14.2:(13.75)	13417.842	0.52382	EA:	
NSV 08194*	GSC 7869 0281	12.6−13.15 (13.1:)	13219.530	7.4158	EA	
NSV 08441*	GSC 5066 0736	12.15−12.6:(12.6:)	12720.838	0.43096	EW	
NSV 08472*	GSC 6237 0573	12.75−13.5 (13.5)	13544.686	3.3337	EA	
NSV 08486*	GSC 6241 0062	13.2−14.0: (13.9)	12841.670	1.87423	EA	
NSV 08629*	GSC 8736 1572	13.6−14.25:(13.8:)	12508.663	0.55277	EB:	
NSV 08766*	GSC 6235 2570	12.7−14.0:(12.85)	12756.768	1.70477	EA	
NSV 09542	GSC 8355 0968	11.41−12.0 (11.85)	13526.855	3.14535	EA	
NSV 09550	GSC 0997 0236	12.30−2.85:(12.40)	13077.904	3.3515	EA	
NSV 09637	GSC 0994 0998	12.57−13.2 (13.0)	11453.688	0.384055	EB/KW:	
NSV 09816*	GSC 6853 1925	12.43−13.1 (13.0:)	13263.542	4.4361	EA	
NSV 10161	GSC 8747 0760	13.5−14.15:(13.9:)	12548.610	0.96025	EA	
NSV 10993*	GSC 1032 1378	12.65−13.05(12.77)	11448.350	40.0	EA	
NSV 11107*	GSC 8745 1479	11.79−12.3 (12.28)	12739.824	3.45563	EA	

Table 1. New elements for 80 eclipsing binary stars.

Star Name		Magnitude range	Epoch	Period	Type	Spectral
Variable	Other ID	(V)	(HJD2440000+)	(days)		type
NSV 11441*	GSC 1034 0184	12.47−13.05(13.0:)	12888.602	3.63592	EA	A5 (45)
NSV 12008	GSC 1063 0905	13.15−14.0 (13.9:)	12868.547	0.396110	EW	
NSV 12699	GSC 1621 0052	13.2−14.0 (13.9)	12918.604	0.395831	EW	
NSV 13304*	GSC 0520 1197	12.51−13.5 (12.80)	12930.625	0.558654	EA	
NSV 13492	GSC 4247 0864	11.39−11.87(11.82)*	11481.644	2.5035	EA	
NSV 14149*	GSC 4476 0892	12.20−12.54(12.40)*	11426.642	0.62455	EB	
NSV 14288*	GSC 4277 0789	11.40−11.85(11.45)*	11338.882	1.25996	EA	
NSV 15208*	HD 005464	9.04−9.37 (9.33)	12627.610	0.439298	EW/KE	A2 (33)
NSV 15394	HIP 008472	8.45−8.63 (8.58)	8375.910	7.43367	EA	A2mA5-A7 (1)
NSV 16254*	SAO 131822	9.32−9.41 (9.36)	13085.591	0.533437	EB	F0 (24)
NSV 16801*	HD 043164	9.43−9.83 (9.70)	13517.483	2.23415	EA	F5/6IV/V (1)
NSV 17520*	HD 060941	9.13−9.65 (9.39)	12520.898	7.24816	EA	A0V (14)
NSV 19754*	CPD −61 3639	10.09−10.36(10.30)	13474.580	31.029	EA	B1Ia (47)
NSV 20056	HIP 069358	7.67−7.80 (7.72)	8433.960	2.67096	EB	B4/5III/IV (1)
NSV 20247	HD 133950	8.54−8.69 (8.61)	13419.846	1.66703	EA	F0V (3)
NSV 20263*	HIP 074348	8.94−9.05 (9.03)	12878.610	6.14395	EA	A1mA3-A6 (2)
NSV 20802*	HD 326320	9.77−10.19(10.07)	13478.825	1.317716	EA	B0V (45)
NSV 24327*	HIP 089218	8.40−8.55 (−)	12437.660	34.536	EA	O7.5If+O9I (60)
NSV 24452	HIP 090773	9.11−9.20 (9.12)	8528.814	5.64797	EA	F2IV (1)
NSV 24909*	HD 187601	8.78−8.96(¡0.01:)	11421.753	2.1774	EA	G5V (14)
NSV 25338*	HIP 102744	9.10−9.6: (−)	11995.160	20.8553	EA+SRD:	G6/G8III (2)
NSV 25881	HIP 110370	8.49−8.60 (8.60)	8367.865	3.69948	EA	F8 (33)
NSV 26112*	HIP 116475	8.81−8.93:(8.92:)	8077.581	10.28857	EA/DM	F7V (3)
V0392 Vul*	HIP 096228	9.82−10.18(10.02)	12888.570	1.351425	EB	B8 (9)

Sources of spectral type: (1) Houk and Cowley, 1975. (2) Houk, 1978. (3) Houk, 1982. (9) Nesterov et al., 1995. (14) Kholopov et al., 2004. (15) Spencer and Jackson, 1939. (24) Ochsenbein, 1980. (33) Cannon and Pickering, 1993. (36) Jaschek et al., 1964. (45) Skiff, 2005. (47) Jaschek, 1978. (55) Cruz-Gonzlez et al., 1974. (60) Pourbaix et al., 2004.

Notes on individual stars:

AL Dor = Eccentric system. Few eclipses recorded. Primary eclipse might be the secondary.

FV Vel = Wrong identification in the GCVS (GSC 7705 1243) and in Dvorak, 2003 (GSC 7705 1501). GCVS period (3.04228 d.) is wrong. The ASAS catalogue (Pojmanski, 2003) gives a period of 1.52117 days.

GSC 7705 1501 = Wrongly identified as FV Velorum in Dvorak (2003). The ASAS catalogue (Pojmanski, 2003) gives a period of 1.9585 days.

NSV 00353 = Primary eclipse might be the secondary.

NSV 01114 = L-type in the NSV catalogue (Kukarkin and Kholopov, 1982). Period might be half the value given.

NSV 01668 = Slightly eccentric system.

NSV 01677 = IN:-type in the NSV catalogue.

NSV 02826 = Very eccentric system.

NSV 02850 = S:-type in the NSV catalogue. Primary eclipse might be the secondary.

NSV 02889 = USNO A-2.0 1125-03672692 = 2MASS J06161279+2539556.

NSV 02962 = Primary eclipse might be the secondary.

NSV 03710 = Period might be half the value given. Primary eclipse might be the secondary.

NSV 03754 = Strong O'Connell effect. Max II = 10.86. L-type in the NSV catalogue.

NSV 04067 = S:-type in the NSV catalogue.

NSV 04629 = I-type in the NSV catalogue.

NSV 04881 = Eccentric system. Total eclipses.

NSV 04996 = Period might be half the value given. Primary eclipse might be the secondary.
NSV 05154 = RR-type in the NSV catalogue. Period might be half the value given.
NSV 05488 = Period might be half the value given. Primary eclipse might be the secondary. S-type in the NSV catalogue.
NSV 05504 = S-type in the NSV catalogue.
NSV 05648 = Period might be twice the value given.
NSV 06303 = Slightly eccentric system. S:-type in the NSV catalogue.
NSV 06956 = Eccentric system.
NSV 06989 = L-type in the NSV catalogue.
NSV 07445 = USNO-A2.0 0600-19625998 = 2MASS J16070488-2916480.
NSV 07730 = Amplitude reduced by light from nearby stars.
NSV 07907 = Might be EB-type. Slight O'Connell effect.
NSV 08010 = Lack of observations at mideclipse I and II.
NSV 08017 = In NGC 6231. Amplitude corrected for light contamination from nearby stars in ASAS data using the GCPD V-magnitudes (Mermilliod et al., 1997) as a reference. Spectroscopic periods of 4.1593 and 4.160 days listed in the SB9 catalogue (Pourbaix et al., 2004)
NSV 08125 = USNO-A2.0 0225-26840934 = 2MASS J17035968-6324356.
NSV 08194 = Period might be half the value given.
NSV 08441 = S-type in the NSV catalogue.
NSV 08472 = S-type in the NSV catalogue. Period might be half the value given. Primary eclipse might be the secondary.
NSV 08486 = Period might be half the value given. L-type in the NSV catalogue.
NSV 08629 = RR:-type in the NSV catalogue.
NSV 08766 = The period given in Otero (2003b) was twice the real value.
NSV 09816 = Period might be half the value given.
NSV 10993 = EW:-type in the NSV catalogue.
NSV 11107 = Period might be half the value given.
NSV 11441 = NSVS amplitude is reduced by light from nearby stars. S-type in the NSV catalogue.
NSV 13304 = S-type in the NSV catalogue. NSV position is wrong.
NSV 14149 = S-type in the NSV catalogue.
NSV 14288 = NSV position is wrong.
NSV 15208 = Visual binary. A= $9\overset{\mathrm{m}}{.}2$; B= $10\overset{\mathrm{m}}{.}8$ Hp. Sep. $1\overset{\prime\prime}{.}01$ (Perryman et al., 1997).
NSV 16254 = Strong O'Connell effect. Max II = 9.35.
NSV 16801 = Visual binary. A= $9\overset{\mathrm{m}}{.}7$; B= $11\overset{\mathrm{m}}{.}1$ Vt. Sep. $2\overset{\prime\prime}{.}16$ (Fabricius et al., 2002).
NSV 17520 = In NGC 2422.
NSV 19754 = Eccentric system.
NSV 20263 = Apsidal motion. Primary eclipse period given. Secondary eclipse period is 6.14416 d.
NSV 20802 = In NGC 6231.
NSV 24327 = Spectroscopic binary with period 34.54 d. in Pourbaix et al. (2004).
NSV 24909 = Period might be twice the value given with similar minima.
NSV 25338 = SRD period is 40.87 days with range $9\overset{\mathrm{m}}{.}1$ - $9\overset{\mathrm{m}}{.}3$ (V).
NSV 26112 = Eccentric system. Visual binary. A= $9\overset{\mathrm{m}}{.}1$; B= $11\overset{\mathrm{m}}{.}8$. Sep. $3\overset{\prime\prime}{.}0$ (Worley et al., 1997).
V0392 Vul = ACV: in the GCVS based on the Hipparcos catalogue that classifies it as ACV with a period of 0.67571 d.

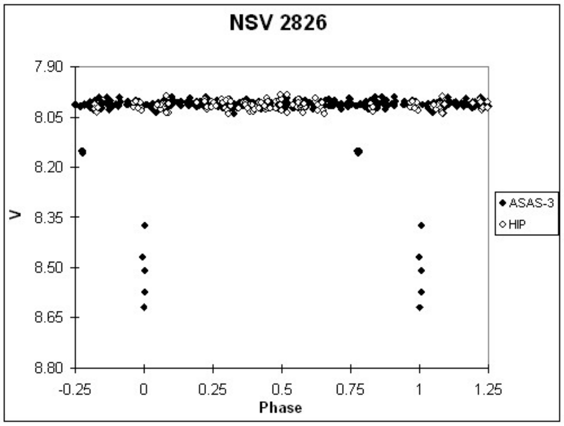

Figure 1. Light curve of NSV 2826 showing ASAS-3 and Hipparcos observations.

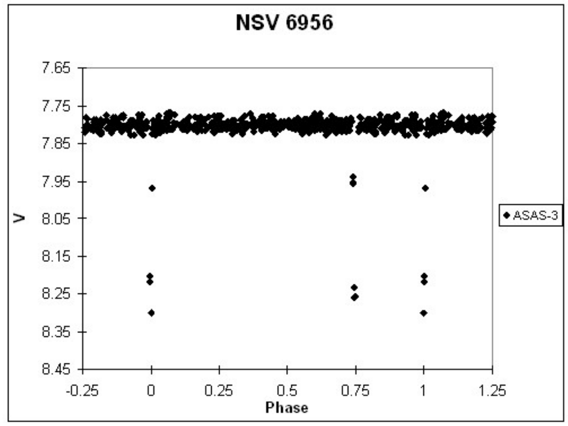

Figure 2. Light curve of NSV 6956 showing ASAS-3 observations.

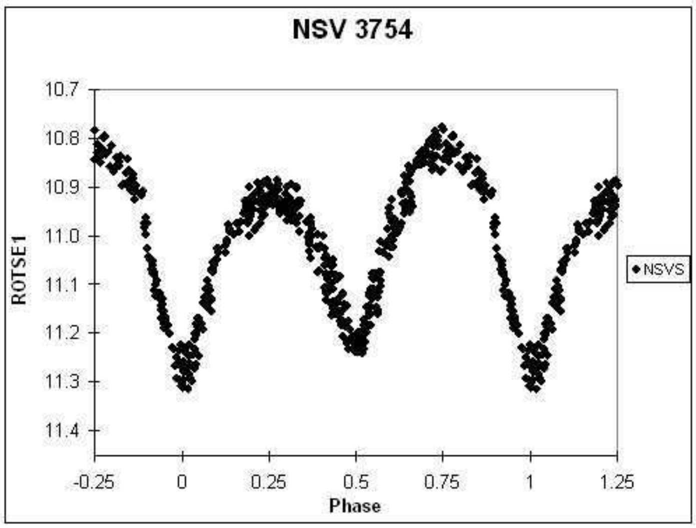

Figure 3. Light curve of NSV 3754 showing NSVS observations.

Acknowledgements:

The authors want to thank John Greaves for his collaboration and suggestions. This research has made use of the SIMBAD and VizieR databases operated at the Centre de Données Astronomiques (Strasbourg) in France and the data from the Northern Sky Variability Survey created jointly by the Los Alamos National Laboratory and University of Michigan. The NSVS was funded by US Department of Energy, the National Aeronautics and Space Administration and the National Science Foundation.

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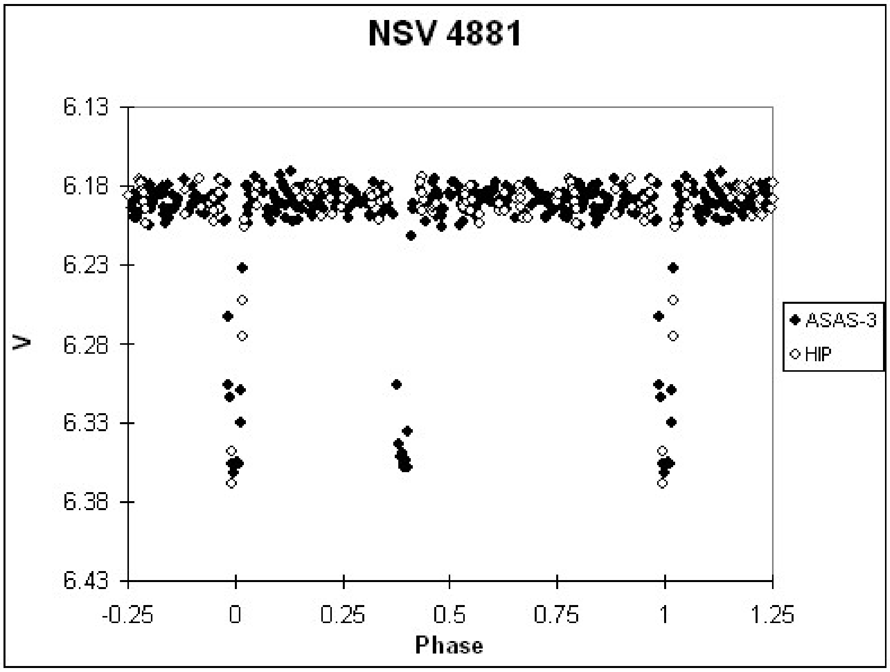

Figure 4. Light curve of NSV 4881 showing ASAS-3 and Hipparcos observations.

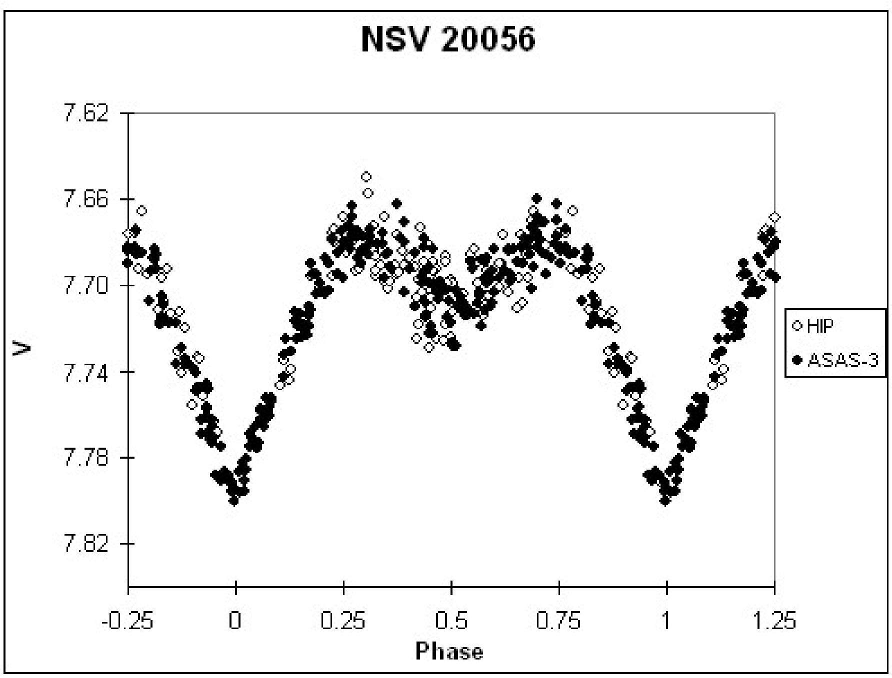

Figure 5. Light curve of NSV 20056 showing ASAS-3 and Hipparcos observations.

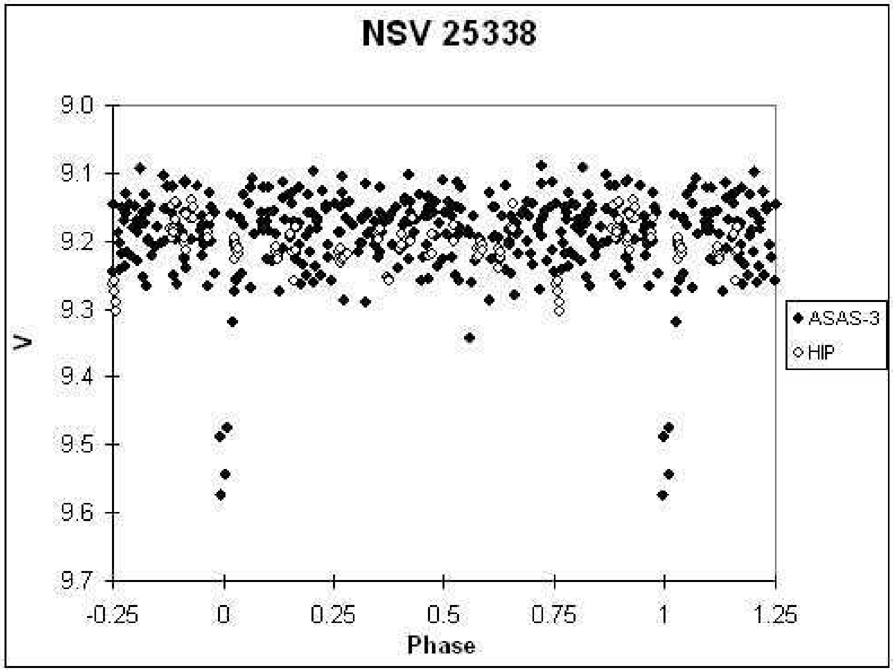

Figure 6. Light curve of NSV 25338 showing ASAS-3 and Hipparcos observations.

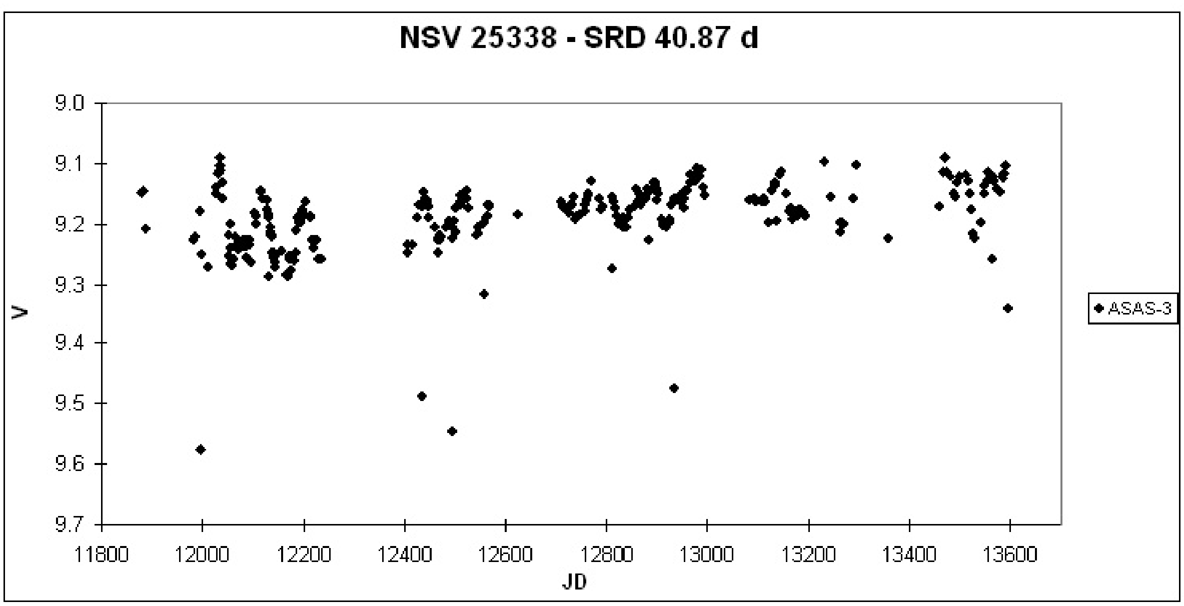

Figure 7. The semiregular light variability of NSV 25338 from ASAS-3 data.

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ERRATUM FOR IBVS 5586

The EA/RS: star NSV 16225 published as HIP 32218 is actually HIP 23385 = HD 32218.

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5645

Konkoly Observatory
Budapest
23 August 2005

HU ISSN 0374 – 0676

CCD TIMES OF MINIMA OF SEVERAL ECLIPSING BINARIES

PEJCHA, ONDŘEJ

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e-mail: pejcha@astro.sci.muni.cz

Observatory and telescope:
N. Copernicus Observatory and Planetarium in Brno – 16″ Newtonian telescope (f/1750 mm) (RL400) – 3″ refractor (f/340 mm) (RF80) Vyškov observatory (part of N. Copernicus Observatory and Planetarium in Brno) – 12″ Newtonian telescope (RL300)

Detector:	SBIG ST7 CCD camera (RL400 and RL300), binning 2×2 SBIG ST8 CCD camera (RF80), binning 2 × 2

Method of data reduction:
Reduction of the CCD frames was made with software packages Munipack and C-Munipack (Motl, 2004)

Method of minimum determination:
The minima times were computed using Kwee and van Woerden method as implemented in AVE (Barbera, 2000).

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
BX And	52930.4735	0.0012	I	R	RF80
EP And	52899.4831	0.0004	I	R	RF80
EP And	52902.5137	0.0003	II	R	”
GSC 2791-02148	53043.3273	0.0007	II	VRI	RL400; MisV1095
GSC 2791-02148	53266.4707	0.0004	II	VRI	”
GSC 2808-00139	52685.2892	0.0004	II	VI	RL400; MisV1097, see IBVS 5600
GSC 2791-01524	53250.4751	0.0013	II	RI	RL400; Pej 023, see IBVS 5700
GSC 2791-01524	53257.4751	0.0012	I	VRI	”
GSC 2791-01524	53266.3820	0.0011	I	VRI	”
GSC 5149-02845	52522.4432	0.0008	I	VRI	RL400; BrhV121, see IBVS 5318
GSC 5149-02845	52576.3098	0.0008	II	VRI	”
GSC2.2 N02013121751	53205.4431	0.0003	I?	I	RL400; Pej 024, see IBVS 5700
AC Boo	53164.4930	0.0008	I	VRI	RF80
FP Boo	52363.5663	0.0024	II	VRI	RL400
FP Boo	52364.5273	0.0009	I	VRI	”

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
LR Cam	52576.6711	0.0012	II	VRI	RL400; see Pejcha et al. (2005)
LR Cam	52640.4890	0.0005	II	VRI	”
LR Cam	52651.5594	0.0006	I	VRI	”
LR Cam	52930.4928	0.0008	II	VRI	”
LR Cam	53047.4936	0.0003	I	VRI	”
AI Cep	52863.4544	0.0007	II	RI	RF80
SS Com	53047.5191	0.0003	I	R	RF80
V388 Cyg	53183.4668	0.0019	I	VRI	RF80
V388 Cyg	53250.4722	0.0015	I	VRI	”
V388 Cyg	53253.4737	0.0014	II	RI	”
V442 Cyg	53209.5233	0.0018	II	VRI	RF80
V442 Cyg	53258.4358	0.0006	I	VRI	”
HD 332325	52885.5182	0.0025	II	RI	RF80
HD 332325	53203.4501	0.0013	I	RI	”
HD 332325	53217.4617	0.0019	II	RI	”
HD 332325	53250.4712	0.0037	II	VRI	”
GSC 2685-01453	53257.4795	0.0011	II	RI	RF80
GSC 2685-01453	53258.3987	0.0012	I	RI	”
GSC 4288-00186	52867.4505	0.0013	I	RI	RF80
GSC 2137-00222	52888.3824	0.0022	I	VI	RL400; Pej 018, see IBVS 5700
GSC 2137-00222	52889.3045	0.0008	II	VI	”
GSC 2137-00222	52902.3959	0.0005	I	VI	”
GSC 2137-00222	52907.3760	0.0006	II	VI	”
V338 Her	53258.3423	0.0003	I	R	RL400
V921 Her	52840.5150	0.0005	I	R	RF80
V921 Her	52862.4454	0.0013	I	RI	”
V1005 Her	52872.4222	0.0011	II?	VRI	RL300, with J. Kudrnáčová
GSC 3101-00683	53258.3739	0.0008	II	R	RL400; Pej 026, see IBVS 5699
EM Lac	53183.4501	0.0004	II	VRI	RL400
EM Lac	53225.4759	0.0003	II	VRI	”
GSC2.2 N030320055368	53253.4635	0.0002	I	C	RL400; Pej 025, see IBVS 5700
UX Peg	52907.5259	0.0009	I	R	RF80
II Per	52907.5611	0.0006	II	R	RL400
II Per	52996.3358	0.0014	I	VI	”
HW Vir	52395.4166	0.0001	II	R	RL400
IM Vul	52888.4438	0.0007	II	VI	RL400
IM Vul	52889.3503	0.0009	II	VI	”
IM Vul	52902.2978	0.0010	I	VI	”
IM Vul	52907.2951	0.0014	I	VI	”

Acknowledgements:

This investigation was supported by the Grant Agency of the Czech Republic, grant No. 205/04/2063.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5646

Konkoly Observatory
Budapest
24 August 2005

HU ISSN 0374 – 0676

PARTIAL ECLIPSES IN BR CYGNI

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BR Cygni ($\alpha_{2000} = 19^{\rm h}40^{\rm m}54\overset{\rm s}{.}7$, $\delta_{2000} = +46^\circ47'05''\!.6$, $V = 9.98$) is a classical Algol with a period of about 1.33 days. The SIMBAD database lists its spectral type as A3V and $B - V = 0.05 \pm 0.03$ from Tycho observations, a color consistent with the spectral type. Wehinger (1968) published photometry in yellow and blue filters that showed an odd dependence of the nature of the primary eclipse on wavelength. The yellow light curve showed an apparent totality that lasted approximately 38 minutes while the blue light curve exhibited a partial primary eclipse and Wehringer was unable to explain this unusual behavior. Koch et al. (1979) expressed surprise that no further study of the system had been done.

In order to explore this potentially unusual system, we began observing BR Cyg with BVR_cI_c filters at the Sonoita Research Observatory. We used the 0.35m telescope equipped with a Santa Barbara Instrument Group Research STL-1001XE CCD camera. Calibration (bias, dark, flat) and aperture photometry were done with IRAF.

Observations were made on eight nights in June 2005 with a total of 776 observations with the B filter, 742 in V, 737 in R_c and 738 in I_c. GSC 3556-3216 ($B-V = 0.03 \pm 0.03$ from Tycho) was used as the comparison star. The standard deviation of individual measurements in each filter was about 0.01 magnitudes. The instrumental differential magnitudes for BR Cyg are available from the IBVS web site as 5646-t2.txt (B), 5646-t3.txt (V), 5646-t4.txt (R_c) and 5646-t5.txt (I_c).

Inspection of Figure 1 shows that the primary eclipse is partial in all filters. The light curves show no indications of the odd morphology seen in the Wehinger (1968) data. BR Cyg thus appears to be a normal Algol with the typical small night-to-night variability most likely related to mass transfer from the lobe-filling secondary component. We see no evidence of pulsations (with amplitude greater than the 1% precision of our photometry) as seen in some other Algols (e.g. IU Per observations by Kim, et al., 2005).

We analyzed our observations with the 2003 version of the Wilson-Devinney program (WD; Wilson & Devinney, 1971; Wilson, 1979). The analysis must be viewed as preliminary since the eclipses are partial and we have no radial velocity from which to determine the mass ratio, which is only weakly constrained by the photometry (Terrell & Wilson, 2005). Initial experiments showed that the light curve fits required the secondary to fill its Roche lobe, so we used WD's mode 5 and adjusted the parameters shown in Table 1. We set the mean effective temperature of star 1 (the star eclipsed at primary minimum) equal to 8900 K based on the $B-V$ value and the calibration of Flower (1996). Unadjusted parameters such as the gravity darkening exponents and bolometric albedos were set to their theoretically expected values for radiative and convective envelopes for the primary and secondary respectively. Limb darkening coefficients for the logarithmic limb darkening law were interpolated from the Van Hamme (1993) tables.

Figure 1 shows the fits to the observations. The errors in Table 1 are the formal errors from the differential corrections solution and are probably too optimistic given the actual uncertainty in the mass ratio. The error estimate for T_2 is more correctly interpreted as the error in $T_1 - T_2$ as the assumption of fixing T_1 based on the $B-V$ value involves an uncertainty of the order of 300 K. A spectroscopic study of the system is needed before further progress can be made.

Table 1. Adjusted Parameters for the Light Curve Solution

Parameter	Value	Std. Error†
i	81°.87	0°.04
T_2	5698 K	5 K
q	0.532	0.003
Ω_1	3.872	0.008
HJD_0	2452501.0124	0.0004
P	1.d3327286	0.d0000006
$L_1/(L_1+L_2)_B$	0.905	0.001
$L_1/(L_1+L_2)_V$	0.840	0.001
$L_1/(L_1+L_2)_{R_c}$	0.791	0.001
$L_1/(L_1+L_2)_{I_c}$	0.738	0.001

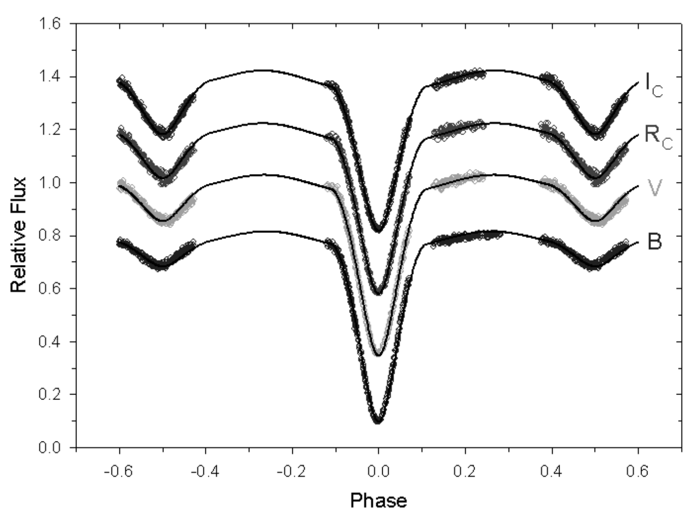

Figure 1. BVR_cI_c light curves of BR Cyg and the fits from the Wilson-Devinney solution.

†Formal errors from the differential corrections solution.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5647

Konkoly Observatory
Budapest
2 September 2005

HU ISSN 0374 – 0676

NEW PHOTOMETRY OF THE roAp STAR 33 Lib

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While photometry has been successful for discovering roAp stars and studying their frequency spectra, it is now clear that high resolution spectroscopy is a superior tool for these purposes, and for other purposes out of the reach of photometry. In a high-resolution spectroscopic survey of roAp stars, Kurtz, Elkin & Mathys (2005a) have shown that radial velocity variations of lines of the Rare Earth ion Pr III show amplitude modulation on time scales shorter than 2 hr. In the amplitude spectra this appears as new frequencies that are not known from previous photometric studies.

The first star showing such a new frequency was 33 Lib. The principal frequency at $\nu_1 = 2.015$ mHz and its harmonic are well-known in this star from both photometric studies (e.g., Kurtz 1991) and spectroscopic studies (Mkrtichian et al. 2003). Kurtz Elkin & Mathys (2005b) discovered the presence of another frequency at $\nu_2 = 1.769$ mHz with an amplitude 60% of the amplitude of the principal frequency ν_1, yet this frequency is clearly and definitely not visible in the earlier photometry, as shown in Figure 2 of Kurtz (1991).

The photometric observations of Kurtz (1991) and the spectroscopic observations of Kurtz, Elkin & Mathys (2005b) are separated by 17 yr, and roAp stars are known to have mode lifetimes shorter than this in some cases. For example, Kreidl et al. (1991) found a significant new pulsation frequency for the roAp star HD 217522, in data obtained in 1989, that was definitely not present at high precision in data obtained in 1982. This possibility is low for 33 Lib because we have two decades of data for the star with no evidence of ν_2. However, to check this more carefully we obtained a new light curve 75 d after the spectroscopic data were obtained. While this is not simultaneous, it is close in time, given the lack of changes to its frequency spectrum over the two decades of photometric observations that we already had, and it brings the photometric observations up to date.

33 Lib was observed with the South African Astronomical Observatory 0.75-m telescope and University of Cape Town Photometer on 2004 May 5 for a total of 5.1 hr through a Johnson B filter using 10-s integrations. The data were corrected for dead time losses, sky was subtracted and extinction corrections were made. Fig. 1 shows the amplitude spectrum for this light curve. There is no evidence of $\nu_2 = 1.769$ mHz.

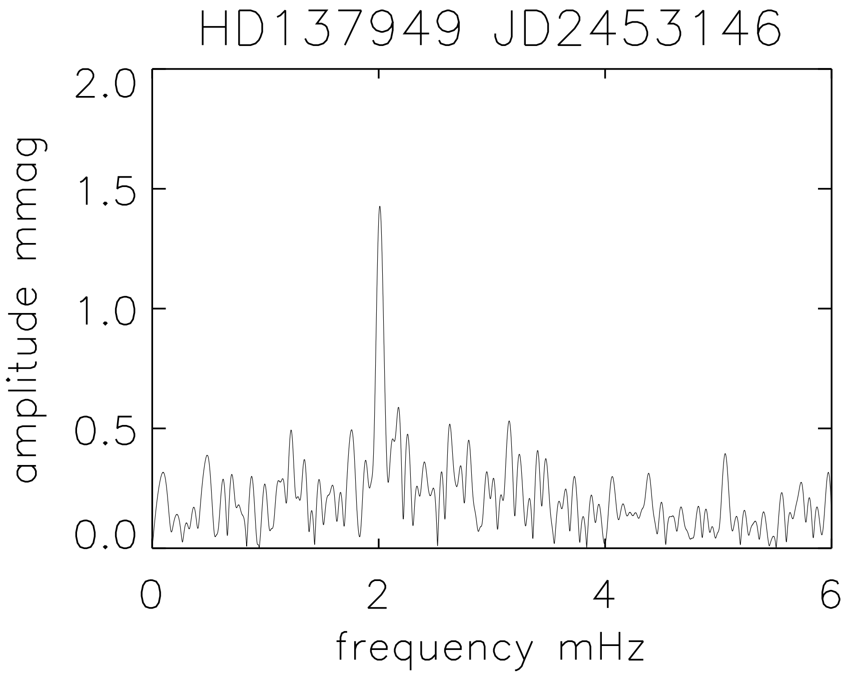

Figure 1. The amplitude spectrum of the *B* photometric variations for a 5.1-hr light curve obtained on 2004 May 20/21. If $\nu_2 = 1.769$ mHz were present at the same relative amplitude that is seen in the photometry, it would have an amplitude here of 0.9 mmag.

We conclude that the photometry is not sensitive to ν_2, whereas it can be seen in the amplitude spectra of radial velocity variation in the Rare Earth element lines. Kurtz, Elkin & Mathys (2005b) discuss two possible explanations for this: One is that there are modes that have detectable amplitude high in the atmosphere where the Rare Earth element lines form, but not lower in the atmosphere where continuum variations give rise to the broad-band photometric variations. The other is that there is short time-scale growth and decay of pulsation amplitude high in the atmosphere that gives rise to amplitude modulation of the radial velocity curves of the Rare Earth element lines, but that the amplitudes are more stable lower in the atmosphere where the photometric observations are sampling.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5648

Konkoly Observatory
Budapest
8 September 2005

HU ISSN 0374 – 0676

ERRATUM: "A HIGH-RESOLUTION SPECTRUM OF THE TrES-1 PARENT STAR"

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In a previous IBVS note (Strassmeier & Rice 2004; IBVS 5566; Oct. 2004) we presented a single high-resolution (R=120,000) spectrum of the parent star of the TrES-1 planet in a 10nm wide wavelength region centered at the lithium region at 671nm. Our intentions were to determine the lithium abundance of the host star and to obtain an accurate value of its rotational line broadening. As a by product, we found an iron abundance of –0.6dex compared to the most recent solar value. In the meantime, Sozzetti et al. (2004) also published a high-resolution spectrum of TrES-1 ($R \approx$60,000) but obtained a solar abundance of [Fe/H]≈0.00, in agreement with an earlier note in Alonso et al. (2005) but in strong disagreement with our value.

Due to a data-reduction error during the combination of our five individual TrES-1 spectra, our combined spectrum appeared with spectral lines too shallow by 50% and left its analysis faulty. After a complete re-reduction of the individual and the combined TrES-1 spectra, this error did not appear again and its line depths were produced correctly. We have then repeated the analysis described in our previous note and confirm our earlier non-detection of the lithium line at 670.8nm and the $v \sin i$ value of 2.8±0.2 (rms) km s^{-1}. The best fit to the Fe I 670.356-nm line (Fig. 2 in the previous note) was now achieved with an iron abundance of 7.46±0.04 though (on the $\log n$(H)=12.00 scale), in very good agreement with the [Fe/H]=0.00±0.09 value put forward by Sozzetti et al. (2004). Fig. 1 shows a new plot of the lithium region that gives the correct line depth of our TrES-1 spectrum. This figure replaces the one in IBVS 5566. Fig. 2 in IBVS 5566 is obsolete.

We apologize for any inconveniences and confusions this may have caused.

Name of the object:
TrES-1, GSC02652-01324

Equatorial coordinates:	**Equinox:**
R.A.= $19^h04^m09\overset{s}{.}8$ **DEC.=** $+36°37'58''$	2000

Observatory and telescope:
3.6m Canada-France-Hawaii telescope (CFHT), Gecko spectrograph

Detector:	EEV2 CCD 2048×4600, 13.5μm pixels, –113°C cooled.

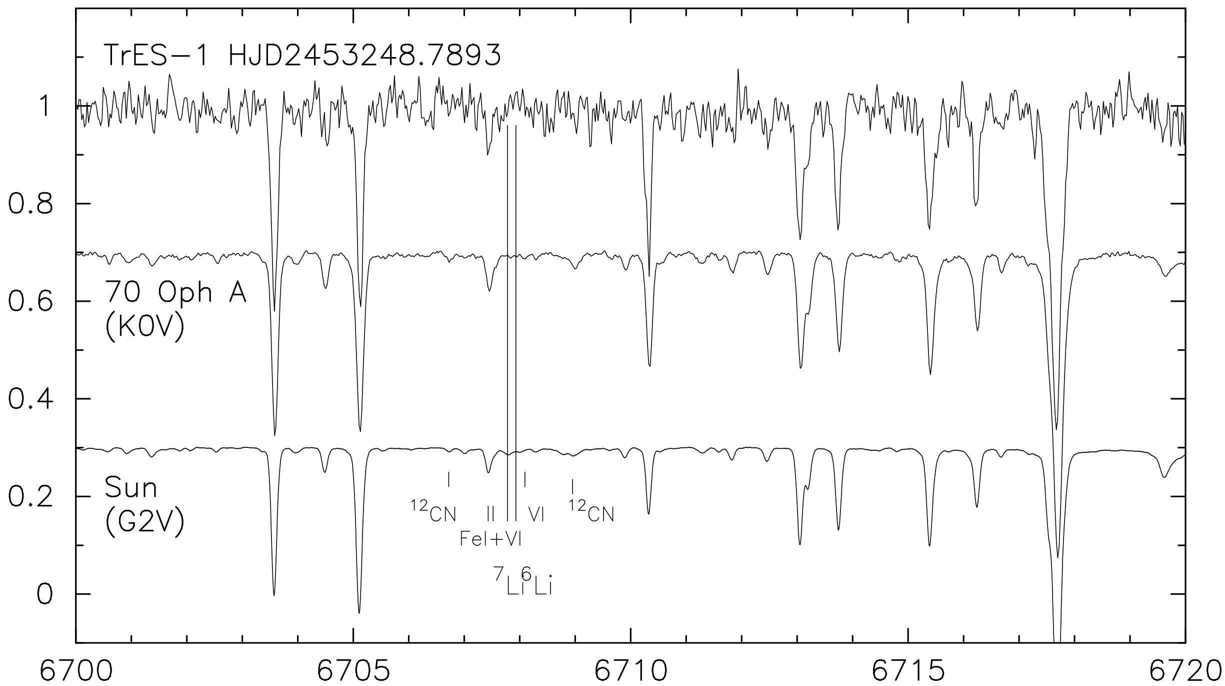

Figure 1. R=120,000 spectrum of the lithium region of the TrES-1 parent star (top). The other spectra are comparisons and arbitrarily shifted. Middle spectrum: the K0V-standard star 70 Oph(A) obtained with the same equipment. Lower spectrum: a R=600,000 spectrum of the Sun.

Date(s) of the observation(s):
2004.08.31; UT

References:

Alonso R., Brown T. M., Torres G. et al., 2004, *ApJ*, **613**, L153
Sozzetti A., Yong D., Torres G. et al., 2004, *ApJ*, **616**, L167
Strassmeier K. G., Rice J. B., 2004, *IBVS*, 5566

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5649

Konkoly Observatory
Budapest
15 September 2005

HU ISSN 0374 – 0676

PHOTOELECTRIC MINIMA OF SOME ECLIPSING BINARY STARS

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Observatory and telescope:
30-cm Maksutov telescope of the Ankara University Observatory

Detector:	OPTEC SSP-5A photoelectric photometer (uncooled) containing a side-on R1414 Hamamatsu photomultiplier.

Method of data reduction:
Reduction of the observations were made in the usual way (Hardie, 1962).

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
BX And	53323.3856	0.0004	I	UBV	Ylk-Mh
V376 And	53314.3346	0.0005	I	UBV	Trh-Ul
	53315.5360	0.0006	II	UBV	Tpr-Öy
AH Aur	53410.2834	0.0002	I	BV	Özg-Kh
	53417.4468	0.0003	II	BV	Alp-Ul
AP Aur	53357.5220	0.0002	I	BV	Bş-Krc
AR Aur	53301.4462	0.0003	II	BV	Cv-Pk
	53303.5133	0.0001	I	BV	Km-Ak
V410 Aur	53345.5570	0.0003	II	BV	Çn-Ev
CK Boo	53494.4546	0.0007	I	BV	Kcz-Çtn
	53495.3439	0.0006	II	BV	Klç-Yld
	53509.3735	0.0002	I	BV	Öz-Klç
TY Boo	53464.4958	0.0006	II	BV	At-Ev
	53501.4419	0.0003	I	BV	Çrk-Çtn
	53529.3498	0.0003	I	BV	Şn-Şh
TZ Boo	53120.5147	0.0005	II	UBV	Elm-Çn
	53128.3863	0.0005	I	BV	Alp-Krc
	53128.5385	0.0006	II	BV	Alp-Çrk
	53146.5148	0.0005	I	BV	Pk-Cv
	53448.4305	0.0002	I	BV	Ylk-Kh
	53501.3236	0.0006	I	BV	Çrk-Çtn
DK Cyg	53605.3969	0.0014	I	BV	Sğ-Özy
	53614.3416	0.0007	I	BV	Klç-Öz

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
GO Cyg	53198.4772	0.0003	II	UBV	Elm-Çn
	53253.3879	0.0003	I	UBV	Özy-Mh
	53271.3315	0.0003	I	UBV	Özy-Sk
	53284.2532	0.0004	I	UBV	Alp-Krc
V477 Cyg	53598.3317	0.0030	I	BV	Er-Sğ
V836 Cyg	53277.2944	0.0003	I	BV	Ok-Tn
V2150 Cyg	53580.3590	0.0009	I	BV	Uğ-Bk
BI CVn	53451.3784	0.0013	I	UBV	Gr-Dğn
BO CVn	53545.3509	0.0004	I	BV	Kb, Ky
LS Del	53302.2526	0.0005	I	UBV	Ky-Bng
	53303.3418	0.0007	I	UBV	Çkr-Ul
	53304.2501	0.0006	II	UBV	Dğn-Sğ
	53613.3409	0.0004	I	BV	Kcz-Şh
YY Eri	53310.4827	0.0002	I	UBV	Çn-Şnr
AK Her	53545.4387	0.0003	II	BV	Ky, Kb
HS Her	53601.3902	0.0006	I	BV	Öz-Bk
SW Lac	53280.4472	0.0002	I	UBV	Tpr-Ok
	53290.3892	0.0002	I	UBV	Ylm-Yld
	53298.4072	0.0002	I	UBV	Ak-Kb
	53322.3002	0.0004	II	BV	Tn-Ok
AM Leo	53403.4847	0.0006	II	BV	Elm-Alp
	53411.5311	0.0001	II	UBV	Gr-Şnr
	53442.2609	0.0002	II	UBV	Sp-Tn
	53442.4431	0.0004	I	UBV	Sp-Kb
AP Leo	53453.4048	0.0009	I	BV	Özy-Alt
UV Leo	53096.3212	0.0002	II	UBV	Tr-Ylk
	53102.3214	0.0003	II	UBV	Alp-Krc
	53120.3254	0.0003	II	BV	Er-Ky
	53382.5637	0.0001	II	UBV	Özg-Krc
	53383.4648	0.0003	I	UBV	Bng-Öz
XZ Leo	53379.5708	0.0001	II	UBV	Er-Kb
SW Lyn	53375.5356	0.0001	I	UBV	Elm-Krc
V502 Oph	53500.5220	0.0009	I	BV	Şh-Alt
	53524.3252	0.0004	II	BV	Uğ-Tp
V839 Oph	53512.5330	0.0003	II	BV	Tp-Ky
	53538.5006	0.0001	I	BV	Bş-Mh
DI Peg	53236.4400	0.0001	I	UBV	Öz-Şnr
V357 Peg	53607.4567	0.0003	I	UBV	Klç-Öz
CF Tau	52972.4836	0.0005	II	BV	Trh-Yld
	52979.3728	0.0007	I	BV	Bş-Mh
	53311.4615	0.0007	II	BV	Gr-Şnr
V781 Tau	53380.2863	0.0003	I	BV	Dğn-Alt
AH Vir	53487.3591	0.0002	I	BV	Er-Kb
ER Vul	53571.3715	0.0003	II	BV	Bş-Çkr
	53572.4200	0.0004	I	BV	Trh-Klç
	53573.4642	0.0005	II	BV	Tp-Ky
Z Vul	53184.5456	0.0002	I	BV	Çn-Ev

Explanation of the remarks in the table:
Observers: Ak: O. Aksu, Alp: I. Alpay, Alt: S. Altıntop, At: Ö. Atlagan, Bk: M. Bakırcı, Bş: Ö. Baştürk, Bng: F. Bingöl, Cv: E. Civelek, Çtn: E. Çetin, Çn: D. Çınar, Çrk: C. Çırakoğlu, Çkr: D. Çoker, Dğn: G. Doğan, Elm: A. Elmaslı, Er: İ. Ergün, Ev: B. Evin, Gr: G. Gürkan, Kb: Ö. Kabadayı, Kh: A. S. Kahraman, Ky: F. Kaya, Klç: T. Kılıçoğlu, Krc: M. Kırca, Kcz: S. Kocazeybek, Km: S. Kösemen, Mh: B. Mahmutoğlu, Ok: A. Okan, Öz: İ. Özavcı, Özg: E. Özgür, Öy: Ö. Yılmaz, Özy: D. Özuyar, Pk: E. Peker, Sğ: U. Sağır, Sk: S. Sakallı, Sp: S. Sipahioğlu, Şh: C. R. Şahin, Şn: H. V. Şenavcı, Şnr: H.T. Şener, Tn: T. Tanrıverdi, Tp: S. Topal, Tpr: S. Toprakçı, Tr: E. Törün, Trh: B. Turhanoğlu, Uğ: B. Uğurluoğlu, Ul: C. Uluğ, Ylk: K. Yelkenci, Yld: Y. Yıldıran, Ylm: M. Yılmaz

Acknowledgements:

This work was supported by the research fund of the Ankara University with the project number: 2004-07-05-089. Also we would like to thank to all observers at Ankara University Observatory.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5650

Konkoly Observatory
Budapest
15 September 2005

HU ISSN 0374 – 0676

THE GEOS RR Lyr SURVEY

Third list of maxima of RR Lyr stars observed by the automated telescope TAROT

(GEOS Circular RR 25)

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We present here the third list of light maxima of RR Lyrae stars from the GEOS RR Lyr Survey, a GEOS program (`http://www.upv.es/geos/`) (Boninsegna et al., 2002) of automated observations of RR Lyr stars started in January 2004. We are using the 25cm automatic telescope TAROT (`http://tarot.obs-hp.fr`) (Boër et al., 2001, Bringer et al., 1999) located in Calern Observatory (Observatoire de la Côte d'Azur, Nice University, France). The aim of this legacy project for the study of period variations of RR Lyr stars is to monitor maxima of light of these stars in order to feed the GEOS RR Lyr web database (`http://www.ast.obs-mip.fr/people/leborgne/dbRR`).

The present list contains 179 maxima observed with no filter between January and June 2005 (Table 1). The maxima are determined by fitting a polynomial function on the data points. The uncertainties on individual maxima are estimated from the data sampling of each maximum. The nominal sampling (two consecutive measurements taken every 10 minutes on a time baseline of 2 hours centered around the predicted maximum time) may be altered by local events (weather or telescope operation). This results uncertainties from 0.002 to 0.010 day. For a well observed star, the mean uncertainty on maxima is about 0.003 day (4.3 minutes). The $O-C$'s are computed with the GCVS elements (Kholopov et al. 1985) and are displayed in table 1 in column "$O-C$". When no elements are available in the GCVS, the reference of the elements is given as a footnote of Table 1.

Table 1: maxima of RR Lyrae stars

Variable	Maximum HJD 24...	$O-C$ (days)	E	Variable	Maximum HJD 24...	$O-C$ (days)	E
V921 Aql	53540.584±0.010	−0.215	36949.	S Com	53494.433±0.003	−0.092	21889.
BH Aur	53378.534±0.006	0.000	23300.	ST Com	53486.520±0.005	−0.029	17134.
RS Boo	53421.595±0.005	0.010	30877.	ST Com	53492.515±0.004	−0.024	17144.
RS Boo	53463.481±0.002	0.011	30988.	TV CrB	53461.509±0.005	0.020	37363.
RS Boo	53472.536±0.005	0.010	31012.	TV CrB	53482.563±0.005	0.028	37399.
RS Boo	53480.455±0.002	0.005	31033.	TV CrB	53478.467±0.003	0.025	37392.
RS Boo	53486.495±0.003	0.008	31049.	TV CrB	53495.421±0.004	0.025	37421.
RS Boo	53489.512±0.002	0.006	31057.	TV CrB	53516.464±0.005	0.022	37457.
RS Boo	53494.416±0.004	0.005	31069.	UY Cyg	53539.439±0.004	0.054	55476.
RS Boo	53529.513±0.002	0.009	31162.	XZ Cyg	53524.473±0.004	0.228	20141.
RS Boo	53532.527±0.003	0.004	31171.	DM Cyg	53542.494±0.004	0.063	26103.
ST Boo	53488.458±0.002	0.086	55130.	DM Cyg	53550.467±0.002	0.058	26123.
ST Boo	53511.469±0.002	0.073	55167.	V939 Cyg [2]	53524.403±0.002	0.011	9640.
ST Boo	53516.448±0.002	0.073	55174.	RW Dra	53464.511±0.002	0.145	31804.
ST Boo	53521.421±0.003	0.068	55183.	RW Dra	53480.482±0.002	0.171	31841.
ST Boo	53529.511±0.003	0.068	55196.	RW Dra	53487.580±0.005	0.182	31857.
ST Boo	53539.473±0.004	0.074	55212.	RW Dra	53495.548±0.003	0.178	31875.
ST Boo	53544.437±0.003	0.059	55220.	RW Dra	53511.465±0.005	0.150	31911.
TW Boo	53417.591±0.002	−0.042	49836.	RW Dra	53515.455±0.005	0.153	31920.
TW Boo	53440.475±0.004	−0.045	49879.	RW Dra	53542.480±0.002	0.160	31981.
TW Boo	53448.457±0.002	−0.048	49894.	RW Dra	53546.456±0.002	0.150	31990.
TW Boo	53457.504±0.005	−0.049	49911.	RW Dra	53550.437±0.007	0.145	31999.
TW Boo	53464.429±0.005	−0.044	49924.	SU Dra	53417.416±0.003	0.038	14408.
TW Boo	53489.444±0.003	−0.046	49971.	SU Dra	53442.524±0.005	0.050	14446.
TW Boo	53514.462±0.005	−0.044	50018.	SW Dra	53472.516±0.010	0.046	47831.
TW Boo	53522.442±0.005	−0.049	50033.	XZ Dra	53522.417±0.005	−0.082	24332.
TW Boo	53539.480±0.003	−0.043	50065.	XZ Dra	53540.511±0.005	−0.095	24370.
UY Boo	53448.577±0.010	0.007	17843.	XZ Dra	53542.418±0.005	−0.094	24374.
UY Boo	53450.529±0.004	0.007	17846.	BK Dra	53489.531±0.003	−0.152	47234.
UY Boo	53463.540±0.002	0.001	17866.	BK Dra	53521.503±0.003	−0.152	47288.
UY Boo	53478.510±0.008	0.002	17889.	BK Dra	53524.466±0.005	−0.149	47293.
TT Cnc	53442.444±0.005	0.083	23956.	BK Dra	53527.420±0.005	−0.156	47298.
EZ Cnc [1]	53385.438±0.010	−0.031	11418.	BT Dra	53437.429±0.005	−0.007	38566.
W CVn	53438.552±0.002	−0.122	58062.	BT Dra	53457.448±0.010	−0.003	38600.
W CVn	53448.481±0.002	−0.125	58080.	BT Dra	53464.505±0.002	−0.010	38612.
W CVn	53464.479±0.004	−0.128	58109.	BT Dra	53467.446±0.005	−0.013	38617.
W CVn	53491.520±0.003	−0.123	58158.	BT Dra	53474.509±0.002	−0.014	38629.
Z CVn	53463.393±0.010	0.241	22226.	BT Dra	53487.465±0.003	−0.009	38651.
Z CVn	53474.508±0.003	0.241	22243.	BT Dra	53490.405±0.002	−0.012	38656.
Z CVn	53491.504±0.005	0.238	22269.	BT Dra	53510.424±0.005	−0.008	38690.
RU CVn	53464.370±0.010	0.191	33111.	RR Gem	53387.458±0.004	0.085	30279.
RU CVn	53488.445±0.004	0.190	33153.	RR Gem	53408.505±0.003	0.075	30332.
RU CVn	53496.469±0.003	0.188	33167.	TW Her	53482.462±0.002	−0.011	79923.
RZ CVn	53489.451±0.002	−0.178	23168.	TW Her	53492.456±0.004	−0.007	79948.
RZ CVn	53527.461±0.003	−0.185	23235.	TW Her	53502.448±0.005	−0.005	79973.
SS CVn	53478.431±0.005	0.150	28955.	TW Her	53518.428±0.003	−0.009	80013.
SS CVn	53488.497±0.002	0.168	28976.	TW Her	53522.422±0.005	−0.011	80023.
SS CVn	53490.411±0.002	0.167	28980.	VX Her	53480.478±0.002	0.073	69679.
SS CVn	53521.515±0.003	0.168	29045.	VX Her	53490.492±0.004	0.068	69701.
SS CVn	53522.468±0.004	0.164	29047.	VX Her	53495.502±0.003	0.069	69712.
SS CVn	53532.512±0.005	0.159	29068.	VX Her	53521.464±0.005	0.075	69769.
UZ CVn	53388.547±0.005	0.231	38638.	VX Her	53526.466±0.004	0.068	69780.
AA CMi	53415.450±0.005	0.041	35352.	VZ Her	53502.489±0.004	0.065	37956.
S Com	53440.469±0.010	−0.089	21797.	VZ Her	53532.428±0.003	0.062	38025.
S Com	53467.454±0.005	−0.088	21843.	VZ Her	53539.471±0.003	0.060	38041.
S Com	53474.492±0.004	−0.089	21855.	VZ Her	53543.434±0.005	0.060	38050.
S Com	53491.498±0.005	−0.094	21884.	VZ Her	53550.481±0.002	0.062	38066.

Table 1 (cont.): maxima of RR Lyrae stars

Variable	Maximum HJD 24...	$O-C$ (days)	E	Variable	Maximum HJD 24...	$O-C$ (days)	E
AR Her	53532.439±0.004	−0.218	25697.	AN Ser	53525.500±0.004	0.003	74351.
V698 Her	53521.505±0.010	0.100	27955.	AV Ser	53518.485±0.002	0.124	51635.
RR Leo	53438.581±0.002	0.069	22421.	RU Sex [3]	53441.426±0.010	0.021	30908.
RR Leo	53443.555±0.005	0.066	22432.	RV UMa	53466.525±0.007	0.102	17927.
RR Leo	53463.460±0.002	0.066	22476.	RV UMa	53474.478±0.004	0.098	17944.
RX Leo	53441.551±0.008	0.086	26224.	RV UMa	53518.474±0.002	0.097	18038.
RX Leo	53458.544±0.005	0.091	26250.	TU UMa	53441.483±0.004	−0.026	19026.
RX Leo	53492.517±0.006	0.086	26302.	TU UMa	53461.558±0.003	−0.027	19062.
RX Leo	53494.478±0.006	0.087	26305.	TU UMa	53475.501±0.003	−0.025	19087.
ST Leo	53379.589±0.004	−0.017	53257.	TU UMa	53494.459±0.003	−0.028	19121.
AX Leo	53408.525±0.005	−0.036	38749.	ST Vir	53467.562±0.004	0.039	30989.
V LMi	53379.519±0.002	0.029	62232.	ST Vir	53472.492±0.005	0.039	31001.
V LMi	53415.415±0.005	0.027	62297.	ST Vir	53488.524±0.003	0.049	31040.
TW Lyn	53442.529±0.004	0.049	17474.	UV Vir	53437.510±0.005	0.016	22901.
RZ Lyr	53487.484±0.002	−0.010	24067.	UV Vir	53474.484±0.004	0.004	22964.
RZ Lyr	53529.416±0.004	0.000	24149.	AF Vir	53475.504±0.004	−0.091	27166.
AW Lyr	53514.535±0.002	0.039	56655.	AF Vir	53490.505±0.002	−0.087	27197.
AW Lyr	53526.484±0.010	0.049	56679.	AF Vir	53491.474±0.004	−0.085	27199.
CN Lyr	53514.550±0.005	0.020	21946.	AF Vir	53492.441±0.004	−0.086	27201.
CN Lyr	53510.436±0.003	0.020	21936.	AT Vir	53438.554±0.002	−0.239	26171.
CN Lyr	53540.468±0.004	0.021	22009.	AT Vir	53448.547±0.004	−0.236	26190.
CN Lyr	53542.520±0.005	0.016	22014.	AT Vir	53467.475±0.005	−0.237	26226.
CR Lyr	53510.417±0.005	−0.004	48135.	AT Vir	53487.452±0.002	−0.240	26264.
CR Lyr	53542.489±0.004	−0.005	48200.	AV Vir	53436.556±0.007	0.019	18216.
IO Lyr	53511.407±0.002	−0.024	24072.	AV Vir	53461.519±0.003	0.019	18254.
IO Lyr	53515.446±0.003	−0.025	24079.	AV Vir	53490.416±0.002	0.012	18298.
V340 Lyr	53529.419±0.010	−0.033	40419.	BB Vir	53442.576±0.002	0.233	29354.
V445 Oph	53502.500±0.003	0.021	65384.	BB Vir	53467.546±0.003	0.235	29407.
V445 Oph	53529.499±0.003	0.022	65452.	BN Vul	53521.495±0.006	0.058	13450.
AN Ser	53478.513±0.002	0.002	74261.	BN Vul	53524.475±0.005	0.068	13455.
AN Ser	53489.475±0.002	0.001	74282.	BN Vul	53540.508±0.005	0.059	13482.
AN Ser	53524.455±0.005	0.002	74349.	BN Vul	53543.477±0.003	0.057	13487.

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1 Boninsegna, 1990
2 Agerer and Moschner, 1996
3 Williams, 1993

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5651

Konkoly Observatory
Budapest
5 October 2005

HU ISSN 0374 – 0676

A PHOTOMETRIC NULL RESULT IN THE SEARCH FOR PULSATIONS OF THE LUMINOUS RAPIDLY OSCILLATING Ap STAR HD 116114

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The rapidly oscillating Ap (roAp) stars are cool, magnetic, chemically peculiar A-type stars that pulsate with periods in the range of $5.6 - -21$ min and Johnson B semi-amplitudes < 0.008 mag. These oscillations are caused by global p-mode pulsations of low spherical degree ($\ell < 3$) and high radial overtones ($n \gg \ell$). Because they show multiperiodic oscillations, the roAp stars are good targets for the application of the techniques of asteroseismology. For instance, by comparing the observed frequency spectrum to asymptotic pulsation theory it is possible to determine their absolute magnitudes.

Most of the roAp stars have so far been discovered with high-speed photometry. However, it has recently become clear that spectroscopy is even more sensitive for the detection of rapid pulsations because it provides information over a larger depth range of the chemically stratified atmospheres (see, e.g., Ryabchikova et al. 2002; Kurtz et al. 2003). Therefore, some spectral lines may show quite large radial velocity amplitudes (e.g., Elkin et al. 2005a) due to the rapid oscillations. In some cases, even photometrically undetected pulsation modes may be discovered spectroscopically (Kurtz et al. 2005).

Rapid oscillations of the luminous Ap star HD 116114 were recently discovered by Elkin et al. (2005b). The radial velocity variability has a period of 21 min, making HD 116114 the longest-period pulsator among the roAp stars. The star had already been checked for photometric variability by Martinez & Kurtz (1994) who found no rapid oscillations. However, as some roAp stars are known to show intrinsic amplitude variability (on top of their rotational amplitude modulations) and as the measurements by Martinez & Kurtz (1994) were taken some 15 yr before the spectroscopy by Elkin et al. (2005b), we decided to carry out a new photometric study.

Our observations were acquired at the Sutherland site of the South African Astronomical Observatory (SAAO) using a computer-controlled pulse-counting photometer on the 0.5-m telescope. To minimize the noise introduced into the light curves by telescope tracking errors we used a large aperture ($45''$). We observed the star for one to two hours with continuous integrations through a Johnson B filter during seven nights. The nearby G2V star HD 115642 was additionally observed every $\sim$15 min to verify the stability of the photometric conditions; only the six best nights were chosen for further analysis. Our final data set comprises 6.2 hr of observation and spans a total of 12 d, corresponding to about 45 per cent of the rotation period of HD 116114 as derived by Mathys et al. (2005, in preparation). This means that the known amplitude modulation of roAp stars over the rotation cycle should not be able to mislead us into believing the star to be constant, if it has detectable variability.

Amplitude spectra of our measurements are shown in Fig. 1. The periodogram in the upper panel was computed from the relative (HD 116114 – HD 115642) magnitudes. It shows some low-frequency noise increase which can be due to one (or both) of the two stars. Setting all the nightly mean magnitudes to zero results in the periodogram in the lower panel of Fig. 1. Again, we find no statistically significant rapid variability of HD 116114 in our photometry, although it is interesting to note that the highest peak in this plot occurs at a period of 21.3 min, within the errors the same as the period detected by Elkin et al. (2005b). We conclude that spectroscopy is indeed a very sensitive tool to discover the pulsations of roAp stars: whereas a 2-hr spectroscopic run was sufficient to detect the variability of the star with certainty (Elkin et al. 2005b), our photometric measurements, being three times as extensive, were not.

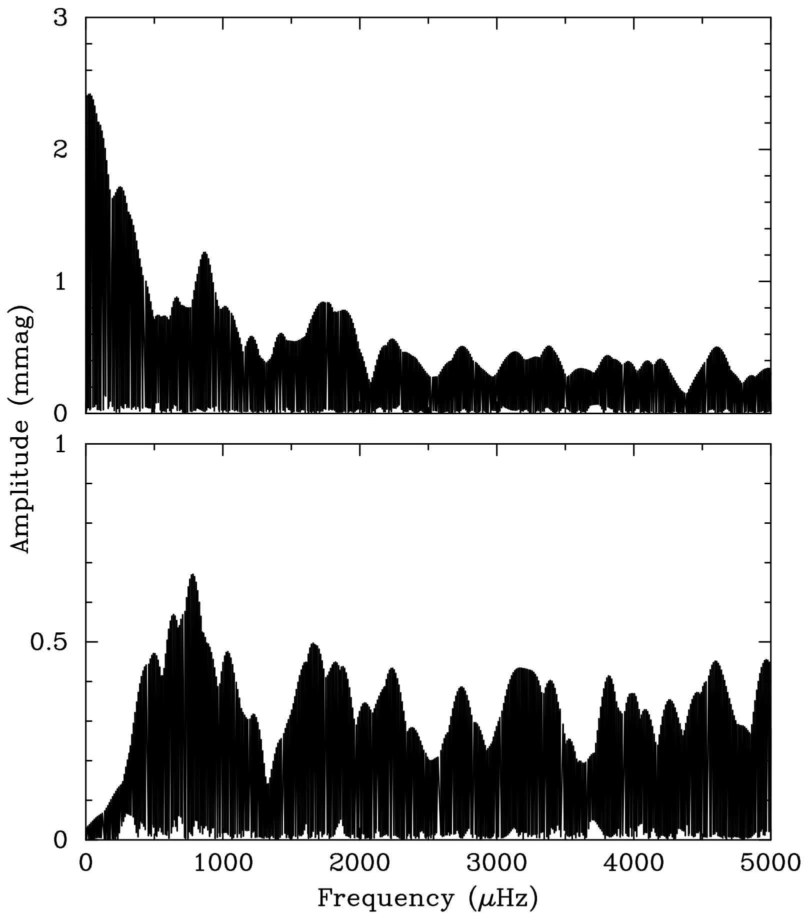

Figure 1. Upper panel: amplitude spectrum of our observations of HD 116114 relative to the comparison star HD 115642. Lower panel: amplitude spectrum of our data after nightly zeropoint adjustments. Note the magnified scale of the lower panel.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5652

Konkoly Observatory
Budapest
5 October 2005

HU ISSN 0374 – 0676

ADDITIONAL DATA FOR 69 VARIABLES

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The General Catalogue of Variable Stars (Kholopov et al., 2004) still contains many variables for which the elements are completely or partly unknown. In the New Catalogue of Suspected Variable Stars (NSV) (Kukarkin, Kholopov, 1982) and its supplement (Kazarovets, Samus, Durlevich 1998) there are another 25000 variables – approximately – that need further investigation. In this investigation, a group of variables was selected from the GCVS and some from the NSV and supplement catalogues to find the elements, or additional elements for them.

Data from the ASAS-3 database (Pojmanski, 2002), as well as from NSVS (Wozniak et al., 2004) and Hipparcos (Perryman et al., 1997) were used. In 15 cases a combination of data was used to make a better analysis possible. Hipparcos magnitudes were transformed to the V system (Otero, 2001).

NSVS magnitudes were shifted to match the maximum light of the ASAS-3 data for these variables. For 2 cases the ASAS and NSVS magnitudes were shifted to match the maximum light of the Hipparcos observations.

In almost all cases ASAS-3 data were used from the diaphragm appropriate for the magnitude of the variable. Only in the case of DV Cen a set of data from another diaphragm was used to avoid contaminated data. In all cases only data with "A" and "B" status in ASAS-3 were used. Flagged NSVS and Hipparcos data were avoided as well. Elements for the variables were found with AVE (Barbera, 1999).

Data for the selected stars were taken from the online version of the GCVS, to ensure most recent data on positions of the variables.

Identification in ASAS-3 was done by limiting the search radius in ASAS-3 query field to 5 arcseconds. In a few cases the search radius needed to be expanded to 10 or 15 arcseconds, before a matching star in the ASAS-3 database was found. These stars are labeled in Table 1 with 1 and 2 asterisks respectively following the name of the variable. A search radius bigger then 15 seconds was considered an identification issue, that would need resolving before continuing the investigation. Only 12 variables needed a 15 arcseconds search radius.

Similarly, identifications in NSVS were done by using a search radius of 6 arcseconds. No bigger search radius was needed here.

All variables were identified in VizieR by their matching GSC numbers (see Table 2). In four cases, where there was no GSC identification, the UCAC2 catalogue in VizieR was used for identification.

As many of the variables as possible were identified by their original identification chart as well, but this was not possible for all. In total, of the 69 variables in Table 1, the position of 40 of them could be checked by using the original identification chart. In case the identification created a problem some comments were added in the Remarks section of this publication.

Data from ASAS-3, NSVS and Hipparcos were transferred to Excel, and then into AVE for analysis. Many light curves exhibit an unusual amount of noise and many secondary minima are not well defined. General problems with the ASAS-3 system, faintness or contamination by close neighbouring stars are the main cause.

In many cases there are observed minima in the original discovery publications, but it was not attempted to link them to the present newly found elements. A period with 5 significant digits, cannot be used to connect with minima observed in the 1930's or 40's.

Table 1.

Name	Type	Epoch	D	e	Period	Magnitude
SS Aps*	EB	51902.135			0.582665	13.30–14.04 (13.63)
WX Aps	EA	51876.706	7.0		4.696797	11.42–13.14 (11.48:)
AY Aps	EA	51911.256	10.8		1.28707	12.51–14.09
BV Aps	EA	51868.275	9.1		1.6469	12.39–13.21
V447 Ara**	EA	51936.878	3.2		18.146	12.86–13.99
V502 Ara*	EA	51941.311	8.1		2.41155	13.41–14.44
V530 Ara	EA	51934.900	11.8		3.6383	12.00–13.59
V562 Ara	EA	52026.679	8.1		3.08214	13.72–14.46
V760 Ara*	EA	51948.501	8.1		5.5851	12.09–13.04
V871 Ara	EA	51922.306	2.2		9.4166	10.97–12.59
CP Aur	EA	51274.800	8.1		2.7645	13.22–14.74*
KL Aur	EA	51275.200	8.6		3.195	13.34–15.13*
V534 Aur	EA	51278.940	5.4		2.14186	10.43–10.76
SY Boo	EB	51273.620			0.714490	12.25–12.87 (12.46:)
AI Cap	EA	51978.995	10.8		3.08367	12.16–13.53
KP Car	EA	51873.670	5.9		12.1910	11.09–12.74
PW Car	EA	51868.407	9.7		2.914	13.14–14.45
V518 Cas	EA	51364.700	4.3		6.312	11.06–11.37 (11.23)*
AE Cen	EA	51871.285	10.8		2.11510	12.25–14.15 (12.38:)
DV Cen	EA	51885.318	10.8		1.20591	11.62–12.75 (11.90)
V406 Cen*	EA	52404.440	5.4		5.667	12.21–12.64 (12.51:)
V413 Cen*	EA	51900.518	8.1		4.011	9.80–10.26
TX Cha	EA	51868.420	12.7		0.901636	13.08–14.00
RR Cir*	EB	51905.235			1.09173	11.51–12.78 (11.89)
UX Cir	EA	51903.398	10.8		1.48124	11.95–12.79
VY Cir	EA	51901.832	4.3		4.68708	12.60–13.32 (13.11)
AW Cir	EA	51912.141	4.8		17.312	10.88–11.88 (11.14:)
RR Col	EA	51863.210	2.7	0.538	12.6248	11.07–11.36 (11.34)
ST Col	EA	51880.322	10.8		2.22129	11.43–12.31 (11.56:)
V359 CrA	EA	51950.690	9.1		2.5525	12.02–12.78
V445 CrA	EA	51960.063	13.1		1.45437	12.49–13.36
V703 Cyg	EA	51289.180	8.1		4.1473	12.79–14.43 (13.05:)*
V1774 Cyg	EA	51277.001	11.8		2.4571	12.78–14.17 (12.98:)*
V1909 Cyg	EB	51295.473			3.0947	13.09–13.78 (13.50:)*
DF Dra	EW	51277.800			2.80705	13.06–13.65 (13.54)*
SV Gru	EA	51873.197	9.7		1.35939	11.96–14.16
BD Hyi	EA	51871.340	9.7		2.18187	12.88–14.36
GI Lib	EA	51915.303	8.1		2.08955	12.12–13.79 (12.27:)
TU Lup	EA	51914.900	9.7		2.9378	12.87–14.05 (13.14:)
ZZ Lup	EA	51915.098	7.0		4.5564	12.93–14.33
AB Lup	EA	51912.778	5.4		5.2934	12.29–13.06
GT Lup	EA	51916.390	10.8		1.60222	11.74–12.65 (11.85:)

Table 1 (cont.)

Name	Type	Epoch	D	e	Period	Magnitude
V481 Lyr	EA	51276.350	8.6		7.227	13.01−14.30 (13.28:)*
SW Men	EA	51867.259	10.8		1.41461	12.17−13.09 (12.40:)
CY Oph	EA	51931.924	3.8	0.296	16.355	10.59−11.09 (11.01)
FG Oph	EA	51938.452	8.6		2.10375	12.23−12.84
V983 Oph	EA	52092.359	1.6	0.731	8.4449	10.06−10.45 (10.43)
V1065 Oph	EB	51274.591			9.8570	11.99−12.84 (12.32)
V1027 Ori	EA	52626.300	1.6	0.559	10.3938	10.55−11.21 (11.14)
BB Pav	EA	51946.880	9.8		1.697525	12.99−13.81
BO Pav	EA	51873.102	2.7	0.532	19.2315	9.39−10.25 (9.78)
EY Pav	EA	51869.730	2.2	0.688	15.321	11.94−12.65 (12.21:)
QU Pav	EA	51869.024	2.2	0.392	9.1825	11.53−11.90 (11.82)
V379 Per	EA	51421.080	16.1		3.1985	12.65−13.41 (12.85)*
SW PsA*	EA	51868.730	12.9		2.34921	10.81−13.63 (10.85:)
KK Pup	EA	51869.510	5.4		10.0404	11.68−12.31
OQ Pup	EA	51874.076	8.1		13.07	11.72−13.85 (11.87:)
RY Pyx	EA	51870.279	10.8		1.62182	11.54−12.41 (11.67:)
DM Sgr*	SR	52713.000			132.3	11.1 −14.6
V4727 Sgr	EA	51956.951	11.8		2.99719	11.58−12.54
V761 Sco	EA	51924.669	9.7		3.8877	11.86−14.00 (11.87:)
V1067 Sco	EA	47926.150	2.7	0.430	12.0424	10.55−10.94 (10.83:)
SS Ser**	EA	51954.850	8.1		7.8630	12.84−14.07
WZ TrA**	EA	51921.581	10.8		2.03749	12.50−13.67
CK Vel	EA	51882.331	1.6		17.5125	11.71−12.26
EG Vel**	EA	51872.921	8.1		4.8927	11.76−13.55
GT Vel	EA	51874.580	3.8	0.581	4.67007	9.68−10.63 (9.90)
NSV 5499	CW	51272.640			6.395	10.36−10.77*
NSV 25346	EA	52754.379	9.1		7.125	10.96−11.47

In Table 1, the photometric data are presented as follows:
Column 1 Name of the variable
Column 2 Type of variability
Column 3 Epoch of primary minimum for eclipsing binaries, or maximum light for others
Column 4 Duration of the eclipse as percentage of the period
Column 5 Eccentricity of the system, given as a fraction of the period between primary minimum and secondary minimum
Column 6 Period in days
Column 7 Magnitude range in V (in ROTSE1 for NSVS variables, indicated by * in Table 1), secondary minimum in brackets, derived from folded light curve

Table 2.

Name	Other id	GSC/UCAC2	ASAS/NSVS	NSVS/HIP
SS Aps*	HV 5094	GSC 09265-01104	ASAS 143429-7255.7	
WX Aps	S 4985	GSC 09256-01845	ASAS 141532-7415.6	
AY Aps	S 5536	GSC 09433-01119	ASAS 155815-7738.6	
BV Aps	S 5572	GSC 09450-01461	ASAS 162809-7957.7	
V447 Ara**	S 6036	GSC 08734-02381	ASAS 170256-5623.8	
V502 Ara*	S 6119	2UCAC 08136018	ASAS 171429-5455.5	
V530 Ara	S 7639	GSC 08350-00729	ASAS 172800-4916.6	
V562 Ara	S 8679	2UCAC 07890784	ASAS 174923-5519.3	
V760 Ara*	S 7649	GSC 08348-00855	ASAS 174930-4826.8	
V871 Ara		GSC 08329-03364	ASAS 163723-4842.2	
CP Aur	AN 1933.0342	GSC 02929-00693	NSVS 4536784	
KL Aur	S 8010	GSC 03386-00676	NSVS 4496038	
V534 Aur		GSC 01887-01240	ASAS 062624+2756.7	NSVS 7107371
SY Boo	HV 3680	GSC 01471-00505	ASAS 141240+1732.4	NSVS 10513199
AI Cap	BV1640	GSC 05744-01730	ASAS 201728-1057.7	NSVS 17107469
KP Car	S 4929	GSC 09218-00938	ASAS 101330-7241.5	

Table 2. (cont.)

Name	Other id	GSC/UCAC2	ASAS/NSVS	NSVS/HIP
PW Car	S 6356	GSC 09237-00157	ASAS 111809-7434.8	
V518 Cas		GSC 03698-01119	NSVS 1786136 /1835836/1862650	
AE Cen	AN 1920.0047	GSC 08636-01713	ASAS 120256-5513.1	
DV Cen	HV 4746	GSC 08662-01937	ASAS 132419-5329.1	
V406 Cen*	HV 6471	GSC 02357-01517	ASAS 134130-6355.7	
V413 Cen*	HV 6502	GSC 08677-02964	ASAS 140440-5853.5	
TX Cha	S 6333	GSC 09422-01073	ASAS 110201-8124.7	
RR Cir*	HV 5038	GSC 09016-01958	ASAS 135034-6657.9	
UX Cir	HV 5072	GSC 09244-00568	ASAS 141559-6739.2	
VY Cir	HV 5080	GSC 09261-00134	ASAS 142423-6958.0	
AW Cir	S 7619	GSC 09015-00629	ASAS 145011-6432.7	
RR Col	HV 3027	GSC 07082-00760	ASAS 063319-3517.9	
ST Col	S 7613	GSC 07602-00265	ASAS 055904-3927.5	
V359 CrA	HV 11869	GSC 07900-02773	ASAS 181603-3839.1	
V445 CrA	S 7666	GSC 07914-00917	ASAS 183738-4430.5	
V703 Cyg	SVS 1116	GSC 03602-01536	NSVS 3282554/5859166	
V1774 Cyg	LD 23	GSC 03580-00223	NSVS 5776136	
V1909 Cyg	SVS 2379	GSC 02712-00168	NSVS 8717725	
DF Dra	GR 79	GSC 04451-00310	NSVS 1335430/1242151	
SV Gru	S 7701	GSC 07994-00210	ASAS 215849-4419.5	
BD Hyi	BV 1017	GSC 09346-00981	ASAS 001528-7638.1	
GI Lib	BV 1625	GSC 01673-00130	ASAS 150442-1725.1	NSVS 16193460
TU Lup	HV 4665	2UCAC 10434348	ASAS 144341-4950.4	
ZZ Lup	HV 4691	GSC 08293-01190	ASAS 150539-4518.4	
AB Lup	HV 4693	GSC 08305-01956	ASAS 151006-5048.6	
GT Lup	BV 1628	GSC 08695-01062	ASAS 152155-5306.0	
V481 Lyr	WR 115	GSC 03130-00816	NSVS 5502816	
SW Men	S 6723	GSC 09368-00504	ASAS 041950-7748.3	
CY Oph	HV 4272	GSC 06822-02623	ASAS 165606-2821.8	NSVS 19207277
FG Oph	HV 4334	GSC 06815-00950	ASAS 170220-2522.5	NSVS 19266678
V983 Oph	BV 168	GSC 00421-02468	ASAS 175538+0228.7	NSVS 13743670
V1065 Oph	S 8622	GSC 00997-00164	ASAS 173853+1023.5	NSVS 10895577
V1027 Ori	AN 1934.0289	GSC 00742-00125	ASAS 061204+1456.0	NSVS 9688725
BB Pav	HV 9963	GSC 08757-01938	ASAS 183450-5914.5	
BO Pav	S 3312	GSC 09097-00144	ASAS 195017-6547.0	HIP 97605
EY Pav	S 6996	GSC 09314-00065	ASAS 194311-7237.8	
QU Pav	S 6998	GSC 09314-00344	ASAS 194335-7207.1	
V379 Per	S 10161	GSC 08999-01458	NSVS 6707761	
SW PsA*	S 5137	GSC 06960-00669	ASAS 220610-2932.9	NSVS 19906011/19925086
KK Pup	S 8520	GSC 06581-02102	ASAS 082355-2836.6	NSVS 18129350
OQ Pup	BV 663	GSC 08133-02606	ASAS 073819-4602.7	
RY Pyx	AN 1932.0199	GSC 06015-01088	ASAS 083952-1752.1	NSVS 15598307
DM Sgr*	S 5078	2UCAC 18546614	ASAS 193635-3145.1	
V4727 Sgr		GSC 06870-00614	ASAS 183331-2858.8	
V761 Sco	S 7636	GSC 07358-00621	ASAS 164348-3548.4	
V1067 Sco	HD 151831	GSC 06817-01768	ASAS 165059-2646.9	NSVS 19243530/ HIP 82451
SS Ser**	AN 1924.0040	GSC 06234-00597	ASAS 172348-1501.1	
WZ TrA**	HV 5192	GSC 09044-02629	ASAS 160139-6500.4	
CK Vel		GSC 08605-01636	ASAS 103731-5607.7	
EG Vel**	S 4942	GSC 07736-00877	ASAS 105016-4432.2	
GT Vel	BV 1579	GSC 07686-01288	ASAS 091038-4305.0	
NSV 5499	BV 273	GSC 04393-01510	NSVS 2645865/885910	
NSV 25346		GSC 01647-01627	ASAS 204901+1613.8	NSVS 11486002

Information about deviating duration of the secondary minimum, and duration of total eclipse, is given in the remarks section.

The epoch of minimum light was obtained by using the bisected chords method on the folded light curve. For every variable, there is a folded light curve, based on the ASAS-3, NSVS or Hipparcos measurements.

Remarks

V502 Ara: the position given in the original publication: (1875) $17^{h}04^{m}16^{s}$, $-54°46'.1$, is the position of the star 2UCAC08136035, but this is not the star on the identification chart. That is 2UCAC08136018 at $17^{h}14^{m}28^{s}.2$, $-54°55'29''.2$. This is close to the position given by the GCVS and by ASAS and this was adopted for this investigation.
V534 Aur: previously derived period 1.4280d based on part of the light curve in Han (2000). The two minima in this publication seem to confirm these elements. The period could be twice the value given in the table.
V518 Cas: DII=2.7 %. Very steep ascending and descending branches. There could be a short period of totality, but this part of the light curve is not in the data.
DV Cen: Because data from a different diaphragm were used, the magnitudes given could be slightly different from V.
V413 Cen: The period could be twice the value given in the table.
RR Cir: wrongly identified as GSC 09016-01864 in Simbad. That star is also slightly variable according to the ASAS-3 data.
RR Col: DII=2.8 %. Reported as 'missing' by Dvorak (2004). Primary and secondary minima are almost equally deep, so the primary minimum could be the secondary.
DF Dra: Very distorted light curve.
TU Lup: Very steep ascending and descending branches. There could be a period of totality, but this part of the light curve is not in the data.
CY Oph: Reported as 'missing' by Dvorak (Dvorak, 2004). Duration of secondary minimum is very short, it needs to be observed properly.
FG Oph: The period could be twice the value given in the table.
V983 Oph: Primary and secondary minima are almost equally deep, so the primary minimum could be the secondary. Only five measurements during minima.
V1027 Ori: DII=4.8%. Identification chart in Olijnik (1963) has wrong scale written in chart. Primary and secondary minima are almost equally deep, so the primary minimum could be the secondary.
KK Pup: The period could be twice the value given in the table.
DM Sgr: =V1162 Sgr. Reported as identical in GCVS, but still have separate positions in Simbad.
V4727 Sgr: Very steep ascending and descending branches. There could be a period of totality, but this part of the light curve is not in the data.
V761 Sco: Finder chart in Astronomische Nachrichten is not accurate enough to distinguish between several neighbouring stars. Identification was based on coordinates from GCVS.
CK Vel: Reported as 'missing' by Dvorak (2004). The period could be twice the value given in the table.
GT Vel: DII=3.2%
NSV 5499: Possibly same object as X-ray source RX J1212.2+6853
NSV 25346: The period could be twice the value given in the table.

Acknowledgements

This research has made use of the Simbad and VizieR databases operated at the Centre de Donnees Astronomiques in Strasbourg, France, as well as the ASAS-3, NSVS and Hipparcos databases.

I want to thank Richard Huziak, Tom Krajci, Sebastian Otero and Erwin van Ballegoij for their comments in the varying stages of this investigation.

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ERRATUM FOR IBVS 5652

The eccentricity (Min II phase) given for V983 Oph in Table 1 in IBVS 5652 should read 0.269 instead of 0.731.

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5653

Konkoly Observatory
Budapest
5 October 2005

HU ISSN 0374 – 0676

164. LIST OF TIMINGS OF MINIMA ECLIPSING BINARIES BY BBSAG OBSERVERS

(BBSAG Bulletin No. 131)

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The following Table lists 217 timings of minima of eclipsing binaries secured by CCD observations by BBSAG observers, primarily obtained between July 2004 and June 2005. The given O−C values generally refer to the linear elements of the GCVS (Kholopov et al., 1985), except for the cases stated in the remarks. All times given are heliocentric UTC.

Variable	Type	HJD 24...	±	$O - C$	n	Obs	Remarks*
AS And	p	53381.289	0.004		14	RD	V; GCVS elements in error
	p	53410.3288	0.0018		14	RD	V
BL And	p	53267.542	0.005	−0.005	130	APs	
FK And	p	53381.3059	0.0009	−0.0121	16	RD	V
NSV223	s	53324.4191	0.0003	+0.0066	14	RD	V; 2451422.749 + 0.30944 × E
WZ Ant	p	53129.369		−0.001	160	FH, RDr	2434419.295 + 0.4459239 × E
AF Aps	s?	53114.449	0.001	+0.002	480	FH, RDr	2436690.399 + 0.797613 × E
BH Aps	p	53200.5328	0.0015	+0.0050	523	FH, RDr	2436728.435 + 3.650732 × E
BV Aps	p	53215.427	0.002	+0.005	480	FH, RDr	2436809.413 + 1.646859 × E
RY Aur	p	53388.2581	0.0003	+0.0290	21	EBl	
ZZ Aur	p	53388.2739	0.0004	+0.0139	22	EBl	
	p	53406.3111	0.0006	+0.0146	19	EBl	
	p	53409.3169	0.0002	+0.0143	39	EBl	
	s	53409.6199	0.0019	+0.0167	25	EBl	
	s	53411.4207	0.0004	+0.0139	37	EBl	
	s	53440.2808	0.0013	+0.0156	17	EBl	
	p	53440.5816	0.0010	+0.0158	23	EBl	
	p	53445.3899	0.0004	+0.0144	41	EBl	
CG Aur	p	53384.2750	0.0011	+0.0027	18	EBl	
	s	53384.2769	0.0012	+0.1044	18	EBl	
DO Aur	p	53409.274	0.005	+0.063	15	EBl	
EI Aur	p	53388.232	0.004	−0.142	10	EBl	
EP Aur	p	53385.2383	0.0006	+0.0155	12	EBl	IBVS No. 4099
GX Aur	p	53462.386	0.005	+0.027	11	RD	V; BAV Mitt. 69

Variable	Type	HJD 24...	±	$O-C$	n	Obs	Remarks*
HL Aur	p	53388.2803	0.0003	−0.0051	19	EBl	AJ 113, 2270
	p	53462.3595	0.0004	−0.0041	19	RD	V
HP Aur	s	53462.3529	0.0019	+0.0475	19	RD	V
IZ Aur	s	53409.2504	0.0015	−0.0062	13	EBl	IBVS No. 4586
KU Aur	p	53409.2722	0.0002	+0.0042	21	EBl	
V364 Aur	p	53409.3387	0.0005	−0.0158	15	RD	V; MVS 10, 153 and RD
V404 Aur	p	53381.3212	0.0008		14	RD	V; period needs refinement
V410 Aur	s	53409.2969	0.0010	−0.0182	25	RD	V; Hipparcos
GSC2915:212		53388.2872	0.0005		22	EBl	new variable
TU Boo	s	53502.3585	0.0014	+0.0034	9	EBl	
	p	53502.5222	0.0007	+0.0049	17	EBl	
TZ Boo	p	53165.531	0.005	+0.080	97	APs	
UW Boo	p	53463.5577	0.0005	−0.0070	24	RD	V
VW Boo	s	53502.4782	0.0008	−0.0101	13	EBl	MNRAS 246, 47
XY Boo	p	53515.4774	0.0008	+0.0343	17	EBl	AJ 76, 923
AC Boo	p	53502.4873	0.0016	+0.0806	15	EBl	
AD Boo	p	53463.5256	0.0013	−0.0196	19	RD	V; Chin. AA 6, 366
AQ Boo	s	53515.4450	0.0017	−0.0102	15	EBl	IBVS No. 4871
AR Boo	s	53515.5263	0.0010	+0.0184	16	EBl	IBVS No. 4601
GM Boo	p	53445.5102	0.0009	+0.0201	12	EBl	IBVS No. 5125
GN Boo	s	53445.4658	0.0010	+0.0099	18	EBl	IBVS No. 5125
GQ Boo	s	53445.510	0.002	+0.004	10	EBl	IBVS No. 5125
GR Boo	s	53445.4471	0.0010	+0.0020	16	EBl	IBVS No. 5125
AS Cam	p	53410.294	0.002	−0.028	11	RD	V
CD Cam	s?	53409.349	0.003	−0.065	13	RD	V; IBVS No. 3753
DF CVn	s	53464.3901	0.0014	+0.0311	14	EBl	IBVS No. 5021
DH CVn	p	53464.3920	0.0015	−0.0036	14	EBl	IBVS No. 5149
GSC2004:784	p	53463.3392		+0.0022	10	EBl	IBVS No. 5269
GSC2533:1519	s	53464.4104		−0.0007	10	EBl	IBVS No. 5541
GSC2534:216	s	53464.3316		−0.0021	8	EBl	IBVS No. 5403
	s	53491.3842	0.0018	−0.0039	10	DH	
	p	53491.5071	0.0009	−0.0039	19	DH	
GSC2536:122	s	53491.4508	0.0014	−0.0025	15	DH	IBVS No. 5403
	p	53491.5918	0.0010	−0.0019	17	DH	
GSC2537:520	p	53464.307	0.002	+0.007	6	EBl	IBVS No. 5541
GSC2544:1007	s	53464.443	0.002	0.000	6	EBl	IBVS No. 5541
GSC2548:936	s	53491.4147	0.0012	−0.0023	15	DH	IBVS No. 5403
	p	53491.5455	0.0009	−0.0019	18	DH	
GSC3022:996	p	53491.4630	0.0011	+0.0006	13	DH	IBVS No. 5403
GSC3026:1046	s	53463.4401		+0.009	17	EBl	IBVS No. 5269
RS CMi	p	53350.49	0.01	−0.04	20	APs	BBSAG Bull. 112, 11
TY CMi	p	53462.3580	0.0010	−0.5359	22	RD	V
AP CMi	p	53351.561	0.004	−0.046	79	APs	BBSAG Bull. 95
BB CMi	p	53353.575	0.010	+0.093	205	APs	AJ 109, 1239
GSC181:2426	p	53400.416	0.003		123	APs	2451514.059 + 1.053831 × E
BH Cas	p	53353.3128	0.0009	+0.0140	18	EBl	
CV Cas	p	53341.3013	0.0007	+0.5831	27	RD	V
CW Cas	p	53353.2800	0.0010	−0.0305	17	EBl	JAAVSO 21, 34
EI Cas	p	53410.3041	0.0014	+0.0818	14	RD	V
EP Cas	p	53283.5132	0.0004	−0.0356	35	RD	
GR Cas	p	53324.3860	0.0002	−0.0389	12	RD	V
GU Cas	p	53341.2757	0.0015	−0.3024	24	RD	V
KL Cas	p	53283.5153	0.0003	−0.0117	32	RD	
	s	53353.2697	0.0013	−0.0089	12	EBl	
MT Cas	s	53353.3663	0.0007	+0.0089	18	EBl	
NU Cas	p	53353.362	0.003	+0.222	23	EBl	
OR Cas	s	53283.5110	0.0004	−0.0184	27	RD	
	s	53353.2694	0.0010	−0.0199	14	EBl	
PV Cas	s	53302.5354	0.0005	−0.0037	34	RD	displ. secondary

Variable	Type	HJD 24...	±	$O-C$	n	Obs	Remarks*
V350 Cas	p	53266.5608	0.0020	−0.0226	14	RD	
V359 Cas	p	53283.5076	0.0005	−0.0096	32	RD	IBVS No. 5016
V537 Cas	p	53353.3716	0.0010	+0.0085	21	EBl	priv. comm. F. Agerer
WW Cep	p	53283.3085	0.0003	+0.0014	13	RD	IBVS No. 4131
GG Cep	p	53266.5256	0.0017	−0.0532	21	RD	
GI Cep	p	53341.2753	0.0002	−0.0694	26	RD	V
LP Cep	p	53266.5529	0.0015	+0.0033	15	RD	IBVS No. 4829
OT Cep	p	53324.3860	0.0010	−0.0012	10	RD	V; IBVS No. 5212
BN Cir	p	53542.463	0.003	+0.014	350	FH	IBVS No. 5542
	s	53543.457	0.003	−1.197	420	FH	displ. secondary
LO Com	p	53464.444	0.003	+0.005	6	EBl	
LP Com	s	53464.3749	0.0014	−0.0048	9	EBl	IBVS No. 5052
GSC1996:437	p	53463.325	0.003	−0.015	8	EBl	IBVS No. 5269
GSC2040:1361	s	53216.4331	0.0007	−0.0006	16	EBl	IBVS No. 5295
	s	53541.4673	0.0008	−0.0004	25	EBl	
GSC2579:1125	s	53216.4409	0.0017	−0.0008	15	EBl	IBVS No. 5295
	p	53541.5235	0.0005	−0.0001	13	EBl	
GSC2580:2086	s	53216.4754	0.0009	−0.0056	16	EBl	IBVS No. 5295
	p	53541.4651	0.0006	−0.0054	20	EBl	
V635 Cyg	p	53266.296	0.005	−0.038	8	RD	
V1066 Cyg	p	53283.307	0.004	+0.077	15	RD	
V2280 Cyg	p	53233.3768	0.0006	+0.0302	19	EBl	IBVS No. 4996
V2282 Cyg	p	53233.3799	0.0008	−0.0237	20	EBl	IBVS No. 4996
V2284 Cyg	s	53233.4137	0.0007	+0.0020	18	EBl	IBVS No. 4985
V2294 Cyg	p	53233.443	0.004		9	EBl	IBVS No. 4995
	s	53251.3485	0.0014		20	EBl	
BE Dra	p	53463.5588	0.0004	+0.1229	22	RD	V
KK Dra	p	53463.5651	0.0005	+0.0091	20	RD	V
GSC3549:929	p	53236.4084		−0.0120	13	EBl	IBVS No. 5232
	s	53540.438	0.003	−0.018	10	EBl	
GSC3888:464	p	53236.4381		+0.0029	13	EBl	IBVS No. 5505
RZ Equ	p	53280.300	0.002	−0.016	9	RD	BBSAG Bull. 110, 9
AA Eri	p	49288.474	0.010	+0.021	6	APs	2452143.776 + 0.500846 × E
	p	53350.314	0.004	0.000	39	APs	
U Gem	p	52286.309	0.002	+0.018	50	RDr	
AF Gem	p	53385.2428	0.0005	−0.0681	15	EBl	
AI Gem	s	53385.234	0.002	−0.238 :	6	EBl	
AV Gem	s	53385.295	0.002	−0.057	19	EBl	
BS Gem	p	53410.38	0.01	−0.52	6	RD	V
EY Gem	p	53385.2967	0.0009	−0.2082	21	EBl	
GP Gem	s	53385.251	0.003	+0.066 :	8	EBl	
HR Gem	s	53385.2491	0.0016	+0.0120	15	EBl	
	p	53409.3031	0.0003	+0.143	25	RD	V
KQ Gem	s	53409.2772	0.0005	−0.0773	16	RD	V
V412 Her	p	53463.617	0.004	−0.003	10	RD	V
V490 Her	p	53463.601	0.006	+0.336	8	RD	V
V842 Her	p	53463.5780	0.0005	+0.0644	20	RD	V
V1033 Her	p	53216.4240	0.0017	−0.0091	13	EBl	IBVS No. 5146
	s	53216.5722	0.0004	−0.0100	14	EBl	
V1036 Her	s	53216.4838	0.0008	+0.0013	15	EBl	IBVS No. 5146
V1038 Her	s	53216.4435	0.0017	+0.0019	15	EBl	IBVS No. 5146
	p	53216.5782	0.0013	+0.0025	12	EBl	
V1039 Her	p	53236.3893	0.0010	+0.0010	14	EBl	BBSAG Bull. 128, 10
GSC1537:1557	p	53236.4161	0.0005	+0.0004	19	EBl	IBVS No. 5505
GSC1549:121	p	53250.4161	0.0008	+0.0011	25	EBl	IBVS No. 5505

Variable	Type	HJD 24...	±	$O-C$	n	Obs	Remarks*
GSC3097:1297	p	53121.5543	0.0006	−0.0004	27	EBl	IBVS No. 5699
	p	53143.4064	0.0010	+0.0002	10	EBl	
	p	53150.4440	0.0010	+0.0008	18	EBl	
	p	53154.5175	0.0005	+0.0003	24	EBl	
	p	53173.4054	0.0006	−0.0004	21	EBl	
	p	53203.4050	0.0005	−0.0004	15	EBl	
	s	53229.5160	0.0005	−0.0001	25	EBl	
	p	53250.4417	0.0007	−0.0002	26	EBl	
GSC3101:547	p	53121.5467	0.0005	−0.0002	27	EBl	IBVS No. 5699
	p	53143.3703	0.0019	+0.0004	8	EBl	
	p	53150.3981	0.0006	+0.0004	12	EBl	
	s	53150.5821	0.0015	−0.0005	10	EBl	
	p	53154.4662	0.0005	−0.0002	24	EBl	
	s	53173.5150	0.0003	−0.0002	21	EBl	
	s	53203.4748	0.0005	−0.0008	17	EBl	
	s	53229.3671	0.0025	−0.0002	11	EBl	
	p	53229.5524	0.0010	+0.0002	23	EBl	
	s	53250.4519	0.0008	+0.0014	25	EBl	
GSC3106:1368	s	53150.5167	0.0011	+0.0049	18	EBl	IBVS No. 5699
	s	53154.4579	0.0017	+0.0037	20	EBl	
	s	53173.4518	0.0005	+0.0028	22	EBl	
	s	53229.356	0.002	−0.003	8	EBl	
	p	53229.5364	0.0015	−0.0022	21	EBl	
	p	53250.3218	0.0007	−0.0039	10	EBl	
	s	53250.5045	0.0010	−0.0004	17	EBl	
GSC3510:5	p	53121.620	0.004	+0.003	9	EBl	IBVS No. 5699
	s	53143.4439	0.0011	−0.0004	12	EBl	
	s	53150.4239	0.0010	−0.0050	16	EBl	
	p	53154.4476	0.0012	+0.0028	14	EBl	
	s	53173.4762	0.0015	−0.0020	21	EBl	
	s	53229.353	0.003	−0.002	8	EBl	
	p	53229.5333	0.0012	+0.0035	26	EBl	
	p	53250.4850	0.0012	+0.0014	24	EBl	
AG Lac	p	53343.243	0.003	−0.363	9	EBl	
EK Lac	p	53341.2685	0.0002	−0.0039	26	RD	V
EL Lac	p	53343.2715	0.0014	+0.1237	12	EBl	
HX Lac	p	53343.294	0.005	−0.040	11	EBl	
IM Lac	p	53302.2982	0.0010	−0.1690	16	RD	
PP Lac	s	53343.2520	0.0008	−0.0476	10	EBl	
V344 Lac	s	53343.282	0.002	+0.013	12	EBl	BBSAG Bull. 127, 10
AL Leo	p	53400.578	0.007	+0.012	130	APs	IBVS No. 3401
LZ Lyr	p	53190.481	0.005	+0.263	76	APs	
V512 Lyr	p	53266.332	0.003	−0.067	15	RD	MVS 12, 156
GSC2632:319	p	53236.3646	0.0005	+0.0013	20	EBl	IBVS No. 5232
	p	53540.4725	0.0019	+0.0011	15	EBl	
GSC3104:1384	p	53540.4431	0.0006	+0.0008	11	EBl	IBVS No. 5232
GSC3540:85	p	53540.400	0.002	+0.001	10	EBl	IBVS No. 5232
V496 Oph	p	52821.340	0.007	−0.009	223	APs	25442.427 + 2.57587 × E (T. Berthold)
V511 Oph	p	52819.519	0.003	−0.039	174	APs	R
V1016 Oph	p	53165.434	0.005	+0.123	23	APs	BBSAG Bull. 99, 9
GSC995:1646	p	53250.3326	0.0011	+0.0024	17	EBl	IBVS No. 5505
V641 Ori	s	53410.357	0.002	+0.032	14	RD	V
V645 Ori	p	53410.3032	0.0018	+0.0472	11	RD	V
ZZ Peg	p	53341.3349	0.0017	+0.1273	15	EBl	IBVS No. 4916
BO Peg	p	53341.3049	0.0006	−0.0253	23	EBl	
BX Peg	p	53341.2285	0.0004	−0.0730	13	EBl	
BY Peg	s	53341.3101	0.0006	−0.0308	21	EBl	
CE Peg	p	53341.3138	0.0008	−0.1996	19	EBl	
	p	53341.317	0.005	−0.196	13	RD	V

Variable	Type	HJD 24...	±	$O-C$	n	Obs	Remarks*
DZ Per	p	53302.514	0.003	−0.005	25	RD	
EQ Per	p	53266.5498	0.0011	+0.4670	17	RD	
II Per	p	53302.4799	0.0004	−0.0584	26	RD	
PS Per	p	53302.5428	0.0010	+0.0588	18	RD	
QT Per	s	53410.364	0.003	−0.040	12	RD	V
V450 Per	p	53302.5235	0.0010	+0.0726	20	RD	
Y Psc		53302.3456	0.0015	+0.0030	13	RD	
CX Ser	s	53447.530	0.008	−0.082	57	APs	
GSC2035:175	s	53216.3884	0.0004	+0.0005	12	EBl	IBVS No. 5295
	p	53541.4207	0.0008	+0.0051	15	EBl	
WY Tau	p	53384.2470	0.0002	+0.0527	16	EBl	
CR Tau	p	53384.229	0.004	0.000	11	EBl	IBVS No. 4778
ES Tau	p	53406.3856	0.0008	+0.0143	23	EBl	
IV Tau	p	53381.2911	0.0015	+0.0017	12	RD	V
V781 Tau	s	53384.2515	0.0012	−0.0437	19	EBl	
V1112 Tau	p	53381.359	0.005		11	RD	V
HW Vir	s	53548.3716	0.0010	+0.0021	18	EBl	A&A 364, 199
	p	53548.4308	0.0004	+0.0030	20	EBl	
CS Vul	p	53283.3085	0.0005	+0.0248	16	RD	

* Filter (if used) and source of elements. The elements explicitly given in the Remarks are the first elements of the corresponding binary.

Observers:

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RD :	R. Diethelm	Rodersdorf, Switzerland
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Reference:

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5654

Konkoly Observatory
Budapest
19 October 2005

HU ISSN 0374 – 0676

GSC 02050-00745: A NEW RR LYRAE STAR WITH BLAZHKO EFFECT

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The variability of GSC 02050-00745 ($\alpha = 16^{\rm h}18^{\rm m}34\overset{\rm s}{.}35$, $\delta = +27^\circ 28' 13\overset{''}{.}3$ (J2000.0)) was discovered and initially investigated on the plates of Moscow collection taken with the 40-cm astrograph in Crimea. The phased light curve based on the photographic observations (206 estimates, JD2441829–49930) is given in Fig. 1. The curve's shape and period permit us to consider the new variable as an RR Lyrae type star with some peculiarity. The scatter on this phased curve is fairly large both in maximum (close to phase 0.0) and in minimum, suggesting some modulation, such as multimodality or Blazhko effect. To study the effect in more detail, we undertook additional CCD observations.

Our CCD photometry was carried out using a Pictor 416XTE camera at the 50-cm reflector of the Crimean Laboratory (Sternberg Astronomical Institute). The observations in the Johnson V band continued for two years. 778 brightness measurements were obtained on 10 nights in 2004 (July 5–28, JD2453192–215), and additional 467 on 10 nights in 2005 (June 30 – July 20, JD2453552–572). The images were dark subtracted, flat-fielded and analyzed with the aperture photometry package developed by V.P. Goranskij. The comparison and check stars are marked in Fig. 2. The accuracy of our photometry is $0\overset{\rm m}{.}02$.

The phased light curves for two sets of CCD observations are shown in Fig. 3. The light elements are the following:

$$\mathrm{Max} = \mathrm{HJD}2453558.37 + 0\overset{\rm d}{.}508646 \times \mathrm{E}.$$

Significant changes of the light curve shape and the amplitude of the variability (from $0\overset{\rm m}{.}93$ in 2004 to $1\overset{\rm m}{.}34$ in 2005) are clearly seen. The maximum brightness also shows night-to-night changes which is evident in both sets of observations (Fig. 4). This behaviour is most resembling to RR Lyrae stars with Blazhko effect. To prove the periodic nature of the effect and to determine the period of the modulation further observations are needed. The only statement we can make now is that the Blazhko period is fairly long, considerably longer than the intervals of the observations in each of the two seasons. Note that the two sets of observations were not specially planned for maximum and minimum amplitude light variation, thus the total effect may be even more significant.

Finally, all our CCD observations were analyzed with the package *VAST* developed by Sokolovsky & Lebedev (2005) which aims to detect new variable stars on series of CCD images. This investigation resulted in the discovery of a new eclipsing variable USNO-B1.0 1175-0308984 ($\alpha = 16^h18^m26\overset{s}{.}91$, $\delta = +27°33'15\overset{''}{.}7$ (J2000.0), marked in Fig. 2 as EW). The star is an EW variable with the following light elements:

$$\mathrm{MinI} = \mathrm{HJD}2453214.387 + 0\overset{d}{.}336486 \times \mathrm{E}.$$

The corresponding phased light curve is given in Fig. 5.

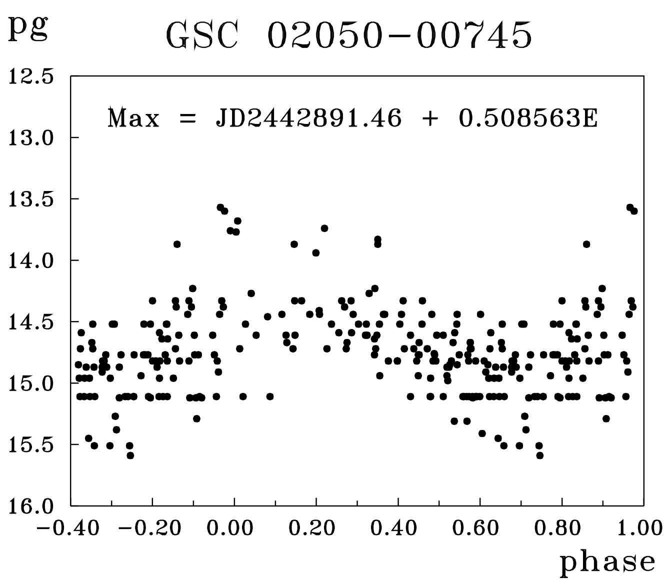

Figure 1. GSC 02050-00745. The photographic phased light curve.

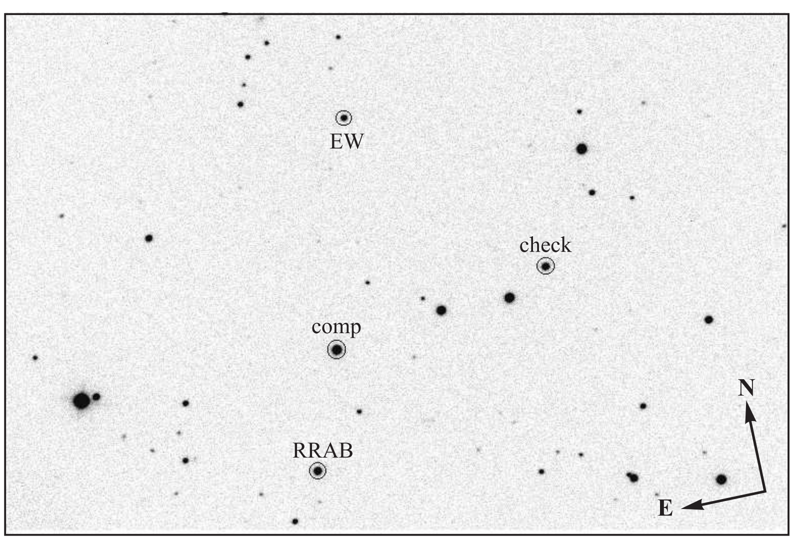

Figure 2. A V-band image (12′x 8′) of the field around GSC 02050-00745 (RRAB). The comparison (comp), the check (check) stars and the newly discovered eclipsing variable (EW) are marked.

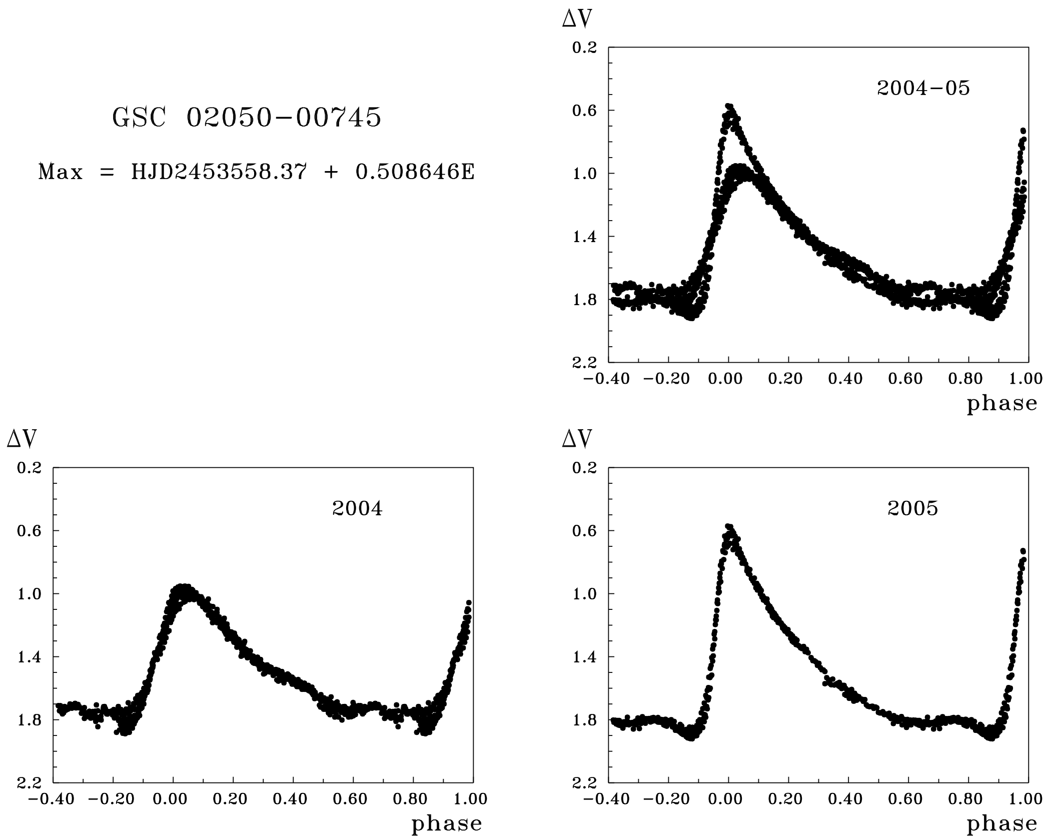

Figure 3. GSC 02050-00745. The phased light curves based on CCD observations. Two bottom panels show separate light curves for the seasons of 2004 and 2005. The changes of the light curve shape and of the amplitude of variability are clearly seen.

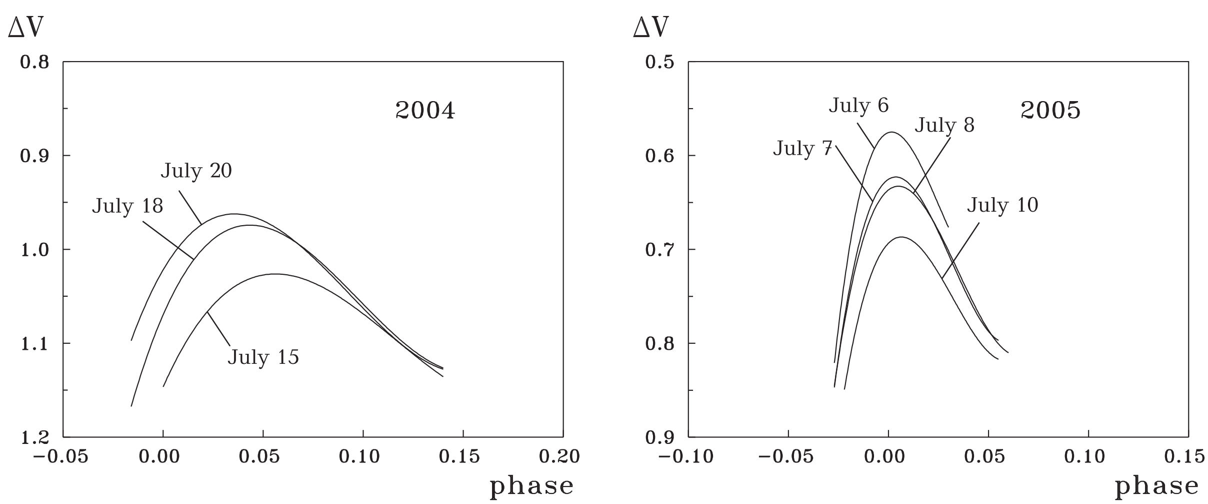

Figure 4. GSC 02050-00745. Night-to-night variations in the height of maxima for the two seasons of observations.

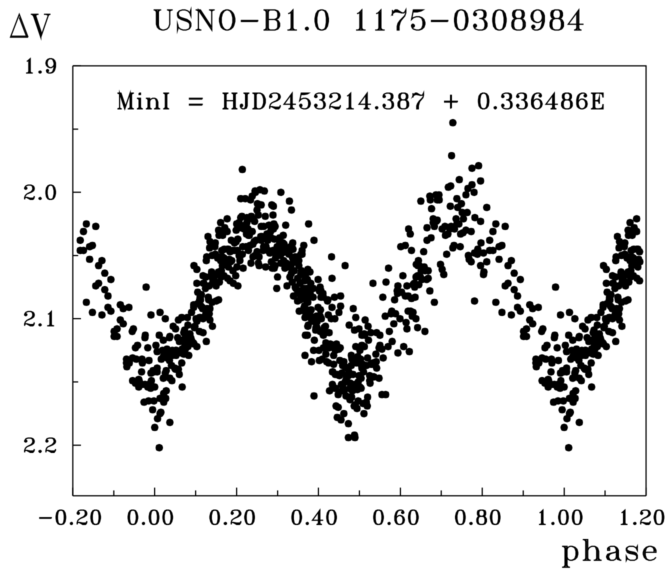

Figure 5. USNO-B1.0 1175-0308984. The phased light curve of the newly discovered eclipsing variable.

Acknowledgements: Two of the authors (S. Antipin and K. Sokolovsky) are grateful to the Russian Foundation of Basic Research (grant No. 05-02-16688) for partial support of this study.

Reference:

Sokolovsky, K., Lebedev, A., 2005, in *12th Young Scientists' Conference on Astronomy and Space Physics*, Kyiv, Ukraine, April 19–23, 2005, eds.: Simon, A.; Golovin, A., p.79 (VAST: `http://saistud.sai.msu.ru/poisk`)

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5655

Konkoly Observatory
Budapest
26 October 2005

HU ISSN 0374 – 0676

SOUTHERN RR LYRAE STARS EXHIBITING THE BLAZHKO EFFECT

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A fraction of the RR Lyrae variable stars show a cyclic modulation of the amplitude and shape of their light curves, known as the Blazhko effect (Blazhko, 1907). This effect has periods typically of the order of tens of days, and manifests itself as additional frequencies in the periodogram, very close to the main frequency. Its cause is not yet well understood.

Recently a large number of new variables were discovered in the Southern sky by the All Sky Automated Survey (ASAS3; Pojmanski, 2002 and 2003 and Pojmanski and Maciejewski, 2004 and 2005), among which there are a substantial number of RR Lyrae stars. Complete light curves of already known variables were obtained for the first time also. In this paper the RRab stars found by ASAS3 were studied more closely to search for the presence of the Blazhko effect.

We have chosen those RRab stars for detailed study from the ASAS database for which the folded light curve showed signs of modulation by visual inspection, i.e. increased scatter around the rising branch and light maxima. We analyzed the Fourier spectra of the candidate stars' light curve using the abilities of the MUFRAN package (Kolláth, 1990). We looked for modulation peaks in the prewhitened Fourier spectra around the pulsation frequency and its harmonics. We also scanned the whole possible modulation frequency range (from 0.0007 c/d to 0.2 c/d) looking for any feasible modulation frequency. During this process we fitted the light curve with the pulsation frequency, its harmonics and the first four trial modulation frequencies (i.e. $f_0 \pm f_{\mathrm{mod}}$ and $2f_0 \pm f_{\mathrm{mod}}$), and searched for a modulation frequency which gave significantly reduced *rms* scatter of the fit, than the fit with only the pulsation frequency and its harmonics. We also examined whether the light curve folded with the pulsation period at different phases of the modulation showed significant changes in shape and amplitude. We accepted a candidate star to exhibit light curve modulation only if all the three tests were positive with the same modulation frequency.

The stars for which the Blazhko effect was positively identified are presented in Tables 1 and 2. In Table 1 we give new elements for the Blazhko RR Lyrae stars with already published Blazhko period. Here the old Blazhko periods are also given. In Table 2 data of the newly discovered or previously suspected Blazhko stars are given. The tables include the objects' GSC number, ASAS3 coordinates, the pulsation and the Blazhko periods in days and GCVS names (Kholopov et al., 1985) if exist. In Table 3, which is available only electronically[1], we give the Fourier parameters of the light curve fit for all stars. Table 3

[1]Available on the IBVS website as `5633-t3.txt`

includes the GCVS name or ASAS identifier of the star, the pulsation and modulation frequencies, the amplitudes ($A_1, \ldots A_8$) and phases ($\phi_1, \ldots \phi_8$) of the pulsation frequency and its harmonics, the amplitudes ($A_9, \ldots A_{12}$) and phases ($\phi_9, \ldots \phi_{12}$) of the first four modulation frequencies, the *rms* scatter of the fit and the epoch which the phases refer to. The phases correspond to a sine-term solution.

We got ambiguous results for two stars, namely for GSC 6756-0012 and for CK Aps. They seem to be modulated according to all the three tests, but the effect is very weak compared to the scatter of the measurements. The suspected modulation periods are 74 d and 56 d for GSC 6756-0012 and CK Aps respectively.

Phase plots at different phases of the Blazhko period are shown in Fig. 1 and Fig. 2 for UV Oct and NSV 4350 respectively.

Animated figures for some of the stars are electronically available also.

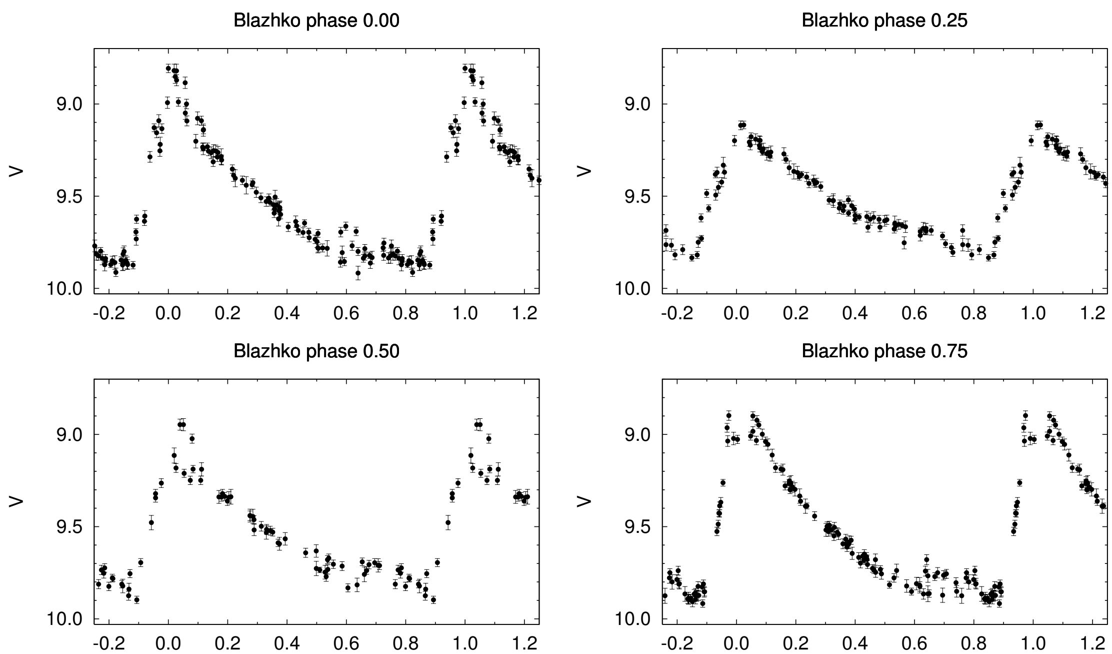

Figure 1. ASAS3 phased light curves of UV Oct at different phases of the Blazhko cycle.

Acknowledgements: Sebastián Otero, John Greaves and Johanna Jurcsik are acknowledged for helpful suggestions. This research has utilized the ASAS3 public photometry catalogue, and the SIMBAD and VizieR databases operated at the *Centre de Données Astronomiques (Strasbourg)*. Á. S. acknowledges the financial support of OTKA grants T-043504 and T-048961.

Table 1: New elements of known Blazhko RR Lyrae stars.

GSC	ASAS ID	$P_{\rm puls}$ [d]	$P_{\rm Bl}$ old [d]	Ref.	P_{Bl} new [d]	GCVS	Note
8866-1496	032520−6503.3	0.49201	> 45	1	161	X Ret	
7591-1523	051508−4137.7	0.47884	90:	2	82	RY Col	
5458-0044	091349−0919.1	0.53723	25.8	3	26.3	SZ Hya	*
6675-0028	120447−2740.7	0.65033	≈ 30	4	72	IK Hya	
6730-0109	141345−2254.7	0.44794	≈ 26	5	26.6		*
9522-0447	163225−8354.2	0.54258	82:	1	145	UV Oct	*

* Animated figure is available electronically.
References: (1) Hoffmeister, 1956; (2) Kinman, 1960; (3) Kanyó, 1970; (4) Andrews et al., 1982; (5) Wils & Greaves, 2004.

Table 2: Elements of new and suspected Blazhko RRab stars of the ASAS database.

GSC	ASAS ID	$P_{\rm puls}$ [d]	$P_{\rm Bl}$ [d]	GCVS	Ref.	Note
5847-1684	003338−1529.2	0.57373	256	RX Cet	1	
7540-0920	010949−4418.9	0.48440	62.5	NSV 420		
6432-1585	020752−2651.9	0.49543	34.8	SS For	1	
5281-1037	021515−1048.0	0.62341	112	RV Cet	2	*
6442-0690	031113−2629.0	0.59731	31.8	RX For	1	
5885-0757	040011−1949.6	0.60225	122			
5318-0800	041117−1350.9	0.55426	50	XY Eri	1	
8082-0469	044131−5216.6	0.54861	34.0	NSV 1700		
8905-0975	060746−6658.6	0.57057	25.9	VW Dor	1	
7084-0453	061315−3715.0	0.59376	130	RX Col	1	
9506-1365	085448−8317.0	0.47786	36.8	NSV 4350		*
6619-1146	102608−2315.2	0.59826	59			*
8207-1400	105303−4954.4	0.52741	59	AF Vel	3	*
0847-0851	110137+0810.0	0.53408	179	SZ Leo	2	
5515-0451	112614−1404.1	0.50290	63	NSV 5200		*
5520-0554	114856−1026.5	0.73284	143	X Crt	2	
6672-0596	121206−2612.8	0.39878	48.3			
6686-0081	123030−2602.9	0.47855	63	SV Hya	1	
6120-0430	132333−1639.9	0.61509	49.8	AM Vir	2	
5590-0758	145315−1435.9	0.54007	41.7			
8297-1427	150327−4756.1	0.60058	49.5			
7833-0197	150924−4319.6	0.38215	42.4	FU Lup		
7842-0863	155553−4041.7	0.58198	48.8	NSV 7330		
5613-0312	161256−0827.5	0.54871	78	BT Sco	4	
6811-0414	170223−2422.0	0.46137	22.2			*
7376-0369	174048−3132.6	0.42730	455	V494 Sco	2	
8352-0201	175911−4926.0	0.45186	49.5	S Ara		
7911-1078	180537−4350.0	0.55949	35.5	WW CrA		
9089-0842	195142−6244.1	0.55144	571	FO Pav		
7448-0418	195927−3400.1	0.37972	45.7			
8814-0696	212433−5712.1	0.60514	133			
9532-0988	214714−8739.0	0.45800	244	RS Oct	1	
8437-1538	215159−4559.1	0.51216	87	RT Gru	5	
9524-1884	215335−8246.7	0.62185	145	SS Oct	1	
8826-0640	223427−5635.4	0.61499	63			
6964-0926	225248−2442.2	0.52956	182			
5828-0847	232031−1447.9	0.62697	54			

* Animated figure is available electronically.
References: (1) Kovács, 2005; (2) Jurcsik & Kovács, 1996; (3) Breger, 1965; (4) Zessewitsch & Szczepanowska, 1967; (5) Clube et al., 1969.

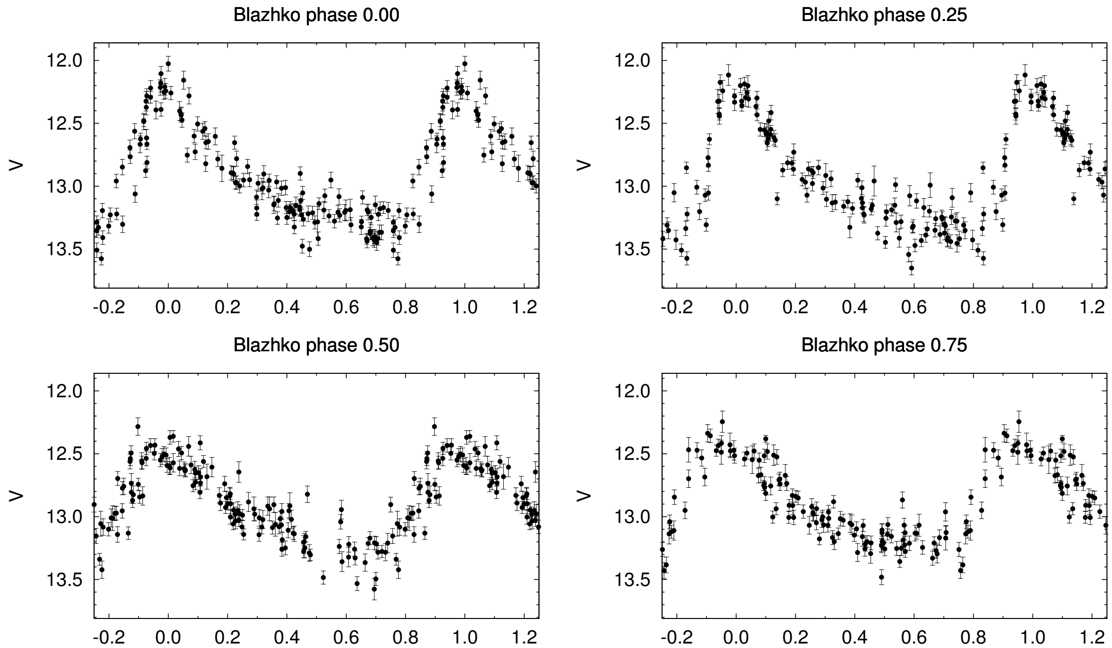

Figure 2. ASAS3 phased light curves of NSV 4350 at different phases of the Blazhko cycle.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5656

Konkoly Observatory
Budapest
26 October 2005

HU ISSN 0374 – 0676

NEW VARIABLE STARS IN THE OPEN CLUSTER M103 (NGC581)

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[1] Dept.of Earth Science Education, Korea National University of Education, Choongbuk 363-791, Korea (email:leeho119@boao.re.kr)

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Observatory and telescope:
Mt. Lemmon Optical Astronomy Observatory (LOAO)[1] in USA, 1.0m telescope

Detector:	2K CCD camera

Filter(s):	Johnson B, V

Transformed to a standard system:	yes
Standard stars (field) used:	Landolt's (1992) SA 98

Method of data reduction:
Standard CCD-frame reduction using the IRAF/DAOPHOT[2] package.

Remarks:
As a part of our survey project to search for low-amplitude pulsating stars in open clusters, we carried out time-series CCD photometry for 9 nights between October 2003 and February 2005. The observations were performed at LOAO. Instrumental magnitudes were obtained using the Point Spread Function fitting routine photometry in IRAF/DAOPHOT package (Massey & Davis 1992). To obtain reference standard magnitude we observed a standard region and B, V frames. We applied the ensemble normalization technique (Gilliland & Brown 1988, Kim et al. 1999) to standardize the instrumental magnitudes of all stars in the time-series CCD frames. We examined light variations of 5,023 stars in the observation field. Fifteen of 21 variable stars we found are new variable stars: seven δ Scuti-type pulsating stars and eight eclipsing binaries. Six variable stars have already been known in M103 (Wyrzykowski et al. 2002). Then we labeled the new variables as V7 $\sim$ V21. A chart of these new variable stars is shown in Figure 1. Light curves are displayed in Figure 2. Photometric properties of the new variable stars are listed in Table 1.

[1]Korea Astronomy and Space science Institute (KASI) had installed the telescope and has been operating it by remote control from Korea via a network connection.

[2]IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

[3]This study is partially supported by the research fund of the Korea National University of Education.

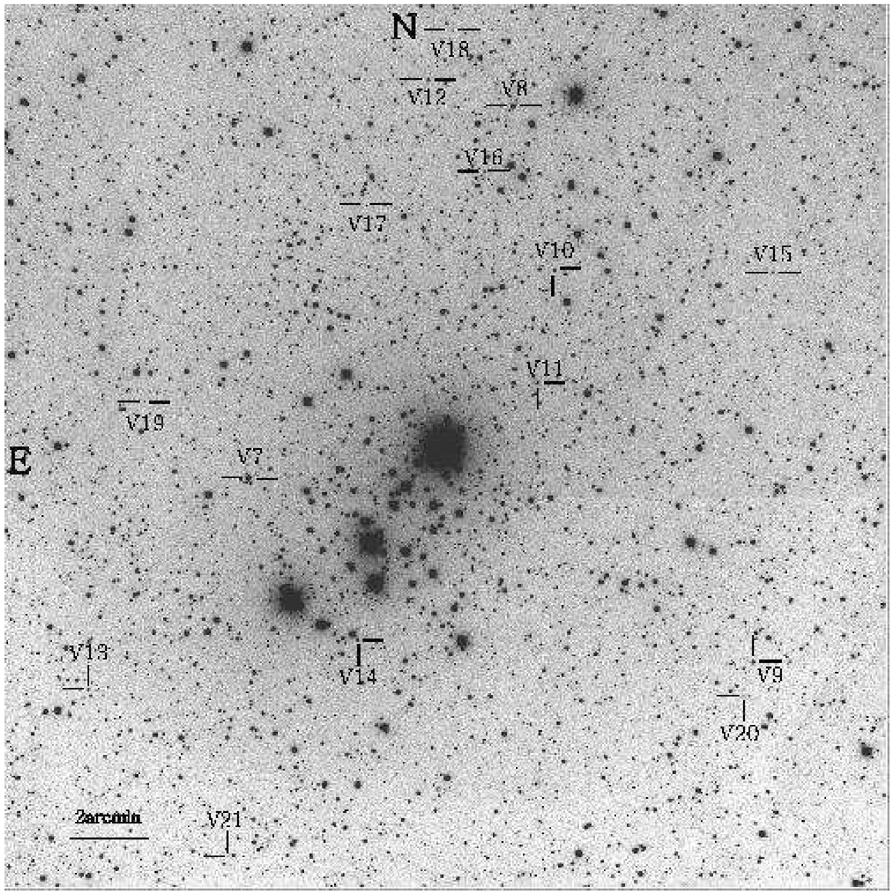

Figure 1. Observation field ($22'.2\times22'.2$) of the open cluster M103. New variable stars are labeled as V7 $\sim$ V21. North is up and east to the left.

Table 1. List of new Variable stars

ID_{WEB} † or ID_{USNO}	ID_{OUR}	RA (J2000)	DEC (J2000)	m_V	T_0 ‡	Type	P_{days}
0112	V7	$01^h33^m53^s.975$	$+60^\circ40'25''.50$	13.84	370.550	EA	2.0278
4910	V8	$01^h32^m59^s.571$	$+60^\circ49'38''.25$	14.03	405.680	δ Sct	0.0725
4683	V9	$01^h32^m11^s.274$	$+60^\circ35'45''.58$	15.16	402.643	δ Sct	0.1239
4901	V10	$01^h32^m51^s.155$	$+60^\circ45'32''.81$	15.76	403.698	δ Sct	0.0282
1289	V11	$01^h32^m54^s.965$	$+60^\circ42'44''.13$	15.84	403.625	δ Sct	0.0736
4922	V12	$01^h33^m16^s.874$	$+60^\circ50'17''.75$	15.96	403.700	δ Sct	0.1463
5362	V13	$01^h34^m26^s.948$	$+60^\circ35'09''.05$	16.69	405.660	EW	0.7080
1500-01583928	V14	$01^h33^m32^s.038$	$+60^\circ36'24''.88$	16.74	367.935	δ Sct	0.3551
1500-01558083	V15	$01^h32^m06^s.490$	$+60^\circ45'26''.75$	16.98	405.680	δ Sct	0.1100
8165	V16	$01^h33^m07^s.235$	$+60^\circ47'50''.67$	16.99	365.760	EA	1.2410
7283	V17	$01^h33^m29^s.902$	$+60^\circ47'10''.66$	17.25	366.690	EW	0.3525
1500-01577918	V18	$01^h33^m11^s.882$	$+60^\circ51'31''.36$	18.29	405.650	EW	0.2915
5685	V19	$01^h34^m15^s.466$	$+60^\circ42'18''.30$	18.62	365.760	EW	0.4464
1500-01560154	V20	$01^h32^m13^s.270$	$+60^\circ34'56''.14$	18.81	405.680	EW	0.3555
1500-01592132	V21	$01^h33^m58^s.272$	$+60^\circ31'02''.10$	19.17	405.620	EB	0.4514

† : Mermilliod J.C., 1992, in Open cluster data base (webda).
‡ : epoch (2453000.0+) at maximum brightness for pulsating stars and minimum one for eclipsing binaries.

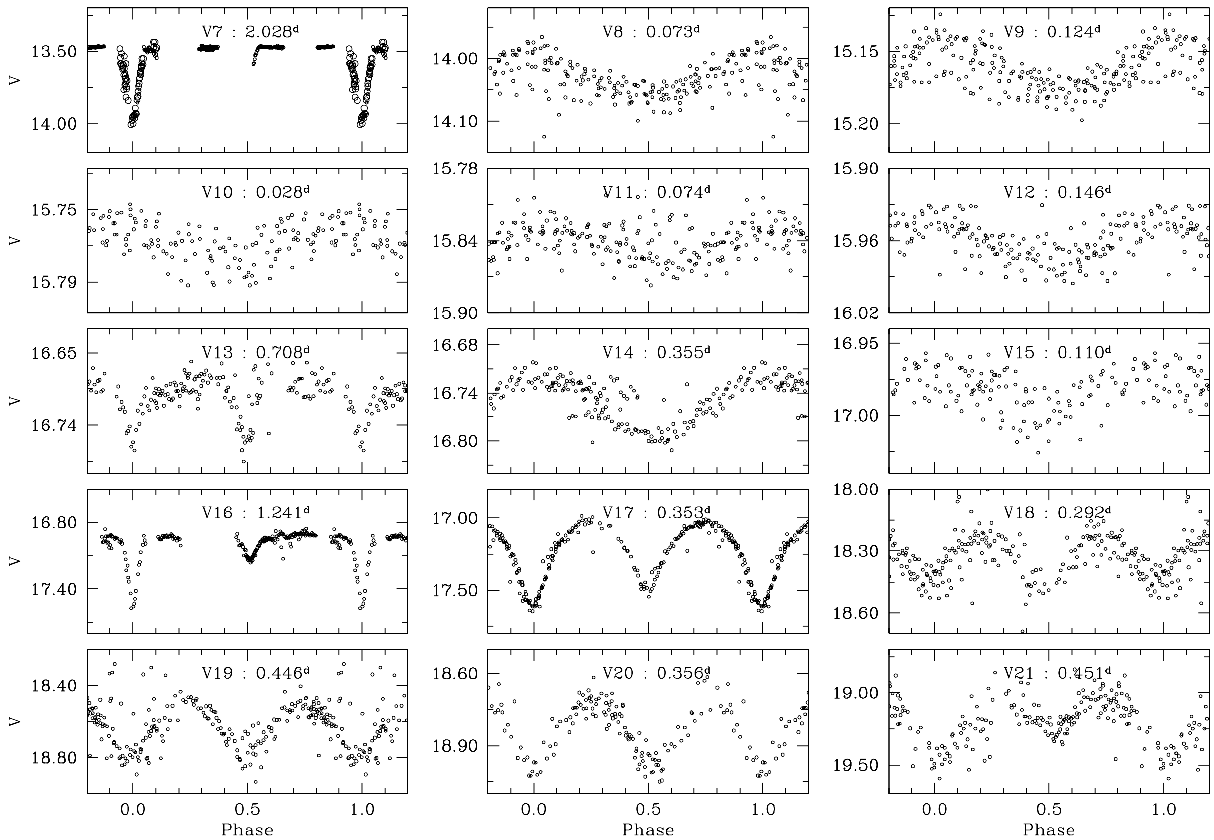

Figure 2. Light curves of 15 new variable stars.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5657

Konkoly Observatory
Budapest
28 October 2005

HU ISSN 0374 – 0676

PHOTOELECTRIC MINIMA OF SELECTED ECLIPSING BINARIES AND MAXIMA OF PULSATING STARS

(BAV MITTEILUNGEN NO. 173)

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In this 53rd compilation of BAV results, photoelectric observations obtained in the years 2004 till 2005 are presented on 591 variable stars giving 1309 minima and maxima. All moments of minima and maxima are heliocentric. The errors are tabulated in column '±'. The values in column '$O-C$' are determined without incorporation of non-linear terms. The references are given in the section 'Remarks'. All information about photometers and filters are specified in the column 'Rem'. The observations were made at private observatories. The photoelectric measurements and all the light curves with evaluations can be obtained from the office of the BAV for inspection.

Table 1: Eclipsing binaries

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
RT And	52864.5007	.0012	MON	−0.0055		GCVS 85	V	1)
	53334.3123	.0004	JU	−0.0043		GCVS 85		2)
TT And	53300.2418	.0001	RAT RCR	−0.0601		GCVS 85	-IR	1)
WZ And	53303.3754	.0018	AG	+0.0319	s	GCVS 85	-IR	1)
XZ And	53267.3919	.0002	JU	+0.1412		GCVS 85		2)
AD And	53298.3180	.0002	RAT RCR	−0.0279		GCVS 85	-IR	1)
AP And	53349.4139	.0007	JU					2)
	53411.3168	.0009	SCI					2)
BL And	53223.4770	.0003	RAT RCR	−0.0048		GCVS 85	-IR	1)
	53360.3777	.0001	RAT RCR	+0.0057	s	GCVS 85	-IR	1)
DO And	53411.413	.002	SCI					2)
FL And	53303.4649	.0010	AG				-IR	1)
GZ And	53316.4994	.0042	PC	−0.0023	s	GCVS 85	-IR	7)
	53349.2889	.0020	JU	−0.0022		GCVS 85		2)
	53360.2709	.0010	SCI	−0.0009		GCVS 85		2)
LM And	53268.4653	.0002	MS FR					6)
LO And	53290.6115	.0003	RAT RCR	+0.0521		GCVS 85	-IR	1)
V376 And	53346.2795	.0070	JU					2)
GCS1731.0551 And	53266.4771	.0004	FR				-IR	11)
	53267.3226	.0004	FR				-IR	11)
	53267.5355	.0018	FR				-IR	11)
DD Aqr	53253.4481	.0003	RAT RCR	+0.0342		GCVS 85	-IR	1)
KP Aql	53216.4671	.0017	SCI	−0.0189		GCVS 85		2)
	53216.4678	.0006	JU	−0.0182		GCVS 85		2)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
KP Aql	53297.2874	.0005	JU	−0.0181		GCVS 85		2)
OO Aql	53226.4964	.0017	SCI	+0.0284		GCVS 85		2)
V346 Aql	53266.3385	.0009	WTR	−0.0108		GCVS 85		13)
V1097 Aql	53215.4326	.0002	AG					1)
V1353 Aql	53227.4596	.0035	SCI	+0.0158		BAVR 44,62		2)
V1430 Aql	53251.3730	.0002	WTR	−0.0041	s	IBVS 3708		13)
	53255.3020	.0002	WTR	−0.0069		IBVS 3708		13)
SS Ari	53028.2681	.0007	MON	−0.0042		GCVS 85	V	1)
RY Aur	53388.2574	.0010	AG	+0.0283		GCVS 85		1)
	53407.3339	.0053	PC	+0.0270		GCVS 85	-IR	7)
SX Aur	53082.3693	.0002	RAT RCR	+0.0075		GCVS 85	-IR	1)
ZZ Aur	53081.3578	.0006	RAT RCR	+0.0182	s	GCVS 85	-IR	1)
AP Aur	53096.4598	.0005	RAT RCR	+0.0496	s	IBVS 3942 BAVM 67	-IR	1)
	53386.5568	.0002	AG	+0.0533		IBVS 3942 BAVM 67	-IR	1)
	53407.3370	.0014	JU	+0.0515	s	IBVS 3942 BAVM 67		2)
CI Aur	53361.2581	.0007	MS FR					6)
CL Aur	53387.3896	.0005	AG	+0.1062		GCVS 85		1)
	53407.2977	.0006	AG	+0.1044		GCVS 85		1)
	53407.2987	.0035	PC	+0.1054		GCVS 85	-IR	7)
	53410.4121	.0003	AG	+0.1079	s	GCVS 85		1)
DO Aur	53410.4667	.0001	AG					1)
EM Aur	52953.4962	.0013	MON	+0.0338	s	SAC 73	V	1)
	52965.3415	.0011	MON	+0.0365		SAC 73	V	1)
EO Aur	53386.5338	.0005	AG	+0.0111		GCVS 85	-IR	1)
EP Aur	53380.5093	.0006	JU	+0.0059		GCVS 85		2)
GI Aur	53381.3052	.0017	JU					2)
GX Aur	53095.3890	.0004	RAT RCR	+0.0137		BAVM 69	-IR	1)
HP Aur	53387.6521	.0016	AG	+0.0444		GCVS 85		1)
	53388.3641	.0006	AG	+0.0450	s	GCVS 85		1)
	53410.4180	.0023	AG	+0.0453		GCVS 85		1)
HU Aur	53300.4254	.0004	RAT RCR	−0.0295		GCVS 85	-IR	1)
HW Aur	53070.4077	.0007	RAT RCR	+0.0161	s	IBVS 5016 BAVM 132	-IR	1)
	53359.4643	.0066	PC	+0.0169		IBVS 5016 BAVM 132	-IR	7)
	53388.3092	.0012	AG	+0.0151	s	IBVS 5016 BAVM 132		1)
KU Aur	53360.4491	.0010	JU	+0.0269		GCVS 85		2)
MN Aur	53300.5572	.0004	MS FR	−0.0782		GCVS 85		6)
V364 Aur	53351.3193	.0001	MS FR					6)
V379 Aur	53301.5155	.0006	MS FR					6)
V402 Aur	53410.3398	.0002	AG					1)
V410 Aur	53386.4034	.0015	AG				-IR	1)
	53386.5869	.0016	AG				-IR	1)
	53387.3177	.0014	AG					1)
	53387.5029	.0008	AG					1)
	53388.4170	.0021	AG					1)
	53407.4659	.0008	AG					1)
	53410.3992	.0010	AG					1)
SU Boo	53164.4264	.0040	PC	+0.0155		GCVS 85	-IR	7)
TU Boo	53112.4045	.0001	MS FR	+0.0498	s	GCVS 85		6)
	53352.7031	.0001	MS FR	+0.0519	s	GCVS 85		6)
	53451.6082	.0028	PC	+0.0495	s	GCVS 85	-IR	7)
	53463.6072	.0026	PC	+0.0499	s	GCVS 85	-IR	7)
	53503.4945	.0029	PC	+0.0499	s	GCVS 85	-IR	7)
TY Boo	53080.5869	.0002	PRK	−0.0125		BAVM 68		1)
	53093.4307	.0001	RAT RCR	−0.0133	s	BAVM 68	-IR	1)
	53093.5911	.0004	RAT RCR	−0.0114		BAVM 68	-IR	1)
	53110.3987	.0015	AG	−0.0128		BAVM 68		1)
	53143.3821	.0001	WTR	−0.0131		BAVM 68		13)
	53145.4439	.0015	AG	−0.0128	s	BAVM 68		1)
	53150.3595	.0002	WTR	−0.0130		BAVM 68		13)
	53151.4697	.0002	AG	−0.0129	s	BAVM 68		1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
TY Boo	53165.4232	.0054	PC	−0.0140	s	BAVM 68	-IR	7)
	53255.3327	.0002	RAT RCR	−0.0167		BAVM 68	-IR	1)
	53472.5809	.0028	PC	−0.0168		BAVM 68	-IR	7)
	53475.4364	.0037	AG	−0.0157		BAVM 68	-IR	1)
TZ Boo	53094.507 :	.001	MS FR	−0.067	s	BAVM 68		6)
	53145.4739	.0039	AG	−0.0620		BAVM 68		1)
	53163.4513	.0033	PC	−0.0626	s	BAVM 68	-IR	7)
	53460.6128	.0040	PC	−0.0577	s	BAVM 68	-IR	7)
	53485.5729	.0051	PC	−0.0588	s	BAVM 68	-IR	7)
UW Boo	53460.5461	.0042	PC	−0.0045		GCVS 85	-IR	7)
	53461.5539	.0039	PC	−0.0015		GCVS 85	-IR	7)
	53463.5600	.0043	PC	−0.0048		GCVS 85	-IR	7)
VW Boo	53110.3559	.0002	MS FR	−0.0379		BAVR 32,122ff		6)
	53163.4137	.0033	PC	−0.0397		BAVR 32,122ff	-IR	7)
	53460.5433	.0022	PC	−0.0438		BAVR 32,122ff	-IR	7)
AC Boo	53123.4320	.0005	AG	+0.0632	s	GCVS 85	-IR	1)
	53163.4336	.0045	PC	+0.0640		GCVS 85	-IR	7)
	53164.4932	.0039	PC	+0.0663		GCVS 85	-IR	7)
	53460.5492		PC	+0.0816		GCVS 85	-IR	7)
	53478.529 :	.007	PC	+0.088		GCVS 85	-IR	7)
AR Boo	53117.5406	.0012	AG				-IR	1)
	53203.4157	.0004	AG					1)
	53409.6501	.0044	AG					1)
CK Boo	53451.658 :	.003	PC	+0.076		GCVS 85	-IR	7)
CV Boo	52783.4573	.0003	MON	−0.0100		BAVR 49,117	V	1)
	53110.3953	.0024	AG	−0.0115		BAVR 49,117		1)
	53151.4757	.0002	AG	−0.0103	s	BAVR 49,117		1)
	53165.4515	.0027	PC	−0.0099		BAVR 49,117	-IR	7)
	53179.4260	.0014	SCI	−0.0108	s	BAVR 49,117		2)
	53463.5929	.0026	PC	−0.0102		BAVR 49,117	-IR	7)
	53475.4504	.0003	AG	−0.0106		BAVR 49,117	-IR	1)
EF Boo	53463.6248	.0008	SCI					3)
ET Boo	53123.4478	.0005	AG				-IR	1)
EW Boo	53475.4628	.0012	AG				-IR	1)
FI Boo	53455.4399	.0027	SCI					3)
FY Boo	53117.3894		AG				-IR	1)
	53117.5104		AG				-IR	1)
	53203.4829	.0011	AG					1)
GN Boo	53110.3860	.0003	AG					1)
Y Cam	53462.5272	.0015	AG	−1.3691		GCVS 85	-IR	1)
UU Cam	52685.5697	.0004	AG				-IR	1)
WW Cam	53386.3430	.0009	WTR	−0.0215		GCVS 85	-IR	13)
XZ Cam	53407.3551	.0186	PC	+0.0975		GCVS 85	-IR	7)
AO Cam	53360.4840	.0001	RAT RCR	−0.0124		GCVS 85	-IR	1)
	53407.3394	.0031	PC	−0.0052		GCVS 85	-IR	7)
AY Cam	53462.3876	.0004	AG	+0.0102		GCVS 85	-IR	1)
LR Cam	53446.4641	.0006	AG				-IR	1)
RY Cnc	53451.426 :	.005	PC	+0.059		GCVS 85	-IR	7)
TX Cnc	53410.5373	.0044	PC	+0.0339		GCVS 85	-IR	7)
	53455.3357	.0022	SCI	+0.0351		GCVS 85		3)
WW Cnc	53096.3686	.0030	PC	−0.0587		BAVR 32,36ff	-IR	7)
	53097.4829	.0002	RAT RCR	−0.0603		BAVR 32,36ff	-IR	1)
WY Cnc	53110.3669	.0002	AG	−0.0263		GCVS 85	-IR	1)
	53445.4313	.0014	SCI	−0.0278		GCVS 85		3)
	53445.4318		PRK	−0.0273		GCVS 85		3)
	53460.3628	.0040	PC	−0.0250		GCVS 85	-IR	7)
AB Cnc	53461.3722	.0020	SCI					3)
AE Cnc	53443.3356	.0009	AG				-IR	1)
EV Cnc	53443.3450	.0016	AG				-IR	1)
VV CVn	53465.3249	.0011	AG				-IR	1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
VV CVn	53465.5904	.0010	AG				-IR	1)
VZ CVn	53409.6722	.0026	PC	−0.0015		GCVS 85	-IR	7)
	53409.6739	.0004	AG	+0.0002		GCVS 85		1)
BI CVn	53462.5215	.0033	PC	−0.0212		GCVS 85	-IR	7)
	53465.4037	.0013	AG	−0.0202	s	GCVS 85	-IR	1)
BO CVn	53461.5214	.0006	AG				-IR	1)
DF CVn	53465.3693	.0022	AG				-IR	1)
	53465.5344	.0015	AG				-IR	1)
RZ Cas	53386.2574	.0013	SCI	+0.0562		GCVS 85		2)
AB Cas	52863.5727	.0002	MON	+0.0720		GCVS 85	V	1)
AE Cas	53251.4967	.0001	MS FR					6)
AL Cas	53252.5922	.0007	MS FR	−0.0036		GCVS 85		6)
AX Cas	53254.3861	.0002	MS FR	−0.0798		GCVS 85		6)
BS Cas	53258.3224	.0004	MS FR	−0.0118		IBVS 4778 BAVM 123		6)
BU Cas	53316.4321	.0067	PC	−0.0200		GCVS 85	-IR	7)
EG Cas	53349.3493	.0027	AG	+0.1403		GCVS 85	-IR	1)
EP Cas	53253.4155	.0001	MS FR	−0.0360		GCVS 85		6)
	53301.4090	.0004	MS FR	−0.0354		GCVS 85		6)
	53349.4016	.0019	AG	−0.0358		GCVS 85	-IR	1)
GH Cas	53388.3658	.0002	AG				-IR	1)
GK Cas	53255.4939	.0002	MS FR	−0.3039		GCVS 85		6)
GR Cas	53258.4715	.0003	MS FR					6)
IR Cas	53303.3604	.0002	WTR	+0.0113		GCVS 85		13)
	53316.2938	.0017	PC	+0.0117		GCVS 85	-IR	7)
IT Cas	52982.2414	.0011	MON	+0.0025	s	SAC 69	V	1)
KL Cas	53217.4357	.0001	MS FR	−0.0107		GCVS 85		6)
MN Cas	53382.3635	.0011	AG	+0.0168	s	GCVS 85	-IR	1)
OR Cas	53250.5003	.0008	MS FR	−0.0178		GCVS 85		6)
OX Cas	53385.2647	.0028	JU	−0.0017		GCVS 85		2)
V359 Cas	53349.3561	.0019	AG	−0.0068	s	IBVS 5016 BAVM 132	-IR	1)
V360 Cas	53349.4742	.0025	AG				-IR	1)
V380 Cas	53381.3200	.0006	AG	−0.0588		GCVS 85		1)
V471 Cas	53382.2732	.0004	AG	−0.0176		GCVS 85	-IR	1)
	53388.2877	.0006	AG	−0.0510		GCVS 85	-IR	1)
	53388.4874	.0010	AG	−0.0193	s	GCVS 85	-IR	1)
	53409.3352	.0019	AG	−0.0034	s	GCVS 85	-IR	1)
V473 Cas	53251.3795	.0003	MS FR	−0.0103		IBVS 4669 BAVM 115		6)
V520 Cas	53349.3953	.0025	AG	−0.1029	s	GCVS 85	-IR	1)
V523 Cas	53316.4290	.0010	PC	−0.0547	s	GCVS 85	-IR	7)
	53316.5451	.0011	PC	−0.0555		GCVS 85	-IR	7)
	53316.6628	.0015	PC	−0.0546	s	GCVS 85	-IR	7)
WZ Cep	53381.4077	.0002	AG	−0.0658	s	GCVS 85		1)
	53381.6236	.0002	AG	−0.0586		GCVS 85		1)
XX Cep	53214.4119	.0014	JU	−0.0315		GCVS 85		2)
XY Cep	53302.3652	.0002	WTR	−0.0294		GCVS 85		13)
ZZ Cep	53229.5242	.0020	JU	−0.0102		GCVS 85		2)
CW Cep	52983.2240	.0004	MON	−0.0014	s	GCVS 85	V	1)
	53227.4800	.0070	JU	−0.0035		GCVS 85		2)
DK Cep	53110.5591	.0001	MS FR	+0.0353		GCVS 85		6)
EF Cep	53267.3866	.0010	AG	+0.0745	s	GCVS 85	-IR	1)
	53381.3370	.0007	AG	+0.0834	s	GCVS 85	-IR	1)
	53381.6433	.0012	AG	+0.0867		GCVS 85	-IR	1)
EY Cep	53267.4531	.0005	AG				-IR	1)
IO Cep	53254.3386	.0002	WTR	−0.0011		GCVS 85		13)
KP Cep	53149.5204	.0004	MS FR					6)
OT Cep	53360.4779	.0002	AG	−0.0017		BAVM 142	-IR	1)
RW Com	53106.4409	.0017	PC	−0.0242	s	GCVS 85	-IR	7)
	53409.6543	.0022	PC	−0.0201		GCVS 85	-IR	7)
	53462.3459	.0004	AG	−0.0193		GCVS 85	-IR	1)
	53462.4622	.0003	AG	−0.0217	s	GCVS 85	-IR	1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
RW Com	53462.5835	.0002	AG	−0.0191		GCVS 85	-IR	1)
	53463.5325	.0034	PC	−0.0195		GCVS 85	-IR	7)
	53476.4662	.0010	AG	−0.0211	s	GCVS 85	-IR	1)
	53476.5863	.0069	AG	−0.0197		GCVS 85	-IR	1)
RZ Com	53410.6102	.0033	PC	+0.0410		GCVS 85	-IR	7)
	53462.4004	.0002	AG	+0.0398		GCVS 85	-IR	1)
	53462.5695	.0018	AG	+0.0396	s	GCVS 85	-IR	1)
	53485.4181	.0034	PC	+0.0391		GCVS 85	-IR	7)
SS Com	53461.3709	.0003	AG	−0.0925		BAVR 33,152ff	-IR	1)
	53461.5776	.0004	AG	−0.0922	s	BAVR 33,152ff	-IR	1)
CC Com	53106.4436	.0028	PC	−0.0077		GCVS 85	-IR	7)
	53116.4819	.0013	PC	−0.0106	s	GCVS 85	-IR	7)
	53460.5312	.0021	PC	−0.0112	s	GCVS 85	-IR	7)
	53462.4063	.0009	AG	−0.0119		GCVS 85	-IR	1)
	53462.5169	.0021	AG	−0.0117	s	GCVS 85	-IR	1)
	53464.5030	.0024	PC	−0.0118	s	GCVS 85	-IR	7)
	53472.4471	.0021	PC	−0.0124	s	GCVS 85	-IR	7)
	53485.4677	.0026	PC	−0.0123	s	GCVS 85	-IR	7)
DD Com	53462.3490	.0005	AG				-IR	1)
	53462.4853	.0001	AG				-IR	1)
EK Com	53112.4478	.0003	RAT RCR				-IR	1)
	53163.3870	.0022	PC				-IR	7)
	53164.4550	.0028	PC				-IR	7)
	53476.4732	.0009	AG				-IR	1)
LL Com	53093.3962	.0002	MS FR					6)
LO Com	53462.4396	.0017	AG				-IR	1)
	53462.5820	.0010	AG				-IR	1)
	53476.4695	.0011	AG				-IR	1)
LP Com	53462.3453	.0004	AG				-IR	1)
	53462.5141	.0013	AG				-IR	1)
	53476.5394	.0009	AG				-IR	1)
U CrB	53151.5383	.0040	PC	+0.1035		GCVS 85	-IR	7)
RW CrB	53082.5531	.0003	PRK	−0.0106		GCVS 85		1)
	53258.3455	.0002	RAT RCR	−0.0098		GCVS 85	-IR	1)
TU CrB	53095.4691	.0017	MS FR					6)
TW CrB	53107.5251	.0001	RAT RCR	+0.0067	s	SAC 70	-IR	1)
	53165.5295	.0030	PC	+0.0070		SAC 70	-IR	7)
	53503.5423	.0020	PC	+0.0057		SAC 70	-IR	7)
Y Cyg	53297.2686	.0019	SCI	+0.0097	s	GCVS 85		2)
	53300.2640	.0025	JU	+0.0088	s	GCVS 85		2)
WW Cyg	53257.5183	.0001	RAT RCR	+0.0530		GCVS 85	-IR	1)
WZ Cyg	53259.4598	.0013	AG	+0.0572		GCVS 85		1)
ZZ Cyg	53217.5882	.0012	AG	−0.0429		GCVS 85	-IR	1)
BR Cyg	53259.3679	.0002	WTR	+0.0008		GCVS 85		13)
	53291.3492	.0014	SCI	+0.0006		GCVS 85		2)
CG Cyg	53267.3572	.0001	WTR	+0.0507		GCVS 85		13)
CV Cyg	53227.4197	.0046	AG	−0.0082		SAC 68	-IR	1)
	53323.3010	.0024	ATB	−0.0096	s	SAC 68		1)
DK Cyg	53227.4292	.0001	AG	+0.0399		BAVR 35,1ff		1)
DO Cyg	53254.5755	.0045	AG				-IR	1)
	53255.4345	.0003	AG				-IR	1)
	53284.5151	.0019	AG				-IR	1)
DX Cyg	53225.4885	.0016	FR				-IR	11)
KV Cyg	53165.5150	.0007	MS FR	+0.0464		GCVS 85		6)
NZ Cyg	53227.4188	.0006	AG				-IR	1)
PY Cyg	53258.4884	.0035	AG					1)
QS Cyg	53227.5073	.0012	AG				-IR	1)
QU Cyg	53094.5686	.0008	MS FR					6)
	53258.4852	.0005	AG					1)
QX Cyg	53258.5772	.0013	AG					1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
V370 Cyg	53256.4494	.0002	RAT RCR	−0.0184		GCVS 85	-IR	1)
V387 Cyg	53252.5182	.0002	RAT RCR	+0.0134		GCVS 85	-IR	1)
V477 Cyg	53220.4661	.0008	JU	−0.0009		SAC 58		2)
	53300.2640	.0010	SCI	−0.0005		SAC 58		2)
	53303.3171	.0025	JU	+0.7056		SAC 58		2)
V488 Cyg	53250.4664	.0014	FR	+0.0795		GCVS 85	-IR	11)
V502 Cyg	53258.6065	.0011	AG					1)
V508 Cyg	52802.4672	.0027	AG				-IR	1)
	52834.4374	.0020	AG					1)
	52864.4531	.0011	AG				-IR	1)
	52867.5747	.0030	AG				-IR	1)
	52946.3186	.0004	AG				-IR	1)
	53216.4645	.0005	AG				-IR	1)
	53221.5264	.0011	AG				-IR	1)
V526 Cyg	53152.4619	.0003	MS FR	+0.0520		GCVS 85		6)
V628 Cyg	53225.5431	.0049	PC	−0.0035		IBVS 4381 BAVM 89	-IR	7)
	53226.5134	.0056	PC	+0.0002		IBVS 4381 BAVM 89	-IR	7)
V652 Cyg	53155.4495	.0029	MS FR	−0.1044		GCVS 85		6)
V699 Cyg	53258.5458	.0027	AG					1)
V700 Cyg	53250.4301	.0002	RAT RCR	−0.0424		GCVS 85	-IR	1)
	53250.5744	.0002	RAT RCR	−0.0681	s	GCVS 85	-IR	1)
	53258.4221	.0013	AG	−0.0415	s	GCVS 85		1)
	53258.5677	.0009	AG	−0.0659		GCVS 85		1)
	53316.2575	.0041	PC	−0.0139	s	GCVS 85	-IR	7)
V704 Cyg	52898.4501	.0007	AG	+0.0332	s	GCVS 85		1)
V706 Cyg	53259.4397	.0017	AG					1)
V725 Cyg	53250.3906	.0015	FR	+0.2378		GCVS 85	-IR	11)
V728 Cyg	53164.4791	.0002	MS FR	+0.0485		GCVS 85		6)
V856 Cyg	53227.4418	.0008	FR				-IR	11)
V859 Cyg	53225.4430	.0018	FR	−0.0117		GCVS 85	-IR	11)
	53227.4655	.0002	FR	−0.0142		GCVS 85	-IR	11)
V866 Cyg	53227.5023	.0008	FR				-IR	11)
V880 Cyg	53107.5760	.0003	MS FR					6)
V891 Cyg	51045.5938	.0007	FR	+0.0384		GCVS 85		10)
	53233.4345	.0002	WTR	+0.0408		GCVS 85		13)
V963 Cyg	53245.4258	.0005	FR	+0.0011		GCVS 85	-IR	11)
V979 Cyg	53233.4410	.0006	FR	+0.0403	s	GCVS 85	-IR	11)
	53245.3991	.0009	FR	+0.0397	s	GCVS 85	-IR	11)
V995 Cyg	53145.5717	.0007	MS FR					6)
V1034 Cyg	53250.4426	.0017	FR	−0.0116	s	GCVS 85	-IR	11)
V1074 Cyg	53259.5978	.0032	AG					1)
V1187 Cyg	53258.4717	.0012	AG	−0.0191		IBVS 4133 BAVM 73		1)
V1191 Cyg	53258.4871	.0040	AG	+0.0456	s	GCVS 85		1)
	53340.2859	.0003	RAT RCR	+0.0530	s	GCVS 85	-IR	1)
V1302 Cyg	53258.4501	.0010	RAT RCR				-IR	1)
V1305 Cyg	53227.3959	.0044	AG				-IR	1)
	53258.4895	.0055	AG					1)
V1321 Cyg	53258.4029	.0003	AG					1)
V1401 Cyg	53253.5058	.0010	AG				-IR	1)
	53259.4277	.0036	AG				-IR	1)
	53282.4929	.0018	AG				-IR	1)
V1411 Cyg	53255.3647	.0004	AG	+0.2033		GCVS 85	-IR	1)
	53282.5473	.0021	AG	+0.2000		GCVS 85	-IR	1)
V1417 Cyg	53226.4036	.0014	AG				-IR	1)
	53242.3962	.0035	AG				-IR	1)
	53247.4843	.0020	AG				-IR	1)
	53255.4774	.0012	AG				-IR	1)
	53258.3852	.0004	AG				-IR	1)
	53282.3672	.0015	AG				-IR	1)
	53284.5468	.0003	AG				-IR	1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
V1961 Cyg	53259.3798	.0024	AG					1)
	53259.5228	.0008	AG					1)
V2181 Cyg	53250.4342	.0004	FR	+0.0089		BAVR 50,45f	-IR	11)
V2239 Cyg	53258.5873	.0060	AG					1)
V2240 Cyg	53258.5395	.0002	AG					1)
V2263 Cyg	53254.4495	.0028	AG				-IR	1)
Z Dra	53407.6405	.0027	PC	−0.1668		GCVS 85	-IR	7)
RZ Dra	53137.5573	.0001	AG	+0.0394		GCVS 85		1)
TZ Dra	53226.3813	.0003	WTR	−0.0138		GCVS 85		13)
	53226.3815	.0006	JU	−0.0136		GCVS 85		2)
	53510.4375	.0011	AG	−0.0170		GCVS 85	-IR	1)
XY Dra	53502.4510	.0006	AG				-IR	1)
AR Dra	53464.3633	.0005	AG				-IR	1)
AX Dra	53460.5517	.0030	PC	−0.0033		BAVR 32,36ff	-IR	7)
	53464.5296	.0003	AG	−0.0025		BAVR 32,36ff	-IR	1)
	53464.5296	.0033	PC	−0.0025		BAVR 32,36ff	-IR	7)
	53472.4839	.0025	PC	−0.0025		BAVR 32,36ff	-IR	7)
	53484.4141	.0043	PC	−0.0038		BAVR 32,36ff	-IR	7)
BH Dra	53445.5506	.0028	SCI	−0.0062		GCVS 85		3)
BX Dra	53409.5346	.0007	AG	+0.0091	s	IBVS 4266 BAVM 82	-IR	1)
CV Dra	53502.4242	.0005	AG	−0.0008		BAVM 69	-IR	1)
FU Dra	53409.5811	.0003	AG				-IR	1)
GV Dra	53384.359	.001	SCI	−0.001		IBVS 4990		2)
AC Gem	50517.4631	.0017	FR	−0.1978	s	GCVS 85		10)
AH Gem	53381.3955	.0007	FR				-IR	11)
	53381.5637	.0006	FR				-IR	11)
	53382.5743	.0002	FR				-IR	11)
	53386.2802	.0005	FR				-IR	11)
	53386.4492	.0006	FR				-IR	11)
	53386.6167	.0015	FR				-IR	11)
	53387.2896	.0019	FR				-IR	11)
	53387.4580	.0007	FR				-IR	11)
	53387.6283	.0030	FR				-IR	11)
	53407.3269	.0004	FR				-IR	11)
	53408.3369	.0007	FR				-IR	11)
	53408.5033	.0009	FR				-IR	11)
	53409.3478	.0007	FR				-IR	11)
	53409.5134	.0007	FR				-IR	11)
	53410.3543	.0016	FR				-IR	11)
	53410.5178	.0017	FR				-IR	11)
AI Gem	53381.5861	.0005	FR				-IR	11)
	53386.2950	.0004	FR				-IR	11)
	53387.3810	.0004	FR				-IR	11)
	53407.2965	.0006	FR				-IR	11)
	53408.3836	.0007	FR				-IR	11)
	53409.4695	.0004	FR				-IR	11)
	53410.5566	.0043	FR				-IR	11)
AN Gem	53463.3222	.0030	SCI					3)
AY Gem	53432.4538	.0031	SCI	−0.0534		GCVS 85		3)
EG Gem	53407.4054	.0058	PC	+0.2563		GCVS 85	-IR	7)
EN Gem	53411.4163	.0043	FR	−0.0298		GCVS 85	-IR	11)
EY Gem	53464.3495	.0022	SCI	−0.2115		GCVS 85		3)
FG Gem	53410.3349	.0003	AG	−0.0312		GCVS 85	-IR	1)
GP Gem	53432.3168	.0035	SCI					3)
GX Gem	53360.3810	.0006	MS FR	+0.1585	s	GCVS 85		6)
KM Gem	53388.4886	.0025	FR	+0.0398		GCVS 85	-IR	11)
KQ Gem	53410.3015	.0011	AG				-IR	1)
KV Gem	52722.4703	.0021	ATB	+0.0009	s	BAVR 52,95ff		1)
	53088.3412	.0014	ATB	−0.0019		BAVR 52,95ff		1)
	53096.4105	.0028	ATB	+0.0006	s	BAVR 52,95ff		1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
KV Gem	53387.5298	.0014	ATB	−0.0016	s	BAVR 52,95ff		1)
	53407.4325	.0084	PC	+0.0030		BAVR 52,95ff	-IR	7)
	53409.3982	.0050	PC	−0.0032	s	BAVR 52,95ff	-IR	7)
MR Gem	51925.5685	.0036	FR					10)
	53386.2962	.0013	FR				-IR	11)
	53387.3964	.0021	FR				-IR	11)
	53408.5357	.0009	FR				-IR	11)
GSC1331.0726 Gem	53381.3786	.0004	FR				-IR	11)
	53381.5558	.0003	FR				-IR	11)
	53382.6067	.0006	FR				-IR	11)
	53386.2895	.0006	FR				-IR	11)
	53386.4625	.0007	FR				-IR	11)
	53386.6386	.0009	FR				-IR	11)
	53387.3400	.0006	FR				-IR	11)
	53387.5153	.0004	FR				-IR	11)
	53407.3255	.0004	FR				-IR	11)
	53408.3770	.0004	FR				-IR	11)
	53408.5518	.0004	FR				-IR	11)
	53409.4300	.0005	FR				-IR	11)
	53410.3038	.0002	FR				-IR	11)
	53410.4804	.0006	FR				-IR	11)
TT Her	53164.4837	.0033	PC	+0.0302		GCVS 85	-IR	7)
	53463.639 :	.004	PC	+0.025		GCVS 85	-IR	7)
UX Her	53164.4420	.0003	QU	+0.0494		GCVS 85	V	4)
AK Her	53462.6058	.0019	SCI	+0.0105		GCVS 85		3)
CT Her	53112.5608	.0002	RAT RCR	−0.0010		GCVS 85	-IR	1)
MS Her	53155.5049	.0009	RAT RCR	+0.0447	s	GCVS 85	-IR	1)
MT Her	53165.5236	.0018	PC	+0.0140		GCVS 85	-IR	7)
V338 Her	53254.4251	.0002	RAT RCR	+0.0675		GCVS 85	-IR	1)
V381 Her	53502.4867	.0004	AG				-IR	1)
V450 Her	53515.4313	.0016	FR	+0.1282	s	GCVS 85	-IR	11)
V719 Her	52741.4992	.0006	AG				-IR	1)
	53082.4864	.0009	MS FR					6)
	53117.3678	.0003	AG					1)
	53117.5673	.0003	AG					1)
	53123.3821	.0002	MS FR					6)
	53221.4091	.0007	RAT RCR				-IR	1)
V728 Her	53117.3653	.0016	AG	+0.0336	s	IBVS 3234 BAVM 51		1)
	53145.4107	.0005	RAT RCR	+0.0374		IBVS 3234 BAVM 51	-IR	1)
	53151.5362	.0020	AG	+0.0362		IBVS 3234 BAVM 51	-IR	1)
V731 Her	53117.4099	.0018	AG					1)
V742 Her	53117.4681	.0026	AG					1)
V829 Her	53137.4976	.0004	AG				-IR	1)
V842 Her	53464.625 :	.003	PC	−0.022	s	BAVR 49,180	-IR	7)
	53485.5795	.0035	PC	−0.0201	s	BAVR 49,180	-IR	7)
V1036 Her	53143.4346	.0002	RAT RCR				-IR	1)
	53502.4086	.0006	AG				-IR	1)
V1038 Her	53137.4644	.0001	AG				-IR	1)
	53142.4255	.0002	RAT RCR				-IR	1)
V1047 Her	53137.3997	.0012	AG				-IR	1)
V1055 Her	53117.4042	.0040	AG					1)
	53117.5684	.0118	AG					1)
	53151.4679	.0013	AG				-IR	1)
V1062 Her	53117.4232	.0001	AG					1)
	53117.5507	.0002	AG					1)
V1067 Her	53117.3654	.0054	AG					1)
	53117.4938	.0036	AG					1)
V1071 Her	53510.5112	.0010	AG				-IR	1)
GSC2111.1158 Her	53282.3575	.0004	FR				-IR	11)
	53284.3804	.0006	FR				-IR	11)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
DI Hya	53463.3199	.0004	WTR				-IR	13)
GSC0238.0793 Hya	53446.3610	.0008	AG				-IR	1)
	53446.5200	.0017	AG				-IR	1)
SW Lac	53250.4596	.0003	JU	+0.0660		GCVS 85		2)
	53303.3777	.0011	SCI	+0.0652		GCVS 85		2)
TW Lac	53316.3233	.0051	PC	+0.2372		GCVS 85	-IR	7)
ZZ Lac	53256.5830	.0003	AG				-IR	1)
AG Lac	53233.4242	.0018	AG				-IR	1)
	53242.4473	.0025	AG				-IR	1)
	53251.4774	.0030	AG				-IR	1)
	53257.4935	.0009	AG				-IR	1)
	53284.5708	.0001	AG				-IR	1)
AW Lac	53150.4888	.0010	AG	+0.0281	s	BAVR 35,1ff		1)
	53254.4915	.0019	AG	+0.0310	s	BAVR 35,1ff	-IR	1)
CM Lac	53301.5361	.0017	SCI	−0.0002		GCVS 85		2)
DG Lac	53251.4701	.0031	AG	−0.2046		GCVS 85	-IR	1)
EM Lac	53228.3922	.0027	AG	+0.0525		GCVS 85	-IR	1)
	53233.4519	.0048	AG	+0.0535		GCVS 85	-IR	1)
	53251.3533	.0036	AG	+0.0548		GCVS 85	-IR	1)
	53251.5482	.0051	AG	+0.0551	s	GCVS 85	-IR	1)
	53254.4673	.0049	AG	+0.0557		GCVS 85	-IR	1)
	53303.3039	.0006	AG	+0.0560	s	GCVS 85	-IR	1)
	53303.5001	.0005	AG	+0.0577		GCVS 85	-IR	1)
	53335.4049	.0005	RAT RCR	+0.0535		GCVS 85	-IR	1)
EP Lac	53303.4967	.0019	AG	−0.3418		GCVS 85	-IR	1)
FL Lac	53266.3758	.0003	MS FR	−0.0643		GCVS 85		6)
HR Lac	53226.4812	.0017	AG				-IR	1)
	53250.5075	.0029	AG				-IR	1)
	53253.5103	.0032	AG				-IR	1)
	53255.4319	.0037	AG				-IR	1)
	53257.3749	.0004	AG				-IR	1)
	53257.5778	.0002	AG				-IR	1)
	53258.4387	.0025	AG				-IR	1)
	53259.5161	.0034	AG				-IR	1)
	53282.4640	.0002	AG				-IR	1)
	53284.4019	.0040	AG				-IR	1)
IM Lac	53222.3875	.0032	AG	−0.1737		GCVS 85	-IR	1)
	53251.5665	.0009	AG	−0.1667		GCVS 85	-IR	1)
	53255.3702	.0007	AG	−0.1680		GCVS 85	-IR	1)
	53258.5403	.0032	AG	−0.1688	s	GCVS 85	-IR	1)
	53284.5407	.0029	AG	−0.1695		GCVS 85	-IR	1)
IP Lac	53226.5164	.0010	AG				-IR	1)
	53255.4854	.0012	AG				-IR	1)
	53258.4669	.0034	AG				-IR	1)
	53282.3250	.0002	AG				-IR	1)
	53284.4520	.0095	AG				-IR	1)
IU Lac	53242.4655	.0026	AG				-IR	1)
IZ Lac	53226.4903	.0015	AG				-IR	1)
	53242.4652	.0020	AG				-IR	1)
	53250.4567	.0001	AG				-IR	1)
	53256.4572	.0042	AG				-IR	1)
	53284.4188	.0047	AG				-IR	1)
MZ Lac	53262.4215	.0009	AG	+0.1438		GCVS 85	-IR	1)
	53303.4878	.0061	AG	+0.1458		GCVS 85	-IR	1)
NR Lac	53258.5608	.0017	AG				-IR	1)
	53259.4768	.0023	AG				-IR	1)
	53282.4579	.0023	AG				-IR	1)
OO Lac	53303.4805	.0035	AG	+0.1351	s	GCVS 85	-IR	1)
PP Lac	53233.5338	.0042	AG	−0.0477		GCVS 85	-IR	1)
	53262.4186	.0029	AG	−0.0467		GCVS 85	-IR	1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
V339 Lac	53233.5433	.0014	AG				-IR	1)
	53250.5798	.0008	AG				-IR	1)
	53257.3999	.0021	AG				-IR	1)
V342 Lac	53233.3894	.0019	AG				-IR	1)
	53242.4943	.0024	AG				-IR	1)
	53250.5535	.0023	AG				-IR	1)
	53256.5101	.0026	AG				-IR	1)
V344 Lac	53222.4672	.0010	AG				-IR	1)
	53233.4496	.0002	AG				-IR	1)
	53242.4693	.0024	AG				-IR	1)
	53256.3940	.0005	AG				-IR	1)
	53256.5921	.0002	AG				-IR	1)
	53259.5359	.0042	AG				-IR	1)
	53284.4405	.0065	AG				-IR	1)
V441 Lac	52875.4197	.0024	AG	+0.0627	s	IBVS 5024 BAVM 135	-IR	1)
	53222.4834	.0005	AG	+0.0840		IBVS 5024 BAVM 135	-IR	1)
	53226.5004	.0031	AG	+0.0854		IBVS 5024 BAVM 135	-IR	1)
	53242.4039	.0007	AG	+0.0808	s	IBVS 5024 BAVM 135	-IR	1)
	53255.3831	.0063	AG	+0.0865	s	IBVS 5024 BAVM 135	-IR	1)
	53255.5357		AG	+0.0846		IBVS 5024 BAVM 135	-IR	1)
	53256.4653	.0006	AG	+0.0875		IBVS 5024 BAVM 135	-IR	1)
	53258.4723	.0004	AG	+0.0867	s	IBVS 5024 BAVM 135	-IR	1)
	53259.4008	.0013	AG	+0.0886	s	IBVS 5024 BAVM 135	-IR	1)
	53259.5528	.0002	AG	+0.0861		IBVS 5024 BAVM 135	-IR	1)
UU Leo	53082.4026	.0001	MS FR	+0.1320		GCVS 85		6)
UV Leo	53461.474 :	.001	PC	+0.000		IBVS 5338	-IR	7)
	53476.4787	.0013	AG	+0.0030		IBVS 5338	V	1)
	53482.4784	.0002	FR	+0.0019		IBVS 5338	-IR	11)
	53483.3785	.0002	FR	+0.0018	s	IBVS 5338	-IR	11)
UZ Leo	53462.3740	.0009	WTR	−0.1441	s	GCVS 85	-IR	13)
	53482.4583	.0005	FR	−0.1462		GCVS 85	-IR	11)
	53483.3874	.0004	FR	−0.1442	s	GCVS 85	-IR	11)
VZ Leo	53483.3491	.0102	PC	−0.0620		GCVS 85	-IR	7)
WZ Leo	53443.3360	.0006	AG	−0.2596		GCVS 85	-IR	1)
	53445.4440	.0004	AG	−0.2600	s	GCVS 85	-IR	1)
XY Leo	53445.4253	.0011	AG	+0.0195		GCVS 85	-IR	1)
	53445.5660	.0009	AG	+0.0182	s	GCVS 85	-IR	1)
	53451.5288	.0003	AG	+0.0150	s	GCVS 85	-IR	1)
XZ Leo	53409.5621	.0037	PC	+0.0377		GCVS 85	-IR	7)
	53410.5389	.0039	PC	+0.0391		GCVS 85	-IR	7)
	53445.4107	.0014	AG	+0.0378	s	GCVS 85	-IR	1)
	53451.5041	.0006	AG	+0.0345		GCVS 85	-IR	1)
AL Leo	53445.5316	.0005	AG	+0.0111		IBVS 3401 BAVM 53	-IR	1)
AM Leo	53410.6196	.0068	PC	+0.0072		GCVS 85	-IR	7)
	53465.4891	.0008	AG	+0.0071		GCVS 85	-IR	1)
	53468.4093	.0020	PC	+0.0009		GCVS 85	-IR	7)
AP Leo	53462.4452	.0026	PC	−0.0384		GCVS 85	-IR	7)
BW Leo	53092.3971	.0004	MS FR					6)
CE Leo	53094.3622	.0001	MS FR					6)
ET Leo	53476.4595	.0026	AG				V	1)
EX Leo	53453.4993	.0049	SCI					3)
	53476.3863	.0002	AG				V	1)
T LMi	53460.3789	.0051	PC	−0.0821		GCVS 85	-IR	7)
	53463.3993	.0063	PC	−0.0815		GCVS 85	-IR	7)
RT LMi	53107.3865	.0002	RAT RCR	−0.0055		GCVS 85	-IR	1)
	53409.5701	.0038	PC	−0.0058		GCVS 85	-IR	7)
UU Lyn	53081.4970	.0002	RAT RCR	−0.0056		GCVS 85	-IR	1)
	53407.5450	.0041	PC	−0.0059		GCVS 85	-IR	7)
	53462.3541	.0048	PC	−0.0066		GCVS 85	-IR	7)
UV Lyn	53055.6652	.0018	ATB	+0.0535	s	GCVS 85		1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
UV Lyn	53463.3837	.0005	AG	+0.0533		GCVS 85	-IR	1)
	53463.5928	.0010	AG	+0.0549	s	GCVS 85	-IR	1)
AH Lyn	53463.4023	.0003	AG				-IR	1)
CD Lyn	52980.4529	.0011	MON	−0.0006		IBVS 4911	V	1)
UZ Lyr	53250.3003	.0009	WTR	−0.0247		GCVS 85		13)
DU Lyr	53092.5657	.0003	MS FR					6)
FG Lyr	53164.4861	.0006	RAT RCR				-IR	1)
FL Lyr	53209.4302	.0010	JU	−0.0027		GCVS 85		2)
IP Lyr	53110.4424	.0002	MS FR					6)
V406 Lyr	53145.4862	.0002	RAT RCR	−0.0189		IBVS 4132 BAVM 72	-IR	1)
V574 Lyr	53229.4419	.0002	RAT RCR				-IR	1)
	53229.5803	.0003	RAT RCR				-IR	1)
	53256.3461	.0004	RAT RCR				-IR	1)
RW Mon	53410.3778	.0011	PC	−0.0505		GCVS 85	-IR	7)
UV Mon	52683.3199	.0011	AG				-IR	1)
	53060.3367	.0031	AG				-IR	1)
GU Mon	53352.4110	.0002	MS FR	+0.0103		GCVS 87		6)
IU Mon	53056.3149	.0003	AG				-IR	1)
V527 Mon	53360.4573	.0002	MS FR	−0.0233		GCVS 85		6)
V530 Mon	53354.5274	.0001	MS FR	+0.1266		GCVS 85		6)
V2203 Oph	53142.5268	.0004	FR				-IR	11)
	53143.4357	.0006	FR				-IR	11)
	53151.4020	.0003	FR				-IR	11)
	53155.4970	.0003	FR				-IR	11)
	53163.4581	.0002	FR				-IR	11)
ER Ori	53408.3693	.0002	WTR	+0.0387		GCVS 85	-IR	13)
FT Ori	53385.4662	.0017	JU	+0.1023	s	GCVS 85		2)
FZ Ori	53302.4809	.0003	MS FR	−0.0666		GCVS 85		6)
V645 Ori	53290.6508	.0002	MS FR					6)
UX Peg	53267.4221	.0008	RAT RCR	−0.0026		GCVS 87	-IR	1)
VW Peg	53369.3260	.0015	ATB	−4.8150	s	BAVM 129		1)
ZZ Peg	53323.3184	.0083	PC	+0.1295		GCVS 87	-IR	7)
BO Peg	53287.3252	.0025	PC	−0.0250		GCVS 87	-IR	7)
BX Peg	52878.4018	.0016	AG	−0.0652	s	GCVS 87		1)
	52878.5425	.0052	AG	−0.0647		GCVS 87		1)
	53209.4332	.0014	AG	−0.0705		GCVS 87		1)
	53217.4262	.0003	AG	−0.2097		GCVS 87		1)
	53220.5112	.0003	RAT RCR	−0.2093		GCVS 87	-IR	1)
	53221.4928	.0013	AG	−0.0690		GCVS 87		1)
	53226.5392	.0004	AG	−0.0702		GCVS 87		1)
	53233.4095	.0004	AG	−0.2104		GCVS 87		1)
	53233.5488	.0008	AG	−0.0711		GCVS 87		1)
	53250.3747		AG	−0.0705		GCVS 87		1)
	53250.5140	.0004	AG	−0.2116		GCVS 87		1)
	53255.4219	.0004	AG	−0.0708		GCVS 87		1)
	53255.5628	.0004	AG	−0.2103		GCVS 87		1)
	53257.3845	.0011	AG	−0.0712		GCVS 87		1)
	53257.5226	.0008	AG	−0.0733	s	GCVS 87		1)
	53282.3417	.0072	AG	−0.0714		GCVS 87	-IR	1)
	53282.4834	.0044	AG	−0.2101		GCVS 87	-IR	1)
BY Peg	53209.4902	.0034	AG					1)
	53217.5271	.0019	AG					1)
	53221.4578	.0002	AG					1)
	53226.4168	.0113	AG					1)
	53233.4249	.0033	AG					1)
	53242.4894	.0003	AG					1)
	53251.3792	.0022	AG					1)
	53253.4312	.0006	AG					1)
	53254.4579	.0008	AG					1)
	53255.4834	.0029	AG					1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
BY Peg	53257.3621	.0021	AG					1)
	53257.5348	.0035	AG					1)
	53282.3210	.0014	AG				-IR	1)
	53282.4965	.0061	AG				-IR	1)
	53284.3725	.0002	AG				-IR	1)
	53284.5488	.0003	AG				-IR	1)
BZ Peg	53254.4735	.0003	AG					1)
CC Peg	53217.5276	.0017	AG	−0.0043		IBVS 5017 BAVM 133		1)
	53221.4644	.0038	AG	−0.0039	s	IBVS 5017 BAVM 133		1)
	53228.4275	.0001	AG	−0.0053		IBVS 5017 BAVM 133		1)
	53242.3569	.0004	AG	−0.0047		IBVS 5017 BAVM 133		1)
	53250.5395	.0012	AG	+0.0022	s	IBVS 5017 BAVM 133		1)
	53251.4403	.0005	AG	−0.0054		IBVS 5017 BAVM 133		1)
	53254.4685	.0009	AG	−0.0052		IBVS 5017 BAVM 133		1)
	53255.3802	.0034	AG	−0.0019	s	IBVS 5017 BAVM 133		1)
	53256.5919	.0001	AG	−0.0014	s	IBVS 5017 BAVM 133		1)
	53257.4986	.0018	AG	−0.0031		IBVS 5017 BAVM 133		1)
	53265.3708	.0004	MS FR	−0.0038		IBVS 5017 BAVM 133		6)
	53282.3252	.0010	AG	−0.0062		IBVS 5017 BAVM 133	-IR	1)
	53284.4526	.0006	AG	+0.0015	s	IBVS 5017 BAVM 133	-IR	1)
CE Peg	53216.4383	.0022	AG					1)
	53222.5437	.0023	AG					1)
	53233.4556	.0013	AG					1)
	53242.4442	.0011	AG					1)
	53250.4697	.0022	AG					1)
	53251.4318	.0027	AG					1)
	53257.5378	.0007	AG					1)
	53284.4996	.0007	AG				-IR	1)
CF Peg	53257.4426	.0012	AG					1)
	53267.3665	.0030	AG					1)
CW Peg	53226.4347	.0046	AG	+0.0558	s	GCVS 87		1)
	53284.5568	.0001	AG	+0.0512		GCVS 87	-IR	1)
DI Peg	53262.4225	.0007	AG	−0.0176	s	GCVS 87		1)
	53325.4174	.0002	QU	−0.0185		GCVS 87	V	4)
DV Peg	53222.5258	.0008	AG					1)
EY Peg	53262.4513	.0009	AG					1)
GP Peg	53291.5617	.0009	AG	−0.0376	s	GCVS 87	-IR	1)
IP Peg	53283.3498	.0001	JU					2)
	53283.5078	.0001	JU					2)
	53284.2987	.0002	JU					2)
KW Peg	53221.4850	.0024	AG					1)
	53228.4284	.0010	AG					1)
	53250.4661	.0001	AG					1)
	53255.3663	.0020	AG					1)
	53257.4052	.0026	AG					1)
MQ Peg	53291.4865	.0013	AG				-IR	1)
GSC1127.1808 Peg	52941.3001	.0009	QU				V	4)
	52949.4387	.0030	QU				V	4)
	52964.2369	.0030	QU				V	4)
	52981.2500	.0010	QU				V	4)
RT Per	53385.4350	.0006	SCI	+0.0534		GCVS 87		2)
RV Per	53410.2820	.0063	PC	−0.0094		GCVS 87	-IR	7)
XZ Per	53410.3205	.0053	PC	−0.0587		GCVS 87	-IR	7)
AB Per	53453.4901:	.0034	SCI					3)
BP Per	53407.2970	.0059	PC	−0.0217	s	GCVS 87	-IR	7)
	53410.2650	.0103	PC	−0.0221		GCVS 87	-IR	7)
DK Per	53407.4410	.0014	SCI					2)
HK Per	53387.4601	.0005	AG				-IR	1)
II Per	53387.4130	.0009	AG				-IR	1)
	53387.6447	.0036	AG				-IR	1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
IK Per	53387.2766	.0014	AG	−0.1380	s	GCVS 87	-IR	1)
	53387.6192	.0005	AG	−0.1334		GCVS 87	-IR	1)
IM Per	53254.5845	.0003	MS FR	+0.0806		GCVS 87		6)
IT Per	53387.2908	.0004	WTR	+0.0032		GCVS 87	-IR	13)
IU Per	53253.5389	.0004	RAT RCR	+0.0101		GCVS 87	-IR	1)
	53422.3731	.0019	SCI	+0.0103		GCVS 87		3)
KR Per	53387.4165	.0005	AG	−0.0160	s	GCVS 87	-IR	1)
NZ Per	53447.4032	.0097	SCI	+0.0429		GCVS 87		3)
V427 Per	53382.3382	.0008	AG				-IR	1)
	53427.3065	.0029	SCI					3)
V432 Per	53316.4889	.0030	PC	−0.0107		IBVS 3797 BAVM 61	-IR	7)
V449 Per	53302.3442	.0002	MS FR	+0.0424		GCVS 87		6)
	53316.5301	.0030	PC	+0.0353		GCVS 87	-IR	7)
	53407.3731	.0006	AG	+0.0427		GCVS 87	-IR	1)
V450 Per	53266.4754	.0004	MS FR	+0.0738		GCVS 87		6)
RV Psc	53303.3926	.0010	AG	−0.0420	s	GCVS 87	-IR	1)
	53316.4111	.0030	PC	−0.0423		GCVS 87	-IR	7)
	53361.2857	.0008	DIE	−0.0411		GCVS 87		12)
CU Sge	53236.3915	.0002	WTR	+0.0166		GCVS 87		13)
CW Sge	53206.4972	.0014	AG	−0.0155		GCVS 87		1)
	53215.4072	.0031	AG	−0.0202	s	GCVS 87		1)
EI Sge	53206.4546	.0007	AG					1)
GSC6281.0246 Sct	53216.3623	.0037	FR				-IR	11)
	53221.3592	.0033	FR				-IR	11)
	53226.3644	.0012	FR				-IR	11)
	53236.3566	.0008	FR				-IR	11)
	53241.3581	.0008	FR				-IR	11)
	53246.3483	.0011	FR				-IR	11)
	53251.3407	.0004	FR				-IR	11)
AQ Ser	53510.5107	.0004	FR	−0.2704		GCVS 87	-IR	11)
	53516.4161	.0062	FR	−0.2709	s	GCVS 87	-IR	11)
AU Ser	53165.5019	.0042	PC	+0.0063		SAC 73	-IR	7)
	53510.4501	.0004	AG	+0.0077	s	SAC 73	-IR	1)
CC Ser	53462.6043	.0036	PC	+0.0643	s	GCVS 87	-IR	7)
	53463.6325	.0044	PC	+0.0605	s	GCVS 87	-IR	7)
CX Ser	53492.4138	.0005	FR	−0.0764	s	GCVS 87	-IR	11)
	53503.3859	.0006	FR	−0.0745	s	GCVS 87	-IR	11)
LX Ser	53510.4683	.0005	AG				-IR	1)
Y Sex	53464.4464	.0008	AG	+0.0060	s	BAVR 32,36ff	-IR	1)
RW Tau	53406.2860	.0003	JU	−0.0108		BAVR 45,124		2)
RZ Tau	53348.3777	.0002	RAT RCR	+0.0432		GCVS 87	-IR	1)
	53385.3736	.0002	WTR	+0.0440		GCVS 87	-IR	13)
AH Tau	53349.3137	.0002	AG				-IR	1)
	53349.4809	.0001	AG				-IR	1)
	53349.6461	.0008	AG				-IR	1)
	53360.2906	.0001	AG				-IR	1)
	53360.4589	.0003	AG				-IR	1)
	53360.6249	.0007	AG				-IR	1)
CF Tau	53409.2994	.0053	PC	+0.0074		BAVR 35,1ff	-IR	7)
CR Tau	53407.4413	.0028	PC	+0.0001		IBVS 4778 BAVM 123	-IR	7)
CU Tau	53287.5887	.0052	PC	−0.0144		GCVS 87	-IR	7)
	53349.2608	.0012	AG	+0.0309	s	GCVS 87	-IR	1)
	53349.4688	.0003	AG	+0.0327		GCVS 87	-IR	1)
	53360.4010	.0006	AG	+0.0411	s	GCVS 87	-IR	1)
	53360.6076	.0011	AG	+0.0416		GCVS 87	-IR	1)
EQ Tau	53287.6267	.0052	PC	−0.0278		GCVS 87	-IR	7)
	53349.2405	.0002	AG	−0.0274	s	GCVS 87	-IR	1)
	53349.4106	.0006	AG	−0.0280		GCVS 87	-IR	1)
	53349.5829	.0007	AG	−0.0263	s	GCVS 87	-IR	1)
GR Tau	53055.3580	.0012	ATB	−0.0285		BAVR 35,1ff		1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
GR Tau	53349.3690	.0008	DIE	−0.0366		BAVR 35,1ff		12)
HU Tau	53300.5791	.0024	SCI	+0.0166		GCVS 87		2)
IL Tau	53265.4988	.0003	MS FR					6)
V1094 Tau	53045.4406	.0035	ATB	+0.0175		IBVS 4544		1)
V1188 Tau	53349.3593	.0003	AG				-IR	1)
	53349.6489	.0018	AG				-IR	1)
V Tri	53266.4247	.0001	RAT RCR	−0.0007		GCVS 87	-IR	1)
	53300.3674	.0001	RAT RCR	+0.0000		GCVS 87	-IR	1)
	53303.5809	.0003	AG	−0.0051	s	GCVS 87	-IR	1)
	53349.2321	.0007	RAT RCR	+0.0001	s	GCVS 87	-IR	1)
X Tri	52992.3305	.0002	MON	−0.0561		GCVS 87	V	1)
RS Tri	53351.2093	.0003	RAT RCR	−0.0193		GCVS 87	-IR	1)
AK Tri	53335.5457	.0006	RAT RCR				-IR	1)
AL Tri	53300.3667	.0009	RAT RCR				-IR	1)
W UMa	53116.3934	.0053	PC	−0.0044		BAVR 44,156ff	-IR	7)
	53116.5614	.0049	PC	−0.0032	s	BAVR 44,156ff	-IR	7)
	53451.528 :	.139	PC	−0.007	s	BAVR 44,156ff	-IR	7)
TY UMa	53451.5448	.0038	PC	+0.0398	s	GCVS 87	-IR	7)
	53478.4914	.0040	PC	+0.0414	s	GCVS 87	-IR	7)
UX UMa	53461.5302	.0295	PC	+0.0005		GCVS 87	-IR	7)
	53485.5248	.0049	PC	+0.0012		GCVS 87	-IR	7)
	53503.4221	.0576	PC	+0.0014		GCVS 87	-IR	7)
UY UMa	53151.5066	.0059	PC	+0.0888		GCVS 87	-IR	7)
	53155.4520	.0063	PC	+0.0860	s	GCVS 87	-IR	7)
	53460.5966	.0070	PC	+0.0936		GCVS 87	-IR	7)
	53464.5473	.0112	PC	+0.0962	s	GCVS 87	-IR	7)
	53503.4576	.0085	PC	+0.0888		GCVS 87	-IR	7)
VV UMa	53409.459 :	.002	PC	−0.052		GCVS 87	-IR	7)
	53451.3892	.0030	PC	−0.0517		GCVS 87	-IR	7)
XY UMa	53082.5425	.0001	RAT RCR	+0.0223		GCVS 87	-IR	1)
	53461.4292	.0070	PC	+0.0243		GCVS 87	-IR	7)
AA UMa	53069.5450	.0002	RAT RCR	+0.0281	s	GCVS 87	-IR	1)
	53095.5226	.0003	RAT RCR	+0.0247		GCVS 87	-IR	1)
	53410.5758	.0045	PC	+0.0295		GCVS 87	-IR	7)
AW UMa	53463.4854	.0134	PC	−0.0420		GCVS 87	-IR	7)
BM UMa	53122.4907	.0005	AG				-IR	1)
	53451.3462	.0001	AG				-IR	1)
	53451.4819	.0002	AG				-IR	1)
	53451.6151	.0007	AG				-IR	1)
BQ UMa	53451.4897	.0021	AG				-IR	1)
BS UMa	53451.5355	.0009	AG				-IR	1)
RU UMi	53475.4045	.0002	AG	−0.0115		GCVS 87	-IR	1)
RZ UMi	53511.4579	.0006	AG				-IR	1)
AH Vir	53462.5021	.0030	PC	−0.0333	s	GCVS 87	-IR	7)
AZ Vir	53410.6598	.0034	PC	−0.0197	s	GCVS 87	-IR	7)
	53451.5703	.0028	PC	−0.0200	s	GCVS 87	-IR	7)
	53478.4969	.0039	PC	−0.0176	s	GCVS 87	-IR	7)
HW Vir	53491.3545	.0005	WTR				-IR	13)
GSC0278.0814 Vir	53446.4615	.0016	FR				-IR	11)
	53463.4755	.0024	FR				-IR	11)
	53464.5584	.0070	FR				-IR	11)
	53465.4497	.0020	FR				-IR	11)
AX Vul	53323.2651	.0032	PC	−0.0248		GCVS 87	-IR	7)
BI Vul	53251.3656	.0004	AG					1)
	53251.4940	.0009	AG					1)
	53254.3877	.0003	AG					1)
	53254.5170	.0002	AG					1)
	53255.3944	.0004	AG					1)
	53255.5230	.0007	AG					1)
	53256.5305	.0027	AG					1)

Table 1: (cont.)

Variable	Min JD 24...	±	Obs	$O-C$			Fil	Rem
BI Vul	53257.4091	.0006	AG					1)
	53257.5378	.0010	AG					1)
	53282.3390	.0016	AG				-IR	1)
	53282.4679	.0012	AG				-IR	1)
BK Vul	53209.3920	.0001	AG	+0.0536		GCVS 87		1)
	53216.4218	.0010	AG	+0.0546	s	GCVS 87		1)
	53221.4088	.0023	AG	+0.0534	s	GCVS 87		1)
	53228.4430	.0005	AG	+0.0589		GCVS 87		1)
	53233.4247	.0013	AG	+0.0524		GCVS 87		1)
	53242.4970	.0002	AG	+0.0553		GCVS 87		1)
	53250.4301	.0009	AG	+0.0527	s	GCVS 87		1)
	53253.3782	.0006	AG	+0.0532		GCVS 87		1)
	53254.5135	.0029	AG	+0.0548	s	GCVS 87		1)
	53255.4191	.0021	AG	+0.0535	s	GCVS 87		1)
	53256.5519	.0008	AG	+0.0526		GCVS 87		1)
	53257.4595	.0011	AG	+0.0533		GCVS 87		1)
	53267.4360	.0038	AG	+0.0534		GCVS 87		1)
	53282.3983	.0017	AG	+0.0512		GCVS 87	-IR	1)
	53284.4397	.0035	AG	+0.0520	s	GCVS 87	-IR	1)
BM Vul	53209.4228	.0013	AG					1)
	53216.3988	.0010	AG					1)
	53217.5310	.0011	AG					1)
	53221.4884	.0020	AG					1)
	53222.4316	.0010	AG					1)
	53228.4630	.0037	AG					1)
	53233.3659	.0002	AG					1)
	53233.5543	.0012	AG					1)
	53242.4152	.0067	AG					1)
	53251.4630	.0002	AG					1)
	53253.3489	.0010	AG					1)
	53254.4803	.0007	AG					1)
	53257.4965	.0031	AG					1)
	53267.2989	.0003	MS FR					6)
	53282.3828	.0021	AG				-IR	1)
	53282.5730	.0001	AG				-IR	1)
	53284.4561	.0037	AG				-IR	1)
BU Vul	53323.2759	.0025	PC	+0.0164		GCVS 87	-IR	7)
CD Vul	53245.3523	.0001	WTR	−0.0019		GCVS 87		13)
FF Vul	53163.4656	.0002	MS FR					6)
HS Vul	53215.4369	.0034	AG					1)
GSC2177.0626 Vul	53334.3937	.0066	FR				-IR	11)
	53335.3500	.0009	FR				-IR	11)
	53349.3243	.0016	FR				-IR	11)
GSC2177.0010 Vul	53303.2895	.0005	FR				-IR	11)
	53334.3766	.0007	FR				-IR	11)
	53360.2874	.0006	FR				-IR	11)

Table 2: Pulsating stars

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
SW And	52940.3575	.0008	MON	−0.0268	IBVS 4143 BAVM 76	V	1)
	53287.5453	.0037	PC	−0.0182	IBVS 4143 BAVM 76	-IR	7)
	53323.3531	.0014	PC	−0.0340	IBVS 4143 BAVM 76	-IR	7)
XY And	53303.404	.000	AG			-IR	1)
AT And	53287.4851	.0044	PC	−0.0031	GCVS 85	-IR	7)
BK And	53354.3519	.0009	MZ	−0.0028	BAVR 49,41	-IR	2)
	53359.4102	.0024	ATB	−0.0037	BAVR 49,41		1)
CC And	53290.5613	.0021	SCI	+0.0210	GCVS 85		2)
	53360.3719	.0030	JU	+0.0081	GCVS 85		2)

Table 2: (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
CC And	53381.4953	.0020	SCI	+0.0221	GCVS 85		2)
CI And	53059.3310	.0042	ATB				1)
	53287.6460	.0027	PC			-IR	7)
DR And	53303.519	.000	AG			-IR	1)
GP And	52980.3144	.0011	MON	+0.0032	GCVS 85	V	1)
	53256.4914	.0008	SCI	+0.0039	GCVS 85		2)
	53256.5706	.0008	SCI	+0.0044	GCVS 85		2)
	53256.6488	.0008	SCI	+0.0039	GCVS 85		2)
	53323.3724	.0014	PC	+0.0046	GCVS 85	-IR	7)
	53359.2504	.0009	PC	+0.0033	GCVS 85	-IR	7)
	53359.3310	.0013	PC	+0.0052	GCVS 85	-IR	7)
TY Aps	52823.525	.004	PS				2)
AB Aps	53115.509	.004	HND DVY				14)
BS Aps	53106.430	.005	HND DVY				14)
BW Aps	53153.384	.004	HND DVY				14)
CK Aps	53112.367	.004	HND DVY				14)
DD Aps	53113.378	.004	HND DVY				14)
BS Aqr	53258.3786	.0015	SCI	−0.0085	GCVS 85		2)
CY Aqr	53256.3278	.0003	SCI	+0.0124	GCVS 85		2)
	53256.3883	.0003	SCI	+0.0119	GCVS 85		2)
AA Aql	53215.4879	.0028	SCI	+0.0025	BAVM 78		2)
V341 Aql	53203.4917	.0014	SCI	+0.0026	BAVR 45,74		2)
X Ari	52983.3772	.0013	MON	+0.0405	BAVR 48,189	V	1)
RV Ari	53003.2816	.0011	MON	+0.0007	GCVS 85	V	1)
	53329.5068	.0060	JU	−0.0024	GCVS 85		2)
	53407.2693	.0012	PC	−0.0020	GCVS 85	-IR	7)
TZ Aur	52969.6217	.0012	MON	+0.0599	GCVS 85	V	1)
	53378.4798	.0003	JU	+0.0097	GCVS 85		2)
	53407.4691	.0019	PC	+0.0151	GCVS 85	-IR	7)
BH Aur	53387.654	.001	AG	+0.004	SAC 73		1)
	53410.463	.000	AG	+0.008	SAC 73		1)
RS Boo	53151.4122	.0047	PC	+0.0146	BAVR 36,157ff	-IR	7)
	53163.4875	.0022	PC	+0.0151	BAVR 36,157ff	-IR	7)
	53461.5953	.0017	PC	+0.0254	BAVR 36,157ff	-IR	7)
	53464.6122	.0014	PC	+0.0236	BAVR 36,157ff	-IR	7)
	53472.5359	.0018	PC	+0.0232	BAVR 36,157ff	-IR	7)
	53503.4759	.0017	PC	+0.0214	BAVR 36,157ff	-IR	7)
RU Boo	53462.6440	.0020	MZ			V	17)
ST Boo	53155.5458	.0025	PC	+0.0170	BAVR 49,105	-IR	7)
	53475.394	.003	AG			-IR	1)
SW Boo	53451.6497	.0056	PC			-IR	7)
	53503.5131	.0032	PC			-IR	7)
TV Boo	53163.4440	.0056	PC			-IR	7)
	53451.6429	.0059	PC			-IR	7)
	53461.326	.000	AG			-IR	1)
	53472.5631	.0046	PC			-IR	7)
TW Boo	53451.6544	.0035	PC	−0.0185	BAVR 48,189	-IR	7)
UU Boo	53110.344	.000	AG	+0.162	GCVS 85		1)
	53145.524	.000	AG	+0.160	GCVS 85		1)
	53151.468	.000	AG	+0.163	GCVS 85		1)
	53475.436	.003	AG			-IR	1)
UY Boo	53461.5902	.0028	PC	−0.0126	BAVR 48,121	-IR	7)
	53463.5384	.0034	PC	−0.0172	BAVR 48,121	-IR	7)
	53478.518 :	.004	PC	−0.009	BAVR 48,121	-IR	7)
VY Boo	53165.4674	.0058	PC			-IR	7)
	53472.4970	.0020	MZ			-IR	2)
XX Boo	53464.5990	.0076	PC	+0.0195	GCVS 85	-IR	7)
	53485.5331	.0151	PC	+0.0231	GCVS 85	-IR	7)
YZ Boo	53028.6101	.0008	MON	+0.0034	GCVS 85	V	1)
	53163.4123	.0012	PC	+0.0070	GCVS 85	-IR	7)

Table 2: (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
YZ Boo	53163.5160	.0015	PC	+0.0066	GCVS 85	-IR	7)
	53164.4558	.0030	PC	+0.0096	GCVS 85	-IR	7)
	53446.5375	.0007	SCI	+0.0031	GCVS 85		3)
	53472.5609	.0018	PC	+0.0037	GCVS 85	-IR	7)
	53484.5305	.0018	PC	+0.0027	GCVS 85	-IR	7)
	53503.4756	.0017	PC	+0.0032	GCVS 85	-IR	7)
AE Boo	53151.5379	.0059	PC	+0.0999	GCVS 85	-IR	7)
	53163.4900	.0075	PC	+0.0861	GCVS 85	-IR	7)
	53451.6126	.0052	PC	+0.0824	GCVS 85	-IR	7)
BU Boo	53117.429	.002	AG			-IR	1)
CM Boo	53155.4822	.0045	PC	−0.0760	GCVS 85	-IR	7)
	53163.3978	.0034	PC	−0.0785	GCVS 85	-IR	7)
	53432.6113	.0022	SCI	−0.0783	GCVS 85		3)
CQ Boo	53151.4654	.0068	PC	−0.0042	BAVR 48,189	-IR	7)
	53155.4091	.0042	PC	−0.0068	BAVR 48,189	-IR	7)
	53164.4297	.0038	PC	−0.0065	BAVR 48,189	-IR	7)
	53464.6329	.0049	PC	−0.0092	BAVR 48,189	-IR	7)
	53503.5320	.0034	PC	−0.0100	BAVR 48,189	-IR	7)
CS Boo	53107.3798	.0020	MS FR	−0.0070	IBVS 2855		6)
	53154.4233	.0010	MZ	−0.0014	IBVS 2855	-IR	9)
	53164.3794	.0042	PC	−0.0062	IBVS 2855	-IR	7)
	53451.5800	.0039	PC	−0.0129	IBVS 2855	-IR	7)
	53461.5413	.0042	PC	−0.0126	IBVS 2855	-IR	7)
CU Boo	53462.5472	.0008	MZ			V	17)
	53462.5472	.0008	MZ			V	17)
DD Boo	53502.4340	.0020	MZ			-IR	2)
DG Boo	53463.5240	.0050	MZ			V	17)
	53503.4214	.0005	MZ			-IR	2)
UY Cam	53409.4674	.0077	PC	+0.0642	BAVR 49,41	-IR	7)
AH Cam	52277.5820	.0044	HSR	+0.0773	GCVS 85		5)
	52941.6307	.0019	PC	+0.0350	GCVS 85	-IR	7)
	53407.3316	.0035	PC	+0.0241	GCVS 85	-IR	7)
RW Cnc	53381.4959	.0015	JU	+0.1992	GCVS 85		2) 18)
	53461.3909	.0069	PC	+0.2031	GCVS 85	-IR	7)
SS Cnc	53410.4625	.0022	PC	−0.0132	BAVR 49,41	-IR	7)
	53463.3579	.0018	PC	−0.0147	BAVR 49,41	-IR	7)
TT Cnc	53065.4888	.0056	ATB	+0.0038	BAVR 47,67		1)
	53407.5119	.0028	PC	+0.0119	BAVR 47,67	-IR	7)
	53464.4368	.0015	QU	+0.0282	BAVR 47,67	V	4)
VZ Cnc	53406.5210	.0012	JU	+0.0078	GCVS 85		2)
AQ Cnc	53360.6647	.0013	SCI	−0.0696	GCVS 85		2)
	53409.4851	.0040	PC	−0.0674	GCVS 85	-IR	7)
CQ Cnc	53446.3974	.0015	MZ	−0.0157	BAVR 49,41	-IR	2)
W CVn	53165.4349	.0047	PC	−0.0129	SAC 70	-IR	7)
Z CVn	53427.4448	.0038	SCI	+0.2528	GCVS 85		3)
	53455.5422	.0028	SCI	+0.2359	GCVS 85		3)
	53472.5468	.0059	PC	+0.2412	GCVS 85	-IR	7)
RR CVn	53472.4994	.0043	PC			-IR	7)
RU CVn	53163.4143	.0042	PC	+0.0010	BAVR 52,89 ff	-IR	7)
RX CVn	53164.3916	.0052	PC	−0.0219	BAVM 75	-IR	7)
	53461.404	.000	AG	−0.024	BAVM 75	-IR	1)
	53463.5624	.0093	PC	−0.0255	BAVM 75	-IR	7)
RZ CVn	53461.6404	.0039	PC	+0.0778	BAVR 48,189	-IR	7)
SS CVn	53464.5335	.0059	PC			-IR	7)
ST CVn	53151.4405	.0099	PC	−0.0790	BAVR 49,105	-IR	7)
	53155.3915	.0053	PC	−0.0767	BAVR 49,105	-IR	7)
SV CVn	53151.4733	.0038	PC			-IR	7)
	53155.4884	.0042	PC			-IR	7)
SW CVn	53068.6640	.0020	PC			-IR	7)
	53165.3921	.0026	PC			-IR	7)

Table 2: (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
SW CVn	53451.5945	.0033	PC			-IR	7)
	53463.5176	.0027	PC			-IR	7)
	53478.534 :	.002	PC			-IR	7)
TZ CVn	53465.544	.000	AG			-IR	1)
UV CVn	53460.5769	.0093	PC	+0.0421	GCVS 85	-IR	7)
	53472.5758	.0124	PC	+0.0406	GCVS 85	-IR	7)
UZ CVn	53462.5138	.0053	PC	−0.0268	BAVR 49,41	-IR	7)
	53483.4498	.0130	PC	−0.0247	BAVR 49,41	-IR	7)
VW CVn	53409.454	.001	AG	+0.024	BAVR 49,105		1)
	53485.527 :	.015	PC	+0.027	BAVR 49,105	-IR	7)
XY CVn	53164.4768	.0086	PC	+0.0578	GCVS 85	-IR	7)
	53409.549	.000	AG	+0.037	GCVS 85		1)
	53464.562 :	.014	PC	+0.029	GCVS 85	-IR	7)
XZ CVn	53151.5009	.0119	PC	+0.1570	GCVS 85	-IR	7)
	53409.647	.001	AG	+0.102	GCVS 85		1)
	53460.5387	.0130	PC	+0.1411	GCVS 85	-IR	7)
	53484.5039	.0207	PC	+0.1563	GCVS 85	-IR	7)
	53485.4870	.0181	PC	+0.1551	GCVS 85	-IR	7)
AP CVn	53464.5487	.0084	PC			-IR	7)
BN CVn	53163.4270	.0044	PC	+0.0544	BAVM 75	-IR	7)
	53478.4982	.0043	PC	+0.0529	BAVM 75	-IR	7)
	53482.4433	.0034	PC	+0.0525	BAVM 75	-IR	7)
X CMi	53350.664	.005	PS	+0.017	BAVR 44,162f		16)
AA CMi	53385.4379	.0008	MZ	+0.0111	BAVR 49,41	-IR	2)
HU Cas	53287.4737	.0036	PC			-IR	7)
PS Cas	53382.280	.000	AG			-IR	1)
	53388.492	.000	AG			-IR	1)
	53409.342	.000	AG			-IR	1)
QR Cas	53349.450	.001	AG			-IR	1)
V470 Cas	53388.308	.001	AG	+0.243	IBVS 4332 BAVM 87	-IR	1)
RZ Cep	53259.2864		SG	−0.1096	GCVS 85		4)
DX Cep	53224.5684	.0031	PC			-IR	7)
	53359.2295	.0033	PC			-IR	7)
EZ Cep	53267.489	.000	AG	+0.069	SAC 74	-IR	1)
	53287.5756	.0019	PC	+0.0689	SAC 74	-IR	7)
	53381.569	.000	AG	+0.071	SAC 74	-IR	1)
RV Cet	52982.3741	.0012	MON	+0.1646	GCVS 85	V	1)
S Com	53165.3562	.0024	PC	+0.0038	SAC 73	-IR	7)
	53464.5184	.0030	PC	+0.0070	SAC 73	-IR	7)
U Com	53164.4437	.0040	MZ	−0.0023	BAVR 49,41	-IR	9)
	53410.6531	.0067	PC	+0.0147	BAVR 49,41	-IR	7)
	53476.505	.002	AG			-IR	1)
	53484.424 :	.007	PC	+0.016	BAVR 49,41	-IR	7)
V Com	53407.6717	.0038	PC	+0.0298	GCVS 85	-IR	7)
	53463.4995	.0031	PC	+0.0293	GCVS 85	-IR	7)
	53478.513 :	.003	PC	+0.030	GCVS 85	-IR	7)
RY Com	53461.5209	.0024	PC	−0.0077	GCVS 85	-IR	7)
	53484.5094	.0059	PC	+0.0021	GCVS 85	-IR	7)
	53485.4443	.0049	PC	−0.0009	GCVS 85	-IR	7)
	53493.4058	.0010	MZ	−0.0116	GCVS 85	-IR	2)
ST Com	53462.5637	.0047	PC	−0.0033	BAVR 47,67	-IR	7)
AO Com	53461.465	.001	AG			-IR	1)
BS Com	53117.407	.000	AG			-IR	1)
	53151.5538	.0056	PC			-IR	7)
	53155.5091	.0074	PC			-IR	7)
	53461.6134:	.0152	PC			-IR	7)
	53472.5202	.0092	PC			-IR	7)
RV CrB	53453.6279	.0063	SCI	+0.1051	GCVS 85		3)
SZ CrB	53151.5559	.0032	PC	+0.0079	BAVR 49,41	-IR	7)
WX CrB	52793.597 :	.010	AG			-IR	1)

Table 2: (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
XX Cyg	53265.3260	.0005	SCI	+0.0029	GCVS 85		2)
	53265.4607	.0005	SCI	+0.0027	GCVS 85		2)
	53265.5958	.0006	SCI	+0.0029	GCVS 85		2)
	53287.3100	.0010	PC	+0.0038	GCVS 85	-IR	7)
	53287.4473	.0019	PC	+0.0063	GCVS 85	-IR	7)
	53287.5803	.0017	PC	+0.0044	GCVS 85	-IR	7)
XZ Cyg	52797.5004	.0012	MON	+0.0138	BAVR 48,189	V	1)
	53216.5108		BRN STK	+0.0219	BAVR 48,189	-IR	4)
	53217.4451	.0015	JU	+0.0230	BAVR 48,189		2)
	53224.4562	.0060	PC	+0.0352	BAVR 48,189	-IR	7)
	53245.4405	.0010	JU	+0.0227	BAVR 48,189		2)
	53267.3694	.0013	SE	+0.0217	BAVR 48,189	-IR	15)
	53302.3677	.0008	JU	+0.0253	BAVR 48,189		2)
DM Cyg	52930.3228	.0012	MON	−0.0041	BAVR 51,98ff	V	1)
	53154.5307	.0019	MON	−0.0032	BAVR 51,98ff	V	1)
	53225.4898	.0022	PC	−0.0010	BAVR 51,98ff	-IR	7)
	53233.4669	.0010	JU	−0.0013	BAVR 51,98ff		2)
	53283.4272	.0007	QU	−0.0047	BAVR 51,98ff	V	4)
V759 Cyg	53221.417	.000	AG			-IR	1)
	53226.4625	.0046	PC			-IR	7)
V830 Cyg	53215.5835	.0030	MZ			-IR	17)
	53216.394 :	.008	MZ			-IR	17)
	53250.5125	.0004	MZ			-IR	17)
	53259.354	.000	AG				1)
V835 Cyg	53227.475	.000	AG				1)
V882 Cyg	51045.4716	.0023	FR				10)
V1949 Cyg	52834.4865	.0010	MZ			-IR	9)
	52835.4777	.0010	MZ			-IR	9)
	52849.4538	.0010	MZ			-IR	9)
	53215.5132	.0020	MZ			V	17)
	53251.4675	.0004	MZ			V	17)
V1962 Cyg	52902.574 :	.008	MZ			V	17)
	52928.5063	.0005	MZ			V	17)
	52929.5285	.0004	MZ			V	17)
	53252.3316	.0001	MZ			V	17)
	53253.3450	.0003	MZ			V	17)
AX Del	53253.4281	.0007	MZ			V	17)
DX Del	53225.4602	.0033	PC	+0.0039	Monthly Notices	-IR	7)
	53233.4961	.0013	SCI	+0.0053	Monthly Notices		2)
RW Dra	53111.5371	.0012	MON	+0.1758	GCVS 85	V	1)
	53165.5671	.0013	PC	+0.1699	GCVS 85	-IR	7)
SU Dra	53485.4471	.0042	PC	+0.0456	GCVS 85	-IR	7)
SW Dra	53254.3431		SG	+0.0090	BAVR 47,67	-IR	4)
	53266.2984	.0008	SG	+0.0012	BAVR 47,67	V	4)
XZ Dra	53207.4554	.0013	JU	−0.0791	GCVS 85		2)
AE Dra	53224.4517	.0034	PC			-IR	7)
BK Dra	53154.4138	.0019	MON	+0.0467	BAVR 46,1	V	1)
	53225.4675	.0031	PC	+0.0517	BAVR 46,1	-IR	7)
BT Dra	53484.5166	.0056	PC			-IR	7)
CY Dra	53359.3319	.0020	MZ			-IR	2)
DD Dra	52764.6272	.0139	MON	+0.0545	BAVR 49,6	V	1)
	53137.465	.000	AG	+0.021	BAVR 49,6		1)
RR Gem	53056.5024	.0021	ATB	+0.0039	BAVR 47,67		1)
	53068.4250	.0021	ATB	+0.0078	BAVR 47,67		1)
	53070.4073	.0021	ATB	+0.0036	BAVR 47,67		1)
	53105.3709	.0035	ATB	+0.0055	BAVR 47,67		1)
SZ Gem	52982.4670	.0012	MON	+0.0076	BAVR 48,65	V	1)
	53407.4256	.0031	PC	+0.0061	BAVR 48,65	-IR	7)
	53407.4257	.0010	JU	+0.0062	BAVR 48,65		2)
GI Gem	53409.4217	.0038	PC	−0.0031	BAVR 51,40ff	-IR	7)

Table 2: (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
GSC1893.0089 Gem	53110.3829	.0020	FR			-IR	11)
TW Her	53151.6010	.0028	PC	−0.0032	GCVS 85	-IR	7)
VX Her	53164.4568	.0015	PC	+0.0801	GCVS 85	-IR	7)
	53257.3468	.0021	ATB	+0.0741	GCVS 85		1)
VZ Her	53252.3765	.0014	ATB	+0.0590	GCVS 85		1)
AR Her	53155.4927	.0031	PC	+0.0092	BAVR 52,3ff	-IR	7)
	53163.4791	.0046	PC	+0.0059	BAVR 52,3ff	-IR	7)
DY Her	53094.6223	.0012	MON	−0.0040	BAVR 48,189	V	1)
	53164.4832	.0014	PC	+0.0002	BAVR 48,189	-IR	7)
HN Her	53238.342		SHT			V	4)
IP Her	53165.5593	.0043	PC			-IR	7)
	53251.4579	.0062	ATB				1)
	53258.3973	.0028	ATB				1)
	53268.3685	.0042	ATB				1)
	53291.3603	.0028	ATB				1)
	53298.3077	.0042	ATB				1)
LS Her	53151.4708	.0071	PC	+0.0238	GCVS 85	-IR	7)
	53163.4462	.0030	PC	−0.0028	GCVS 85	-IR	7)
V418 Her	53502.541	.005	AG			-IR	1)
V458 Her	53502.446	.003	AG			-IR	1)
V469 Her	53502.392	.003	AG			-IR	1)
UU Hya	53446.356	.000	AG			-IR	1)
UV Hya	53446.403	.001	AG			-IR	1)
WZ Hya	52983.6542	.0012	MON	−0.0117	GCVS 85	V	1)
CQ Lac	53359.2916	.0028	ATB	+0.0250	SAC 74		1)
CZ Lac	53222.403	.000	AG	+0.014	BAVR 53,12f	-IR	1)
	53247.462	.000	AG	+0.006	BAVR 53,12f	-IR	1)
	53250.480	.000	AG	−0.001	BAVR 53,12f	-IR	1)
	53251.340	.000	AG	−0.005	BAVR 53,12f	-IR	1)
	53253.498	.000	AG	−0.008	BAVR 53,12f	-IR	1)
	53256.534	.000	AG	+0.002	BAVR 53,12f	-IR	1)
	53257.402	.000	AG	+0.006	BAVR 53,12f	-IR	1)
	53282.469	.001	AG	+0.006	BAVR 53,12f	-IR	1)
	53334.3318	.0010	SCI	+0.0070	BAVR 53,12f		2)
DE Lac	52863.4000	.0012	MON	+0.0325	GCVS 85	V	1)
IT Lac	53284.300	.001	AG			-IR	1)
IV Lac	53222.429	.000	AG			-IR	1)
	53226.438	.000	AG			-IR	1)
	53242.472	.001	AG			-IR	1)
	53258.504	.000	AG			-IR	1)
	53282.553	.001	AG			-IR	1)
	53284.559	.000	AG			-IR	1)
RR Leo	53463.4613	.0022	PC	+0.0316	BAVR 47,67	-IR	7)
	53478.3906	.0024	PC	+0.0318	BAVR 47,67	-IR	7)
RV Leo	53462.3500	.0009	MZ			V	17)
	53462.3500	.0009	MZ			V	17)
RX Leo	53460.4969	.0053	PC	−0.0054	BAVR 49,41	-IR	7)
SU Leo	53461.3798	.0042	PC	−0.0054	BAVR 49,41	-IR	7)
SZ Leo	53483.3907	.0136	PC	−0.0953	BAVR 49,105	-IR	7)
WW Leo	53446.442	.000	AG	+0.031	GCVS 85	-IR	1)
AA Leo	53407.5758	.0040	PC	+0.0104	BAVR 49,41	-IR	7)
	53461.4540	.0038	PC	+0.0101	BAVR 49,41	-IR	7)
	53464.4442	.0050	PC	+0.0071	BAVR 49,41	-IR	7)
	53482.4036	.0046	PC	+0.0070	BAVR 49,41	-IR	7)
	53485.3998	.0053	PC	+0.0099	BAVR 49,41	-IR	7)
AQ Leo	53462.4286	.0250	PC			-IR	7)
AX Leo	53464.4864	.0088	PC	−0.0079	BAVR 49,105	-IR	7)
	53483.3851	.0126	PC	−0.0067	BAVR 49,105	-IR	7)
BX Leo	53478.3639	.0027	PC	−0.1091	GCVS 85	-IR	7)
	53483.3741	.0154	PC	−0.1789	GCVS 85	-IR	7)

Table 2: (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
DL Leo	53407.579 :	.004	PC	+0.034	IBVS 2533	-IR	7)
V LMi	53483.4069	.0039	PC	+0.0318	SAC 72	-IR	7)
Y LMi	53462.3635	.0056	PC	+0.0031	BAVR 49,41	-IR	7)
	53472.3306	.0058	PC	+0.0060	BAVR 49,41	-IR	7)
	53483.3406	.0052	PC	+0.0029	BAVR 49,41	-IR	7)
TX Lib	53462.6391	.0009	MZ			V	17)
EH Lib	53143.4530	.0009	SEL	+0.0081	GCVS 85		8)
RW Lyn	53109.3971	.0009	ATB	+0.0030	BAVR 47,35		1)
SZ Lyn	52983.4844	.0010	MON	+0.0234	GCVS 85	V	1)
	53028.4459	.0008	MON	+0.0253	GCVS 85	V	1)
	53409.5689	.0015	PC	+0.0169	GCVS 85	-IR	7)
	53409.6874	.0017	PC	+0.0149	GCVS 85	-IR	7)
	53451.3985	.0046	PC	+0.0209	GCVS 85	-IR	7)
TT Lyn	53461.3403	.0118	PC			-IR	7)
TV Lyn	53407.5279	.0080	PC	+0.0190	GCVS 85	-IR	7)
TW Lyn	53059.4491	.0021	ATB	+0.0482	GCVS 85		1)
	53460.3584	.0032	PC	+0.0499	GCVS 85	-IR	7)
AN Lyn	53052.3833	.0012	MON			V	1)
	53094.3458	.0025	PC			-IR	7)
	53410.5031	.0039	PC			-IR	7)
	53410.5988	.0048	PC			-IR	7)
	53451.3846	.0026	PC			-IR	7)
	53451.4835	.0047	PC			-IR	7)
	53451.4835	.0046	PC			-IR	7)
BE Lyn	53094.3515	.0008	MON	+0.0034	Rev Mex 20,37	V	1)
	53094.4467	.0008	MON	+0.0028	Rev Mex 20,37	V	1)
	53410.5408	.0047	PC	+0.0153	Rev Mex 20,37	-IR	7)
	53472.3714	.0049	PC	+0.0101	Rev Mex 20,37	-IR	7)
	53472.4639	.0024	PC	+0.0067	Rev Mex 20,37	-IR	7)
RZ Lyr	52807.5383	.0051	PC	−0.0042	BAVR 48,189	-IR	7)
	53214.4878	.0014	SCI	−0.0037	BAVR 48,189		2)
	53254.3562	.0014	SE	−0.0122	BAVR 48,189	-IR	15)
	53256.3980	.0021	ATB	−0.0154	BAVR 48,189		1)
	53300.3843	.0021	ATB	+0.0041	BAVR 48,189		1)
CN Lyr	52858.3939	.0012	MON	+0.0066	BAVR 43,57	V	1)
	53215.4731	.0016	JU	+0.0056	BAVR 43,57		2)
	53217.5315	.0031	SCI	+0.0070	BAVR 43,57		2)
EZ Lyr	53221.4889	.0030	SE	+0.0298	BAVR 34,145ff	-IR	15)
	53251.4270	.0014	SCI	+0.0278	BAVR 34,145ff		2)
	53251.4278	.0022	JU	+0.0286	BAVR 34,145ff		2)
IO Lyr	53253.4300	.0014	SCI	−0.0272	GCVS 85		2)
	53257.4679	.0028	ATB	−0.0291	GCVS 85		1)
	53286.3262	.0021	ATB	−0.0270	GCVS 85		1)
	53316.3330	.0021	ATB	−0.0306	GCVS 85		1)
LX Lyr	53287.3191	.0024	ATB	+0.0078	BAVR 49,105		1)
V530 Oph	53143.3919	.0030	FR			-IR	11)
	53151.3888	.0011	FR			-IR	11)
	53155.3778	.0030	FR			-IR	11)
CM Ori	53054.4160	.0042	ATB	+0.0143	BAVR 49,105		1)
	53384.3438	.0010	MZ	+0.0139	BAVR 49,105	-IR	2)
V1640 Ori	53386.4236	.0008	MZ	+0.0742	BAVM149	-IR	2)
VV Peg	53287.4774	.0017	ATB	−0.0283	GCVS 87		1)
VZ Peg	53285.3485	.0009	MZ	−0.0035	BAVR 49,41	-IR	2)
	53287.4852	.0060	PC	−0.0122	BAVR 49,41	-IR	7)
	53291.4745	.0056	ATB	−0.0073	BAVR 49,41		1)
AV Peg	52953.2767	.0012	MON	+0.0198	BAVR 47,67	V	1)
	53226.5451	.0029	PC	+0.0235	BAVR 47,67	-IR	7)
	53316.3288	.0016	PC	+0.0202	BAVR 47,67	-IR	7)
	53330.3908	.0015	QU	+0.0286	BAVR 47,67	V	4)
	53350.2929	.0014	ATB	+0.0214	BAVR 47,67		1)

Table 2: (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
BF Peg	52941.3601	.0027	PC	+0.0419	BAVR 49,41	-IR	7)
	53287.3919	.0051	PC	+0.0060	BAVR 49,41	-IR	7)
BH Peg	53250.3786	.0021	SCI	+0.0028	BAVR 47,67		2)
	53255.5020	.0021	SCI	−0.0017	BAVR 47,67		2)
	53257.4304	.0023	SCI	+0.0037	BAVR 47,67		2)
	53284.3535	.0028	SCI	+0.0054	BAVR 47,67		2)
	53298.4553	.0049	ATB	+0.0054	BAVR 47,67		1)
BP Peg	52941.3293	.0012	MON	−0.0116	BAVR 48,189	V	1)
	53224.4999	.0026	PC	−0.0129	BAVR 48,189	-IR	7)
	53287.3782	.0027	PC	−0.0130	BAVR 48,189	-IR	7)
BT Peg	53250.546	.000	AG	+0.076	BAVR 49,105		1)
	53254.448	.001	AG	+0.080	BAVR 49,105		1)
CG Peg	53209.463	.000	AG	−0.019	SAC 72		1)
	53216.469	.000	AG	−0.020	SAC 72		1)
	53222.542	.000	AG	−0.019	SAC 72		1)
	53250.571	.000	AG	−0.019	SAC 72		1)
	53258.5095	.0021	ATB	−0.0215	SAC 72		1)
	53267.389	.000	AG	−0.018	SAC 72		1)
	53282.336	.000	AG	−0.019	SAC 72	-IR	1)
CM Peg	53267.351	.000	AG				1)
CN Peg	53217.428	.001	AG				1)
	53255.356	.000	AG				1)
	53267.369	.000	AG				1)
CQ Peg	53255.501	.000	AG				1)
CS Peg	53250.6399	.0020	MZ			V	17)
	53253.4602	.0010	MZ			V	17)
CV Peg	53222.435	.001	AG				1)
	53250.5720	.0006	MZ			V	17)
CY Peg	53253.3191	.0010	MZ			V	17)
DH Peg	53226.5884	.0063	PC	+0.0327	GCVS 87	-IR	7)
	53255.4512	.0083	SE	+0.0228	GCVS 87	-IR	15)
DY Peg	52858.5451	.0011	MON	−0.0039	GCVS 87	V	1)
	52858.6179	.0012	MON	−0.0040	GCVS 87	V	1)
	52929.2833	.0011	MON	−0.0042	GCVS 87	V	1)
	52929.3562	.0011	MON	−0.0042	GCVS 87	V	1)
	53359.1828	.0010	PC	−0.0052	GCVS 87	-IR	7)
	53359.2556	.0008	PC	−0.0053	GCVS 87	-IR	7)
ET Peg	53291.450	.000	AG			-IR	1)
	53323.2923	.0040	PC			-IR	7)
GV Peg	53353.3906	.0005	MZ			-IR	2)
IX Peg	53262.398	.000	AG				1)
IY Peg	53262.373	.000	AG				1)
AR Per	53407.3865	.0053	PC	+0.0611	GCVS 87	-IR	7)
RU Psc	53254.5744	.0038	SCI	−0.0345	BAVR 47, 67		2)
SS Psc	53254.3810	.0035	SCI	+0.0060	BAVR 47, 67		2)
BI Sge	53215.435	.001	AG				1)
DP Sge	53215.546	.000	AG				1)
V1025 Sgr	53236.4067	.0003	FR			-IR	11)
AP Ser	53463.5866	.0067	PC			-IR	7)
BH Ser	53151.5487	.0038	PC	+0.0780	GCVS 87	-IR	7)
	53155.4539	.0019	MON	+0.0723	GCVS 87	V	1)
	53155.4580	.0034	PC	+0.0764	GCVS 87	-IR	7)
	53503.5346	.0023	PC	+0.0763	GCVS 87	-IR	7)
CW Ser	53143.3699	.0012	MON	−0.0039	BAVR 48,189	V	1)
	53462.6549	.0039	PC	−0.0069	BAVR 48,189	-IR	7)
DF Ser	53462.6461	.0024	PC			-IR	7)
T Sex	53464.366	.001	AG	−0.046	BAVR 51,247	-IR	1)
BO Tau	53360.4834	.0003	MZ			-IR	2)
U Tri	53359.3251	.0027	PC	−0.0059	BAVR 49,105	-IR	7)
UV Tri	53300.3592	.0007	RAT RCR			-IR	1)

Table 2: (cont.)

Variable	Max JD 24...	±	Obs	$O-C$		Fil	Rem
UV Tri	53349.2417	.0011	RAT RCR			-IR	1)
UX Tri	53056.3227	.0028	ATB				1)
	53070.3114	.0018	ATB				1)
	53359.3449	.0094	PC			-IR	7)
RV UMa	53503.4998	.0028	PC	+0.0081	BAVR 48,189	-IR	7)
SX UMa	53460.5934	.0047	PC	+0.0948	SAC 73	-IR	7)
	53464.5851	.0039	PC	+0.0940	SAC 73	-IR	7)
	53484.5500	.0047	PC	+0.0962	SAC 73	-IR	7)
TU UMa	53165.4419	.0005	QU	−0.0262	GCVS 87	V	4)
	53455.4240	.0005	QU	−0.0266	GCVS 87	V	4)
	53460.4431	.0035	PC	−0.0264	GCVS 87	-IR	7)
AE UMa	52980.5608	.0011	MON	+0.0057	BAVR 48,189	V	1)
	52980.6421	.0011	MON	+0.0010	BAVR 48,189	V	1)
	52980.7279	.0011	MON	+0.0008	BAVR 48,189	V	1)
	53451.4136	.0022	PC	+0.0012	BAVR 48,189	-IR	7)
	53451.5042	.0024	PC	+0.0058	BAVR 48,189	-IR	7)
	53484.3616	.0024	PC	+0.0047	BAVR 48,189	-IR	7)
UZ Vir	53462.3270	.0060	MZ			V	17)
AT Vir	53407.5404	.0017	SCI	−0.2310	GCVS 87		2)
AV Vir	53446.4207	.0042	SCI	+0.0087	BAVR 48,189		3)
	53461.5170	.0089	PC	−0.0040	BAVR 48,189	-IR	7)
	53484.5022	.0101	PC	−0.0106	BAVR 48,189	-IR	7)
FU Vir	53097.4288	.0006	MS FR	+0.0229	BAVR 49,105		6)
	53151.4009	.0041	PC	+0.0066	BAVR 49,105	-IR	7)
	53461.5158	.0061	PC	−0.0248	BAVR 49,105	-IR	7)
BN Vul	52864.3888	.0012	MON	−0.0129	SAC 73	V	1)
	53224.4323	.0031	PC	−0.0163	SAC 73	-IR	7)
CE Vul	53251.4078	.0007	MZ			V	7)
	53252.5213	.0007	MZ			V	17)
FH Vul	53252.3746	.0001	MZ	−0.0432	BAVR 49,41	V	17)

Remarks:

AG :	Agerer, F., Tiefenbach	ATB:	Achterberg, Dr. H., Norderstedt
BRN:	Brauner, B., Herford	DIE:	Dietrich, M., Radebeul
DVY:	Dreveny, R.	FR :	Frank, P., Velden
HND:	Hund, F., Windhoek (Namibia)	HSR:	Husar, Dr. D., Hamburg
JU :	Jungbluth, Dr. H., Karlsruhe	MON:	Monninger, Dr. G., Gemmingen
MS :	Moschner, W., Lennestadt	MZ :	Maintz, G., Bonn
PC :	Poschinger, K., Hamburg	PRK:	Proksch, W., Winhöring
PS :	Paschke, A., Rüti	QU :	Quester, W., Esslingen
RAT:	Rätz, M., Herges-Hallenberg	RCR:	Rätz, Ch., Herges-Hallenberg
SCI:	Schmidt, U., Karlsruhe	SE :	Schlereth, B., Hassfurth
SEL:	Scheel, M., Kempten	SG :	Sterzinger, Dr. P, Wien (A)
SHT:	Scharnhorst, D. Erfurt	STK:	Strunk, J., Leopoldshöhe
WTR:	Walter, F., München		

:	= uncertain
s	= secondary minimum
E	= CCD- or photoelectric observation
red	= reduced results
1)	= photometer ST-6 chip 375*242 uncoated
2)	= photometer ST-7
3)	= photometer ST-7 chip KAF0400
4)	= photometer ST-7E
5)	= photometer ST-8E
6)	= photometer ST-9 chip 512*512
7)	= photometer ST-10 XMR/XME
8)	= photometer ST-9E
9)	= photometer AlphaMini
10)	= photometer OES-LcCCD11
11)	= photometer OES-LcCCD12
12)	= photometer pictor 1616XT
13)	= photometer Pictor 416XT
14)	= photometer starlight Xpress chip 510*256
15)	= photometer starlight Xpress chip 752x580
16)	= photometer Cryocam 80A
17)	= photometer holicam
18)	= double maximum
GCVS *yy*	= General Catalogue of Variable Stars,4th ed. 19*yy*
IBVS *nnnn*	= Information Bulletin on Variable Stars No. *nnnn*
SAC *vv*	= Rocznik Astronomiczny No. *vv*, Krakow (SAC)
BAVM *nnn*	= BAV Mitteilungen No. *nnn*
BAVR *nn*, *ss*	= BAV Rundbrief No. *nn*, page *ss*

ERRATUM FOR IBVS 5643

Corrections to BAVM 172

AD And	52587.4894 RAT RCR	correct time: 52857.4894
SW CVn	53068.5572 PC	must be deleted

ERRATUM FOR IBVS 5657

Corrections to BAVM 173

V699 Cyg 53258.5458 AG must be deleted

ERRATUM FOR IBVS 5657

Corrections to BAVM 173

AO Cam 53360.4840 RAT RCR correct value: 53360.4940

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5658

Konkoly Observatory
Budapest
10 November 2005

HU ISSN 0374 – 0676

DISCOVERY OF A NEW PULSATING STAR: GSC 04619-00846

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e-mail: xzhang@bao.ac.cn, lfxing@bao.ac.cn

Name of the object:
GSC 04619-00846

Equatorial coordinates:	**Equinox:**
R.A.= $01^{\mathrm{h}}14^{\mathrm{m}}00\overset{\mathrm{s}}{.}7$ **DEC.=** $+84^\circ45'26\overset{''}{.}5$	2000

Observatory and telescope:
Xinglong Station, Beijing Astronomical Observatory, 60 cm reflector

Detector:	CCD, 1024×1024

Filter(s):	BV

Date(s) of the observation(s):
2005.10.03, 2005.10.04, 2005.10.07

Comparison star(s):	GSC 04619-00369

Check star(s):	GSC 04619-01518

Transformed to a standard system:	No

Type of variability:	δ Sct

Availability of the data:
`5658-t1.txt` (V), `5658-t2.txt` (B)

Remarks:

The variability of GSC04619-00846 was discovered during a follow-up observation on the suspected beta Cephei-type variable GSC04619-00450 previously discovered by us (Zhang et al., 2004). We report the discovery of oscillations of the star GSC 04619-00846. B and V CCD photometry observations of the star are presented. In Fig. 1 we plot the light curves collected in both filters. It shows obvious periodic light changes with a total amplitude of about $0^{\rm m}_{.}04$. To search for periodicity of the light variations, a Fourier analysis was performed by using the algorithm Period04 (Lenz & Breger, 2005). Fig. 2 represents the amplitude spectra produced from the B and V data. A dominant frequency of $f = 13.546 \pm 0.009$ c/d, corresponding to a period of $P = 0.0738 \pm 0.0001$ days is determined for the star. In addition, two more frequencies can be detected at 8.911 ± 0.013 c/d and 18.600 ± 0.014 c/d. This suggests that GSC 04619-00846 could be pulsating with multi-periods. Adopting the B and V magnitudes of the check star GSC 04619-01518, B=11.7 and V=10.6 (Høg et al., 2000), the color indices of the variable can be estimated as $B-V \simeq 0.4$, which suggests a spectral type of about F3 for the star. Therefore we conclude that GSC 04619-00846 could be very probably a new δ Scuti variable.

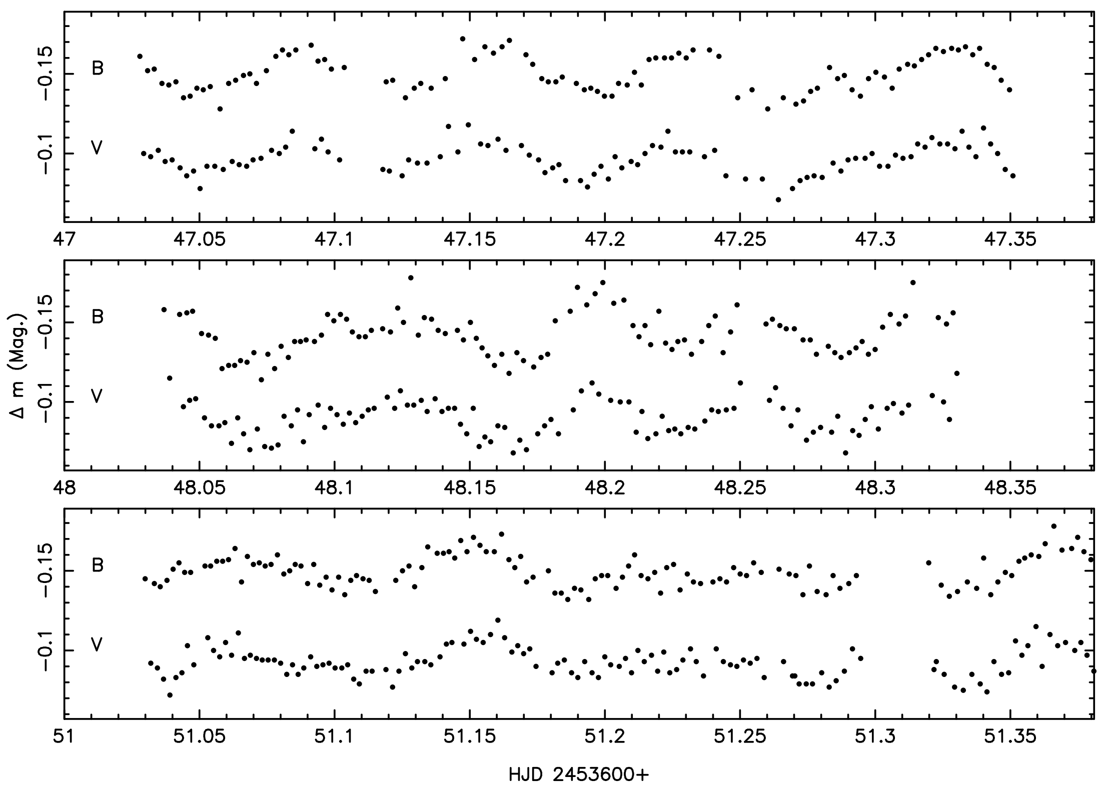

Figure 1. B and V light curves of GSC 04619-00846

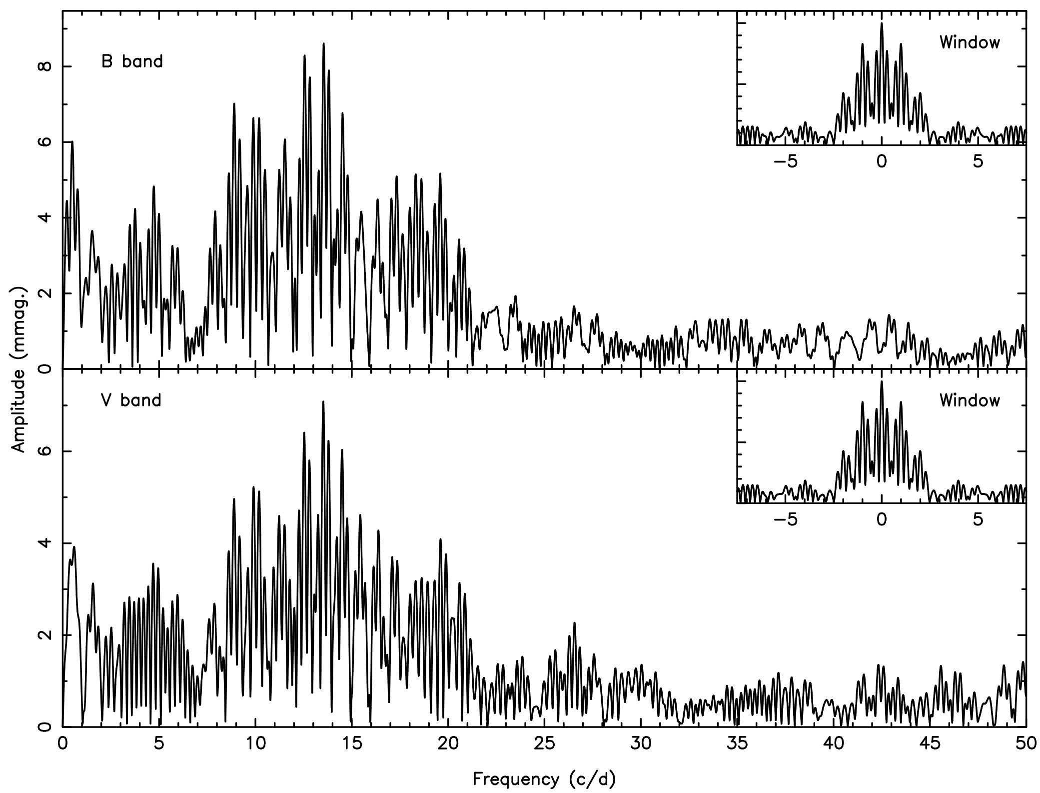

Figure 2. Amplitude spectrum of all the data

References:

Høg, E., Kuzmin, A., Bastian, U., Fabricius, C., Kuimov, K., Lindegren, L., Makarov, V.V., Roeser, S., 1998, *A&A*, **335**, L65

Lenz, P., Breger, M., 2005, *Comm. in Asteroseismology*, **146**, 53

Zhang, X.B.; Deng, L.; Zhou, X.; Xin, Y., 2004, *MNRAS*, **355**, 1369

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5659

Konkoly Observatory
Budapest
21 November 2005

HU ISSN 0374 – 0676

DISCOVERY OF ECLIPSING BINARY GSC 2007:761 AND MISCLASSIFICATION OF δ SCUTI SAO 83225

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[2] Department of Astronomy, Columbia University's Biosphere 2 Center, Oracle, AZ, USA

Observatory and telescope:
The Biosphere 2 Observatory 24″ Ritchey-Chretien telescope was used for these observations.

Detector:	The telescope was fitted with an Apogee AP-7 CCD camera (Peltier cooled, 512 × 512 pixels) controlled by MaxIm DL software and fitted with a V filter.

Remarks:

As a potential δ Scuti star, SAO 83225 was targeted by the Columbia University Biosphere 2 Observatory in the Spring of 2002 as part of a project to match single-mode δ Scuti pulsations to instability strips predicted by theory (Xu, 2002).
SAO 83225 (ROTSE J141249.39+243203.3, 2000 coordinates) is a 10.08V magnitude star of spectral type of F8. SIMBAD presents SAO 83225 as a δ Scuti variable having period P=0.135 d and amplitude of variability = 0.078. The δ Scuti classification was made automatically in the ROTSE1 sky survey (Akerlof et al., 2000).
GSC 2007:761 is an 11.87 V-magnitude star with coordinates $\alpha = 14^{h}12\overset{m}{.}85$, $\delta = +24°32\overset{\prime}{.}05$. No additional information about SAO 83225 or GSC 2007:761 has been found in the literature. The finding chart is given in Fig.1.
613 individual observations were taken in the time interval JD2452395 - JD2452397. The relative photometry was performed using the MaxIm DL v3.03 photometry tool. In Fig.2 we present the light curve of GSC 2007:761 using SAO 83225 as a comparison star and GSC 2007:751 as a check star. Note that the comparison star's curve does not exhibit variability against the check star while that of GSC 2007:761 does, the unexpected result which prompted us to explore further.
We also present the light curve of GSC 2007:761 against GSC 2007:751 and the nonvariability of GSC 2007:751 against check-star GSC 2007:733.

Remarks:

The light curve of GSC 2007:761 exhibits primary and secondary eclipse dips and characteristic shape of a short period contact binary system. The half period, according to our observations, is P1/2 = 0.13550 ± 0.00085 d, the same value that is given for as the δ Scuti pulsation period of SAO 83225, indicating that the binary system has a full period of P = 0.2710 ± 0.0017 d.

Our observations yield primary minima timings: JD 2452395.7197 and JD 2452397.8873. We also present the light curve of GSC 2007:761 superimposed upon the folded light curve of GSC 2007:761 with comparison SAO 83225. The plot provides conclusive evidence of a binary system.

Given the proximity of these two stars, SAO 83225 has apparently been misidentified as a variable star (Jin et al., 2004) where it is GSC 2007:761 that is actually variable. In addition, the variability has been erroneously characterized as δ Scuti type pulsation rather than as an eclipsing binary system.

As our interest lies with the properties of δ Scuti pulsations, we report here only the most fundamental properties of the newly identified eclipsing variable GSC 2007:761. The period has been determined to be P = 0.27 d, designating it a Very Short Period (VSP) system (Samec et al., 1991). The amplitude of the primary eclipse is 0.55 mag while that of the secondary is 0.45 mag.

Acknowledgements:

This research has made use of the SIMBAD database and Smithsonian/NASA Astrophysics Data System (ADS).

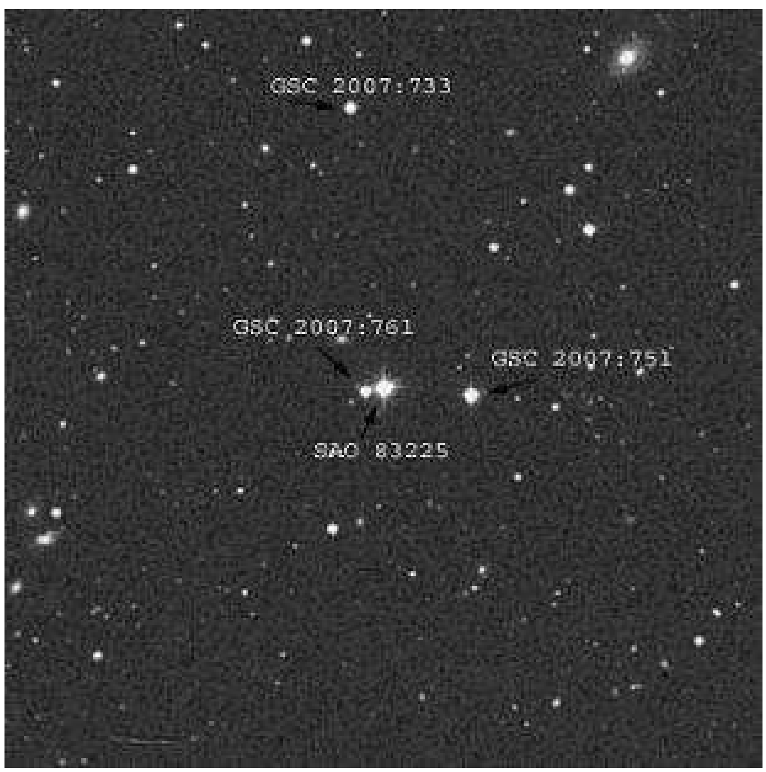

Figure 1. SAO 83225 star field.

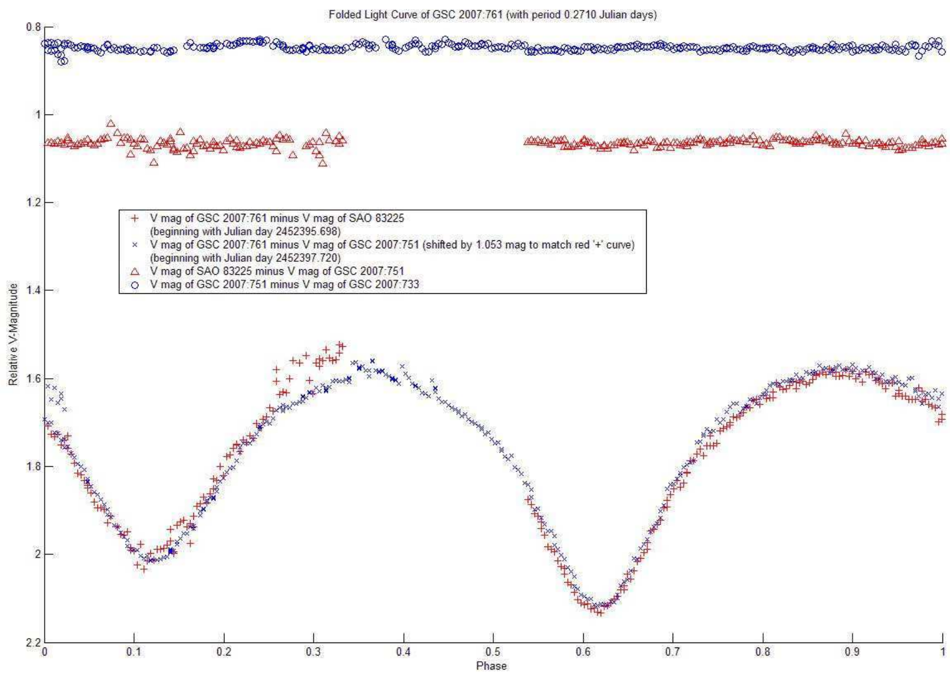

Figure 2. Light curves of GSC 2007:761 and SAO 83225 against comparison stars GSC 2007:751 and GSC 2007:733.

References:

Akerlof, C., Ambrose, S., et al., 2000, *AJ*, **119**, 1901

Jin, H., Kim, S., et al., 2004, *AJ*, **128**, 1847

Samec, R.G., Charlesworth, S.D., Dewitt, J.R., 1991, *AJ*, **102**, 688

Xu, Y., Li, Z., et al., 2002, *Chinese Journal of Astronomy and Astrophysics*, **2**, 441

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5660

Konkoly Observatory
Budapest
22 November 2005

HU ISSN 0374 – 0676

ELEMENTS FOR 8 RR LYRAE VARIABLES IN OPHIUCHUS

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The discovery of the variability of these stars has been reported by Hoffmeister (1949, 1966, 1967, 1968). No further observations or ephemeris were published until today. Photographic plates of a field centered around 67 Oph, taken with the Sonneberg Observatory 40cm Astrographs during three intervals spread over the years from 1938-1994, were used to check the behaviour of these objects (see Table 1).

The given elements were obtained by means of least-squares solutions. Photographic amplitudes were derived with respect to magnitudes of the comparison stars given in Table 2. An extensive list holding the times of maxima derived can be fetched using the link in the HTML version of this paper. Individual data are available upon request.

Table 1. Summary of this paper

Star	Type	Epoch 2400000+	Period (day)	Max.	Min.	M−m	No. of Plates
V938 Oph	RRab	48832.441 ±11	0.6446164 ±8	$14.^{m}3$	$15.^{m}1$	$0.^{p}20$	243
V1081 Oph	RRab	48832.403 ±4	0.4935062 ±2	$14.^{m}9$	$16.^{m}1$	$0.^{p}15$	170
V1085 Oph	RRab	45913.476 ±15	0.7717393 ±12	$15.^{m}0$	$16.^{m}5$	$0.^{p}20$	138
V1087 Oph	RRab	48100.367 ±11	0.5872985 ±6	$15.^{m}1$	$16.^{m}2$	$0.^{p}20$	160
V1088 Oph	RRab	49475.488 ±7	0.5032135 ±3	$15.^{m}5$	$16.^{m}4$	$0.^{p}17$	167
V1091 Oph	RRab	49475.542 ±12	0.7952621 ±11	$15.^{m}0$	$15.^{m}4$	$0.^{p}35$	222
NSV 9902	RRab	48362.576 ±10	0.5628888 ±5	$15.^{m}3$	$16.^{m}3$	$0.^{p}20$	121
NSV 10019	RRab	48747.484 ±8	0.5147988 ±4	$14.^{m}1$	$15.^{m}1$	$0.^{p}18$	267

Table 2. Comparison stars and cross references

	V938 Oph		V1081 Oph	
	S 4186		S 9273	
	USNO 0900-10794389		USNO 0900-11093663	
Comp. No.	GSC	m*	USNO	m*
1	0900-10792222	$14.^{m}0$	0900-11096908	$14.^{m}7$
2	0900-10791987	$14.^{m}7$	0900-11089951	$15.^{m}2$
3	0900-10792950	$15.^{m}1$	0900-11091250	$15.^{m}7$

	V1085 Oph		V1087 Oph	
	S 9279		S 9855	
	USNO 0900-11243049		USNO 0900-11400286	
Comp. No.	USNO	m*	USNO	m*
1	0900-11247487	$14.^{m}7$	0900-11403333	$15.^{m}3$
2	0900-11240287	$15.^{m}8$	0900-11395508	$15.^{m}4$
3	0900-11245747	$17.^{m}1$	0900-11402264	$16.^{m}3$
4			0900-11398534	$16.^{m}4$

	V1088 Oph		V1091 Oph	
	S 9290		S 9292	
	USNO 0900-11479305		USNO 0900-11628043	
Comp. No.	USNO	m*	USNO	m*
1	0900-11472517	$15.^{m}2$	0900-11625407	$15.^{m}0$
2	0900-11477461	$15.^{m}8$	0900-11626381	$15.^{m}4$
3	0900-11479543	$16.^{m}1$		
4	0900-11480787	$16.^{m}4$		

	NSV 9902		NSV 10019	
	S 9269		S 9283	
	USNO 0900-11055326		USNO 0900-11291450	
Comp. No.	USNO	m*	USNO	m*
1	0900-11049203	$15.^{m}1$	0900-11286181	$14.^{m}0$
2	0900-11057976	$15.^{m}4$	0900-11290895	$14.^{m}2$
3	0900-11058995	$16.^{m}0$	0900-11293416	$14.^{m}6$
4			0900-11298413	$15.^{m}4$

* Magnitudes refer to the B values of the USNO−A2.0 catalogue

Remarks:

V938 Oph

Following to a paper of Götz this star is erroneously catalogued as eclipsing binary. According to the observations reported here, V938 Oph is a pulsation variable of RRab type.

V1091 Oph

Type of variability (EA) and ephemeris given by Hoffmeister (1966) are incorrect. V1091 Oph is a RRab type star.

NSV 10019

The discovery paper by Hoffmeister (1966) lists this star as possible eclipsing variable. Contrary to this, NSV 10019 was now found to be a RRab type star.

This research made use of the SIMBAD data base, operated by the CDS at Strasbourg, France.

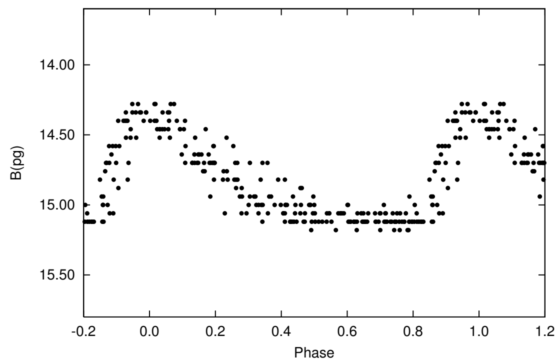

Figure 1. Light curve of V938 Oph

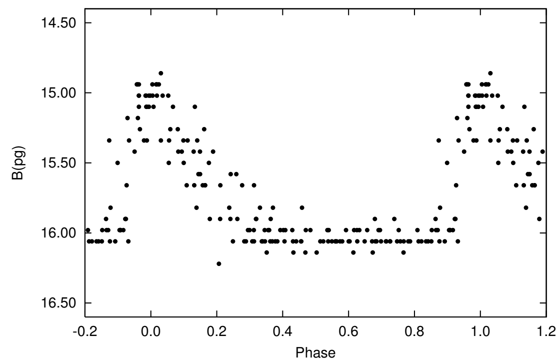

Figure 2. Light curve of V1081 Oph

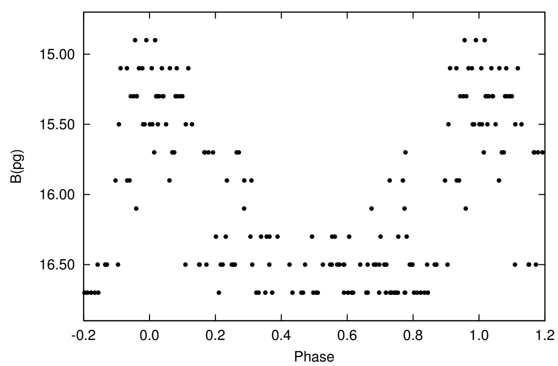

Figure 3. Light curve of V1085 Oph

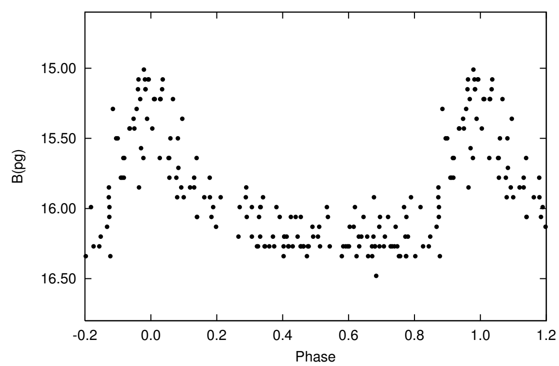

Figure 4. Light curve of V1087 Oph

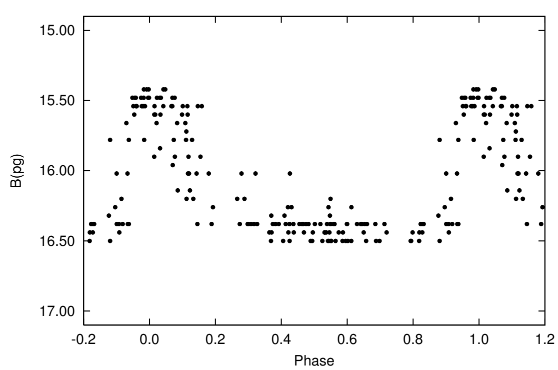

Figure 5. Light curve of V1088 Oph

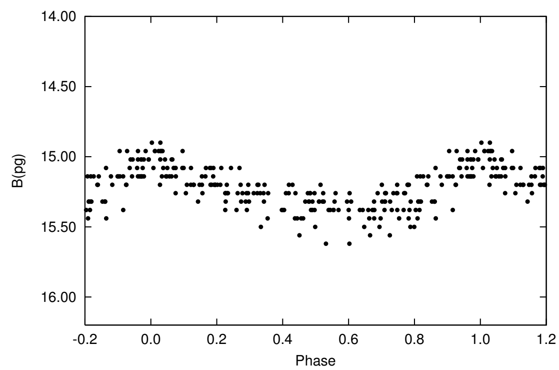

Figure 6. Light curve of V1091 Oph

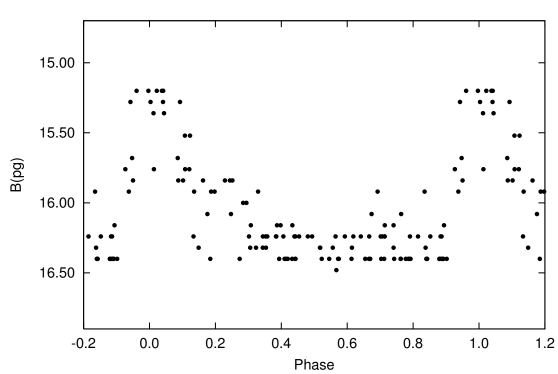

Figure 7. Light curve of NSV 9902

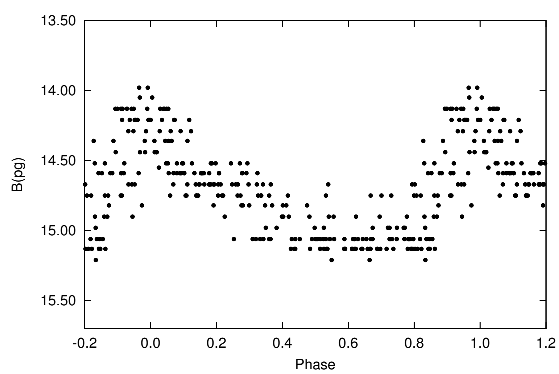

Figure 8. Light curve of NSV 10019

References:

Götz, W. et al., 1957, *Veröff. Sternw. Sonneberg*, **4**, 123, (H2)
Hoffmeister, C., 1949, *Erg. Astron. Nachr.*, **12**, 1
Hoffmeister, C., 1966, *Astron. Nachr.*, **289**, 139
Hoffmeister, C., 1967, *Astron. Nachr.*, **290**, 43
Hoffmeister, C., 1968, *Astron. Nachr.*, **290**, 277

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5661

Konkoly Observatory
Budapest
25 November 2005

HU ISSN 0374 – 0676

THE RAPID FADING OF V1647 ORIONIS: THE SUDDEN END OF A FUOR-TYPE ERUPTION?

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[2] Instituto de Astrofísica de Canarias, 38205 La Laguna, Tenerife, Canary Islands, Spain

V1647 Orionis ($\alpha_{2000} = 05^{\mathrm{h}}46^{\mathrm{m}}13\overset{\mathrm{s}}{.}13$, $\delta_{2000} = -00°06'04\overset{''}{.}8$) is a young eruptive star, which went into outburst in November–December 2003. The star brightened by about 4 mag in the I_C band in 4 months, suggesting that we witness either an FU Orionis-type (FUor) or an EX Lupi-type (EXor) outburst. Since then, the object has been gradually fading at both optical (BVRI) and near-infrared (JHK) wavelengths with a rate typical of FUors (see photometric measurements of Briceño et al. 2004, Maheswar & Bhatt 2004, Masi et al. 2004, McGehee et al. 2004, Ojha et al. 2004, Semkov 2004, and Walter et al. 2004).

In this paper we present observations of V1647 Ori using the 1m RCC telescope of the Konkoly Observatory (Hungary) equipped with Cousins $V(RI)_C$ filters and a Princeton VersArray:1300B CCD camera (image scale: $0\overset{''}{.}3$, field of view: $6\overset{'}{.}8 \times 6\overset{'}{.}6$). Integration time was selected so that the comparison stars would not be saturated. This resulted in integration times between 180 and 600 s. With each filter, 3–10 frames were taken. All frames were bias-subtracted and flat-fielded and were corrected for cosmic rays. In the case of V and R_C filters, the images were shifted and co-added, and photometry was done in the single co-added image. In the case of I_C filter, photometry was done on each individual frame, and the resulting magnitudes were averaged.

Photometry was performed using IRAF in the following way: on each (co-added in V and R_C, individual in I_C) frame, 4 to 6 isolated, non-saturated stars were selected to build the PSF. Then, PSF-photometry was obtained for V1647 Ori and for 4 comparison stars (denoted as 'A', 'B', 'C' and 'G' by Semkov 2004). Instrumental magnitude differences between V1647 Ori and the comparison stars were transformed to the standard Cousins-system, using the standard magnitudes of comparison stars given by Semkov (2004), and Henden (2004). The resulting magnitudes are presented in Table 1. In the case of V and R_C filters, the errors come from the uncertainties of the standard transformation and from the formal errors of the photometry given by IRAF, while in the case of I_C filter, errors are dominated by uncertainties of the standard transformation and the scatter of the individual magnitudes.

In Fig. 1 we plotted the I_C light curve of V1647 Ori in October–November 2005 complemented with some of our measurements from February–March 2004 (these data were taken with the same instrument and reduced with the same method as in October–November

Table 1. Photometry of V1647 Ori in October–November 2005.

Date	JD − 2,453,000	V	R_C	I_C
04 Oct 2005	648.54	20.45 ± 0.10	18.70 ± 0.10	16.31 ± 0.08
05 Oct 2005	649.53	20.48 ± 0.10	18.55 ± 0.04	16.21 ± 0.07
09 Oct 2005	653.64	–	–	16.42 ± 0.07
10 Oct 2005	654.64	–	–	16.20 ± 0.10
15 Oct 2005	659.65	–	–	16.33 ± 0.02
19 Oct 2005	663.59	–	–	16.36 ± 0.05
28 Oct 2005	672.55	21.34 ± 0.20	19.51 ± 0.10	17.13 ± 0.10
30 Oct 2005	674.58	21.55 ± 0.15	19.68 ± 0.05	17.25 ± 0.08
31 Oct 2005	675.57	21.74 ± 0.10	19.83 ± 0.04	17.44 ± 0.07
17 Nov 2005	692.49	–	–	17.67 ± 0.08
19 Nov 2005	694.60	–	–	17.80 ± 0.10

2005, and belong to a more comprehensive study, Acosta-Pulido et al., in prep.) We also plotted data points from Briceño et al. (2004), who measured the brightening of the star. The overlapping points (in February-March 2004) show that although magnitudes were calculated differently (Briceño et al. used aperture photometry, we used PSF-photometry), the values agree well, thus the comparison of the two datasets is justifiable.

V1647 Ori reached its peak brightness in February 2004, and faded by approximately 1.5 mag by October 2005. Then, between October and November 2005 the brightness of the star suddenly dropped by more than 1 mag. Due to this sudden, rapid fading, V1647 Ori now is only 1 mag above the pre-outburst level. This means that the present fading rate is 1 mag/month, as opposed to 0.1 mag/month in 2004 (calculated from the data of Semkov 2004 or Walter et al. 2004).

In order to check whether the fading is caused by increasing extinction, we plotted our measurements on a colour-colour diagram (Fig. 2). The standard reddening path (Cohen et al. 1981) is also shown. For comparison, we also plotted data points from McGehee et al. (2004) who measured V1647 Ori close to peak brightness in $V(RI)_C$, and performed PSF-photometry similarly to us. From Fig. 2 one can conclude that

- no significant colour change can be seen during the rapid fading in October-November 2005 (filled dots),
- there is a significant colour change between the new measurements (filled dots) and those close to peak brightness (open squares). This colour change cannot fully be explained by increasing extinction, since the colour variations do not follow the reddening path. Thus, the observed colour changes are at least partly intrinsic.

Supposing that the fading rate remains unchanged, the star will return to the pre-outburst state by mid-December 2005. If this prediction holds true, then the total duration of the outburst of V1647 Ori is 2 years, which makes it a unique (somewhat intermediate) object among FUors and EXors.

Acknowledgements: We are grateful to J. Jurcsik for her kind help in the data analysis. The work was partly supported by the grants OTKA T 037508 and OTKA T 049082 of the Hungarian Scientific Research Fund.

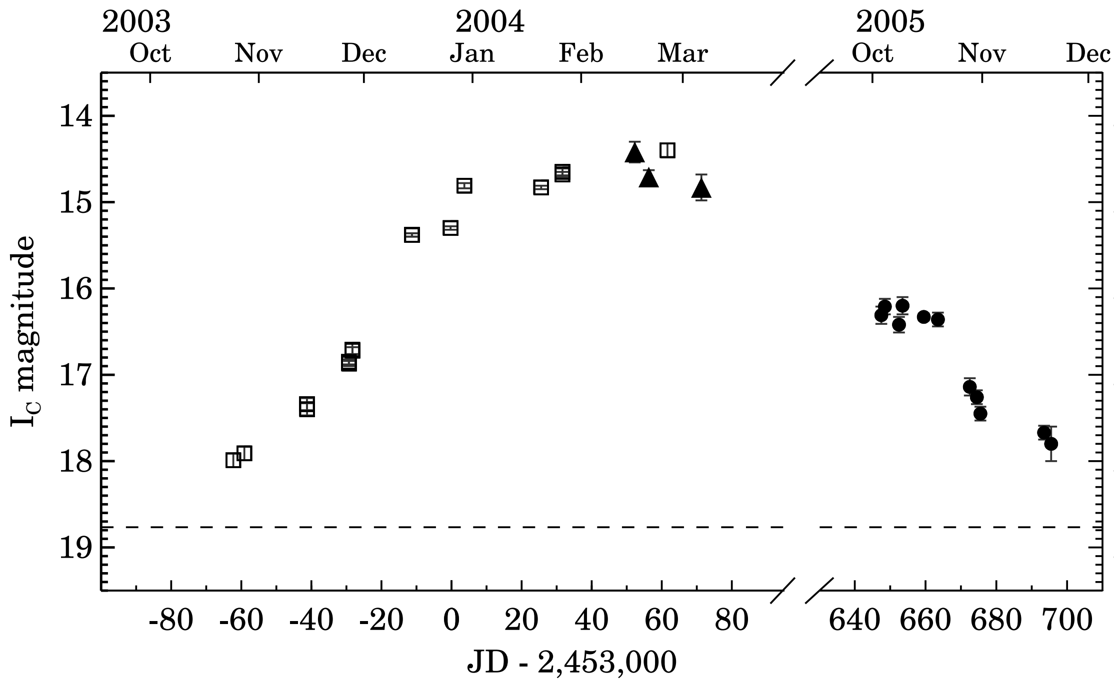

Figure 1. I_C light curve of V1647 Ori. Filled dots: photometry presented in this paper; filled triangles: photometry taken with the same instrument and reduced with the same method as the filled dots (Acosta-Pulido et al., in prep.); open squares: data from Briceño et al. 2004. Dashed line indicates pre-outburst brightness level.

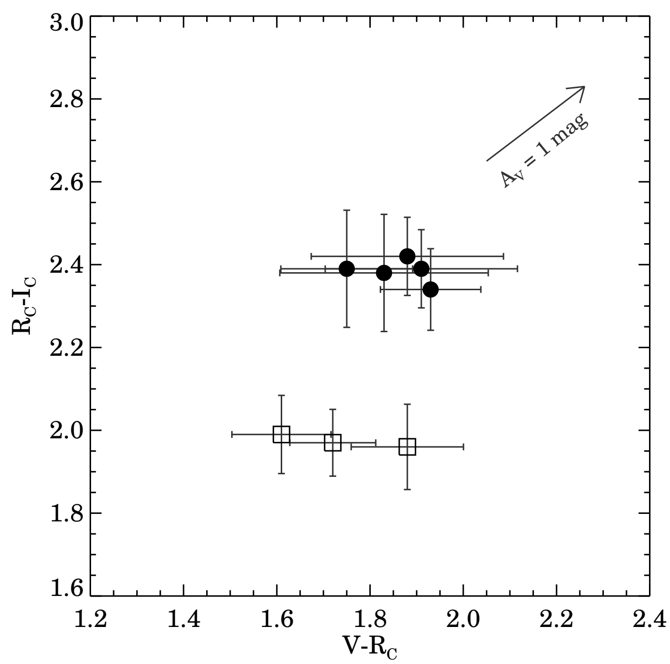

Figure 2. Colour-colour diagram of V1647 Ori. Filled dots: our measurements obtained between 4 October and 31 October 2005; open squares: data taken in February–April 2004 by McGehee et al. 2004. The line represents reddening path corresponding to $A_V = 1$.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5662

Konkoly Observatory
Budapest
1 December 2005

HU ISSN 0374 – 0676

NEW TIMES OF MINIMA OF SOME ECLIPSING BINARY STARS

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Observatory and telescope:
40-cm Cassegrain-Schmidt telescope of the Çanakkale University Observatory, (ÇUG40) 30-cm Cassegrain-Schmidt telescope of the Çanakkale University Observatory, (ÇUG301) 30-cm Cassegrain-Schmidt telescope of the Çanakkale University Observatory, (ÇUG302)

Detector:	-ST10XME camera, Peltier cooling, KAF 3200ME chip, $17' \times 12'$ FOV, 2184×1472 pixels. -ST237 camera, Peltier cooling, TC237 chip, $11' \times 8'$ FOV, 640×480 pixels. -SSP5 photometer, Hamamatsu R6358 photomultiplier tube at Çanakkale University Observatory.

Method of data reduction:
Reduction of the CCD frames was made with C-MUNIPACK[1] software, and reduction of photoelectric observations was made by ATMEX[2] software.

Method of minimum determination:
Kwee – van Woerden method (Kwee & van Woerden, 1956).

[1]Motl, D., 2004, C-MUNIPACK, `http://integral.sci.muni.cz/cmunipack/`
[2]Keskin, V., 2001, ATMEX, `http://astronomy.sci.ege.edu.tr/~keskinv/software/`

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
XZ Aql	52813.4100	0.0002	I	C	ÇUG302
	53583.5258	0.0004	I	BV	ÇUG301
OO Aql	52801.5506	0.0002	II	C	ÇUG302
	52822.3298	0.0005	II	C	ÇUG302
	52842.3471	0.0002	I	C	ÇUG302
TT Aur	53330.5083	0.0002	I	BV	ÇUG40
UW Boo	52793.4183	0.0001	I	C	ÇUG302
AC Boo	52800.4155	0.0002	II	C	ÇUG302
	52801.4716	0.0002	II	C	ÇUG302
	52806.4081	0.0002	II	C	ÇUG302
AR Boo	52808.3591	0.0003	I	C	ÇUG302
SV Cam	52820.3716	0.0002	I	C	ÇUG302
AB Cas	53630.3985	0.0001	I	V	ÇUG301
	53632.4365	0.0003	II	V	ÇUG301
IR Cas	53640.2979	0.0009	I	C	ÇUG301
TV Cas	53627.3470	0.0006	I	BV	ÇUG40
VW Cep	53565.4056	0.0002	I	VR	ÇUG40
XX Cep	53630.4593	0.0003	I	V	ÇUG301
EG Cep	52822.3930	0.0003	I	C	ÇUG302
	53630.3389	0.0002	I	V	ÇUG301
EM Cep	53336.3489	0.0050	II	BV	ÇUG40
	53376.2517	0.0020	I	BV	ÇUG40
	53382.3026	0.0017	II	BV	ÇUG40
	53508.4657	0.0011	II	BV	ÇUG40
GSC 4288-0186	53577.4608	0.0003	II	BVRcIc	ÇUG301
	53580.4396	0.0002	I	BVRcIc	ÇUG301
ZZ Cyg	52806.4742	0.0001	I	C	ÇUG302
	53593.4985	0.0001	I	V	ÇUG301
DK Cyg	53596.4542	0.0001	I	V	ÇUG301
UW Cyg	52848.4325	0.0003	I	C	ÇUG302
V388 Cyg	53585.4975	0.0009	I	BVRc	ÇUG301
V859 Cyg	52815.3687	0.0003	II	C	ÇUG302
V1061 Cyg	52818.4520	0.0009	I	C	ÇUG302
Z Dra	53266.4698	0.0001	I	BVRcIc	ÇUG301
	53296.3321	0.0001	I	BVRcIc	ÇUG301
	53302.4428	0.0010	II	BVRcIc	ÇUG301
	53332.3022	0.0009	II	BVRcIc	ÇUG301
TZ Dra	53634.2801	0.0007	I	BV	ÇUG40
TW Dra	52854.4012	0.0004	I	C	ÇUG302
V1034 Her	53596.3613	0.0007	I	BVRc	ÇUG301
SW Lac	53614.3160	0.0007	I	BV	ÇUG40
	53630.3530	0.0004	I	BV	ÇUG40
EM Lac	52836.3380	0.0004	II	C	ÇUG302
EW Lyr	53542.3617	0.0005	I	BVRcIc	ÇUG301
V502 Oph	52768.5242	0.0002	II	C	ÇUG302
V839 Oph	52771.4088	0.0002	II	C	ÇUG302
	52813.3267	0.0003	I	C	ÇUG302
AT Peg	52842.4231	0.0011	I	C	ÇUG302
BG Peg	53640.4664	0.0004	I	C	ÇUG301
DI Peg	53614.4169	0.0003	I	V	ÇUG40
AU Ser	52821.5178	0.0002	I	C	ÇUG302

Remarks:

We are presenting 51 minima times of 34 eclipsing binaries. In the Remarks column of Times of Minima table, telescopes used in the observations are given. We have detected 0.25 magnitude drop in the brightness of USNO 1522-0015678. If this is due to an eclipse, the time of minimum was calculated to be 2453548.4399±0.0009

Acknowledgements:

This work was partly supported by the Research Found of Çanakkale Onsekiz Mart University.

Reference:

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5663

Konkoly Observatory
Budapest
1 December 2005

HU ISSN 0374 – 0676

UNSUCCESSFUL OPTICAL SEARCH FOR THE 0.006223HZ PULSAR FREQUENCY FROM THE X-RAY BINARY MX0656-072

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The Be X-Ray binary MX0656-072 was discovered as an X-Ray pulsar during the outburst of October 21, 2003 (Remillard et al., 2003), with a pulse period of 160.7s (Morgan et al., 2003; Heindl et al., 2004). We observed the optical counterpart of this source in November 2003 with the OGS ESA telescope and the IAC CCD camera at the Izaña Observatory in Tenerife to verify if the pulsar signal could be observed also in the optical band. We obtained 111 frames in B light with exposure time of 30s on November 10 and 154 frames with exposure time of 20s on November 14, 2003; in the same night we got also 430 frames with exposure time of $10s$ in R light. To have the lowest possible frame transfer time we reduced the image field to a small square containing 4 objects: the target star and the three comparison stars indexed Figure 1. Separate calibration of the comparison objects was obtained in the same nights using additional full field exposures. We performed separate Discrete Fourier Transforms of the magnitudes computed with DAOPHOT from the data obtained in the three runs. We repeated the temporal analysis on a file collecting all B images of the two nights and on a second file collecting all images of the three nights after detrending the nightly mean magnitudes. The frequency of $0.006223Hz = 537.64779c/d$, corresponding to the period of 160.7s, is absent in all our analyses, where the spectral power near to the expected frequency results to be particularly low. Figure 2 shows, as example, the spectral power of the R stream of 430 measures performed on November 14, 2003. This result is not surprising because, due to the high luminosity of the Be companion star, the reprocessed signal could be diluted, the phase information could be destroyed by the large reprocessing area; or the X-ray beam could interact weakly with the companion and/or the accretion flux environment.

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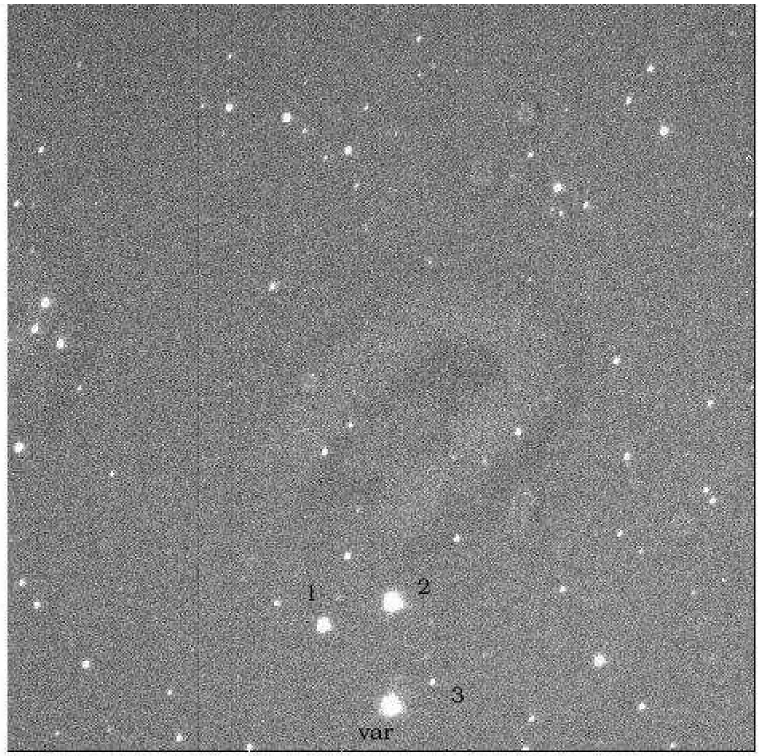

Figure 1. CCD image of the full observation field: the comparison stars are the objects 1, 2 and 3 in the lower central part of the image.

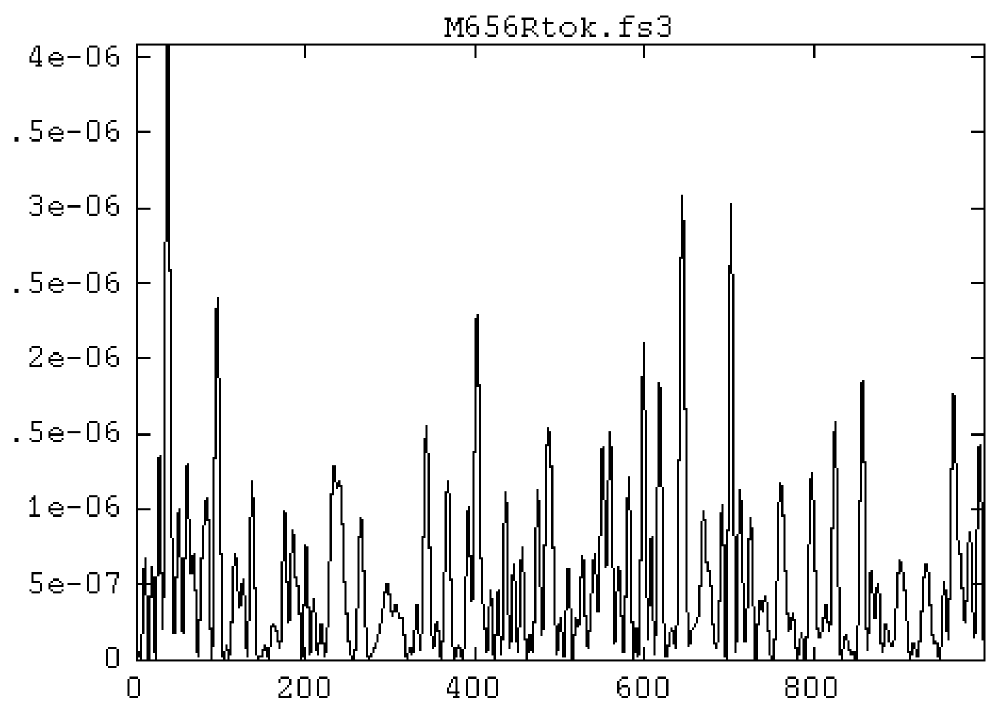

Figure 2. Fourier power spectrum of the observation run of November 14, 2003, performed with R filter, after prewhitening of the two lower frequencies

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5664

Konkoly Observatory
Budapest
9 December 2005

HU ISSN 0374 – 0676

TT Ari: OUT FROM THE POSITIVE SUPERHUMP STATE

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TT Ari is one of the brightest cataclysmic variables, which was a target for few extensive observational campaigns (Andronov et al. 1999, Kraicheva et al. 1999, Skillman et al. 1998, Tremko et al. 1992, 1996, Semeniuk et al. 1987). Before 1997, the estimates of the photometric periods ranged from $0\overset{d}{.}13270$ to $0\overset{d}{.}13298$ (see the compilation by Tremko et al. 1996). In 1997, the photometric period has changed to a "positive superhump" one $P_{sh} = 0\overset{d}{.}14926(3)$ (Skillman et al. 1998). Our observations showed, that during these years, this state continued till at least December 10, 2004. For example, in 2004, it showed a typical asymmetric (M−m=0.316±0.007) shape with a period $P_{sh} = 0\overset{d}{.}14840(1)$, brightness range $10\overset{m}{.}84$-$11\overset{m}{.}03$ and the initial epoch for maximum HJD2453242.1239(7). The shape of the light curve in V and R in 2004 was the same within accuracy estimates (sent to a mailing list in 2004 by Andronov, Ostrova and Burwitz [VSNET-Campaign, 1555]).

The observations obtained in the Astronomical Observatory of the Athens University on October 14-19, 2005, have shown that the system went out of the "positive superhump" state (sent to a mailing list in 2005 by Andronov, Gazeas and Niarchos [VSNET-Campaign, 1630]). The superhumps practically disappeared, but the negative superhumps were not very prominent. The mean brightness for 4 nights was $\langle V\rangle = 11\overset{m}{.}21$, whereas for separate nights it varied from $11\overset{m}{.}08$ (October 18) to $11\overset{m}{.}28$. This differs both from the mean brightness level at the "positive superhump" stage ($10\overset{m}{.}9$, Skillman et al., 1998; $10\overset{m}{.}92$ Andronov et al. 2004 [VSNET-Campaign, 1555]) and at the "negative superhump" $10\overset{m}{.}69$ (Tremko et al., 1996). Kraicheva et al. (1999) have also noted the brightness difference between $V = 10\overset{m}{.}5$ in 1996-1997 and $11\overset{m}{.}0$ in 1998-1999. Despite small differences in the instrumental systems, the results by different authors showed a switch to "positive superhumps" with a luminosity "drop" by a few dozens per cent. Thus the current "non-positive superhump" state with even smaller luminosity is not a return to the high luminosity state observed before 1997. Kraicheva et al. (1999) suggested 27.5 and 6.25 year cycles for the luminosity variations possibly caused by magnetic activity of the secondary.

Further monitoring carried out during 6 nights at the 40-cm telescope of the Chungbuk National University shows quasi-periodic oscillations, “negative superhumps” with variable amplitude and strong flickering. The sample light curves obtained on subsequent nights on Nov 8 and 9, 2005 are shown in Fig. 1 and Fig. 2. Significant difference in the brightness ($0\overset{m}{.}35$) is noticeable, as well as the lack of the 3-hour wave in Fig. 1.

The most prominent peak at the “Λ”–scalegram (Andronov 2003) for the Athens University data corresponds to an effective period of quasi-periodic variations of $P_e = 0\overset{d}{.}0095 = 13.7$ minutes and semi-amplitudes $0\overset{m}{.}046$ and $0\overset{m}{.}044$ for the filters V and R, respectively. On November 4, 2005 (filter B, Konkoly Observatory), this peak was split into three approximately equal ones at $0\overset{d}{.}007 - 0\overset{d}{.}024$ with effective semi-amplitudes $0\overset{m}{.}062 - 0\overset{m}{.}068$. These values are by a factor of 3 larger than that for the ”positive superhump” state on December 10, 2004. The mean B magnitude has dropped from $10\overset{m}{.}92$ to $11\overset{m}{.}60$.

The current luminosity is much lower than expected from a continuation of the long-term fit (Kraicheva et al., 1999) to the present time (the range of B magnitudes is $10\overset{m}{.}55$-$10\overset{m}{.}80$). Moreover, at the previous minimum, the prolonged inactive ($B \sim 16^m$) state was observed. A similar excursion to a low luminosity state may not be excluded after a current deep minimum, so continuation of monitoring is needed.

Acknowledgements. This work was partly supported by the Grant OTKA 34551 (LP), by the Ministry of Education and Science of Ukraine (ILA). VB and NIO are greatful to the Director of the OAM Salvador Sanchez Martinez for granting the observing time and partially supporting this work.

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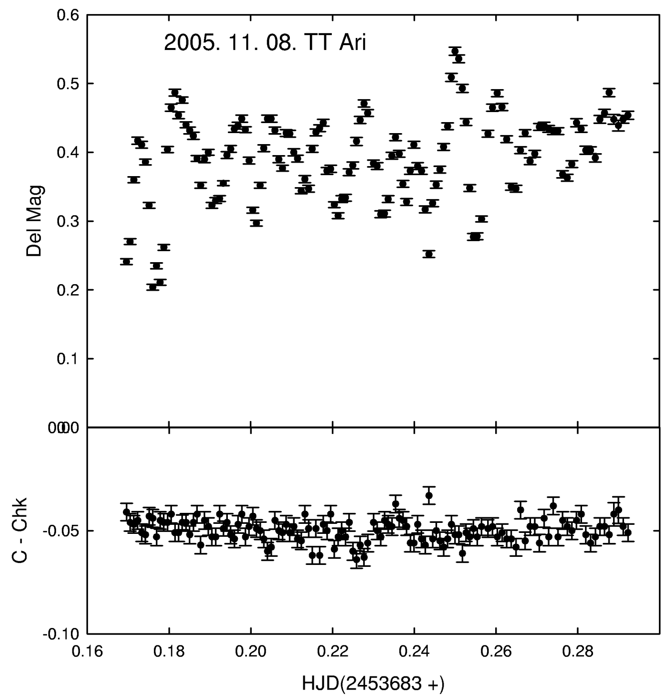

Figure 1. Light curve of TT Ari on November 8, 2005 in filter R (40-cm telescope of the Chungbuk University). The comparison and check stars are "c" ($V = 10.^{m}99$, $B-V = 0.^{m}69$) and "d" ($V = 11.^{m}02$, $B-V = 1.^{m}15$) (Götz, 1985).

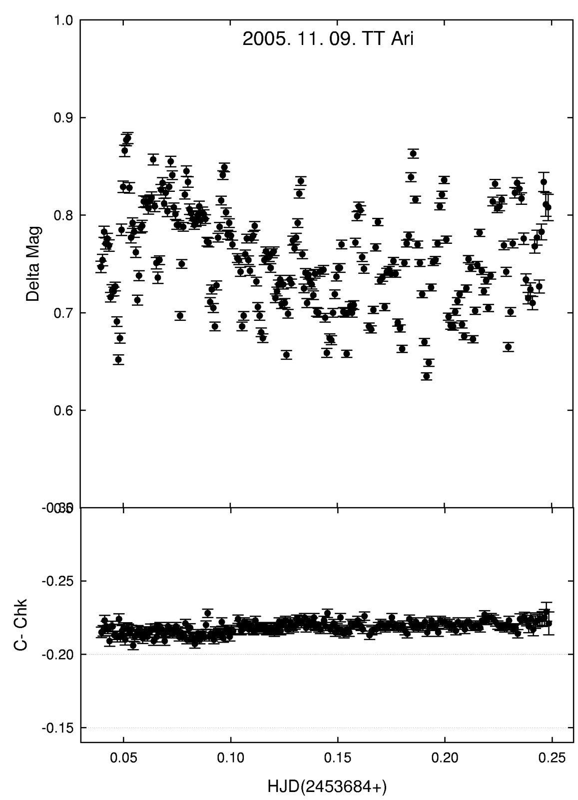

Figure 2. Light curve of TT Ari on November 9, 2005 in filter R (40-cm telescope of the Chungbuk University).

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5665

Konkoly Observatory
Budapest
14 December 2005

HU ISSN 0374 – 0676

SEARCH FOR PHOTOMETRIC ECLIPSES OF THE RUNAWAY STAR 9 Sge

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Name of the object:
QZ Sge = 9 Sge = SAO 105360 = HD 188001 = BD+18°4276

Equatorial coordinates:	**Equinox:**
R.A.= $19^h52^m21\overset{s}{.}76$ **DEC.=** $+18°40'18\overset{''}{.}7$	2000

Observatory and telescope:
Crimean Laboratory, Sternberg Astronomical Institute, 60 cm Cassegrain telescope

Detector:	photometer: one channel

Filter(s):	BVR

Date(s) of the observation(s):
1989.07/2002.08

Comparison star(s):	HD 188062

Check star(s):	none

Transformed to a standard system:	No

Availability of the data:
upon request

Remarks:

The star 9 Sge (HD 188001) is one of the best-known runaway stars, it has a high peculiar space velocity, V_p = 127.6 km/s, and lies at a large distance below the Galactic plane, $z = -205$ pc (Stone 1979). The spectroscopic and photometric studies of 9 Sge have a more than 80-year history. However, despite the attention to this comparatively bright (V = $6^{\rm m}_{.}243$) object, several very important questions are still open. This is especially true for period determination and for revealing the character of spectroscopic and photometric variations.

Hill et al. (1976) were the first to put forward the idea that 9 Sge was an eclipsing binary. Aslanov et al. (1984) found a dominant spectroscopic period of 78.3 d. Aslanov & Barannikov (1992) found a new spectroscopic period of 32.514 d and cautiously proposed that 9 Sge was an eclipsing binary system with a low-mass (1.5 $M_\odot$) companion moving in an eccentric ($e \sim 0.6$) orbit. Underhill & Matthews (1995) specified a more precise spectroscopic period of 78.74 d, with the set of orbital elements indicating that the companion could be a small star whose mass was probably in the $1.2 - 1.9\ M_\odot$ range.

In this paper, we present the B, V and R light curves of 9 Sge obtained in 1989–2002. This is a new attempt to find photometric eclipses of the star on the base of long-term observations. We analyzed the light curves by three methods: Lafler & Kinman (1965), Deeming (1975), and Scargle (1982), in the modification by Horne & Baliunas (1986). Unfortunately, none of the methods revealed a dominant peak in the 0–1 c/d frequency range. Moreover, we could not detect any appreciable eclipses (exceeding 3σ, i.e. $\sim 0^{\rm m}_{.}05$) in the phase diagrams for the earlier-found period values, 32.514 d (Fig. 1, the three upper panels) and 78.74 d (Fig. 2, the three upper panels), though the presence (especially in B light) of the non-dominant brightness minimum at the phases 0.9 - 1.0 for the period of 32.514 d should be mentioned (Fig. 1, top panel). Near this phase, the theoretical radial-velocity curve passes through the gamma velocity (Aslanov & Barannikov 1992, Fig. 2). It is possible that these light variations result from eclipses and the radial-velocity curve results from orbital motion. Unfortunately, absolutely no secondary minimum is visible. The analysis of the Hipparcos data (ESA 1997) reveals no signatures of eclipses with these periods (the bottom panels of Fig. 1 and Fig. 2). It appears from Figs. 1 and 2 that there is no correlation in brightness variability between our observations and Hipparcos observations.

These results cast doubt on the eclipsing status of 9 Sge (but no final decision is possible yet). The question of the star's binarity and hence of the mechanism (binary supernova or dynamical ejection) of its acceleration to the runaway velocity remains unsettled. Observations of 9 Sge should be continued.

Acknowledgements:

I am grateful to Dr. N.N. Samus for his help and useful comments.

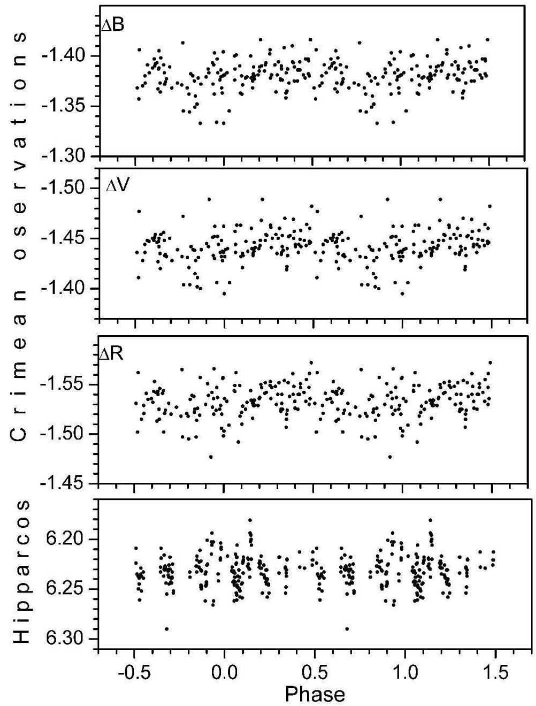

Figure 1. Light curves of 9 Sge with the 32.514-day period. The three top panels show our Crimean B, V, and R observations. The bottom panel shows Hipparcos observations

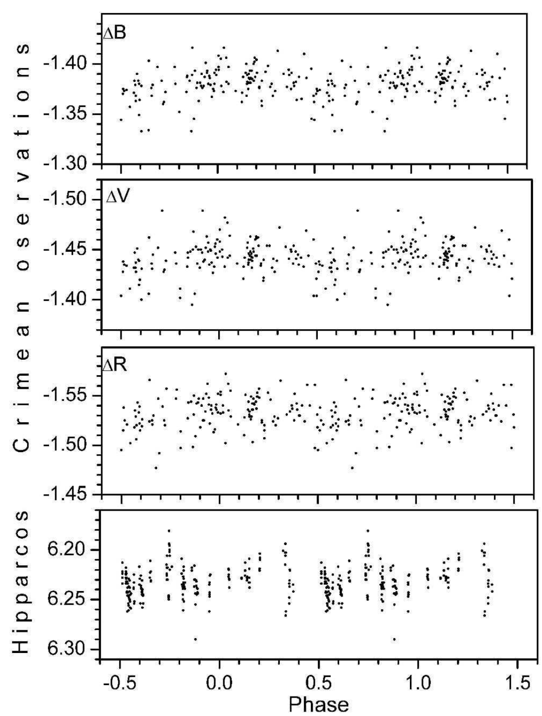

Figure 2. Light curves of 9 Sge with the 78.74-day period. The three top panels show our Crimean B, V, and R observations. The bottom panel shows Hipparcos observations

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5666

Konkoly Observatory
Budapest
16 December 2005

HU ISSN 0374 – 0676

ON THE DISTRIBUTION OF THE MODULATION AMPLITUDES OF BLAZHKO TYPE RRab STARS

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The fact that the light curves of some RR Lyrae stars show variation in phase and/or in amplitude (the so called Blazhko effect) has been known since more than a century, but the adequate explanation of the phenomenon is still missing.

For long, no connection between any of the properties of the modulation and that of the pulsation (which might have served as guidance how to explain the modulation) was found. Quite recently, it has been shown (Jurcsik et al., 2005b) that the possible range of the modulation frequency depends on the pulsation frequency. Short period modulations occur only in the case of variables with short pulsation period. This result was interpreted as the first direct evidence for the identification of the modulation period with the rotation period of the stars.

In this note we examine the distribution of the modulation amplitudes of RRab stars using all available data. It is, however, not at all straightforward how to define the amplitude of the modulation. For example, when the modulation is not pure amplitude modulation, than the amplitude of the variation in the height of maxima may significantly underestimate the real 'power' of the modulation. A further problem is that different types of information are available in different sets of data, e.g., different wavelength bands are used, Fourier parameters or time-series data are given, etc. The bulk of the modulation amplitude data comes from the results of the LMC Blazhko stars (Alcock et al., 2003) where Fourier V amplitudes of six pulsation ($A_{\rm f}, \dots A_{6\rm f}$), and four modulation frequency components ($f \pm f_{\rm mod}, 2f \pm f_{\rm mod}$) are given for 731 RRab stars. Therefore, we decided to measure the modulation amplitude as the sum of the Fourier amplitudes of the first four modulation components. In order to get the possible most homogeneous information about the amplitude of the modulation only those data are used when this sum of the Fourier amplitudes can be reliably determined.

We used all the MACHO data with the exception of MACHO 6.6212.112 (for explanation see Jurcsik et al., 2005b) in our analysis. Fourier amplitudes of the modulation components are available for the Galactic Bulge variables (OGLE, Moskalik & Poretti, 2003), Wils & Sódor (2005) list Fourier parameters of 43 field Blazhko variables utilizing the ASAS data (ASAS3; Pojmanski, 2002 and 2003 and Pojmanski and Maciejewski, 2004 and 2005). The literature has been searched for additional field stars with photometric data suitable to derive Fourier amplitudes of the modulation components. These data are listed in Table 1.

Table 1:

f_{puls} [c/d]	A_{puls} [mag]	A_{mod} [mag]	star	note	reference
2.7223	1.20	0.03	SS Cnc	2	
2.7127	0.76	0.32	AH Cam	3	Smith et al. (1994)
2.6501	0.84	0.17	RS Boo	4	Oosterhoff (1946)
2.5171	1.18	0.03	RR Gem	5	Jurcsik et al. (2005a)
2.3136	0.97	0.12	CZ Lac	2	
2.2577	1.24	0.43	RW Dra	6	Szeidl et al. (2001b)
2.2334	0.76	0.24	RV Cap	1	
2.2066	1.02	0.11	BI Cen	1	
2.1432	1.05	0.09	XZ Cyg	7	LaCluyzé et al. (2004)
2.1365	1.04	0.19	RV UMa	8	
2.1278	1.00	0.34	AR Her	9	Smith et al. (1999)
2.0986	0.65	0.21	XZ Dra	10	Szeidl et al. (2001a)
1.7641	0.56	0.23	RR Lyr	11	Onderlička & Vetešník (1968), Szeidl et al. (1999)
1.7641	0.63	0.08	RR Lyr	12	Smith et al. (2003)
1.7379	0.50	0.15	AR Ser	1	

Notes: (1) ASAS V data. (2) Konkoly Observatory unpublished data, CCD, V band. (3) Combined data from 1989-1992 are used, CCD, V band. (4) Photographic, B band. (5) CCD, V band. (6) Photoelectric, V band. (7) CCD, V band. (8) Photoelectric, V band, Fourier solution is taken from Kovács (1995). (9) CCD, V band. (10) Data between JD 2440494 and JD 2441133 are used, photoelectric, V band. (11) High modulation amplitude between JD 2437477 and JD 2438002, photoelectric, B band. (12) Low modulation amplitude state, CCD, V band.

The OGLE data correspond to I_c band measurements. For RS Boo, and for RR Lyr at the large modulation amplitude phase, photographic and photoelectric B observations are utilized, respectively. To make these data comparable with the V band MACHO results, it has to be defined, how the modulation amplitudes in the different wavelength bands relate. The following data sets were used to define the average wavelength dependence of the amplitude of the modulation: RR Gem (Jurcsik et al., 2005a), SS Cnc (Jurcsik et al., in prep.), RR Lyrae (Smith, 2003), CZ Lac (Jurcsik et al., in prep.), V2 and V25 in M 68 (Walker, 1994). The ratios of the sum of the Fourier amplitudes of the modulation frequency components and the ratios of the amplitudes of the heights of the maximum variations in the different bands were determined from these multicolour observations. We have found that both methods give $A_{\mathrm{mod}}(B)/A_{\mathrm{mod}}(V)$ and $A_{\mathrm{mod}}(V)/A_{\mathrm{mod}}(I_c)$ within the ranges of $1.23-1.39$ and $1.50-1.66$ with mean values of 1.30 and 1.58, respectively. The I_c and B band results were transformed to V amplitudes according to these mean amplitude ratio values.

In Fig. 1 the sum of the Fourier amplitudes of the first four modulation frequency components is plotted against the frequency of the pulsation for all the Blazhko stars where this value could be reliably determined. For comparison, a similar plot for the pulsation amplitude quantified as the sum of the amplitudes of the first six harmonic components of the pulsation ($\sum_{i=1}^{6} A_{if}$) is also shown.

Fig. 1 shows that the possible largest value of the modulation amplitudes increases towards longer pulsation frequencies. At pulsation frequencies about 1.5 c/d ($P = 0.67$ d) the largest modulation amplitudes are $0.1-0.2$ mag, while at $2.0-2.2$ c/d pulsation frequencies ($P = 0.5-0.45$ d) the amplitude of the modulation can be as large as $0.3-0.4$ mag. The increase of the pulsation amplitude towards shorter periods (right panel in Fig. 1) has been already known from both observational and theoretical investigations (e.g., Dorfi & Feuchtinger, 1999; Marconi et al., 2002).

The similar behaviour of the modulation and pulsation amplitudes (i.e., their dependence on the pulsation period) might be considered as an indication that the triggering mechanisms of the two phenomena are somehow connected.

However, we have to be cautious with this interpretation, as we do not indeed know, how to measure correctly the amplitude of the modulation, and what the used Fourier amplitude sum indeed means. Just to illustrate the problem, Table 2 lists different measures of the modulation amplitudes of some Blazhko type variables using data listed in Table 1.

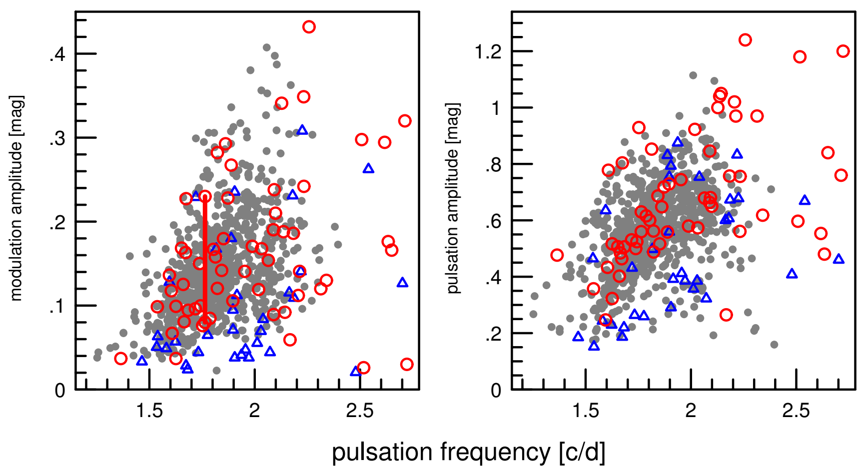

Figure 1. Left panel shows the modulation amplitude (the sum of the Fourier amplitudes of the first four modulation frequency components) versus the pulsation frequency for different samples of Blazhko RRab stars. Dots are for MACHO LMC data, triangles for galactic bulge OGLE data, and circles for galactic field stars. Vertical line connects the two points corresponding to RR Lyrae in its small and large amplitude phase of the modulation. In the right panel the pulsation amplitude (the sum of the Fourier amplitudes of 6 pulsation frequency components) versus the pulsation frequency of the same stars are plotted. The anomalously low pulsation amplitude of the field star at 2.17 c/d is due to the contamination of a close companion. Both plots indicate an amplitude increase towards shorter pulsation periods.

From Table 2 it is evident that the Fourier amplitude sum of the first four modulation components is significantly smaller than both the sum of the amplitudes of all the detectable modulation components, and the amplitude of the maximum brightness variation. Furthermore, only slight connection between these three different measures of the modulation amplitude is evident. Therefore, the possibility cannot be ruled out that the detected increase of the modulation amplitudes is just an artifact of cutting off the modulation components at four terms. If this would be the case then, in order to keep the distribution of the modulation amplitude uniform, the amplitude contribution of the higher order modulation components must be larger for the longer period variables than for the shorter period ones. Unfortunately, there are not enough data to check the validity of this possibility, therefore, as a conclusion we can only say that the correlation shown in Fig. 1 has to be further investigated both from observational and theoretical aspects.

Table 2: Modulation amplitudes*

star	filter	period [d]	$A1$	$A2$ [mag]	$A3$
SS Cnc	B	0.3673	0.11	0.14	0.04
RS Boo	B	0.3773	0.30	0.40	0.18
RR Gem	B	0.3973	0.14	0.13	0.04
CZ Lac	B	0.4322	0.60	0.62	0.15
XZ Cyg	V	0.4666	0.35	0.44	0.09
RV UMa	B	0.4681	0.80	0.47	0.23
AR Her	V	0.4700	0.50	0.50	0.34
RR Lyr	B	0.5668	0.24	0.22	0.08

*Notes:
$A1$ is the amplitude of the maximum brightness variation,
$A2$ is $\sum f_{mod}$ for all the detectable modulation components,
$A3$ is $\sum f_{mod}$ for the first four modulation components.

Acknowledgements:
The authors would like to thank Béla Szeidl for fruitful discussions, and for valuable comments. This research has made use of the SIMBAD database, operated at CDS Strasbourg, France. The financial support of OTKA grants T-043504 and T-048961 is acknowledged.

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*This version of the paper contains corrections, and differs from the one appeared on-line originally. Date of last modification: Tue Mar 8 13:25:54 CET 2011

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5667

Konkoly Observatory
Budapest
21 December 2005

HU ISSN 0374 – 0676

FIVE NEW β CEPHEI STARS REVEALED IN ASAS PHOTOMETRY

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The β Cephei stars are a group of massive early B-type pulsators that oscillate in radial and/or nonradial modes of low radial order. Some 110 galactic representatives of this group are known (e.g. Stankov & Handler 2005, Pigulski 2005) to date, but some open questions concerning their group behaviour still remain.

For instance, the theoretical boundaries of the β Cephei instability strip comprise all known pulsators, but some regions are not populated. In particular, theory predicts the existence of O-type β Cephei stars which are not observed to date. Another interesting aspect is the apparent existence of a few rapidly rotating stars with high photometric pulsation amplitude (Stankov & Handler 2005, Aerts et al. 2005). It is also not known whether post-main sequence β Cephei stars exist or not. Therefore, but also for unravelling interesting asteroseismic targets, the discovery of new β Cephei stars is important.

During the preparation of an observing programme, we noticed that the ASAS-2 (see Pojmański 1997 for a description of this project) periodic variable ASAS J113318-6306.2, so far deemed to be a δ Scuti candidate (Pojmański 1998), had virtually the same coordinates as the B1III star HD 100495. Published Strömgren photometry (Kaltcheva et al. 2000) puts the star into the β Cephei instability strip. We therefore concluded that ASAS J113318-6306.2 and HD 100495 are the same star, which is a β Cephei pulsator.

Consequently, we searched the ASAS-2 data base of periodic variables for similar objects, i.e. stars of O and (early) B spectral type that show short-period variability indicative of β Cephei pulsation, and we performed frequency analyses for these data. Indeed, we found a total of four previously unrecognised β Cephei stars among these variables. As three of these were initially classified as eclipsing variables, we also searched the ASAS-3 data base for OB type variables classified as contact or semi-detached binaries, which resulted in the discovery of another new β Cephei pulsator. In the following, we briefly report our findings for the individual new pulsating stars.

ASAS J113318-6306.2 = HD 100495

We performed a frequency analysis of the ASAS-2 photometry of this star, after adjusting the zeropoints of the individual subsets of data, with the program `Period98` (Sperl 1998), applying both single-frequency power spectrum analysis and simultaneous multi-frequency sine-wave fitting. The Fourier amplitude spectrum of the data and some prewhitening thereof is shown in Fig. 1. We find the same main period as Pojmański (1998), but we also see evidence for a secondary period in the residual amplitude spectrum. Its value is however uncertain due to aliasing.

We estimated the luminosity, effective temperature and mass of the star from the published Strömgren photometry (Kaltcheva et al. 2000) following the procedure described by Stankov & Handler (2005), resulting in $T_{\rm eff} = 27000 \pm 1500$ K, $\log L = 4.34 \pm 0.16$ and $M \approx 14$ $M_\odot$. With these parameters we obtain a pulsation constant $Q = 0.036 \pm 0.011$, perfectly consistent with the values for other β Cephei stars (cf. Stankov & Handler 2005).

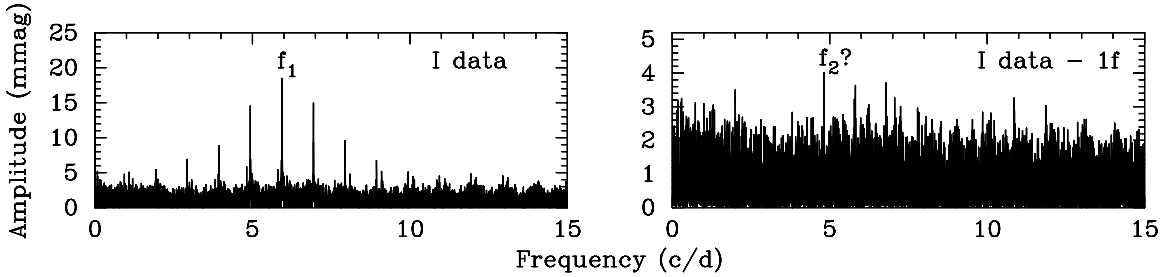

Figure 1. Left panel: amplitude spectrum of the ASAS-2 photometry of HD 100495. Right panel: amplitude spectrum after prewhitening the strongest signal. A possible second periodicity is indicated.

ASAS J123748-6219.4 = CD-61 3543

This B star was originally classified as an eclipsing binary of the W UMa type (Pojmański 1998) with a period near 10 hr. However, our frequency analysis reveals it to be a multiperiodic variable (see Fig. 2). We find four independent variations with periods near 5 hr and one combination frequency (with evidence for more combinations). Three of the independent frequencies form an (almost) equally spaced triplet. The multiperiodicity of the star and its periods make it clear that it is a β Cephei pulsator.

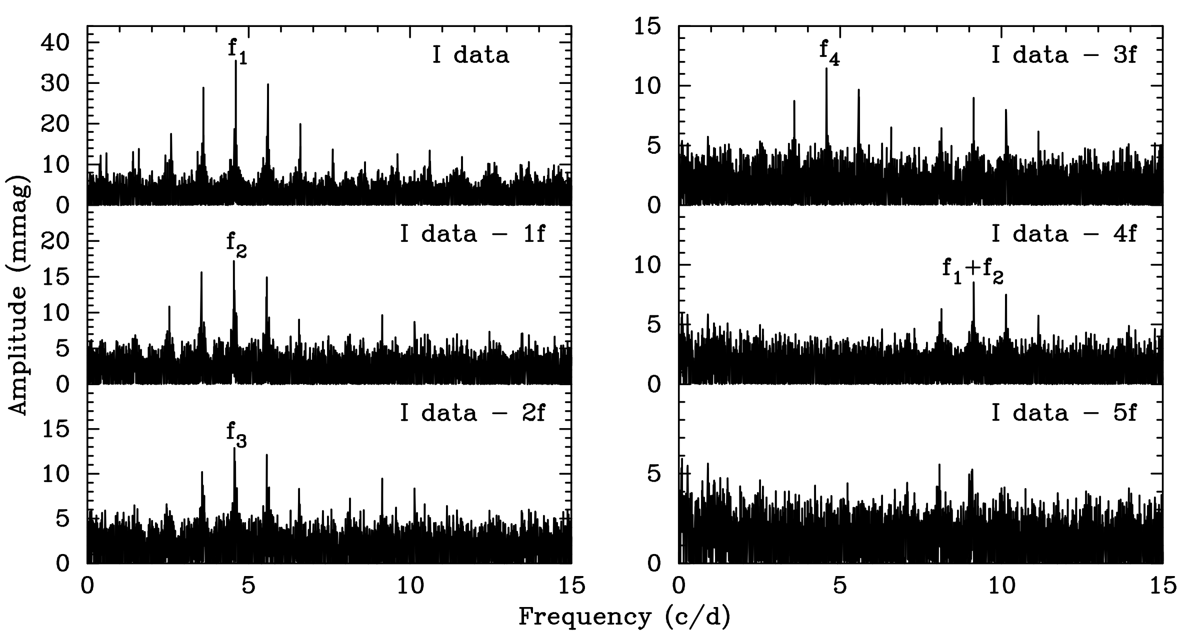

Figure 2. Original and prewhitened amplitude spectra of the ASAS-2 photometry of CD-61 3543.

ASAS J125319-6401.4 = ALS 2798

The B type star ALS 2798 was also originally classified as a W UMa binary with a period near 10 hr (Pojmański 1998). Again, we find multiperiodic variability with periods near half this value (see Fig. 3). The length of the periods and the fact that there are several also imply that we are dealing with a new β Cephei star. Interestingly, the four signals we find are arranged in two close doublets that have the same frequency spacing.

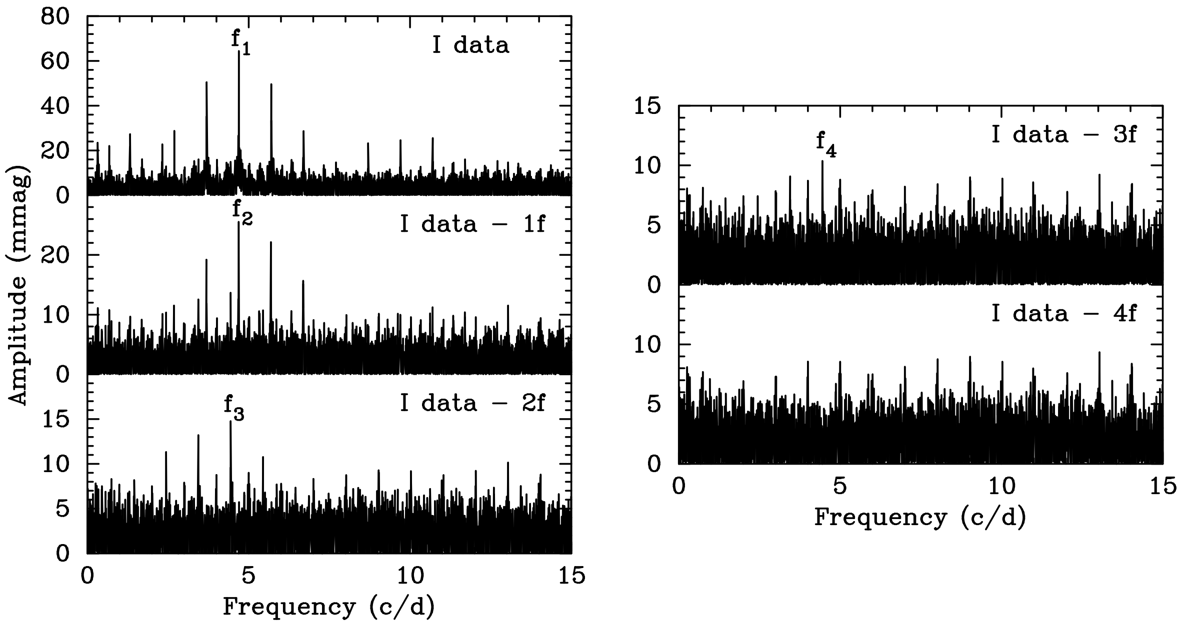

Figure 3. Original and prewhitened amplitude spectra of the ASAS-2 photometry of ALS 2798. The series of peaks discernible in the lower panel of the right-hand side are integer multiples of 1 cycle per sidereal day and are therefore unlikely to be intrinsic to the star.

ASAS J130221-6328.4 = ALS 2877

This B star was also classified as a W UMa binary, but with a period near 9 hr (Pojmański 1998). Once more, multiperiodic variability with periods near half this value is in fact present. This is shown in Fig. 4, where we only used the first two seasons of ASAS measurements since the third was of considerably lower quality. We find three frequencies in the light variations of the star that are (almost) equally spaced.

ASAS J200939+2104.8 = HD 191531

The variability of this B0.5III-IV star (sometimes also mentioned as a Be star) has already been suggested by Koen & Eyer (2002) on the basis of an analysis of its Hipparcos photometry. We find the same frequency as these authors in the ASAS-3 data, and detect a secondary periodicity as well (Fig. 5). The latter is also present in the residual Hipparcos photometry amplitude spectrum, as our re-analysis shows.

Table 1 summarises our findings on the new β Cephei stars. HD 100495 is a new pulsator because of the time scale of its variability and because of its position in the HR diagram. All others are revealed to be pulsators because of their multiperiodicity. The three stars with the most periods appear very attractive for asteroseismology because of their frequency multiplets. Most notably, ALS 2798 seems suitable for a search for differential interior rotation.

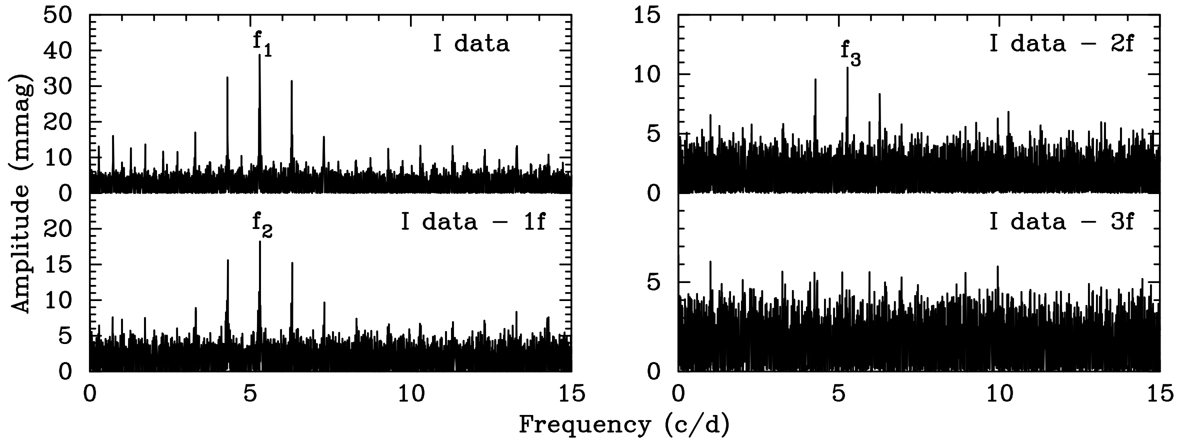

Figure 4. Original and prewhitened amplitude spectra of the ASAS-2 photometry of ALS 2877.

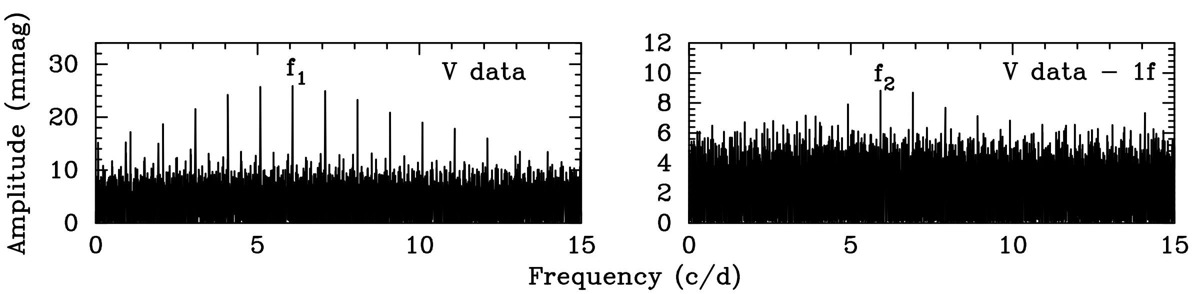

Figure 5. Original and prewhitened amplitude spectra of the ASAS-3 photometry of HD 191531.

Table 1: Pulsation frequencies and amplitudes of the new β Cephei stars

Star	Frequency [c/d]	Amplitude [mmag]
HD 100495	5.9353 ± 0.0004	18.6 ± 0.7 (I)
CD-61 3543	4.598600 ± 0.000014	41.6 ± 1.1 (I)
	4.54019 ± 0.00004	16.9 ± 1.1 (I)
	4.55647 ± 0.00003	17.9 ± 1.1 (I)
	4.57811 ± 0.00004	13.5 ± 1.1 (I)
	9.13879	8.2 ± 1.1 (I)
ALS 2798	4.69541 ± 0.00002	56.3 ± 1.7 (I)
	4.68776 ± 0.00003	31.4 ± 1.7 (I)
	4.44148 ± 0.00006	15.9 ± 1.7 (I)
	4.44909 ± 0.00008	10.8 ± 1.7 (I)
ALS 2877	5.28745 ± 0.00002	42.8 ± 1.3 (I)
	5.30263 ± 0.00004	20.3 ± 1.3 (I)
	5.27222 ± 0.00007	12.2 ± 1.3 (I)
HD 191531	6.08589 ± 0.00004	26.1 ± 1.5 (V)
	5.91437 ± 0.00011	8.7 ± 1.5 (V)

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5668

Konkoly Observatory
Budapest
21 December 2005

HU ISSN 0374 – 0676

NEW MINIMA OF SELECTED ECLIPSING CLOSE BINARIES

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Observatory and telescope:
50cm Newtonian telescope at Stará Lesná (G1), 60cm Cassegrain telescope at Stará Lesná (G2), 60cm Cassegrain telescope at Skalnaté Pleso Observatory (SP), 40cm Cassegrain telescope at Roztoky Observatory (Ro), 5.6/1000 Zeiss Spiegelobjektiv at Hlohovec Observatory (HL)

Detector:	SBIG ST10 MXE CCD camera (G1), photoelectric photometer (G2,SP), SBIG ST8 CCD camera (Ro), SBIG ST9 XE camera (HL)

Method of data reduction:
At G1 aperture photometry was performed using dedicated scripts written under the MIDAS reduction package (`http://www.eso.org/projects/esomidas/`) by one of the authors (TP) while at Ro and HL the MuniPack package (`http://www.ian.cz/munipack/`) has been used. In the case of photoelectric photometry for all observations a 10 second integration was used. Data reduction, the atmospheric extinction correction and transformation to the standard international *UBV* system were carried out in the usual way. Part of the photoelectric photometry was performed with neutral filter (*N*).

Method of minimum determination:
The minima times were computed by Kwee & van Woerden method.

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
RT And	53290.6010	0.0007	I	*BV*	G1
	53291.5430	0.0007	II	*BV*	G1
AB And	52896.5031	0.0001	II	*BV*	G2
BX And	53080.2606	0.0002	II	*RI*	G1
AH Aur	53407.3154	0.0002	II	*BVR*	G1
	53410.2824	0.0001	I	*NBV*	G2
V410 Aur	53251.5808	0.0001	I	*BVRI*	G1
	53283.4556	0.0001	I	*BVRI*	G1
	53355.2632	0.0001	II	*VR*	G1
	53381.4576	0.0001	I	*BVRI*	G1
	53382.3721	0.0001	I	*BVRI*	G1
	53386.4010	0.0004	I	*R*	G1
	53388.2363	0.0001	I	*BVRI*	G1
	53400.3240	0.0001	I	*VRI*	G1
44 Boo	53517.3576	0.0001	II	*BV*	G2
	53517.4923	0.0001	I	*BV*	G2
TZ Boo	53111.4506	0.0001	II	*BVRI*	G1
	53146.3643	0.0001	I	*BVRI*	G1
	53516.4783	0.0001	I	*VRI*	G1
DU Boo	53056.4907	0.0003	I	*UBVRI*	G1
	53149.4121	0.0003	II	*BV*	G2
	53388.5880	0.0003	I	*UBV*	G2
	53433.4377	0.0002	I	*BV*	G2
ET Boo	53450.4854	0.0001	II	*BVRI*	G1
	53451.4519	0.0001	II	*BVRI*	G1
	53460.4806	0.0001	I	*BVRI*	G1
FI Boo	53104.4504	0.0003	II	*BV*	G2
SV Cam	52657.5748	0.0002	II	*BV*	G2
	52688.4054	0.0002	I	*V*	G1
	52694.6407	0.0001	I	*UBV*	G2
	52938.3898	0.0001	I	*UBVRI*	G1
	52952.6234	0.0001	I	*UBVRI*	G1
DN Cam	52896.5715	0.0001	II	*UBV*	G2
BI CVn	52763.4517	0.0001	I	*BVR*	G1
	52764.4114	0.0001	II	*BVRI*	G1
	52765.3727	0.0001	II	*BVRI*	G1
	53490.3770	0.0001	I	*BVRI*	G1
BS Cas	53234.5368	0.0001	II	*VR*	G1
	53236.5194	0.0001	I	*VRI*	G1
	53245.5486	0.0001	I	*VRI*	G1
	53256.5599	0.0001	II	*VRI*	G1
	53259.4229	0.0001	II	*VRI*	G1
	53281.4464	0.0001	I	*VRI*	G1
CW Cas	52931.4268	0.0001	II	*BVI*	G1
	52931.5863	0.0001	I	*BVRI*	G1
	52956.2980	0.0001	II	*BVRI*	G1

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
V523 Cas	52618.2700	0.0001	I	*BV*	G2
VW Cep	53518.3729	0.0001	II	*BV*	G2
WZ Cep	52958.3368	0.0001	II	*BVRI*	G1
	52964.6000	0.0002	II	*BVRI*	G1
	52965.4357	0.0001	I	*BVRI*	G1
	52976.4984	0.0001	II	*BVRI*	G1
GW Cep	52723.2963	0.0001	I	*BV*	G1
	53491.5213	0.0001	II	*VRI*	G1
EE Cet	52956.4747	0.0002	I	*BV*	G2
	53011.3742	0.0002	II	*BV*	G2
RW Com	53406.4491	0.0001	I	*VRI*	G1
	53406.5685	0.0001	II	*VRI*	G1
	53407.6359	0.0001	II	*VRI*	G1
	53409.5324	0.0001	I	*VRI*	Ro
	53409.6534	0.0001	II	*VRI*	Ro
	53410.2565	0.0001	I	*I*	Ro
	53410.3735	0.0001	I	*I*	Ro
SS Com	52766.3856	0.0001	II	*BV*	G1
	52767.4175	0.0001	I	*BV*	G1
	53104.4859	0.0001	I	*BV*	G1
	53361.6745	0.0001	I	*VRI*	G1
CC Com	53504.3365	0.0001	II	*VRI*	G1
	53504.4465	0.0001	II	*VRI*	G1
EK Com	53408.4685	0.0001	I	*VRI*	G1
	53408.6030	0.0001	I	*VRI*	G1
YY CrB	53466.4141	0.0001	I	*BV*	G2
CG Cyg	52863.4241	0.0001	II	*BVRI*	G1
	52864.3716	0.0001	II	*BVRI*	G1
	52898.4514	0.0001	II	*BVRI*	G1
V401 Cyg	53520.4389	0.0001	I	*VRI*	G1
V1191 Cyg	52902.3257	0.0002	II	*BVR*	G1
	52902.4848	0.0001	II	*BVR*	G1
	52905.3050	0.0002	I	*B*	G1
	52905.4591	0.0001	I	*BVR*	G1
	53156.4815	0.0001	I	*UBVR*	G1
	53512.4895	0.0001	II	*VRI*	G1
EF Dra	52908.4374	0.0001	I	*BVR*	G1
	52909.4968	0.0002	I	*BVR*	G1
	53082.5013	0.0001	II	*BVRI*	G1
	53084.4092	0.0001	II	*BVRI*	G1
	53098.4049	0.0002	II	*BVRI*	G1
	53285.3991	0.0005	II	*BV*	G2
	53452.4636	0.0003	II	*BVRI*	G1
	53466.4614	0.0002	II	*BVR*	SP
FU Dra	52721.4555	0.0001	I	*BVRI*	G1
	52721.6081	0.0001	I	*BVRI*	G1

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
FU Dra	53410.4955	0.0001	II	*I*	Ro
	53410.6499	0.0001	I	*I*	Ro
	53462.3367	0.0001	I	*UBVRI*	G1
V829 Her	53462.5160	0.0001	I	*VRI*	G1
V857 Her	52751.4108	0.0001	II	*BV*	G1
	52755.4240	0.0002	I	*BVR*	G1
	52761.3478	0.0002	I	*BR*	G1
V921 Her	52790.5033	0.0001	I	*BV*	G1
	53463.4610	0.0001	II	*BVRI*	G1
SW Lac	52905.3681	0.0001	I	*BV*	G2
V344 Lac	52896.5148	0.0001	II	*BVR*	G1
	52901.4175	0.0001	I	*BVR*	G1
	52901.6141	0.0002	II	*BVR*	G1
	52903.3793	0.0001	I	*BVR*	G1
	52955.3506	0.0003	II	*I*	Ro
	52956.3321	0.0003	I	*I*	Ro
	52957.3119	0.0001	II	*I*	Ro
	52957.5088	0.0002	II	*I*	Ro
CE Leo	52705.5181	0.0001	II	*RI*	Ro
	52707.3391	0.0001	II	*VI*	Ro
	52720.3866	0.0001	I	*BVRI*	G1
	52720.5381	0.0001	I	*BVRI*	G1
	53465.4561	0.0001	I	*BVR*	G1
EX Leo	52723.3246	0.0002	II	*UBV*	G2
	52726.3903	0.0002	I	*UBV*	G2
VW LMi	53461.4592	0.0001	II	*BVN*	G2
	53465.5195	0.0001	I	*BVN*	G2
V714 Mon	52999.3580	0.0001	I	*BVRI*	G1
	53306.6591	0.0002	II	*VI*	G1
	53347.4830	0.0002	II	*VRI*	G1
V753 Mon	53070.2633	0.0001	I	*BV*	G1
	53071.2790	0.0001	II	*BV*	G1
BX Peg	53208.4530	0.0001	I		HL
	53209.4335	0.0001	II		HL
	53209.5743	0.0002	I		HL
	53212.5180	0.0001	I		HL
	53220.3701	0.0001	II		HL
	53220.5099	0.0001	II		HL
	53224.4358	0.0002	I		HL
	53226.5392	0.0001	I		HL
	53236.3538	0.0001	II	*V*	HL
	53236.4931	0.0001	II	*V*	HL
	53240.4180	0.0002	I	*V*	HL
	53240.5597	0.0001	II	*V*	HL
KW Peg	53208.4209	0.0002	II	*V*	HL
	53212.5011	0.0002	II	*V*	HL

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
V432 Per	52927.6188	0.0001	II	*VRI*	G1
	52941.4189	0.0001	I	*VRI*	G1
	52941.6096	0.0001	I	*VR*	G1
	53345.2378	0.0001	I	*VRI*	G1
DV Psc	53284.4221	0.0001	I	*BVRI*	G1
	53285.3479	0.0001	II	*BVRI*	G1
	53285.5025	0.0002	I	*R*	G1
	53344.2782	0.0001	I	*VRI*	G1
V Sge	53217.5102	0.0006	I	*V*	Hl
	53233.4622	0.0005	I	*V*	Hl
	53246.3112	0.0003	I	*V*	Hl
	53265.3322	0.0002	I	*V*	Hl
	53266.3649	0.0007	I	*V*	Hl
	53267.3896	0.0002	I	*V*	Hl
	53282.3009	0.0005	I	*V*	Hl
	53283.3321	0.0002	I	*V*	Hl
	53284.3587	0.0003	I	*V*	Hl
	53285.3871	0.0001	II	*V*	Hl
CW Sge	53519.5063	0.0006	I	*VRI*	G1
OU Ser	52723.5251	0.0002	I	*BV*	G2
AH Tau	52904.5265	0.0001	II	*UBVR*	G1
	52957.2588	0.0001	I	*BRI*	G1
	52957.4246	0.0001	I	*BVRI*	G1
	52971.3916	0.0001	II	*RI*	Ro
	52972.2230	0.0001	I	*RI*	Ro
	52972.3895	0.0001	I	*RI*	Ro
EQ Tau	52902.5862	0.0001	I	*UBVRI*	G1
W UMa	52616.6076	0.0001	I	*UBV*	G2
	53412.3257	0.0001	I	*UBV*	G2
XY UMa	52695.5155	0.0001	I	*RI*	G1
	52697.4310	0.0001	II	*BVRI*	G1
	52697.6320	0.0001	I	*BVRI*	G1
	52706.5325	0.0001	I	*BVRI*	G1
	53399.6394	0.0001	II	*BV*	G1
AA UMa	52745.3655	0.0001	I	*B*	G1
AW UMa	53517.4357	0.0001	I	*BB*	G2
HH UMa	53511.3923	0.0001	I	*VRI*	G1
TV UMi	53452.3801	0.0003	II	*BVN*	G2
AG Vir	53410.6066	0.0001	I	*UBV*	G2
	53411.5647	0.0002	I	*UBV*	G2
HT Vir	53520.4569	0.0001	II	*BV*	G2
ER Vul	52898.4100	0.0001	II	*UBV*	G2

Explanation of the remarks in the table:
Remark gives observatory

Remarks:

Times of minima are weighted averages from all filters used. Ephemerides were markedly improved by new observations of
V410 Aur: Min I = HJD2453364.05523(15) + 0.3663612(15)×E;
DU Boo: Min I = HJD2452256.1254(11) + 1.0558887(9)×E;
BS Cas: Min I = HJD2453194.45421(11) + 0.44046771(14)×E;
EF Dra: Min I = HJD2452340.02549(24) + 0.42402925(31)×E;
BX Peg: Min I = HJD2452653.36492(10) + 0.28041789(2)×E and
DV Psc: Min I = HJD2452379.1787(4) + 0.30853566(13)×E.
In the case of V1191 Cyg the orbital period increases at a very high rate with present ephemeris: Min I = HJD2452552.9001(8) + 0.31338498(71)×E.

Acknowledgements:

This work was supported by Science and Technology Assistance Agency under the contracts No. APVT-20-014402,APVT-51-000802 and Slovak Academy of Sciences VEGA grants 4014 and 4015.

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5669

Konkoly Observatory
Budapest
30 December 2005

HU ISSN 0374 – 0676

DISCOVERY OF A SHORT-PERIODIC PULSATING COMPONENT IN THE ALGOL-TYPE ECLIPSING BINARY SYSTEM IV Cas

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[3] Astronomical Observatory, Odessa National University, Shevchenko Park, Odessa, 65014, Ukraine

Name of the object:
IV Cas

Observatory and telescope:
Mt. Lemmon Optical Astronomy Observatory in USA, 1.0m telescope[1]

Detector:	2K CCD camera (Field of view is 22.2×22.2 arcmin^2)

Filter(s):	Johnson B

Date(s) of the observation(s):
November 27, 29, 30 and December 15, 2004

Comparison star(s):	GSC 04001-00080 ($B = 10\overset{m}{.}987$, $V = 10\overset{m}{.}881$; Kharchenko 2001)

Check star(s):	GSC 04001-01028 ($B = 12\overset{m}{.}787$, $V = 11\overset{m}{.}723$; Kharchenko 2001)

Transformed to a standard system:	No

Availability of the data:
Upon request

Method of data reduction:
Standard CCD-frame reduction using the IRAF/DAOPHOT[2] package

[1]Korea Astronomy & Space science Institute (*KASI*) had installed the telescope and has been operating it by remote control from Korea via a network connection.

[2]IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

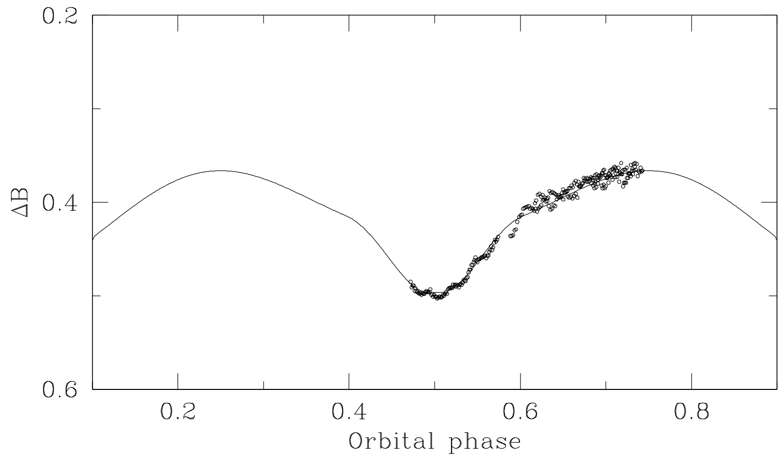

Figure 1. Phase diagram of IV Cas in B-passband. The line is a synthetic eclipsing light curve which is roughly derived from the 1998-version of Wilson & Devinney (1971) code, taking into consideration of observing parameters by Kreiner et al. (2001) and orbital ephemeris by Kreiner (2004).

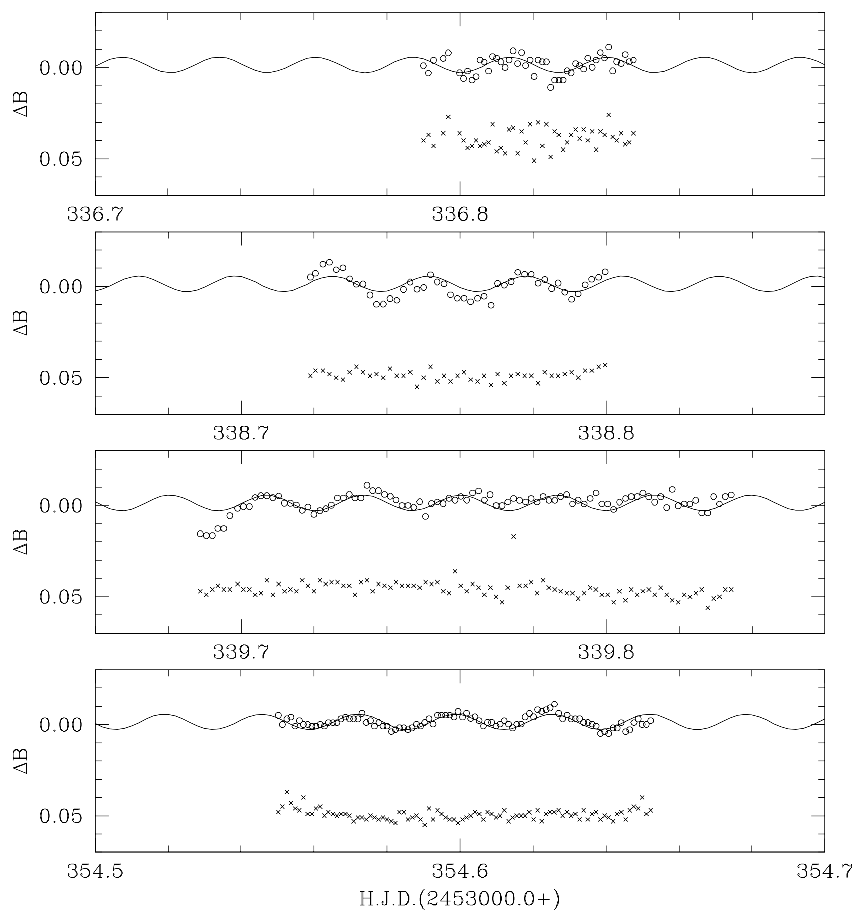

Figure 2. Light variations of the residuals after subtracting the synthetic curve from the data (open circles). The lines are sinusoidal fits with f_1 = 37.672 c/d obtained from the multiple frequency analysis. The residuals and the sinusoidal curves were corrected for the low frequency term (see Figure 3). Differential magnitudes of a check star, ΔB(Check−Comparison), are also displayed in arbitrary scale for comparison (crosses).

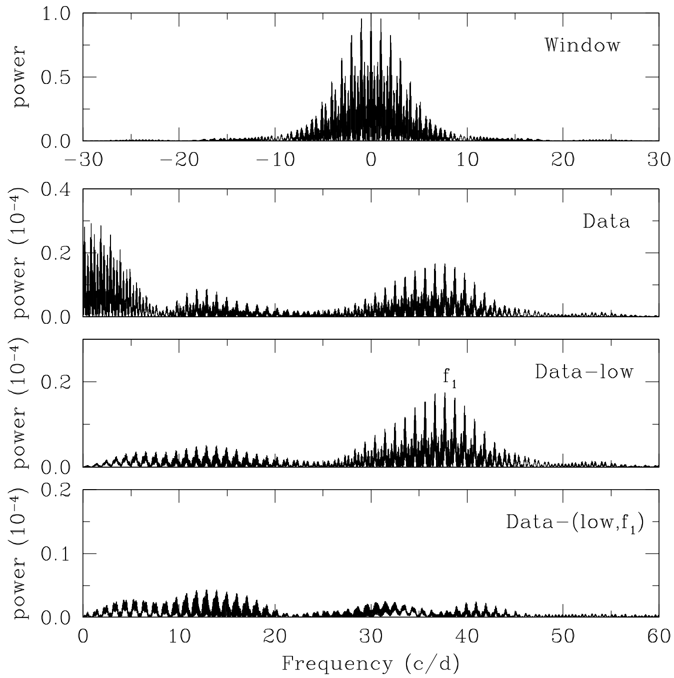

Figure 3. Power spectra of the residuals. The window spectrum is displayed in the top panel. Low frequency peaks in the second panel may be originated from nightly variations of the data and/or the incomplete fit of the synthetic curve. After prewhitening the low frequency, we can detect $f_1 = 37.672$ c/d in the third panel.

Remarks:

As a part of our photometric survey project to search for A-type pulsating components in eclipsing binary systems (Kim et al. 2003), we monitored the Algol-type semi-detached eclipsing binary IV Cas. The observations were performed for four nights between November and December 2004. Simple aperture photometry was applied to get instrumental magnitudes with an aperture radius of 10 pixels (=6$''\!.$4); seeing size was about 3$''\!.$0 during the observing runs. We examined differential magnitudes of tens of stars in the observing field to check their variations. Phase diagram of IV Cas is shown in Figure 1, where orbital phases were calculated with the orbital period of 0.9985132 day and the primary minimum epoch of *H.J.D.* 2452500.3502 (Kreiner 2004). We obtained residuals after subtracting a synthetic eclipsing light curve from the data (Figure 2). The multiple frequency analysis (Kim & Lee 1996) was applied to examine periodicity of the residuals, displayed in Figure 3. We detected a frequency of $f_1 = 37.672$ c/d (cycles per day). The signal to noise (S/N) ratio of its amplitude is larger than 4.0 which is proposed as a criterion of a real frequency by Breger et al. (1993).

Our observations show that the primary component of IV Cas has δ Scuti-type pulsational characteristics such as the short period of about 38 minutes, peak-to-peak amplitudes of about $0\overset{m}{.}01$ in *B*-passband, and spectral type of A4 (Kreiner et al. 2001). Considering these pulsational characteristics and the semi-detached binary configuration (Kreiner et al. 2001), we suggest that IV Cas is a new member of the oscillating EA (oEA) stars, a group of mass-accreting pulsating components in Algol-type semi-detached eclipsing binary systems (Mkrtichian et al. 2004, 2005; Kim et al. 2005).

Acknowledgements:
This research made use of the SIMBAD database, operated at CDS, Strasbourg, France

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5670

Konkoly Observatory
Budapest
3 January 2006

HU ISSN 0374 – 0676

NEW TIMES OF MINIMA OF SOME ECLIPSING VARIABLES

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Observatory and telescope:
URSA: URSA Observatory at the University of Arkansas (`ursa.uark.edu`); 10-inch Schmidt-Cassegrain reflector. NFO: NFO WebScope near Silver City, NM, USA (`www.nfo.edu`); 24-inch classical Cassegrain.

Detector:	URSA: 1020×1530 pixels SBIG ST8EN CCD cooled to (typ.) −20°C; 1.15 arcsec square pixels; 20′(N-S)×30′(E-W) field of view. NFO: 2102×2092 pixels Kodak KAF 4300E CCD cooled to (typ.) −20°C; 0.78 arcsec square pixels; 27′ square field of view.

Method of data reduction:
Virtual measuring engine (Measure 2.0) written by C.H.S. Lacy (2005).

Method of minimum determination:
Kwee & van Woerden (1956)

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
AP And	53348.61894	0.00010	2	V	URSA
	53574.80780	0.00012	1	V	URSA
	53631.95039	0.00007	1	V	NFO
	53670.83898	0.00006	2	V	NFO
	53671.63281	0.00008	1	V	URSA
	53698.61653	0.00008	1	V	URSA
	53706.55315	0.00010	1	V	URSA
CO And	53314.8376	0.0003	2	V	URSA
	53358.7009	0.0005	2	V	URSA
	53360.5309	0.0004	1	V	URSA
	53634.6781	0.0003	1	V	NFO
	53676.7161	0.0004	2	V	URSA
	53687.68078	0.00020	2	V	NFO

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
V602 Aql	53586.6595	0.0009	1	V	URSA
CG Aur	53351.78689	0.00014	1	V	URSA
	53360.8087	0.0006	1	V	URSA
	53398.7110	0.0005	1	V	NFO
	53427.5884	0.0005	1	V	URSA
	53704.6764	0.0005	2	V	URSA
HP Aur	53315.80177	0.00016	2	V	URSA
	53317.93503	0.00013	1	V	URSA
	53354.92842	0.00009	1	V	URSA
	53434.60507	0.00011	1	V	URSA
	53704.94488	0.00010	1	V	URSA
	53704.94469	0.00007	1	V	NFO
	53709.9231	0.0002	2	V	NFO
	53710.63580	0.00012	2	V	URSA
	53714.90415	0.00016	1	V	URSA
	53714.90409	0.00010	1	V	NFO
V381 Cas	53592.9033	0.0011	2	V	URSA
V389 Cas	53693.5518	0.0008	2	V	URSA
V651 Cas	53630.77022	0.00011	2	V	NFO
	53661.67130	0.00007	2	V	NFO
	53668.64914	0.00015	2	V	URSA
	53668.64941	0.00009	2	V	NFO
	53692.57298	0.00014	2	V	URSA
	53696.56003	0.00012	2	V	URSA
	53704.5348	0.0003	2	V	URSA
IO Cep	53357.5317	0.0010	2	V	URSA
V456 Cyg	53540.80686	0.00010	1	V	URSA
	53540.80728	0.00020	1	V	NFO
	53569.77086	0.00012	2	V	URSA
	53581.80183	0.00014	1	V	URSA
	53631.7089	0.0002	1	V	NFO
	53685.62805	0.00021	2	V	URSA
V974 Cyg	53471.93627	0.00017	2	V	NFO
	53553.7418	0.0005	1	V	URSA
	53553.74037	0.00012	1	V	NFO
V1136 Cyg	53497.7828	0.0006	1	V	URSA
	53499.8513	0.0008	2	V	NFO
	53542.7988	0.0011	1	V	URSA
	53544.8553	0.0018	2	V	URSA
	53558.7145	0.0006	2	V	URSA
	53580.8838	0.0006	1	V	URSA
BF Dra	53341.55151	0.00022	1	V	URSA
	53464.87251	0.00012	1	V	NFO
	53503.9275	0.0004	2	V	NFO
LV Her	53430.95992	0.00016	1	V	NFO
GM Hya	53359.8744	0.0006	1	V	URSA
RW Lac	53347.5436	0.0004	2	V	URSA

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
V501 Mon	53376.7091	0.0005	2	V	URSA
	53390.7530	0.0006	2	V	NFO
	53401.6502	0.0005	1	V	NFO
	53404.7933	0.0005	2	V	NFO
SX Oph	53456.92931	0.00014	1	V	NFO
	53545.6552	0.0004	1	V	URSA
V506 Oph	53416.99053	0.00022	2	V	URSA
	53433.95766	0.00017	2	V	NFO
	53441.91088	0.00013	1	V	URSA
	53484.85870	0.00016	2	V	URSA
	53493.87176	0.00008	1	V	URSA
	53493.8720	0.0003	1	V	NFO
	53502.88561	0.00012	2	V	URSA
	53511.89910	0.00010	1	V	URSA
	53511.89923	0.00009	1	V	NFO
	53512.95977	0.00018	1	V	NFO
	53536.81904	0.00012	2	V	URSA
	53545.8324	0.0005	1	V	URSA
	53561.73937	0.00007	1	V	NFO
V648 Ori	53318.77736	0.00020	1	V	URSA
	53389.5292	0.0007	2	V	URSA
	53395.6318	0.0008	2	V	URSA
	53419.6192	0.0007	1	V	URSA
	53661.9631	0.0003	1	V	NFO
	53668.8743	0.0007	2	V	NFO
	53692.8679	0.0003	1	V	NFO
	53693.6791	0.0004	1	V	URSA
IM Per	53387.58488	0.00019	1	V	URSA
	53388.7205	0.0003	2	V	NFO
	53405.61841	0.00019	1	V	URSA
	53405.6176	0.0005	1	V	NFO
	53449.5832	0.0005	2	V	URSA
	53656.97191	0.00019	2	V	NFO
	53681.7703	0.0004	2	V	URSA
	53691.9074	0.0005	1	V	URSA
NP Per	53357.7485	0.0003	1	V	URSA
	53386.72019	0.00018	2	V	URSA
	53671.97505	0.00008	2	V	NFO
V482 Per	53317.6900	0.0003	2	V	URSA
	53318.9165	0.0003	1	V	URSA
	53668.8015	0.0003	1	V	URSA
	53685.9293	0.0005	1	V	URSA
AQ Ser	53389.0149	0.0003	2	V	NFO
	53399.98223	0.00010	1	V	NFO
	53470.85488	0.00018	1	V	URSA
	53476.7603	0.0007	2	V	NFO
	53481.82275	0.00015	2	V	NFO
	53508.8230	0.0004	2	V	URSA

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
BI Ser	53429.96291	0.00011	1	V	NFO
	53478.7595	0.0013	2	V	NFO
	53507.6776	0.0006	2	V	URSA
CF Tau	53341.7779	0.0005	2	V	URSA
	53366.5851	0.0004	2	V	URSA
	53377.6090	0.0005	2	V	NFO
	53399.6557	0.0007	2	V	NFO
	53684.8897	0.0004	1	V	URSA
	53727.6087	0.0004	2	V	URSA
BP Vul	53526.9042	0.0003	2	V	NFO
	53527.91289	0.00009	1	V	NFO
BT Vul	53479.93273	0.00013	1	V	NFO
	53487.9207	0.0003	1	V	NFO
	53491.91457	0.00013	2	V	NFO
	53507.8915	0.0003	2	V	URSA
	53527.86259	0.00016	1	V	NFO
	53539.8449	0.0003	2	V	URSA
	53543.8383	0.0003	1	V	URSA
	53550.6866	0.0010	1	V	URSA
	53554.6805	0.0003	2	V	URSA
	53574.65088	0.00014	1	V	URSA
	53582.64018	0.00014	1	V	URSA
	53583.78144	0.00013	1	V	URSA
	53583.7810	0.0003	1	V	NFO
	53591.7698	0.0003	1	V	URSA
	53619.7297	0.0003	2	V	URSA
EQ Vul	53560.8709	0.0007	2	V	URSA

Remarks:
A sample of the observations has been published by Lacy, Hood & Straughn (2001).

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5671

Konkoly Observatory
Budapest
6 January 2006

HU ISSN 0374 – 0676

SOUTHERN COOL STARS MISCLASSIFIED AS CARBON STARS

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Recently it was found that a number of stars in the third edition of the General Catalog of Galactic Carbon Stars (CGCS; Alksnis et al. 2001) and its earlier editions have either the TiO absorption bands of M stars or no bands at all indicating that they are not carbon stars. They were called carbon stars by Wray (1966) on the basis of objective-prism spectra exposed on Kodak 103a-E plates taken by K.G. Henize at the Lamont-Hussey Observatory, Bloemfontein, South Africa in the early 1950's. In that spectral region, the Swan bands of C_2 define the carbon stars, and there are 144 stars in the CGCS attributed to Wray. Of these, 104 were found independently by others, so there is little reason to question their nature. Following a request of Brian Skiff, I examined two of the 'Wray-only' stars on my collection of Curtis Schmidt objective-prism, near-IR plates (see MacConnell et al. 1992 for a detailed description) on which carbon stars have prominent CN bands near 0.79 μm and found that they are M stars. I therefore examined the remaining 21 stars of Wray that fall in the area covered by my plates and found that all are either M stars or have no molecular absorption bands and hence are not carbon stars. They are listed in Table 1 under their CGCS number with the spectral type assigned by me. Nos. 2382, 3100, and 3841 have been assigned to the 'Miscellaneous' variable class in the All-Sky Automated Survey-3 Catalog (`http://www.astrouw.edu.pl/~gp/asas/asas.html`; Pojmanski 2002), and no. 3841 has been classified both as M1 and M3 by Raharto et al. (1984; their Tables 5 and 4, respectively). There is no carbon star at or near the position of CGCS 3381, and the carbon star entry has been eliminated from the SIMBAD database. Finally, CGCS 2207, found solely by Henize (unpublished) on the same plates, was not found on my plates and is probably identical to CGCS 2200 as suggested by Stephenson in his notes to the second edition of the CGCS.

Table 1. M stars erroneously listed as carbon stars.

CGCS No.	Spec. Type	ASAS-3 Var. ID
2054	M3	–
2088	M5	–
2157	M3	–
2310	M5	–
2340	M6	–
2350	M6	–
2382	M4	085405-4539.7
2441	M3	–
2529	<M2	–
2545	M4	–
2564	M4	–
2625	M3	–
2633	M4	–
2634	M5	–
2652	M7	–
3069	<M2	–
3100	M5	114613-5704.1
3357	M3	–
3381	blank	–
3462	<M2	–
3655	M4	–
3804	<M2	–
3841	M3	173228-3403.2

Acknowledgements: I wish to thank Brian A. Skiff of the Lowell Observatory for many helpful communications. This research has made use of the SIMBAD and VizieR databases operated at the Centre de Données Astronomiques de Strasbourg, France and was done under the research program for CSC astronomers at STScI which is operated by the Association of Universities for Research in Astronomy, Inc., under NASA contract NAS 5-26555.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5672

Konkoly Observatory
Budapest
13 January 2006

HU ISSN 0374 – 0676

CCD MINIMA FOR SELECTED ECLIPSING BINARIES IN 2005

NELSON, ROBERT H.

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Observatory and telescope:
Sylvester Robotic Observatory (SRO): 33 cm f/4.5 Newtonian on Paramount GT-1100s mount

Detector:	SRO: SBIG ST-7XME, $1''\!.25$ pixels, $15'\!.8 \times 10'\!.5$ FOV, cooled $-10°C < T < -30°C$

Method of data reduction:
Aperture photometry using MIRA, by Axiom Research

Method of minimum determination:
Digital tracing paper method, bisection of chords, curve fitting, and (occasionally) Kwee and van Woerden (1956)

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
AP And	53671.63267	0.00005	I	R	
CN And	53691.8061	0.0001	I	R	
V0346 Aql	53572.8016	0.0001	I	R	
RX Ari	53731.8155	0.0002	I	V	
TX Ari	53718.6859	0.0001	I	R	
SX Aur	53383.6802	0.0001	I	V	
ZZ Aur	53385.8690	0.0001	I	clear	
CL Aur	53704.7068	0.0001	I	R	
DO Aur	53698.7123	0.0002	I	clear	
EM Aur	53696.8596	0.0005	II	R	
EP Aur	53384.6462	0.0001	I	clear	
EP Aur	53410.6506	0.0001	I	clear	
FW Aur	53718.9477	0.0004	I	clear	
GI Aur	53378.8910	0.0001	I	clear	

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
GX Aur	53680.7544	0.0005	I	R	
HL Aur	53372.7174	0.0001	I	clear	
HP Aur	53704.94465	0.00008	I	R	
HU Aur	53437.710	0.001	II	clear	
V0364 Aur	53380.6777	0.0001	I	clear	
V0402 Aur	53378.6537	0.0002	I	clear	
V0410 Aur	53383.8390	0.0001	II	clear	
EF Boo	53718.0383	0.0001	I	R	
GS Boo	53472.8209	0.0003	I	R	
AO Cam	53699.9640	0.0001	I	R	
CW Cas	53671.82201	0.00005	I	R	
V0364 Cas	53732.7270	0.0001	I	R	
V0381 Cas	53717.7095	0.0002	I	R	
V0445 Cas	53735.6466	0.0002	I	V	
V0473 Cas	53698.8277	0.0003	I	R	
V0520 Cas	53589.9008	0.0001	II	R	
WZ Cep	53697.6256	0.0003	I	R	
WZ Cep	53708.6228	0.0002	II	R	
AK CMi	53696.9528	0.0001	I	R	
WW Cnc	53416.64627	0.00008	I	clear	
YY Cnc	53718.8091	0.0003	I	R	
AH Cnc	53442.7929	0.0002	I	clear	
EH Cnc	53462.7957	0.0002	II	R	
CC Com	53517.7983	0.0001	I	R	
EK Com	53377.9339	0.0002	I	clear	
TW CrB	53473.8044	0.0005	II	R	
DF CVn	53414.8649	0.0001	I	clear	
DH CVn	53417.7517	0.0001	II	clear	
DH CVn	53437.870	0.001	II	clear	
DI CVn	53416.8559	0.0003	I	clear	
V0388 Cyg	53706.6151	0.0001	I	V	
V0726 Cyg	53516.8114	0.0001	I	R	
V0824 Cyg	53500.8803	0.0004	I	clear	
V0841 Cyg	53664.688	0.0010	I	R	
V0859 Cyg	53595.8207	0.0001	II	R	
V0865 Cyg	53500.7920	0.0003	II	R	
V1141 Cyg	53681.6193	0.0002	II	R	
V1147 Cyg	53671.7264	0.0001	I	R	
V1191 Cyg	53685.642	0.002	II	R	
V1305 Cyg	53711.641	0.001	II	R	
ET Del	53701.6295	0.0001	II	R	
BE Dra	53515.8098	0.0002	I	R	
EF Dra	53507.8055	0.0003	I	R	
AC Gem	53444.6960	0.0002	I	clear	
DP Gem	53443.7800	0.0001	I	clear	
FT Gem	53442.7086	0.0001	II	clear	
KV Gem	53704.8198	0.0001	II	R	

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
QW Gem	53697.7729	0.0001	I	R	
V0345 Gem	53731.9423	0.0004	II	V	
V0728 Her	53439.9677	0.0001	I	clear	
V0731 Her	53499.8972	0.0001	II	R	
V1043 Her	53508.8894	0.0002	II	R	
WY Hya	53693.9663	0.0003	I	R	
VY Lac	53596.7940	0.0001	I	R	
IM Lac	53585.7712	0.0002	I	R	
PP Lac	53682.6355	0.0001	II	R	
Y Leo	53416.77674	0.00005	I	clear	
UZ Leo	53417.8727	0.0003	I	V	
XY Leo	53703.9530	0.0002	II	V	
RT LMi	53465.8072	0.0001	I	R	
SW Lyn	53418.69455	0.00005	I	V	
UU Lyn	53439.8689	0.0001	I	clear	
BG Lyn	53459.7256	0.0003	II	R	
BG Lyn	53705.0894	0.0001	I	R	
V0448 Mon	53382.787	0.001	II	clear	
V0498 Mon	53374.8307	0.0005	I	clear	
V0514 Mon	53697.9158	0.0001	I	R	
V0714 Mon	53703.8763	0.0001	I	R	
UW Ori	53671.9003	0.0005	I	R	
FF Ori	53417.6301	0.0001	I	clear	
V1363 Ori	53374.7158	0.0001	I	clear	
DK Per	53725.6407	0.0001	I	R	
HW Per	53716.6261	0.0006	II	R	
IK Per	53439.6725	0.0002	I	clear	
KR Per	53682.7549	0.0001	I	R	
RV Psc	53673.7338	0.0001	I	R	
CC Ser	53499.7567	0.0002	I	R	
WY Tau	53385.6326	0.0001	I	clear	
AN Tau	53441.6451	0.0002	II	clear	
BV Tau	53716.7693	0.0003	I	R	
CR Tau	53698.9522	0.0002	I	R	
CU Tau	53701.7633	0.0002	I	R	
V0781 Tau	53696.740	0.001	II	R	
V1128 Tau	53707.7406	0.0002	II	R	
TY UMa	53732.8797	0.0001	II	R	
XY UMa	53372.8148	0.0001	I	clear	
BM UMa	53418.7984	0.0001	II	clear	
HH UMa	53717.9116	0.0002	II	R	
HN UMa	53441.896	0.001	I	clear	
RU UMi	53498.763	0.001	II	R	
BG Vul	53595.9052	0.0002	II	R	
BT Vul	53691.6246	0.0001	II	R	

Acknowledgements:

Thanks are due to Environment Canada for the website satellite views (see reference below) that were essential in predicting clear times for observing runs in this cloudy locale. Thanks are also due to Attilla Danko for his 'Clear Sky Clocks', (see below). This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5673

Konkoly Observatory
Budapest
18 January 2006

HU ISSN 0374 – 0676

VZ Gru: A BLAZHKO-TYPE RR Lyr, NOT A CV

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VZ Gru was first classified as an irregular variable (Is) by Meinunger (1976). It was observed later again by Meinunger (1979) who maintained her initial classification, but as a side remark noted that the observed variations would also fit a RR Lyrae-type variability. With this information the star is also included in the actual General Catalogue of Variable Stars (Samus et al. 2004). Subsequently, the star has received little attention, until Cieslinski et al. (1997, 1998) presented photometric and spectroscopic data, respectively. Their observations showed VZ Gru to be moderately faint ($\langle V \rangle = 15.2$), slightly bluish ($\langle U{-}B \rangle = 0.16$, $\langle B{-}V \rangle = 0.30$), and of spectral type F4–F6. The star caught our attention since it is included in the Downes et al. (2001) catalogue as a candidate cataclysmic variable (CV).

We observed the star in 4 nights in 2002 as a back-up target at the 0.9 m CTIO/SMARTS telescope using direct CCD imaging in the R passband. See Table 1 for details.

The data were reduced in the usual way, using IRAF[1] routines for bias subtraction and flat-fielding. Aperture photometry and light curves were obtained for the target and a number of field stars with IRAF's DAOPHOT package and the stand-alone daomatch and daomaster programs (Stetson 1992). The differential light curve for the target was computed with respect to 5 suitable comparison stars.

Table 1: Log of observations.

date	HJD	$n_{\rm data}$	$t_{\rm exp}$ [s]	Δt [h]
2002-09-17	2 452 535	60	90	2.30
2002-09-18	2 452 536	70	90	2.74
2002-09-19	2 452 537	70	90	2.63
2002-09-22	2 452 540	100	120	4.17

From the resulting light curves (Fig. 1) it becomes immediately clear that VZ Gru is not a CV, but a pulsating variable of type RRab, in good agreement with the spectral

[1] IRAF is distributed by the National Optical Astronomy Observatories.

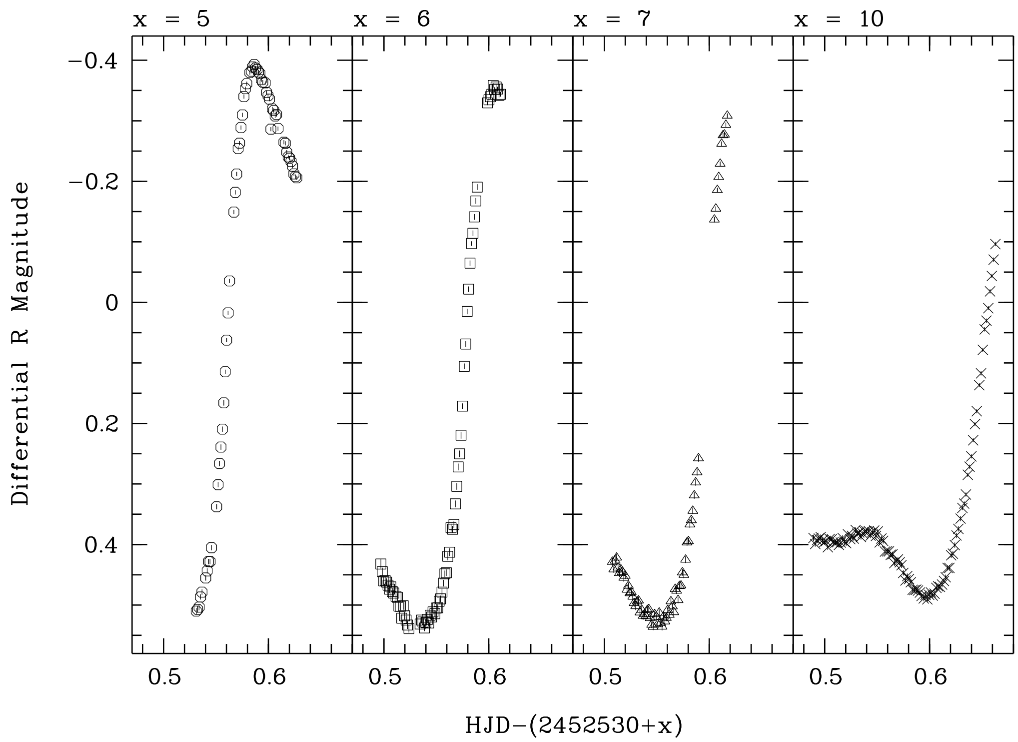

Figure 1. Individual light curves from 2002-09-17/18/19/22 (from left to right). Note that the photometric error bars are included but do not exceed the size of the symbols.

type determined by Cieslinski et al. (1998). In our observations we have been lucky to record a minimum or maximum for all nights, so that a determination of the pulsation period should be possible. However, Fig. 1 also demonstrates the presence of a Blazhko (1907) effect that changes the maximum and minimum magnitude and the slope between those two extrema in VZ Gru (Table 2).

In order to search for the period we prepared the data set by correcting for the differences in the extrema with respect to the data from 2002-09-18, which includes both a maximum and a minimum. A periodogram was then computed using the Scargle (1982) algorithm implemented in MIDAS. The resulting frequency spectrum shows a large number of aliases (Fig. 2). However, taking into account the distinctive shape of the RRab-type light curve together with the period distribution of these systems, we find that the peak corresponding to $P = 0.511$ d $= 12.3$ h represents the only viable choice.

Table 2: Differential R magnitudes for the observed maxima and minima. The errors have been estimated with respect to the spread of data points near the extrema.

date	max	min
2002-09-17	−0.391(10)	
2002-09-18	−0.357(05)	0.537(10)
2002-09-19		0.529(08)
2002-09-22		0.488(05)

In order to estimate the uncertainty of this period we folded the data set with a number of nearby trial periods. The overall best visual result was achieved with P = 0.508 d, with a range of acceptable periods within ±0.004 d (Fig. 3). Note that the Blazhko effect possibly introduces a systematic uncertainty that cannot be resolved in our data set due to the low number of recorded extrema, and that can be suspected to be somewhat larger than the uncertainty derived by us. Further observations with a much longer time base of this field RRab star will be needed to disentangle the fundamental pulsation from the Blazhko contribution, and to provide a period for the latter.

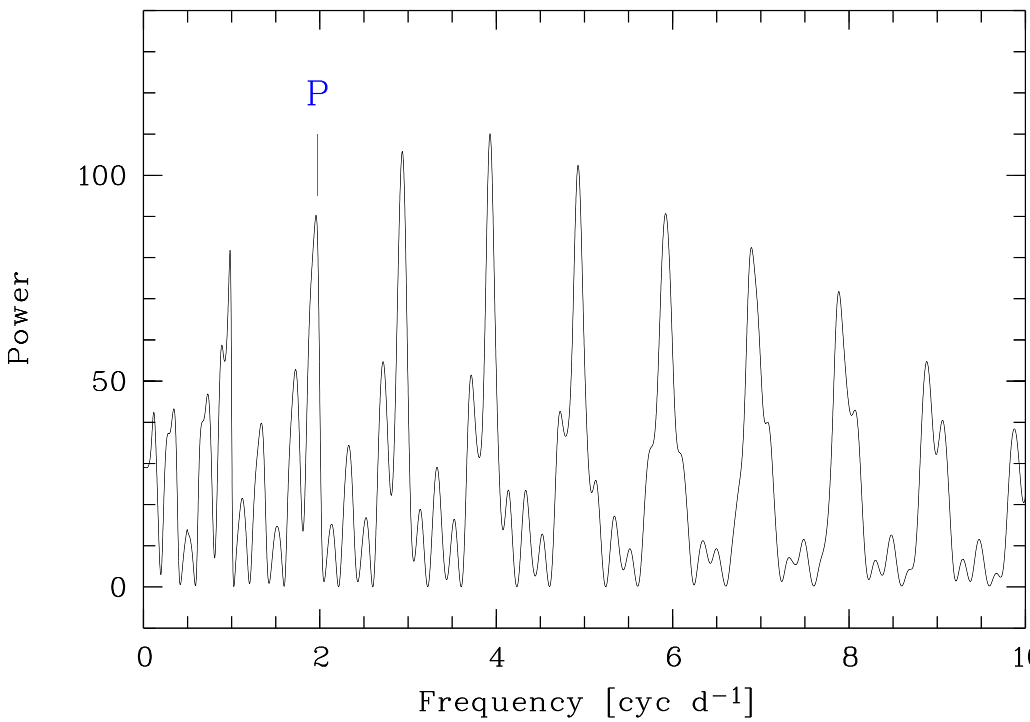

Figure 2. Scargle periodogram. The period $P = 0.511$ d is indicated.

Acknowledgements: CT and MC acknowledge financial support by FONDECYT grants 1051078 and 1030954, respectively. We are indebted to J. Rossa for looking up the Meinunger (1979) reference. CT also would like to thank K. Kolenberg for enlightening discussions on this object and RR Lyr stars in general. This work has made intensive use of the SIMBAD database operated at CDS, Strasbourg, France, and also of the period-search program Peranso (courtesy T. Vanmunster).

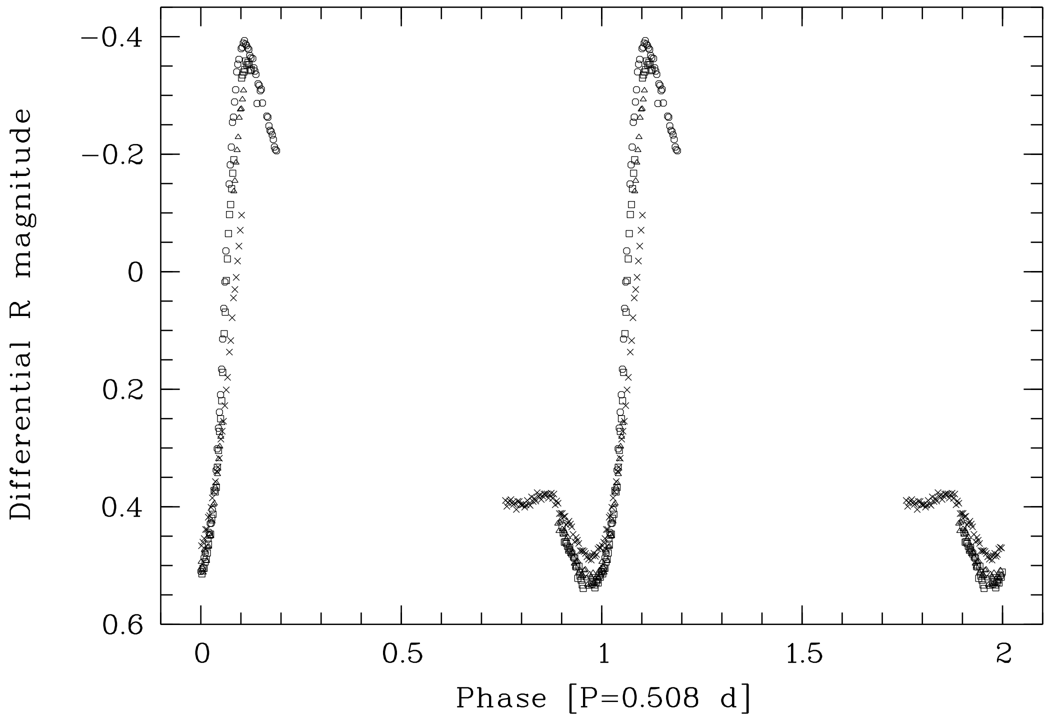

Figure 3. Light curve folded on $P = 0.508$ d. Different symbols indicate different nights (see Fig. 1).

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5674

Konkoly Observatory
Budapest
18 January 2006

HU ISSN 0374 – 0676

NEW ELEMENTS FOR 80 ECLIPSING BINARIES VIII.

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The ASAS-3 (Pojmanski, 2002), NSVS (Wozniak et al., 2004) and Hipparcos (Perryman et al., 1997) databases have been used to find new elements for another set of 80 eclipsing binaries. NSVS, ASAS-3 and Hipparcos data have been combined to improve the period determinations. Unfiltered NSVS ROTSE1 magnitudes were shifted to match the V magnitude of the stars. When neither ASAS nor Hipparcos observations exist, the original ROTSE1 magnitudes have been given. Hipparcos observations have been transformed to V using a table by the author published electronically in IBVS No. 5482 (Otero, 2003). Saturated data in ASAS-3 and flagged observations in the Hipparcos Epoch Photometry and the NSVS dataset were discarded. The candidate stars were selected from the NSV catalogue (Kukarkin and Kholopov, 1982) and its supplement (NSVS) (Kazarovets et al., 1998) and the GCVS (General Catalogue of Variable Stars, Kholopov et al., 2005). Stars in the GCVS and NSV catalogues that had no given classification or were classified as eclipsing binaries, S, L, I, CST or VAR with no spectral type published or spectral type K or earlier were also checked. This list also include new eclipsing binaries randomly found in the ASAS-3 database and not published or published with wrong elements in the ASAS catalogue (Pojmanski, 2002). The method of bisected chords was used to determine times of minima. The accuracy depends on the quantity and quality of the observations. Elements were found with AVE (Barberá, 1999) and a Microsoft Excel period search utility.

Table 1 shows the list of variables. The first column gives the variable star designation according to the GCVS or the GSC number if the star is not a known variable star. The following columns give another identifier; the brightness range of the variable (V= ASAS-3 V magnitudes; *= ROTSE1 magnitudes), with the magnitude of secondary eclipse between brackets; the epoch of minimum light derived from the complete dataset; the period; the variability class and the spectral type with a note to the spectral type source.

Table 1. New elements for 80 eclipsing binary stars.

Star Name		Magnitude range	Epoch	Period	Type	Spectral type
Variable/GSC	Other ID	(V)	(HJD2400000+)	(days)		
AE Ind*	GSC 8796 1142	13.22−14.6 (13.45)V	52087.752	3.6741	EA	A2+G6IV (59)
AF Oph	GSC 0408 0535	12.9−13.6: (13.0)V	52768.730	8.8981	EA	
AL Aps	GSC 9429 1348	12.90−13.95:(12.95:)V	51903.115	7.432	EA	
AS Hya*	GSC 6038 0018	12.02−14.8:(12.15)V	51913.747	1.063597	EA	A3+K2IV (59)
BB Per*	GSC 2357 0743	12.56−13.31 (13.2)*	51488.631	0.485594	EA	
BO Aps	GSC 9281 0157	13.2−14.5:(13.3:)V	52115.510	1.84995	EA	
DE Lyn	GSC 3803 1143	13.13−13.9:(13.7:)*	51630.631	0.40882	EW	
EF Aqr	HD 217512	9.88−10.5:(10.11)V	51483.622	2.85358	EA	G1V (5)
EI CMa	GSC 5952 0136	12.47−14.1 (12.64)V	53025.820	10.6102	EA	
EL And*	GSC 2825 1263	13.28−13.7:(13.7:)*	51473.615	5.242	EA	
EX CMa*	GSC 5391 1000	13.0−13.5:(13.4:)V	52737.330	74.111	EA	
FW Aqr	GSC 5803 1356	12.95−14.4:(13.15)V	53585.888	4.8865	EA	
FZ Aur*		12.55−12.8:(12.8:)*	51518.595	7.132	EA	
GN Aqr	GSC 5229 1615	11.72−12.16(12.1:)V	53244.640	4.40445	EA	
GSC 1158 0201*		12.00−13.2 (12.17)V	51463.840	1.242993	EA	
GSC 1684 0522*		11.77−12.08 (12.0)V	53521.877	0.415211	EW	
GSC 1721 1141*		12.70−13.1:(12.85:)V	52844.853	0.77973	EA	
GSC 1805 0750*	BD +26 0560	9.75−10.31(10.00)V	51475.670	0.993618	EB	F2 (61)
GSC 4678 0496*	HD 003399	9.81−10.26 (9.89)V	51466.870	3.4885	EA	F0V (5)
GSC 4685 1287*		12.88−14.5:(13.07)V	53400.508	2.71883	EA	
GSC 5451 1708*	HD 075338	10.05−10.41(10.09)V	53133.587	2.49447	EA	F0 (33)
GSC 5759 0110*	BD−11 5364	10.03−10.40(10.15)V	52040.825	7.3457	EA/RS	
GSC 6550 3021*		12.85−14.0:(12.95:)V	53459.653	3.5485	EA	
GSC 6816 0087*		11.46−12.49(11.58)V	53479.870	3.2864	EA	
GSC 6839 0257*	HD 315997	11.21−11.40(11.24)V	51961.875	2.8723	EA	A5 (9)
GSC 7102 1072*		12.20−13.25 (12.4)V	53121.520	4.0035	EA	
GSC 7133 3078*		11.93−12.8 (12.6)V	53449.625	2.81344	EA	
GSC 7194 0239*	CD−33 7169	10.33−10.67(10.63)V	52043.870	2.59549	EA	
GSC 7588 0403*	CD−37 2136	10.46−11.0(10.63:)V	52867.708	17.943	EA/RS	
GSC 7666 0960*		10.88−11.05(11.01)V	52196.855	0.525412	EW/KE	
GSC 7672 2238*		11.73−12.24(11.91)V	52997.792	0.972013	EB	
GSC 8198 1376*		12.05−13.3 (12.14)V	51908.748	3.24198	EA	
GSC 8296 2365*	HD 138517	9.86−10.08 (9.89)V	52922.493	5.8472	EA	A0IV (2)
GSC 9135 0268	HIP 002731	8.58−8.64 (8.61)V	52217.605	2.88083	EB/DM	A0V (1)
GSC 9517 0107*		11.37−12.09(12.04)V	52642.759	0.285878	EW/KW	
GW Aur	GSC 2423 0042	12.66−13.3 (12.7:)*	51492.665	2.49481	EA	
KK Gem*	GSC 1332 0569	12.78−14.0 (12.90)V	51503.873	2.5122	EA	
KP And*	GSC 3224 3322	12.43−12.9:(12.52)*	51408.708	1.40538	EA	A0 (14)
LL Oph	GSC 6818 1863	12.8:−13.6:(12.9:)V	52468.615	2.7925	EA	
LY And	GSC 2831 1925	13.8−14.65(14.45)*	51576.776	0.34505	EW	
MM Aps*	GSC 9268 0069	12.32−14.45:(12.46)V	52406.697	3.7300	EA	
MO Pup*	GSC 5404 0593	11.87−12.63(12.52)V	51886.762	3.671778	EA	
MV Car*	GSC 9196 1701	12.92−13.7 (13.17)V	52994.770	0.65776	EB	
MW And*	GSC 2836 1495	13.95−14.9 (14.4)*	51523.637	0.26375	EA/KW	
NSV 00042*	GSC 4022 0939	12.80−13.3:(13.3:)*	51378.760	1.18185	EA	
NSV 00608*	GSC 3283 1455	12.20−12.32(¡12.8)*	51515.897	2.2904	EA	
NSV 01226*	GSC 2355 0826	13.92−15.3 (−)*	51498.846	1.84755	EA	
NSV 07972*	GSC 7871 3750	13.05−13.6 (13.6)V	52900.495	1.46814	EA	
NSV 08269*		12.98−13.6:(13.6:)V	53491.810	2.69691	EA	
NSV 09226*		12.8−13.25:(13.0)V	53194.705	1.27748	EA	
NSV 09650*		13.4−14.1:(14.1:)V	53463.860	5.6303	EA	
NSV 10349	GSC 9449 1999	13.3−14.4:(13.4:)V	53581.740	10.195	EA	
NSV 10761	GSC 6278 1537	12.9−13.5:(13.5:)V	53460.725	2.4887	EA	
NSV 12109	GSC 3560 2589	12.38−12.6(12.42:)V	51363.770	9.727	EA	
NSV 12268	GSC 9092 1184	13.2−15.1: (13.4)V	52124.570	3.29298	EA	
NSV 12860	GSC 3567 1250	13.05−13.9: (13.7)*	51523.654	2.4021	EA	
NSV 14638*	SVS 1473	12.98−13.6 (13.6)*	51452.60	1.924	EA	
NSV 25852*	HIP 109642	7.73−7.85 (7.74:)V	48398.245	4.818025	EA/DM	F8V (1)
NSV 25943*	HIP 112068	8.15−8.25 (8.24:)V	48223.160	11.4456	EA	F8 (33)

Table 1. New elements for 80 eclipsing binary stars.

Star Name		Magnitude range	Epoch	Period	Type	Spectral type
Variable/GSC	Other ID	(V)	(HJD2400000+)	(days)		
SZ Pup*	GSC 7133 2812	13.0−13.8:(13.45)V	52637.715	1.1903	EA	
V0348 Cyg*	GSC 3179 1206	14.1−15.1:(15.0:)*	51336.887	0.28423	EW/KW	
V0355 Aur	GSC 2918 1961	11.14−11.76(11.38)*	51277.680	17.6445	EA	
V0404 Cen*	GSC 8991 2864	12.25−12.9:(12.85:)V	53578.530	4.54842	EA	
V0412 And*	GSC 3639 1081	11.95−12.40(12.35)*	51507.720	1.90871	EA	
V0468 Sco*	GSC 7374 1166	12.15−12.58(12.58)V	53644.570	11.0982	EA	
V0504 Cyg*		13.4−14.1 (14.1)*	51378.646	0.351694	EW	
V0517 Ori*	GSC 0718 0147	12.6:−13.1:(13.1:)V	51565.843	2.83378	EA	
V0529 Ara*	GSC 9057 2833	13.0−13.7: (13.6:)V	52033.740	1.90392	EA	
V0537 Cas*	GSC 3668 1411	11.80−12.50(12.15)*	51442.609	1.63234	EA	
V0600 Cen	GSC 7758 0909	12.85−14.7:(12.97)V	51555.025	1.60523	EA	
V0656 Cen	GSC 7263 1175	13.12−14.25:(13.23:)V	51274.800	2.50883	EA	A9 (63)
V0698 Sco*		13.15−13.97 (−)V	53212.582	4.1791	EA	
V0721 Cen	GSC 7282 1158	13.25−14.6 (13.38)V	51306.772	1.31566	EA	
V0864 Aql*	GSC 1076 1140	12.6:−13.2:(12.7:)V	53115.870	3.12105	EA	
V0887 Aql*	GSC 1051 1084	13.15−14.1: (13.3)V	53651.518	2.71606	EA	
V1021 Her	GSC 3493 1158	13.62−14.05:(13.75:)*	51439.722	1.22665	EA	
V1321 Cyg*		13.07−13.75(13.6:)*	51442.671	0.72818	EA	
V1455 Aql	HIP 095588	8.03−8.26 (8.11)V	48165.415	7.12616	EA	F0V (5)
V1879 Oph*		13.4−14.0: (14.0:)V	53606.615	4.8167	EA	
V1941 Cyg	GSC 3193 0477	12.5−13.2 (12.8)*	51483.638	1.0118	EB	

Sources of spectral type:

(1) Houk and Cowley, 1975. (2) Houk, 1978. (5) Houk and Swift, 1999. (9) Nesterov et al., 1995. (14) Kholopov et al., 2005. (33) Cannon and Pickering, 1993. (59) Svechnikov and Kuznetsova, 1990. (61) Heckmann and Dieckvoss, 1975. (63) Stock et al., 1984.

Notes on individual stars:

AE Ind = Wrong period of 2.5154: d. in the GCVS (Kholopov et al., 2005).
AS Hya = Wrong period of 15.99: d. in the GCVS
BB Per = L:-type in the GCVS.
EL And = Period might be half the value given. Primary eclipse might be the secondary.
EX CMa = Period might be half the value given.
FZ Aur = USNO-A2.0 1200-04342803 = 2MASS J06064357+3155190. Uncertain period of 7.17/N in the GCVS. NSVS results are for a blend of the eclipsing binary and the similar magnitude star 2MASS 06064378+3155561 so the amplitude is reduced. Period might be half the value given.
GSC 1158 0201 = USNO-A2.0 0975-21051931 = 2MASS J22440997+1446386. Classified as ED in the ASAS catalogue (Pojmanski, 2002) with a wrong period of 2.48594 days.
GSC 1684 0522 = USNO-A2.0 1050-20050780 = 2MASS J22014928+1759421. Classified as DSCT/EC in the ASAS catalogue with a period of 0.20761 days.
GSC 1721 1141 = USNO-A2.0 1050-20792957 = 2MASS J23471091+1720337. Classified as ED/ESD in the ASAS catalogue with a wrong period of 0.484597 days.
GSC 1805 0750 = Classified as RRC/EC in the ASAS catalogue with a period of 0.496812 days. Wrongly classified as a slow variable star with a period of 164 days in Wozniak et al. (2004b)
GSC 4678 0496 = Classified as ED in the ASAS catalogue with a wrong period of 6.975 days.
GSC 4685 1287 = USNO-A2.0 0825-00395744 = 2MASS J01441691-0218447.

GSC 5451 1708 = Classified as ED/ESD in the ASAS catalogue with a wrong period of 9.946 days. Visual binary. A=10$^{m}_{.}$2; B=12$^{m}_{.}$2. Sep. 2$''_{.}$4 (Dommanget et al., 2002)
GSC 5759 0110 = Classified as DCEP-FU: in the ASAS catalogue with a period of 7.346002 days. RS period is 7.318 d.
GSC 6550 3021 = USNO-B1.0 0613-0116999 = 2MASS J07243846-2837598. Classified as ED in the ASAS catalogue with a wrong period of 7.098 days. Possibly slightly eccentric.
GSC 6816 0087 = USNO-A2.0 0600-25675250 = 2MASS J17170075-2508146. Classified as ED in the ASAS catalogue with a wrong period of 6.572593 days.
GSC 6839 0257 = Classified as ED in the ASAS catalogue with a wrong period of 5.742958 days.
GSC 7102 1072 = USNO-A2.0 0525-04042431 = 2MASS J07052289-3553203. Classified as ED in the ASAS catalogue with a wrong period of 8.009 days.
GSC 7133 3078 = USNO-A2.0 0525-07791714 = 2MASS J08123183-3632282. Classified as ESD/RRAB/EC/ED in the ASAS catalogue with a wrong period of 0.73703 days.
GSC 7194 0239 = Classified as ESD/ED in the ASAS catalogue with a wrong period of 6.5 days.
GSC 7588 0403 = Classified as DCEP-FU/ESD with a period of 17.980 d. in the ASAS Catalogue. RS period is 17.83 d.
GSC 7666 0960 = USNO-A2.0 0450-07213606 = 2MASS J08374338-3953354. Classified as ESD/RRC/EC/ED in the ASAS catalogue with a wrong period of 0.262705 days.
GSC 7672 2238 = USNO-A2.0 0450-06325650 = 2MASS J08141863-4436357. Classified as ESD/ED in the ASAS catalogue with a wrong period of 0.492270 days.
GSC 8198 1376 = USNO-A2.0 0375-12119576 = 2MASS J10461994-4557595. Classified as ED in the ASAS catalogue with a wrong period of 6.484 days.
GSC 8296 2365 = Classified as ED in the ASAS catalogue with a wrong period of 11.694425 days.
GSC 9517 0107 = USNO A2.0 0000-01324592 = 2MASS J15431380-8648072. Classified as DSCT in the ASAS catalogue with a period of 0.142939 days.
KK Gem = NSVS amplitude strongly reduced by light from nearby stars.
KP And = ISA:-type in the GCVS.
MM Aps = M:-type in the GCVS.
MO Pup = GCVS period is 1.06/N. New period of 1.8358908 d. in Baldwin et al. (1999) who comment on the possibility of similar eclipses.
MV Car = EA-type in the GCVS.
MW And = EW/KW-type in the GCVS.
NSV 00042 = Primary eclipse might be the secondary.
NSV 00608 = Lack of observations at primary minima.
NSV 01226 = Classified as S: in the NSV catalogue.
NSV 07972 = Period might be wrong or half the value given. Primary eclipse might be the secondary.
NSV 08269 = USNO-A2.0 0600-24935651 = 2MASS J17115202-2354346. Primary eclipse might be the secondary.
NSV 09226 = USNO-A2.0 0600-27776554 = 2MASS J17364494-2914271.
NSV 09650 = USNO-A2.0 0375-33270705 = 2MASS J17470325-4633494.
NSV 14638 = USNO-A2.0 1500-09874955 = 2MASS J23352404+6150122 at $23^{h}35^{m}24^{s}_{.}04$ $+61°50'12''_{.}2$ (2000.0). Correctly identified in Hanson et al. (2004). Position in the NSV catalogue is for GSC 4280 0772 which is not the variable star. Primary eclipse might be the secondary.
NSV 25852 = Period might be twice the value given.

NSV 25943 = Wrong period of 1.7299 d. in Koen and Eyer (2002). Visual binary. A=$8^{m}_{.}6$; B=$9^{m}_{.}9$ Hp. Sep. $0''_{.}2$ (Perryman et al., 1997)
SZ Pup = S:-type in the GCVS.
V0348 Cyg = INS:-type in the GCVS.
V0404 Cen = Period might be half the value given. Primary eclipse might be the secondary.
V0412 And = Diethelm and Kroll (1999) give a period of 0.954326 days.
V0468 Sco = Period might be half the value given.
V0504 Cyg = USNO-A2.0 1200-15159209 = 2MASS J20280956+3254279. EB-type in the GCVS.
V0517 Ori = Primary eclipse might be the secondary. NSVS amplitude reduced by light from nearby stars.
V0529 Ara = GCVS gives an uncertain period of 0.610: d.
V0537 Cas = ISA:-type in the GCVS.
V0698 Sco = USNO-A2.0 0525-28033393 = 2MASS J17230117-3054570. Period of 258.0/N in the GCVS.
V0864 Aql = ASAS data contaminated. Values for the largest aperture were used and then adjusted to the mean V values for the smallest aperture. Amplitude is reduced by light from nearby stars.
V0887 Aql = Possibly slightly eccentric.
V1321 Cyg = USNO-A2.0 1275-13882879 = 2MASS J20232874+4131590. GCVS gives a period of 0.3640901 d. with a note indicating a possible double period of 0.7281802 d.
V1879 Oph = USNO-A2.0 0675-18818346 = 2MASS J17200288-2058130. L-type in the GCVS. Period might be half the value given. Primary eclipse might be the secondary.

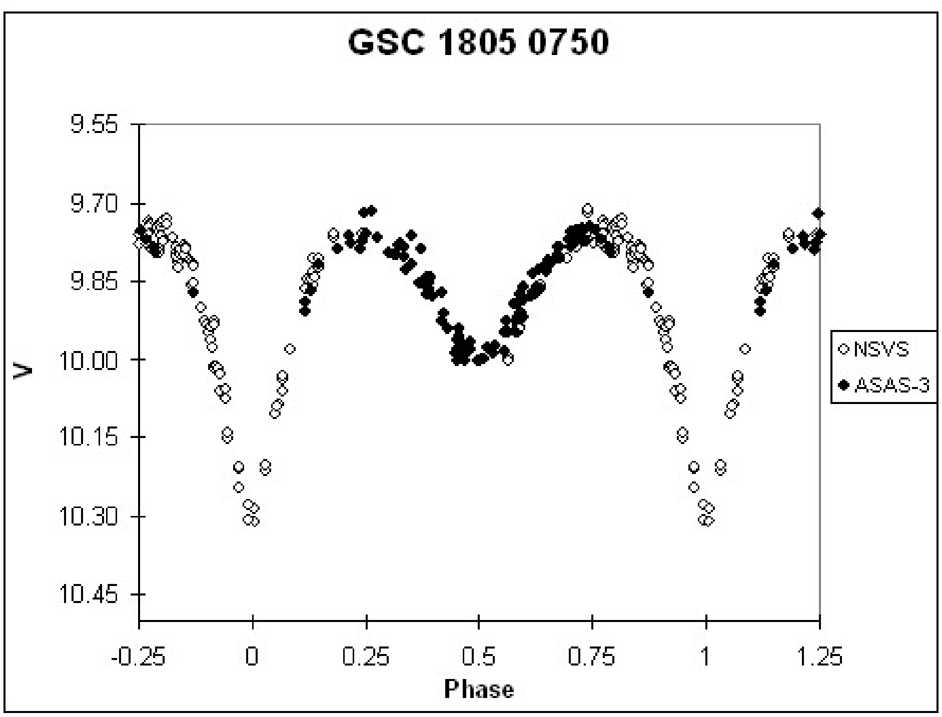

Figure 1. Light curve of GSC 1805 0750 showing ASAS-3 and NSVS observations.

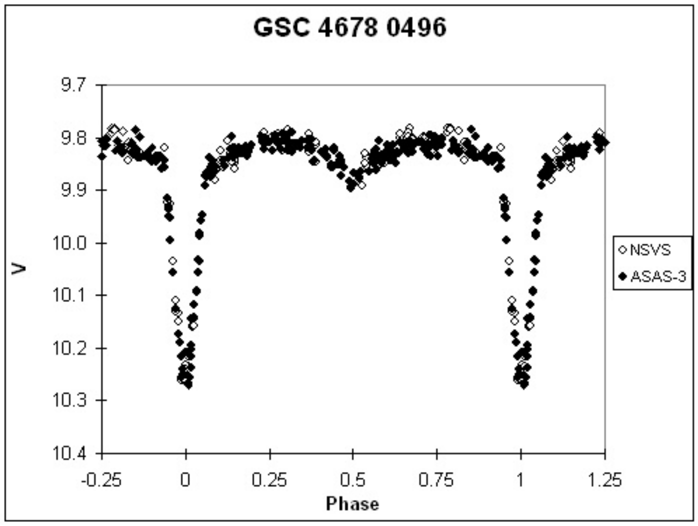

Figure 2. Light curve of GSC 4678 0496 showing ASAS-3 and NSVS observations.

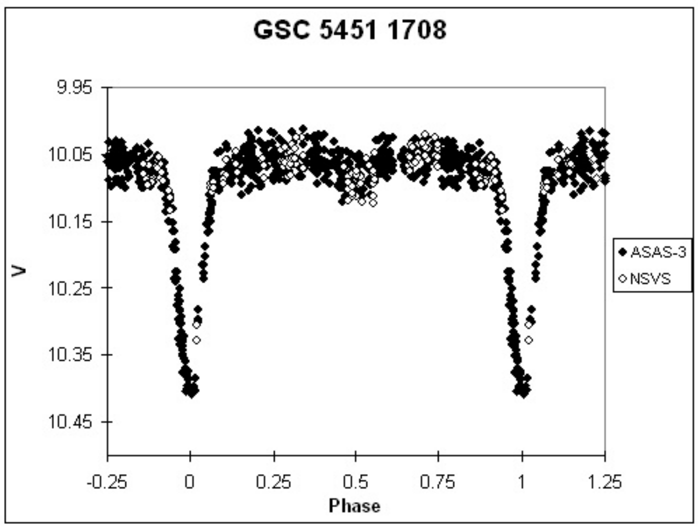

Figure 3. Light curve of GSC 5451 1708 showing ASAS-3 and NSVS observations.

Acknowledgements:
The authors thank John Greaves for his collaboration and suggestions. This research has made use of the SIMBAD and VizieR databases operated at the Centre de Données Astronomiques (Strasbourg) and also of data products from the Two Micron All Sky Survey, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.

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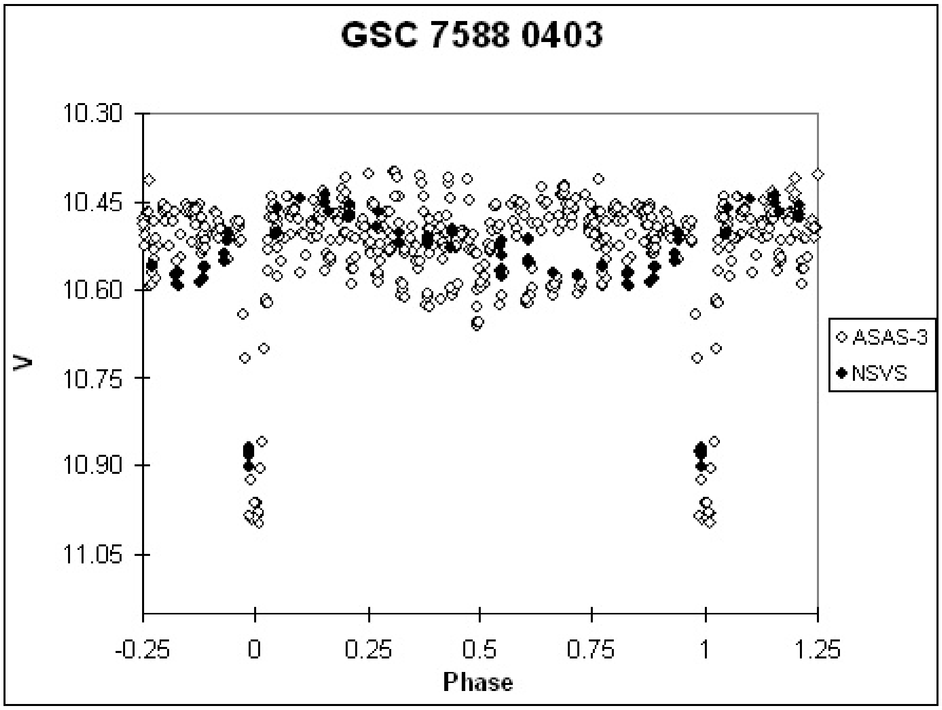

Figure 4. Light curve of GSC 7588 0403 showing ASAS-3 and NSVS observations.

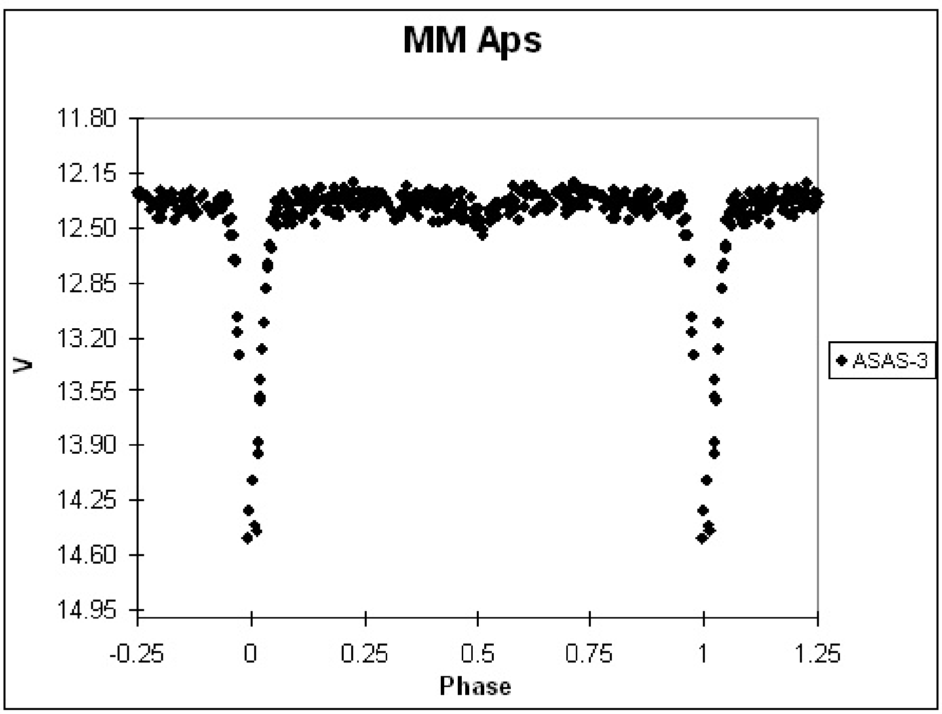

Figure 5. Light curve of MM Aps showing ASAS-3 observations.

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ERRATUM FOR IBVS 5652

The eccentricity (Min II phase) given for V983 Oph in Table 1 in IBVS 5652 should read 0.269 instead of 0.731.

ERRATUM FOR IBVS 5674

The epoch for GSC 7194 0239 should be 2452943.87 instead of 2452043.87 .

S. Otero

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5675

Konkoly Observatory
Budapest
18 January 2006

HU ISSN 0374 – 0676

PHOTOELECTRIC TIMES OF MINIMA OF SOME ECLIPSING BINARIES

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Observatory and telescope:
1. 60cm Zeiss-600 telescope of the Sternberg Astronomical Institute (Russia) at Crimean Station. 2. 48cm AZT-14 telescope of the Sternberg Astronomical Institute (Russia) at Alma-Ata station.

Detector:	1. UBV photometer, 2. WBVR photometer

Method of minimum determination:
1. The minima were computed using software by Khaliullina and Khaliullin (1984). 2. The minima were computed using software by Khaliullina and Khaliullin (1984) and the method of a tracing paper. 3. The minima were computed using the method of a parabola.

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	$O-C$ [day]	Rem.
Y Cam	45302.3340	± 0.0002	I	V	0.0000	Mos/UBV/1
	45360.198	± 0.010	II	V	0.0043	Mos/UBV/2
	47629.54259	± 0.00009	I	V	−0.0046	Volkov/WBVR/1
	49692.3205	± 0.0011	I	V	−0.0011	Luty,Metlov/UBV/3
	49771.6575	± 0.0009	I	W,B,V,R	−0.0011	Kusakin/WBVR/1
	49773.3198	± 0.0181	II	V	0.0017	Kusakin/WBVR/3
W Del	45544.146	± 0.014	I	B,V	−0.0020	Mos/WBVR/2
GG Ori	47529.267	± 0.033	I	V	−0.0018	Mos/UBV/1
	48321.2208	± 0.0003	II	V	0.0001	Mos/UBV/1
TX UMa	46128.4898	± 0.0007	I	U,B,V	0.0024	Mos/UBV/1

Explanation of the remarks in the table:
observer/ instrument/method

Remarks:

Star name	GCVS type	Ephemeris E 2400000+	Period	Source of the ephemeris
Y Cam	EA+DSCTC	45299.0282	3.3057156	Ketsaris, 1995
W Del	EA/SD	44496.423	4.806113	Rocznik Astronomiczny, **54**, 1982
GG Ori	EA/DM	47814.42316	6.6314975	Volkov and Khaliullin, 2002, for MinI
		47817.22769	6.6314869	Volkov and Khaliullin, 2002, for MinII
TX UMa	EA/SD	44998.1475	3.0632382	Oh and Chen,1984

Though we obtained our observations many years ago, it is still important to publish these minima because until now, too few photoelectric minima have been reported for these systems

Acknowledgements:
The author thanks prof. Luty V.M., Dr. Metlov V.G., Dr. Volkov I.M., Dr. Kusakin A.V. for their given to me observations.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5676

Konkoly Observatory
Budapest
18 January 2006

HU ISSN 0374 – 0676

PRECISE CCD TIMES OF MINIMA OF SELECTED ECLIPSING BINARIES

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Observatory and telescope:
0.65-m Cassegrain telescope, Ondřejov Observatory, Czech Republic

Detector:	512 × 512 Apogee AP-7 CCD camera in primary focus, Peltier cooled

Method of data reduction:
Reduction of the CCD frames was made with the APHOT32 code, ver.1.3 (2005), written by M. Velen & P. Pravec, Ondřejov Observatory

Date(s) of the observation(s):
January 9, 2003 – December 20, 2004

Method of minimum determination:
The precise times of minimum light were computed using the light-curve polynomial fitting method and/or the Kwee & van Woerden method.

Availability of the data:
upon request, see also `http://nyx.asu.cas.cz/~lenka/dbvar/`

Remarks:
The following Table lists 135 timings of minima for 93 eclipsing binaries obtained during our supplementary photometric programme or practical exercises in CCD photometry. All times given are heliocentric UTC. The number of CCD frames analysed for each data set is given in the last column of the Table. In several cases the duration of totality, *d*, in minutes is also mentioned.

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
TT And	52957.3556	0.0001	I	R	70
UU And	52925.42553	0.00007	I	R	91
AD And	52869.3267	0.0001	I	R	26
	52897.43312	0.00007	II	R	94
CO And	52982.2009	0.0001	II	R	56
DO And	52897.5608	0.0001	I	R	50
	52985.2269	0.0001	I	R	62
EP And	52869.3759	0.0001	I	R	48
GK And	52899.6028	0.0001	I	R	69
HS And	52955.51573	0.00008	I	R	89, d=31 min
LO And	52898.3842	0.0001	II	R	41
	52985.3140	0.0001	I	R	75
	53251.43536	0.00007	II	R	95
CZ Aqr	52952.3248	0.0003	I	R	20
V343 Aql	52811.5042	0.0001	II	R	99
	52812.42383	0.00005	I	R	115
V407 Aql	53222.4181	0.0001	I	R	45
V417 Aql	52847.4692	0.0001	II	R	181, d=26 min
	52950.2309	0.0001	I	R	179
V609 Aql	52877.5025	0.0001	II	R	128
V694 Aql	52859.4115	0.0002	II	R	79
V803 Aql	52789.5603	0.0001	I	R	29
	52847.5131	0.0001	I	R	52
	53279.2607	0.0001	I	R	29
V1075 Aql	52854.3931	0.0001	I	R	38
AH Aur	52659.2398	0.0001	I	R	105, d=33 min
	52955.7041	0.0001	I	R	118
AM Aur	52683.9245	0.0003	I	R	134, folded min.
	52983.5290	0.0002	I	R	512
CI Aur	52684.3043	0.0001	I	R	120
	52985.3816	0.0001	I	R	110
GX Aur	52952.4816	0.0001	I	R	120
HL Aur	52670.5350	0.0003	I	R	48
	52955.63882	0.00005	I	R	68
	53010.4185	0.0001	I	R	36
HS Aur	52981.33605	0.00005	II	R	215
KO Aur	52956.44405	0.00007	I	R	182
XY Boo	52688.5384	0.0001	II	R	150
RV CVn	52789.4658	0.0001	I	R	44
	52863.3270	0.0001	I	R	30
AH Cas	52957.5565	0.0001	I	R	71
AL Cas	53335.4349	0.0001	II	R	100
CW Cas	52952.63096	0.00005	II	R	185
XY Cep	52844.5698	0.0001	I	V	133
BE Cep	52808.53353	0.00005	I	R	74
	52863.4928	0.0001	II	R	120
	52900.6271	0.0001	I	R	45

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
DK Cep	52897.6037	0.0001	I	R	39
DP Cep	52802.5096	0.0001	I	R	32
	52957.4460	0.0001	I	R	43
RW Com	52801.4482	0.0002	II	R	50
RW CrB	52857.3642	0.0002	I	R	60
TW CrB	52692.6613	0.0001	I	R	47
UW Cyg	52955.4062	0.0001	I	R	99
CG Cyg	52810.4076	0.0001	I	R	64
DX Cyg	52853.4434	0.0001	I	R	82
	52877.4272	0.0003	II	R	63
	53256.3149	0.0003	I	R	25
GV Cyg	52829.4562	0.0001	I	R	39
	53249.50151	0.00007	I	R	65
V401 Cyg	52727.6378	0.0002	I	R	90, d=34 min
V442 Cyg	52721.5987	0.0001	I	R	98
	53178.5071	0.0001	II	R	160
V456 Cyg	52781.5086	0.0001	I	R	60
	52850.5766	0.0001	II	R	58
V469 Cyg	52800.5358	0.0001	I	R	43
	53220.5324	0.0002	I	R	82
V700 Cyg	52801.5530	0.0001	II	R	71
	52859.5331	0.0001	I	R	160
V859 Cyg	52956.3137	0.0001	II	R	57
V865 Cyg	53158.5030	0.0003	II	R	35
V961 Cyg	52688.6516	0.0001	II	R	93
V1004 Cyg	52858.3825	0.0002	I	R	48
	53222.4835	0.0001	I	R	82
RR Dra	52858.49922	0.00005	I	R	120, d=70 min
RZ Dra	52688.5937	0.0001	I	R	55
WX Dra	52829.3687	0.0004	I	R	23
	53081.63013	0.00008	I	R	72
BE Dra	52812.53158	0.00007	I	R	135
	52956.2180	0.0002	I	R	66
	53300.2841	0.0004	II	R	129
BU Dra	52675.6717	0.0001	I	R	210
BD Gem	53010.5297	0.0001	I	R	78
EM Lac	52952.3008	0.0001	II	R	60
	53251.3538	0.0001	I	R	35
V344 Lac	52925.3448	0.0001	I	R	95
	52925.5409	0.0001	II	R	87
	53260.5157	0.0001	II	R	50
Y Leo	52683.33256	0.00008	I	R	30
WZ Leo	52772.3338	0.0002	I	R	63
XZ Leo	52692.5878	0.0001	I	R	64
AM Leo	52705.3596	0.0003	I	R	43
AP Leo	52705.4478	0.0001	I	R	197

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
CE Leo	52692.6222	0.0002	I	R	43
	53075.5493	0.0001	I	R	74, d=17 min
TZ Lyr	52722.63249	0.00007	I	R	146
XZ Mon	52712.3494	0.0002	I	R	36
AY Mon	52715.3619	0.0001	I	R	65, d=84 min
BM Mon	52649.3322	0.0001	I	R	23
	52955.5900	0.0001	I	R	67
DD Mon	52675.4081	0.0001	II	R	30
HM Mon	52670.2956	0.0001	I	R	44
	52981.5415	0.0001	II	R	56
V396 Mon	52981.4090	0.0001	I	R	67, d=23 min
V453 Mon	52981.5676	0.0001	I	R	52
	53062.3045	0.0001	I	R	76
V509 Oph	53102.6135	0.0001	I	R	69
V2203 Oph	53075.6441	0.0003	I	R	32
FZ Ori	52956.4939	0.0003	I	R	64
GU Ori	52981.47224	0.00008	I	R	58
V343 Ori	53010.4804	0.0002	I	R	83
V392 Ori	52715.2725	0.0002	I	R	94, d=35 min
UX Peg	52949.2301	0.0001	I	R	42
KW Peg	52982.2775	0.0001	II	R	79
WY Per	52949.3887	0.0002	I	R	30, d=34 min
HK Per	52926.4399	0.0001	I	R	147, d=66 min
IT Per	52982.3872	0.0001	I	R	131
V432 Per	52897.5296	0.0001	I	R	108
V482 Per	52949.4538	0.0003	I	R	60
AO Ser	52843.3445	0.0001	I	V	38
	53178.3725	0.0001	I	V	42
VV UMa	52743.3864	0.0001	I	R	148
XZ UMa	52716.32648	0.00007	I	R	90
BM UMa	52800.4143	0.0001	II	R	50
	52801.3635	0.0003	I	R	17
	53081.3990	0.0001	II	R	37, d=10 min
HW Vir	52983.6829	0.0003	II	R	15
	53360.6869	0.0001	II	R	22
	53360.7453	0.0001	I	R	18
EU Vul	52955.2825	0.0002	I	R	64
FM Vul	52948.2816	0.0001	I	R	63
GP Vul	52802.37825	0.00008	II	R	70
NO Vul	52747.5646	0.0001	I	R	61
	52877.33335	0.00007	I	R	77
	53222.3310	0.0004	II	R	28

Acknowledgements:

This work was supported by the Grant Agency of the Czech Republic, grant No. 205/04/2063.

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5677

Konkoly Observatory
Budapest
18 January 2006

HU ISSN 0374 – 0676

TIMES OF MINIMA FOR NEGLECTED ECLIPSING BINARIES IN 2005

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Observatory and telescope:
25cm catadioptric telescope at Rolling Hills Observatory (RHO)

Detector:	SBIG ST-9XE, Peltier cooling, Kodak KAF-0261 chip, 18.5′ × 18.5′ FOV, 512 × 512 pixels.

Method of data reduction:
Reduction of the CCD frames was done with sextractor and custom-written applications. [1].

Method of minimum determination:
The times of minima were computed using the Kwee and van Woerden method as implemented in AVE [2].

[1]sextractor is written by Emmanuel Bertin and is available from http://terapix.iap.fr

[2]AVE is written by Rafeal Barbera and the software can be obtained from http://www.astrogea.org/soft/ave/introave.htm

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
CN And	52935.6071	0.0003	I	*V*	
GZ And	53638.9029	0.0001	I	None	
V1355 Aql	53633.5922	0.0001	I	None	
CR Aqr	53653.6341	0.0003	I	None	
HV Aqr	53631.6426	0.0001	I	None	
HW Aur	53732.7036	0.0002	I	*V*	
V0402 Aur	53659.8834	0.0003	I	*V*	
AC Boo	53483.8110	0.0003	I	*V*	
EF Boo	53476.6619	0.0005	II	*V*	
	53484.6516	0.0003	II	*V*	
XY Boo	53483.6069	0.0006	I	*V*	
BS Cas	53630.7377	0.0001	I	None	
V0384 Cas	53711.5561	0.0001	I	*V*	
BE Cep	53643.7392	0.0002	I	None	
DY Cet	53402.5207	0.0003	I	*V*	
YY Cet	53381.5284	0.0001	I	*V*	
TY CMi	53385.7095	0.0004	I	*V*	
WY Cnc	53458.7019	0.0001	I	*V*	
YY CrB	53458.8828	0.0002	I	*V*	
DF CVn	53513.5881	0.0002	I	*V*	
V0753 Cyg	53638.6726	0.0001	I	None	
V1787 Cyg	53699.5183	0.0003	I	*V*	
V1918 Cyg	53638.5729	0.0001	I	None	
V2150 Cyg	53628.6003	0.0003	I	None	
BZ Eri	53376.5493	0.0002	I	*V*	
VV Eri	53377.6501	0.0004	I	*V*	
AV Gem	53379.8292	0.0004	I	*V*	
GW Gem	53677.9092	0.0001	I	*V*	
KV Gem	53422.6635	0.0003	II	*V*	BAVR
	53443.6365	0.0002	I	*V*	BAVR
	53684.9216	0.0002	I	*V*	BAVR
	53700.8758	0.0001	II	*V*	BAVR
	53728.8410	0.0001	II	*V*	BAVR
ES Her	53476.8344	0.0003	I	*V*	
V0733 Her	53479.779	0.001	I	*V*	
V0829 Her	53629.5993	0.0002	I	None	
V1042 Her	53467.7918	0.0002	I	*V*	
V1065 Her	53639.5513	0.0001	I	None	
LU Lac	53644.7399	0.0001	I	None	
PP Lac	53632.6897	0.0001	I	None	
V0344 Lac	53704.5331	0.0003	I	*V*	
VY Lac	53679.6935	0.0001	I	*V*	
DU Leo	53493.6059	0.0001	I	*V*	
VW LMi	53717.9105	0.0001	I	*V*	

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
AO Mon	53406.6005	0.0001	I	*V*	
V0514 Mon	53706.8367	0.0002	I	*V*	
V0508 Oph	53630.6203	0.0001	I	None	
V0509 Oph	53644.6101	0.0002	I	None	
V2357 Oph	53485.812	0.001	I	*V*	
V2383 Oph	53484.7905	0.0001	I	*V*	
V0392 Ori	53671.8957	0.0001	I	*V*	
BY Peg	53688.5478	0.0001	I	*V*	
KW Peg	53627.6449	0.0001	I	None	
V0351 Peg	53718.5349	0.0001	I	*V*	
ZZ Peg	53639.6464	0.0002	I	None	
DV Per	53380.6276	0.0008	I	*V*	
IU Per	53708.6168	0.0001	I	*V*	
KN Per	53681.7019	0.0003	I	*V*	
V0449 Per	53683.6670	0.0003	I	*V*	
DV Psc	53668.7040	0.0003	I	*V*	
VZ Psc	53626.7909	0.0002	I	*V*	
RZ Pyx	53378.7646	0.0003	I	*V*	
AS Ser	53503.7034	0.0004	II	*V*	
OU Ser	53420.9287	0.0002	I	*V*	
CT Tau	53375.6071	0.0002	I	*V*	
GW Tau	53643.8370	0.0001	I	None	
AG Vir	53241.848	0.001	I	*V*	
HW Vir	53731.9133	0.0010	I	*V*	
NN Vir	53458.7954	0.0002	I	*V*	

Explanation of the remarks in the table:
BAVR: Elements from BAV Rundbrief 52

Reference:

Kwee, K. K. & van Woerden, H., 1956, *BAN*, **12**, 327

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5678

Konkoly Observatory
Budapest
20 January 2006

HU ISSN 0374 – 0676

LONG-TERM VARIATIONS OF THE SUPERGIANT IN THE X-RAY BINARY Cyg X-1

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Cyg X-1 is an X-ray binary system (with the orbital period $P = 5^{\rm d}\!.6$) whose relativistic component is the black hole candidate No. 1. More than 30 years passed since the times when the X-ray source Cyg X-1 had been first identified with the star HDE 226868 (Braes & Miley, 1971), its spectroscopic binarity (Webster & Murdin, 1972; Bolton, 1972) and photometric variability (Lyuty, 1972) had been first detected. This time interval is long enough to allow explorations of long-term behavior of the X-ray binary.

As the object's variability amplitude is low, only the homogeneous photometric series of UBV observations acquired at SAI Crimean Laboratory was used for this study (Lyuty, 1985; Kemp *et al.*, 1987; Karitskaya *et al.*, 2001; Lyuty *et al.*, 2006). In order to study intrinsic variability, orbital variations were subtracted.

Figure 1 shows the light curves representing the object's long-term variability. It is easy to see (especially in the U-band) that the objectś brightness is slowly increasing from 1985 to 1995, and then decreasing to a minimum reached in 2003. The brightness minima were observed in 1971 and in 2003–2005. The largest amplitude is $\Delta U = 0^{\rm m}\!.1$. The B-band curve shows a similar behavior of the object, but with a lower amplitude. The V curve reveals a weak maximum only, and the 2003–2005 minimum is deeper than that of 1971.

The accretion disc cannot be responsible for these brightness variations because its contribution to the object's total luminosity does not exceed 2-4% (Bruevich *et al.*, 1978; Kemp *et al.*, 1987; Bochkarev and Karitskaya, 1988a,b). It is more reasonable to explain the variations with temperature changes in accordance with the variations of the B–V and U–B colors. In 1973, the object's spectrum was classified as O 9.7 Iab (Walborn, 1973). The results of our UBV observations are in agreement with the spectral type O 9.7 Iab,

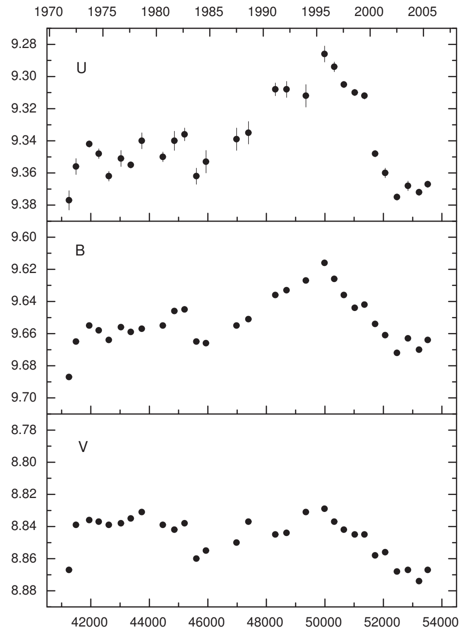

Figure 1. Long-term light curves of Cyg X-1 in the U, B and V bands (yearly averages)

the color excess being $E(\mathrm{B}-\mathrm{V}) = 1.05 - 1.06$. The 1995–1999 brightness maximum corresponds to an earlier spectral type, approximately O9.

Figure 2 shows a more detailed U-band light curve (averaged over 60 days); the lower panel gives an RXTE/ASM X-ray light curve (1-day averages). During the transition from the maximal (1995–1999) to the minimal (2003–2005) brightness, the X-ray activity increased. It should be pointed out that the activity maximum took place exactly at the time of the transition (on average, the U-band brightness decreased linearly).

If the supergiant's temperature variations are real, they must affect the spectrum. In 1997, spectroscopic observations were carried out at the Crimean Astrophysical Observatory (the 2.6-m telescope, the second order of the diffraction grating, spectral range $\lambda\lambda 4655 - 4722$Å, resolution $R = 35000$). In 2003–2004, spectra were obtained at the Peak Terskol Observatory (the 2-m telescope, the echelle spectrograph, spectral range $\lambda\lambda 3800 - 7600$Å, $R = 13000$) and at the BOAO (Korea) (the 1.8-m telescope, fiber echelle spectrograph, $\lambda\lambda 3800 - 10000$Å, $R = 30000$).

The spectral data obtained allows only two line profile comparisons: HeIIλ4686Å and HeIλ4713Å. But as the complex variable HeIIλ4686Å profile is formed mainly outside the supergiant, it cannot be used for the optical component's parameter diagnostic, in contrast to the HeIλ4713Å absorption line that is formed inside the star's atmosphere. The HeIλ4713Å line profiles observed in 1997 and 2003–2004 are compared in Fig. 3. Both presented profiles were averaged over 19 nights of observations. In 1997, 20 spectra were obtained during 1.5 months. One spectrum obtained during an X-ray flare was omitted. To construct the 2003–2004 line profile, we used the spectra got during two observational sets (June, 2003 and June, 2004) at the Terskol Observatory and 4 spectra obtained at the BOAO. Fig. 3 shows that the 1997 line depth is exceeded considerably by that of the 2003–2004 line, which points to changes in the supergiant's atmosphere parameters.

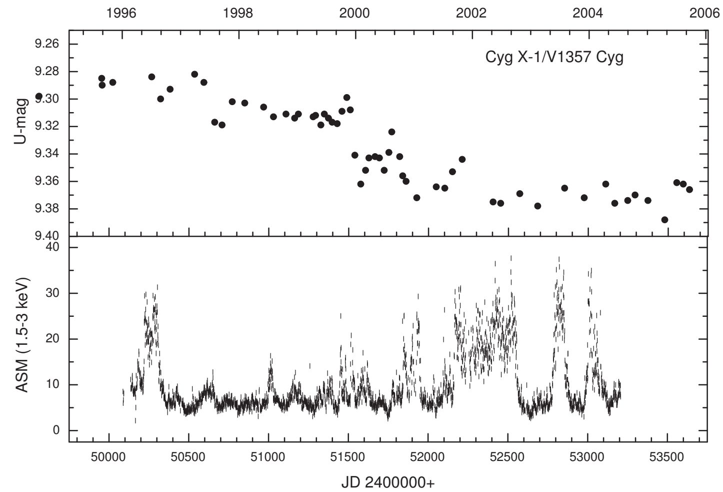

Figure 2. Comparison of the long-term light curve of Cyg X-1 (upper panel) with the X-ray light curve as observed by RXTE/ASM, 1-day averages (lower panel)

The 2003–2004 spectra were analyzed by Karitskaya *et al.* (2005). Using many spectral lines of the ions HI, HeI, MgII, we determined the supergiant's atmospheric physical parameters for that time interval: $T_{eff} = 30400 \pm\ 500$ K, log $g = 3.31 \pm\ 0.07$, [He/H] $= 0.43 \pm\ 0.06$ dex, [Mg/H] $= 0.75 \pm\ 0.15$ dex. We used a stellar-atmosphere modeling code which included: computation of line profiles of tidally distorted stars, illumination of the atmosphere by hard X-ray flux from the secondary, and non-LTE effects for selected ions. For line-profile simulations, we used Sakhibullin and Shimanskii (1997) computer code, "SPECTR", modified by Ivanova *et al.* (2002), Shimanskii *et al.* (2002).

Figure 3 (left panel) shows the model profile of the HeIλ4713Å line as derived for the years 2003–2004. To achieve the best coincidence of the computed and the observed 1997 profiles, we varied T_{eff}, log g, and the macro-turbulent velocity, $V_{\rm macr}$. Two different theoretical profiles corresponding to different T_{eff}, log g values are shown in Fig. 3. The two theoretical profiles practically coincide with each other. Therefore, the differences between the observed and theoretical profiles are shown in the right panel of Fig. 3. The regular growth of the differences from the blue to the red wing is due to a feeble P Cyg component affecting the red wing and by unaccounted weak NII absorption blending with the blue wing. In 1997, $V_{\rm macr}$ was found to exceed the value for 2003–2004 by 7 km/s.

The comparison between the observed (ΔU $= 0.065 \pm\ 0.003$, ΔB $= 0.031 \pm\ 0.003$, ΔV $= 0.029 \pm\ 0.003$) and computed UBV brightness variations shows that the size of the star increased slightly, by $1-4\%$ from 1997 to 2003–2004. The changes of the radius point to slight changes in log g (< 0.04). Besides, the photometric and spectral variations can be described together only assuming that T_{eff} was higher in 1997, being in the $31300-32300$ K range, than in 2003–2004, and the gravity in 1997 was log $g = 3.33-3.36$. The bolometric luminosity was by $14-24\%$ higher in 1997 than in 2003–2004. So the case with log $g = 3.06$ shown in Fig. 3 does not agree with photometric data.

So, from 1997 to 2003–2004 the radius of the star increased by $1-2\%$, that is, the degree of the Roche lobe filling, and consequently of the matter outflow toward the X-ray source, have increased. This is in agreement with the X-ray activity growth in that time interval (see Fig. 2). Moreover, the temperature decrease can lead to decreasing star-wind velocity, that is, to the increase of the portion of matter captured by the X-ray component, which may prove to be another factor keeping up X-ray activity of the system Cyg X-1.

Acknowledgements. This work was partially supported by the Russian Foundation for Basic Research with grant 04-02-16924.

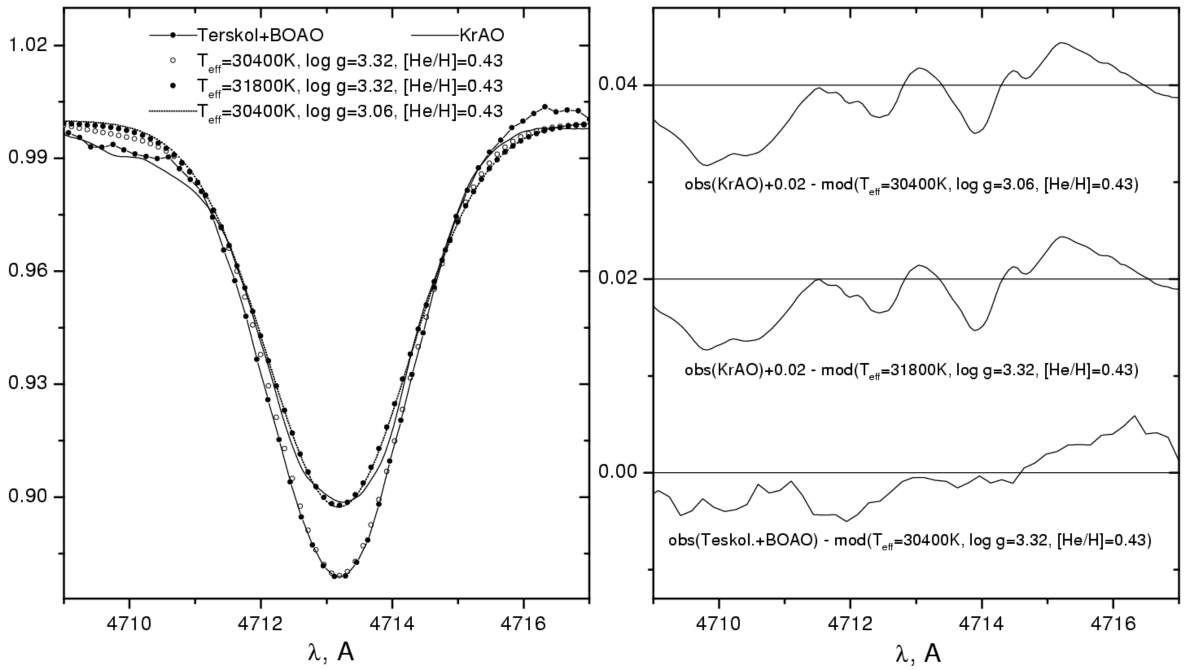

Figure 3. *Right:* Comparison of HeIλ4713Å line profiles observed in 1997 and 2003–2004 with the theoretical ones. The case with log $g = 3.06$ disagrees with photometric data. *Left:* The deviations of the observed profiles from the theoretical ones.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5679

Konkoly Observatory
Budapest
20 January 2006

HU ISSN 0374 – 0676

NEW ECLIPSING VARIABLES IN THE FIELD OF M67

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The old open cluster M67 has been extensively studied photometrically, but its variable star content has not been completely surveyed due in part to its large angular diameter. We have discovered 4 new eclipsing variable stars in our photometric data for the cluster taken using the 1 m telescope at Mount Laguna Observatory. The newly discovered variables are listed in Table 1. The identification numbers are from Fan et al. (1996; abbreviated FBC) and Sanders (1977). The photometry and period estimate comes from the current study (with the tabulated magnitudes being estimates of maximum light). Proper motion membership probabilities come from Sanders (1977; labelled S), Girard et al. (1989; labelled G), and Zhao et al. (1993; labelled Z). The color-magnitude diagram (CMD) positions for the stars are shown in Figure 1.

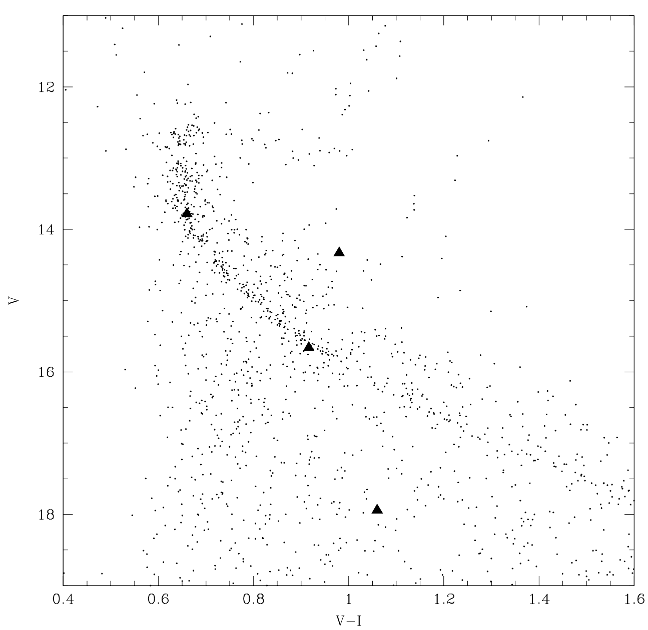

Figure 1. *VI* color-magnitude diagram for M67 stars, with the identified variables indicated.

Two of the new systems have positions in the CMD near the main sequence for M67 members, but have small ($< 20\%$) proper motion membership probabilities. Because M67 has a relatively small distance from the Sun, a velocity of 1 km s^{-1} relative to the cluster

Table 1. New Eclipsing Variables in the Field of M67.

FBC ID	S ID	max(V)	max(I)	V amp.	I amp.	P (d)	P_μ		Type
2404	743	15.66	14.74	0.10			16 (S)		EA
5018	1601	14.32	13.33	0.13	0.11	0.54	91 (S)	48 (G)	EW
5774		17.94	16.88	0.31	0.30	0.28			EW
5986	1849	13.78	13.12	0.15	0.12	0.445	0 (S)	0 (Z)	EW

motion in the plane of the sky would produce an apparent proper motion of 0.25 mas y^{-1}. Dynamical interactions between stars appear to play a significant role in M67 thanks to a high binary star content and low velocity dispersion (e.g. Sandquist 2005), so we need to bear in mind that a relatively small kick velocity ($\sim$ 10 km s^{-1}) resulting from a 3- or 4-body interaction could give a cluster member a membership probability of less than 20% in proper motion studies. The possibility of kicks can be examined by looking at the magnitude of the measured proper motions (which are generally measured relative to high-probability cluster members) and the position of the star in the vector point diagram. If a star falls near the center of the field star proper motion distribution, a kick would be a less likely explanation.

The calibrated VI photometric data for the variables are provided in Tables 2 - 5, available on the IBVS website as `5679-t2.txt - 5679-t5.txt` The columns are heliocentric Julian date − 2450000.0, magnitude, magnitude error, and filter band.

FBC 2404 (S743): The one proper motion study (Sanders 1977) that covered this detached eclipsing system gave it a low, but nonzero, membership probability. Its position close to the cluster main sequence in the CMD, however, hints that the binary might be a cluster member. The system was just outside of the Chandra field observed by van den Berg et al. (2004), and it was not detected by Belloni et al. (1998). The nondetection would not be surprising because of the faintness of the system, especially if the orbital period is more than a few days.

We observed a single partial eclipse, and see no sign of significant variation outside of eclipse. The eclipse is depicted in Figure 2.

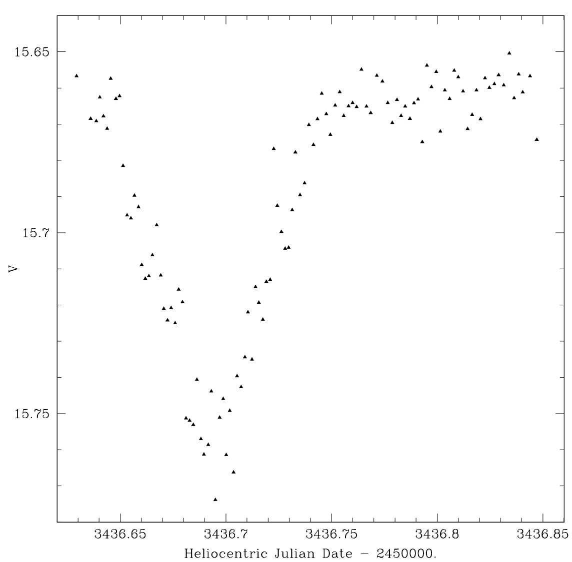

Figure 2. Eclipse observed for the star FBC 2404.

FBC 5018 (S1601): The proper motion membership probabilities for this system identify it as a possible cluster member. Girard et al. (1989) measured a larger proper motion (3.2 mas y^{-1}), which is responsible for their lower membership probability. The color-magnitude diagram position is unusual, however: the system is bluer than the locus for equal-mass binaries. If the system is truly part of the cluster, there must be at least one other star contributing significantly to the system light. If it is not a cluster member, it is unusually bright for its properties: the M_I-period-color relation (Rucinski 1997) for W UMa binaries returns a distance modulus that is about 0.7 mag *larger* than those of cluster member systems in contradiction to its position brighter than M67's main sequence. van den Berg et al. (2004) identified this star in Chandra X-ray observations (CX7), and they found a count rate that was more than twice as large as any of the previously known cluster W UMa variables. The contradictions among the methods we have used to check on membership leads us to recommend that this system be studied further to clarify its unusual nature.

Although we have not observed the binary through an entire orbital cycle, we did observe two maxima in I-band, allowing us to estimate the period (see Figure 3). The first maximum we observed appeared to be slightly fainter than the second, which could indicate the presence of starspots.

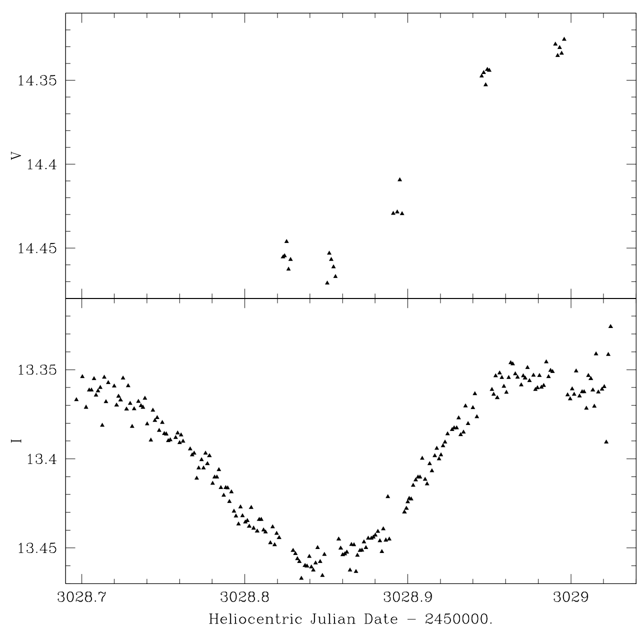

Figure 3. Observations for the W UMa-type variable star FBC 5018.

FBC 5774: No proper motion information is available, but the system falls far to the red of the cluster main sequence, so that it is very unlikely to be a member. Use of the M_I-period-color relation (Rucinski 1997) indicates that the system has a distance modulus more than 2.5 magnitudes larger than the 4 previously known cluster W UMa stars. The amplitude of the variable is fairly large (~ 0.3 mag), and one of the photometric minima is definitely deeper than the other (See Figure 4).

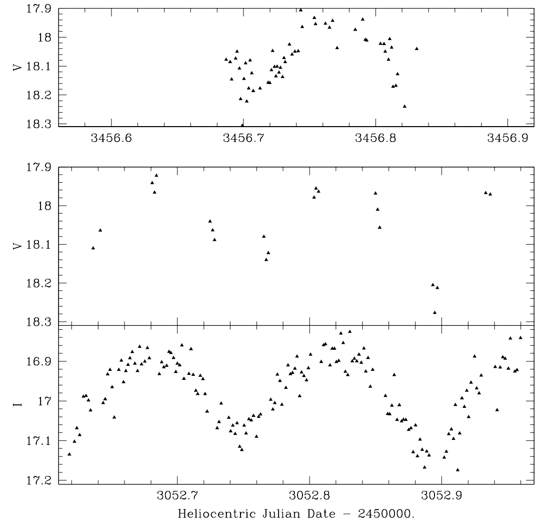

Figure 4. Observations for the W UMa-type variable star FBC 5774.

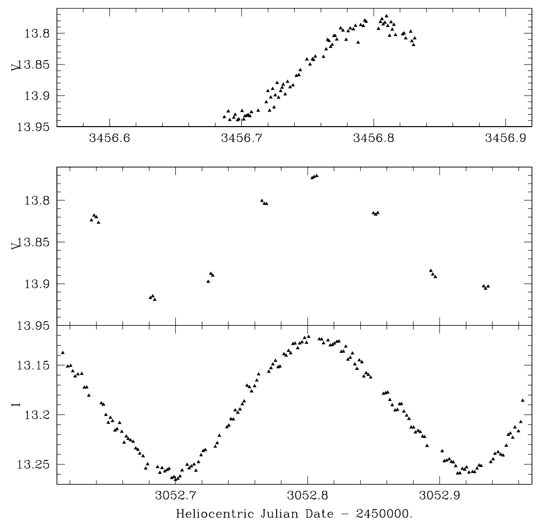

Figure 5. Observations for the W UMa-type variable star FBC 5986.

FBC 5986 (S1849): This contact system happens to lie very close to the cluster main sequence in the CMD. However, two proper motion studies give the system a 0% probability of membership, thanks to measured relative proper motions of 6.8 (Sanders 1977) and 9.1 mas y^{-1} (Zhao et al. 1993). Based on this, the system is unlikely even to be a member in the process of ejection. Use of the M_I-period-color relation also indicates that its distance modulus is about 0.8 mag larger than the cluster W UMa stars. This system was not in the field observed in X-rays by van den Berg et al. (2004) or Belloni et al. (1998). The light curve is fairly symmetrical (see Figure 5).

This work has been funded through grants AST 00-98696 and 05-07785 from the National Science Foundation to E.L.S. and M. Bolte.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5680

Konkoly Observatory
Budapest
25 January 2006

HU ISSN 0374 – 0676

THE FAST APSIDAL MOTION SYSTEM NSV 18773

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Recently the NSV catalogue (Kukarkin and Kholopov, 1982) and its supplement (NSVS) (Kazarovets et al., 1998) were searched for new eclipsing binaries (see Otero, 2003 for more details). After a candidate star was identified, its observations in the *ASAS-3* database (Pojmanski, 2002) were checked. This way, NSV 18773 = HD 99898; V range 9.34 - 9.52 (Min II= 9.50) was found to be an early-type (O9V according to Jaschek, 1978) EA-type system. It is also a visual binary, with components of magnitude 9.9 and $10.3 V_T$, and a separation of 0.″8 (Fabricius et al., 2002). From the *ASAS* data alone there is no way to tell which one of the visual components is the eclipsing binary.

A literature search revealed that the star was already listed in the *ASAS-2* catalogue (Pojmanski, 2000) as an eclipsing binary with a period of 5.048912 days. Combining the *ASAS-2* data (I_c magnitudes were shifted to the V values for the analysis) with the more recent *ASAS-3* observations (see Fig. 1) makes evident that this system shows very fast apsidal motion (Fig. 2) which makes it a specially interesting case. Fig. 3 reveals that no colour changes ($V - I_c = 0.49$) occur during primary (Min I) or secondary minimum (Min II), which is consistent with the observed similar primary and secondary eclipses (0.17 and 0.15 mag. deep respectively) although the third light affects the results and the amplitude. The eclipses are partial, with a duration of Min I= 0.566 days and of Min II= 0.283 days (0.112 P. and 0.056 P. respectively).

The current light elements are:
Min I = HJD 2450563.528 + 5.04913 × E
Min II= HJD 2450566.202 + 5.04983 × E

Table 1 shows times of minima and residuals for NSV 18773 as well as the phase of Min II based on the primary eclipse period to make the phase shift of the secondary eclipse evident.

Assuming an inclination of nearly 90 degrees, the current ratio of eclipse durations of 0.50 and the phase of Min II with respect to Min I (from Table 1) can then be used in the formulae given by Kallrath and Milone (1999), allowing the eccentricity $e = 0.36 \pm 0.03$ and apsidal period $U = 135 \pm 10$ years to be estimated. The uncertainties for these values have been estimated by varying the eclipse duration ratio and the phases of Min II within their uncertainty limits.

Table 1: Recorded minima of NSV 18773.

HJD-2400000	$O-C$	Min	Phase	Source
50583.704	−0.021	I		ASAS-2
51136.811	0.057	II	0.541	ASAS-2
51194.673	0.004	I		ASAS-2
51232.731	0.044	II	0.538	ASAS-2
51303.502	0.127	II	0.555	ASAS-2
51376.483	0.045	I		ASAS-2
51525.741	0.204	II	0.570	ASAS-2
51926.775	−0.018	I		ASAS-3
52103.488	−0.025	I		ASAS-3
52116.482	0.197	II	0.569	ASAS-3
52411.500	−0.010	I		ASAS-3
52512.482	−0.010	I		ASAS-3
52646.756	0.312	II	0.591	ASAS-3
52651.793	0.300	II	0.589	ASAS-3
52739.699	−0.004	I		ASAS-3
52747.725	0.299	II	0.589	ASAS-3
53052.731	−0.018	I		ASAS-3
53365.844	0.049	I		ASAS-3
53444.662	0.456	II	0.620	ASAS-3
53547.560	−0.004	I		ASAS-3

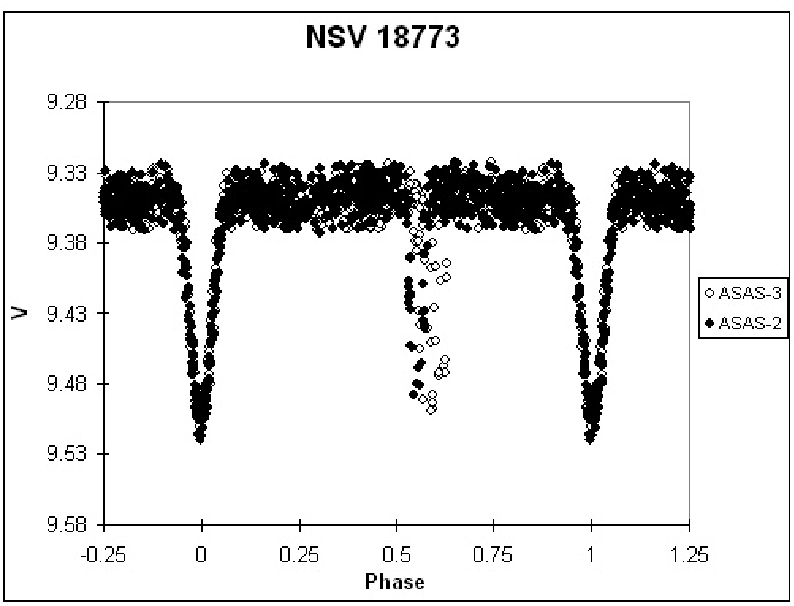

Figure 1. Light curve of NSV 18773 showing *ASAS-2* and *ASAS-3* observations.

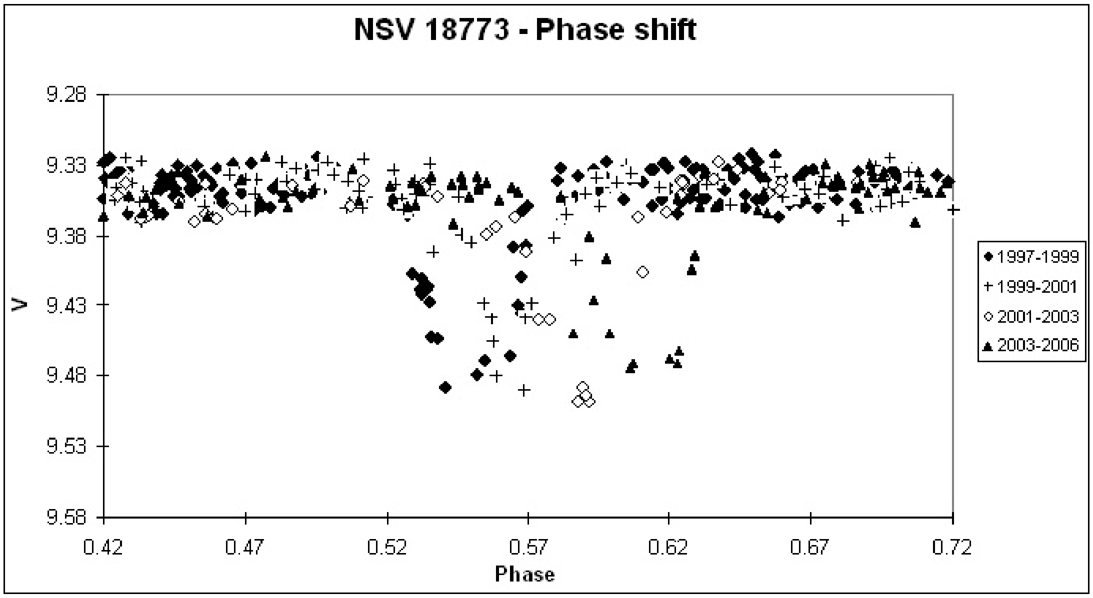

Figure 2. Phase shift in the secondary eclipse of NSV 18773.

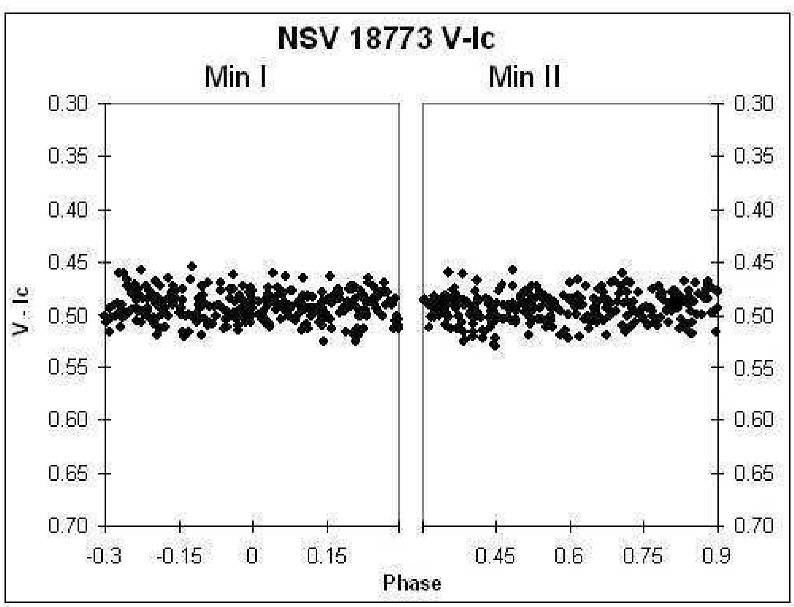

Figure 3. $V - I_c$ light curve of NSV 18773 showing no colour changes during eclipses.

Acknowledgements: The authors thank John Greaves for his collaboration and suggestions. This research has made use of the SIMBAD and VizieR databases operated at the *Centre de Données Astronomiques* (Strasbourg, France).

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5681

Konkoly Observatory
Budapest
26 January 2006

HU ISSN 0374 – 0676

50 NEW ECCENTRIC ECLIPSING BINARIES FOUND IN THE ASAS, HIPPARCOS AND NSVS DATABASES

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The publicly available NSVS (Wozniak et al., 2004), ASAS-3 (Pojmanski, 2002) and Hipparcos (Perryman et al., 1997) databases have been searched for new and suspected eclipsing binaries recently. For more details on these works see Otero (2004) and Otero et al. (2004). A considerable number of the systems found turned out to be eccentric binaries. Some have been published in the previous papers of that series and this work presents a new selection of them separately for easier study. All the systems are of the EA-type and show relatively long periods. Elements were found with AVE (Barberá, 1999). Unfiltered NSVS ROTSE1 magnitudes were shifted to match the V magnitude of the stars. When neither ASAS nor Hipparcos observations exist, the original ROTSE1 magnitudes have been given. Saturated data in ASAS-3 and flagged observations in the Hipparcos Epoch Photometry and the NSVS dataset were also discarded. Hipparcos observations have been transformed to V using a table published electronically in IBVS No. 5482 (Otero, 2003).

Table 1 shows the list of variables. The first column gives the variable star designation according to the GCVS if it is a known variable or the GSC identifier otherwise. The following columns give another identifier; the brightness range of the variable (V= ASAS-3 V magnitudes; *= ROTSE1 magnitudes), with the magnitude of secondary eclipse between brackets; the orbital phase at which Min II takes place; the epoch of minimum light derived from the complete dataset; the period; the variability class and the spectral type with a reference to its source.

Table 1. New elements for 50 eccentric systems.

Star Name		Magnitude range	Min II	Epoch	Period	Spectral type
Variable/GSC	Other ID		phase	(HJD2400000+)	(days)	
EQ Boo*	HIP 072757	8.80−9.20 (9.11)V	0.399	47931.794	5.43536	G5 (33)
GSC 0134 1181	HD 251059	10.15−10.71(10.50:)V	0.436	51629.644	14.3877	B9 (33)
GSC 0169 2236*		11.08−11.65:(11.42)V	0.669	51557.760	23.7704	
GSC 1890 1296	HD 043752	9.72−10.26(10.10:)V	0.789:	52977.747	10.8925	A2 (33)
GSC 2143 1871*	HD 338936	9.94−10.35:(10.33:)V	0.327	51511.507	7.6699	B0.5V (35)
GSC 3152 1202*		12.69−13.26 (13.25)*	0.489:	51478.596	2.09372	
GSC 3612 1565*		11.05−11.65:(11.6:)V	0.334	53671.255	5.85527	
GSC 3670 0919*		11.46−11.93(11.90:)*	0.450	51508.610	5.9613	
GSC 3677 0819*	BD+57 0209	10.81−11.06 (11.06)*	0.562	51548.650	8.4650	
GSC 3682 0837*		11.35−11.95:(11.95:)*	0.531	51556.605	6.1772	A0/A2 (45)
GSC 3964 0741*	BD+58 2217	9.93−10.24 (10.19)*	0.511	51448.645	9.9634	B8 (45)
GSC 4031 2155*		12.28−12.93 (12.76)*	0.441	51542.702	6.9092	B1:V: (17)
GSC 4062 0752*		10.90−11.33 (11.24)*	0.489	51578.625	8.1190	
GSC 4257 0906*	SAO 019456	9.98−10.6 (10.31:)V	0.599:	51475.710	12.922	A0 (24)
GSC 4277 0586*		12.20−12.65:(12.64:)*	0.670	51364.686	2.87475	
GSC 4282 0702*		11.62−12.20 (12.03)*	0.429	51311.870	13.714	
GSC 4292 0745*		10.86−11.21 (11.07)*	0.528	51478.573	6.560	
GSC 4302 0936*		11.42−11.86(11.63:)*	0.443:	51465.650	18.8805	
GSC 4309 0449	BD+73 0077	10.55−10.91 (10.7:)*	0.710	51478.660	24.850	
GSC 4311 0987*		11.06−11.78 (11.67)*	0.230	51427.630	29.067	
GSC 4330 1963*		11.32−11.55 (11.46)*	0.682	51485.8	152.95	
GSC 4349 1189*		11.32−11.88 (11.67)*	0.490	51548.607	17.871	
GSC 4375 1733*		12.47−12.8: (12.78)*	0.466	51628.645	9.272	
GSC 4381 0288*		11.79−12.22 (12.92)*	0.565	51582.760	12.111	
GSC 4479 0412	BD+66 1663	10.43−10.83(10.75:)*	0.482	51442.716	7.0385	A5 (61)
GSC 4480 0830*		11.45−11.69 (11.65)*	0.518	51474.575	4.4871	
GSC 4480 1097*		10.63−11.06 (10.81)*	0.540	51467.580	27.33	
GSC 4480 1261*		11.64−11.96 (11.73)*	0.476:	51466.747	2.3337	
GSC 4481 0230*		11.46−11.92 (11.92)*	0.585	51606.605	3.57494	
GSC 4487 0347*		11.52−11.96 (11.94)*	0.560	51504.666	1.98873	
GSC 4502 0203*		11.90−12.50 (12.43)*	0.232	51607.605	16.080	
GSC 4513 2537*		11.18−11.72 (11.7:)*	0.494	51572.752	6.3344	
GSC 4514 2034*		11.27−11.5 (11.4)*	0.467	51598.565	8.6386	
GSC 4518 1759*		11.37−11.8: (11.7:)*	0.693	51532.600	9.4545	
GSC 4524 1856*		11.03−11.29(11.27:)*	0.522	51524.605	6.6764	
GSC 4544 0439*		11.27−11.55 (11.43)*	0.630:	51462.0	50.517	
GSC 4596 1254	SAO 003282	10.72−11.27 (11.19)*	0.547:	51397.673	9.33543	F8 (24)
GSC 5922 1647*		10.58−11.15 (10.70)V	0.513	53619.883	3.9895	
GSC 8957 2047	HD 093683	7.91−8.18 (8.17)V	0.655	52700.640	17.7997	B1Vnep (8)
NSV 04653	GSC 6611 0836	12.55−13.1: (13.0:)V	0.539	53404.795	5.9199	
NSV 08163*	GSC 7368 1457	13.0:−13.5: (13.5:)V	0.528	53634.555	1.9541	
NSV 08299	GSC 7369 1400	11.74−12.10 (11.78)V	0.342:	51978.842	11.0943	
NSV 12772	GSC 1625 0975	11.70−12.3 (12.22:)V	0.379	52734.943	8.3264	
NSV 17921	HIP 041980	7.85−7.97 (7.91)V	0.291	48112.955	6.17848	B4V (47)
NSV 24564*	HIP 091928	8.54−8.83 (8.66)V	0.784	48315.454	19.2449	B9V (2)
PX Hya	HIP 051683	8.40−8.90: (8.73)V	0.210	48462.195	36.1553	F2V (4)
V0680 Mon*	GSC 0748 0218	9.93−10.31 (10.09)V	0.865	52990.717	8.5381	B8 (33)
V0990 Her*	HIP 090338	7.68−7.92 (7.9:)V	0.445:	48048.755	8.19329	A0 (33)
V3895 Sgr	HD 163632	8.97−9.45 (9.29)V	0.407	53579.348	27.1104	A0 (33)
VZ PsA*	HIP 111809	5.66−5.83 (5.70:)V	0.573:	48810.941	5.76333	A2Vp (47)

Sources of spectral type: (2) Houk, 1978. (4) Houk and Smith-Moore, 1988. (8) Kennedy, 1983. (17) Buscombe, 1998. (24) Ochsenbein, 1980. (33) Cannon and Pickering, 1993. (35) Georgelin et al., 1973. (45) Skiff, 2005. (47) Jaschek, 1978. (61) Heckmann and Dieckvoss, 1975.

Notes on individual stars:

EQ Boo = Visual binary. A=$9.^{m}4$; B=$10.^{m}1$ Hp. Sep. $1.''3$ (Perryman et al., 1997).
GSC 0169 2236 = USNO-A2.0 0900-04878758 = 2MASS J07243141+0303278.
GSC 2143 1871 = Primary eclipse might be the secondary. Visual binary. A=$10.^{m}9$; B=$11.^{m}1$ Vt. Sep. $0.''5$ (Fabricius et al., 2002).
GSC 3152 1202 = USNO-A2.0 1275-13932971 = 2MASS J20271727+3756268. Primary eclipse might be the secondary.
GSC 3612 1565 = USNO-A2.0 1350-14941873 = 2MASS J21470330+5003177. Found with the help of visual observations. Normalized to the Tycho-2 (Hog et al., 2000) V magnitude at maximum. Primary eclipse might be the secondary.
GSC 3670 0919 = USNO-A2.0 1425-02049264 = 2MASS J01305304+5325384.
GSC 3677 0819 = Primary eclipse might be the secondary.
GSC 3682 0837 = USNO-A2.0 1425-02073759 = 2MASS J01315922+5926474. Primary eclipse might be the secondary.
GSC 3964 0741 = In galactic open cluster Trumpler 37. Visual binary. A=$9.^{m}2$; B=$11.^{m}0$. Sep. $0.''2$ (Worley et al., 1997).
GSC 4031 2155 = USNO-A2.0 1500-01666660 = 2MASS J01381799+6108351.
GSC 4062 0752 = USNO-A2.0 1500-03209730 = 2MASS J03321837+6116408.
GSC 4257 0906 = Found with the help of visual observations. Normalized to the Tycho-2 V magnitude at maximum.
GSC 4277 0586 = USNO-A2.0 1500-09201191 = 2MASS J22380235+6727583. Primary eclipse might be the secondary.
GSC 4282 0702 = USNO-A2.0 1500-09437279 = 2MASS J23011398+6234052.
GSC 4292 0745 = USNO-A2.0 1500-09818583 = 2MASS J23303493+6633457.
GSC 4302 0936 = USNO-A2.0 1575-00126395 = 2MASS J00145093+7149452.
GSC 4311 0987 = USNO-A2.0 1575-01245194 = 2MASS J02083191+6806151.
GSC 4330 1963 = USNO-A2.0 1575-01688353 = 2MASS J03245066+7033224.
GSC 4349 1189 = USNO-A2.0 1575-02488101 = 2MASS J06073817+6943468.
GSC 4375 1733 = USNO-A2.0 1575-02922240 = 2MASS J08564648+6940320.
GSC 4381 0288 = USNO-A2.0 1575-02913131 = 2MASS J08515815+7401549.
GSC 4480 0830 = USNO-A2.0 1575-05185169 = 2MASS J22371878+7054287.
GSC 4480 1097 = USNO-A2.0 1575-05088010 = 2MASS J22245961+7018541.
GSC 4480 1261 = USNO-A2.0 1575-05090014 = 2MASS J22251591+7014339. Amplitude reduced by light from nearby stars.
GSC 4481 0230 = USNO-A2.0 1575-05400358 = 2MASS J23013922+6942449. Primary eclipse might be the secondary. Amplitude reduced by light from nearby stars.
GSC 4487 0347 = USNO-A2.0 1575-05818254 = 2MASS J23461047+7129554.
GSC 4502 0203 = USNO-A2.0 1650-00394686 = 2MASS J01543486+7928093.
GSC 4513 2537 = USNO-A2.0 1650-00654079 = 2MASS J03244918+7720122. Primary eclipse might be the secondary.
GSC 4514 2034 = USNO-A2.0 1650-00846009 = 2MASS J04325120+7842541.
GSC 4518 1759 = USNO-A2.0 1650-00829131 = 2MASS J04262307+7913514.
GSC 4524 1856 = USNO-A2.0 1650-01014575 = 2MASS J05464390+7520564. Visual binary. A= $11.^{m}4$; B= $11.^{m}6$ Vt. Sep. $0.''5$ (Fabricius et al., 2002).
GSC 4544 0439 = USNO-A2.0 1650-01398811 = 2MASS J09425469+7856546.
GSC 5922 1647 = USNO-A2.0 0675-02301694 = 2MASS J05453057-1746333. Classified as ED in the ASAS catalogue with a wrong period of 7.979 days.
NSV 08163 = Primary eclipse might be the secondary.

NSV 24564 = Visual binary. A=8$^{\mathrm{m}}_{.}$6; B=11$^{\mathrm{m}}_{.}$3 Hp. Sep. 3$''_{.}$7 (Perryman et al., 1997)
V0680 Mon = Extremely eccentric system. One of the stars is possibly slightly variable. RR-type in the GCVS.
V0990 Her = Primary eclipse might be the secondary.
VZ PsA = Found with the help of visual observations.

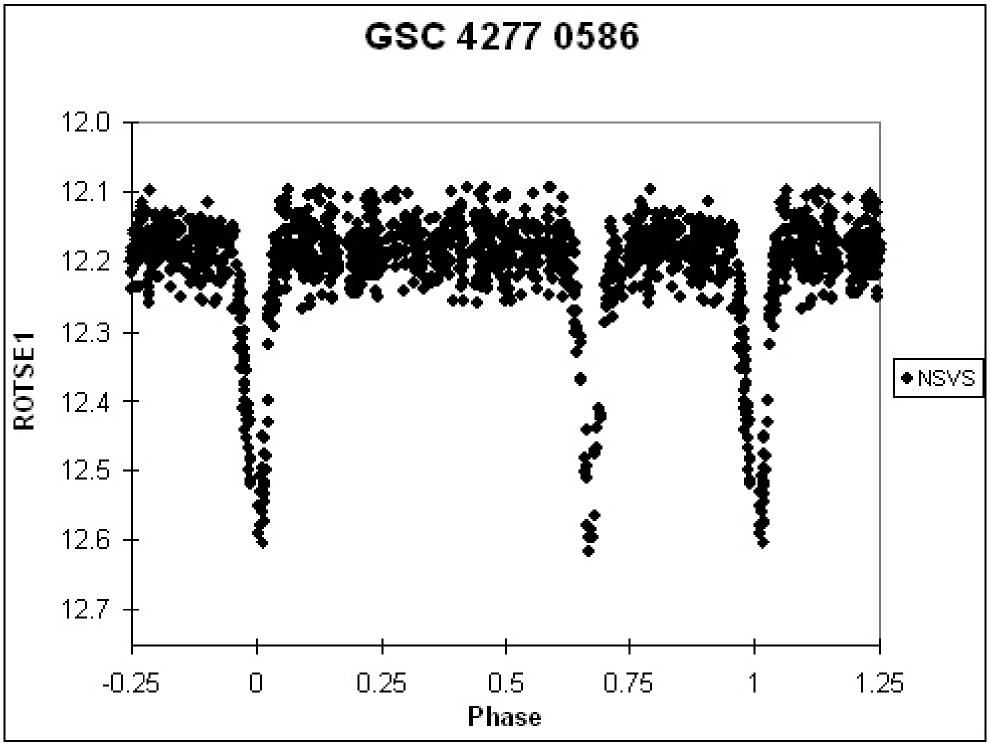

Figure 1. Light curve of GSC 4277 0586 showing NSVS observations.

Acknowledgements: The authors thank John Greaves for his collaboration and suggestions. This research has made use of the SIMBAD and VizieR databases operated at the Centre de Données Astronomiques (Strasbourg) and also of data products from the Two Micron All Sky Survey, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.

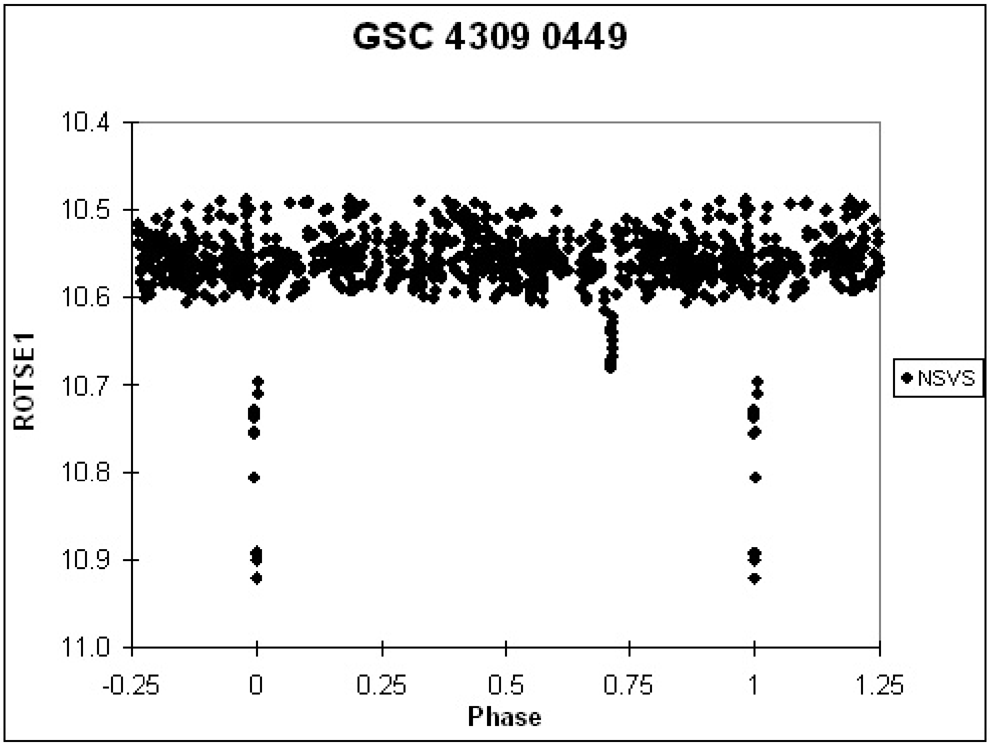

Figure 2. Light curve of GSC 4309 0449 showing NSVS observations.

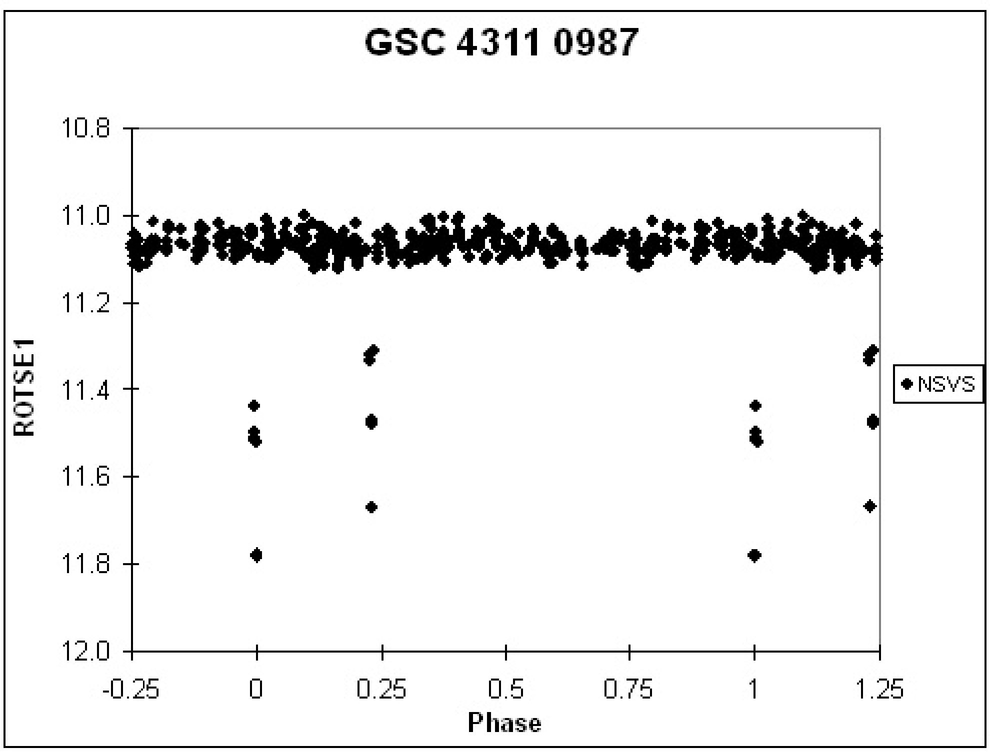

Figure 3. Light curve of GSC 4311 0987 showing NSVS observations.

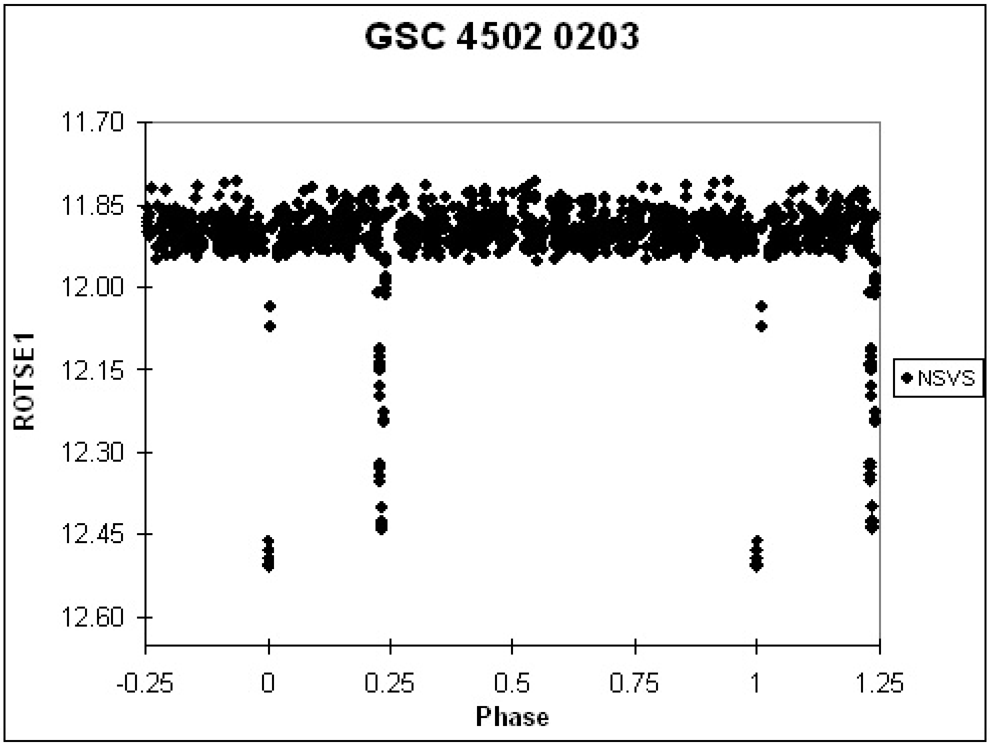

Figure 4. Light curve of GSC 4502 0203 showing NSVS observations.

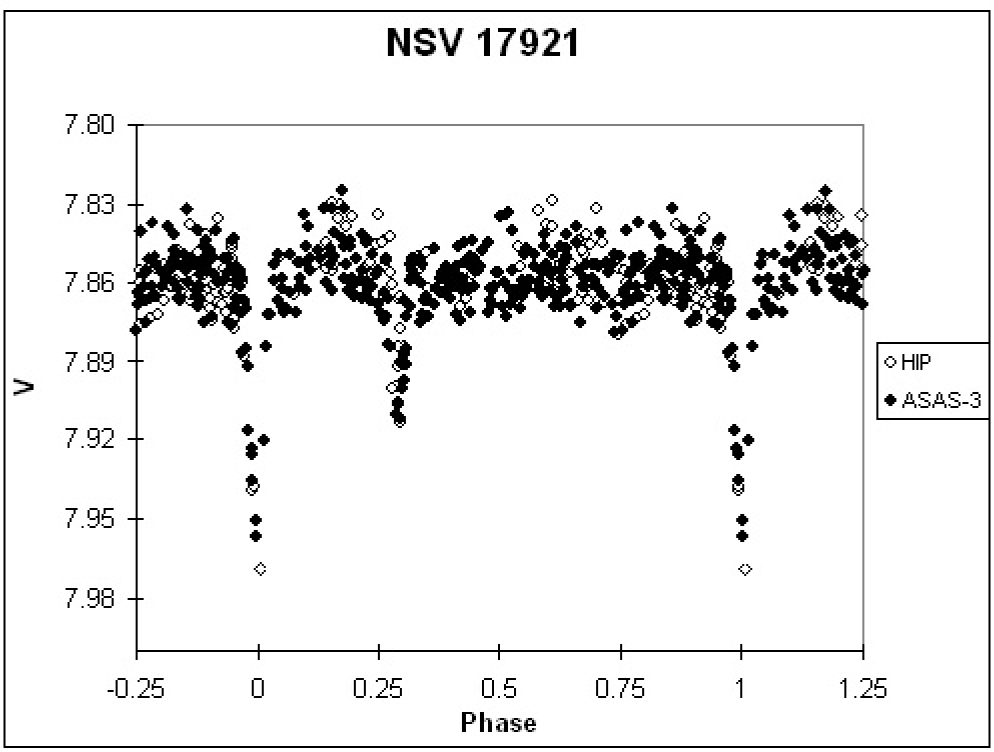

Figure 5. Light curve of NSV 17921 showing ASAS-3 and Hipparcos observations.

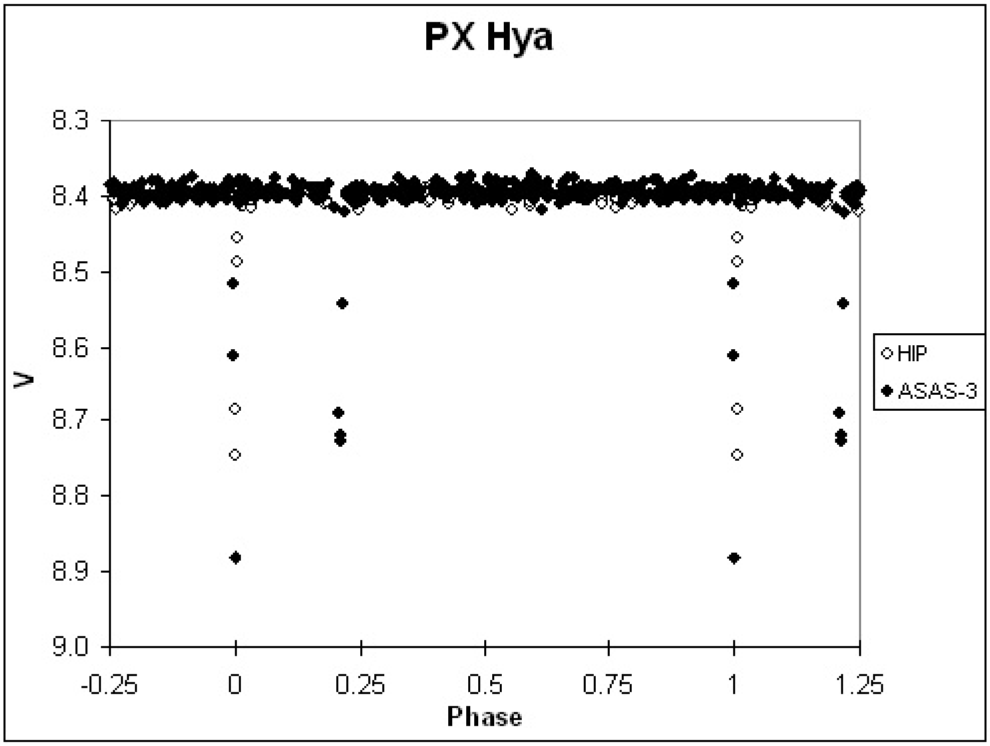

Figure 6. Light curve of PX Hya showing ASAS-3 and Hipparcos observations.

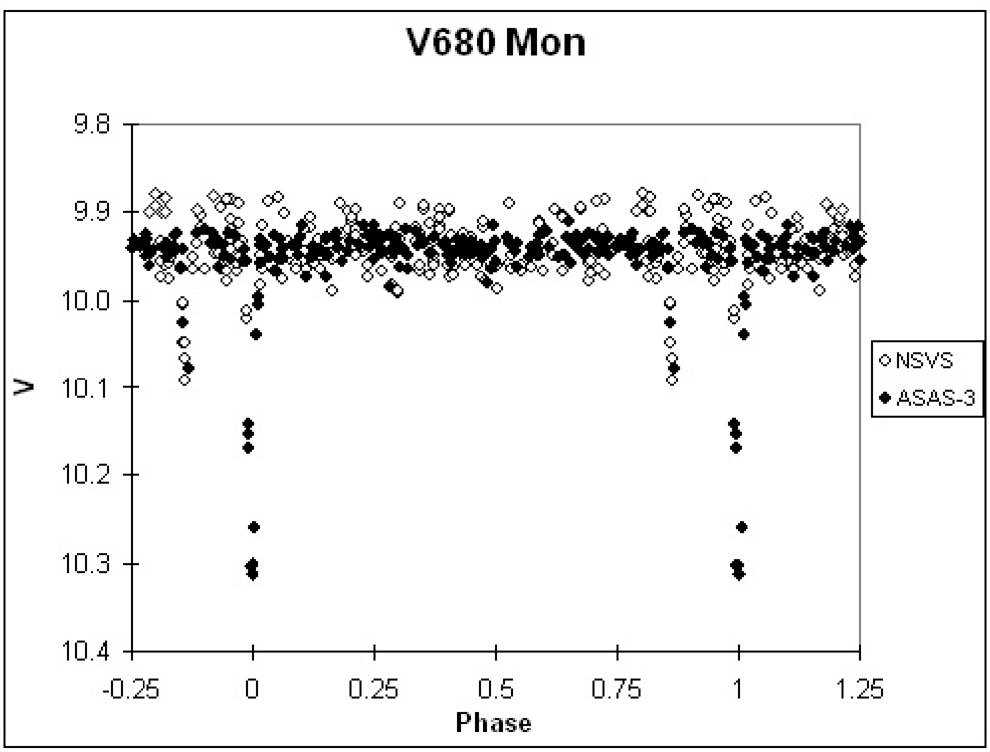

Figure 7. Light curve of V680 Mon showing ASAS-3 and NSVS observations.

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Wozniak, P.R., et al., 2004, *AJ*, **127**, 2436, Northern Sky Variability Survey: Public Data Release

ERRATUM FOR IBVS 5681

One of the eccentric eclipsers in IBVS 5681 is wrongly identified as GSC 3682-0837 = USNO-A2.0 1425-02073759 = 2MASS J01315922+5926474.

The eclipsing binary with a period of 6.1772 d is actually GSC 3682-0736 = UCAC2 50208296 = 2MASS J01215916+5833136 at $01^{h}21^{m}59\overset{s}{.}16$ $+58^{\circ}33^{m}13\overset{''}{.}6$ (2000.0). The spectral type is B0.

P. Dubovsky, S. Otero

ERRATUM FOR IBVS 5681

The star identified as GSC 03682-00837 = USNO-A2.0 1425-02073759 = 2MASS J01315922+5926474 is actually GSC 03682-00736 = 2MASS J01215916+5833136.

S. Otero

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5682

Konkoly Observatory
Budapest
1 February 2006
HU ISSN 0374 – 0676

RW LACERTAE: A NEW PHOTOMETRIC TRIPLE STAR

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The detached eclipsing binary RW Lacertae (GSC 3629.0740 = AN 34.1910 = FL 3421; $\alpha_{2000} = 22^{\rm h}44^{\rm m}57\overset{\rm s}{.}1$, $\delta_{2000} = +49^\circ 39' 28''$, Sp. G5V + G7V, $V_{\rm max} = 10.6$ mag) is a relatively well-known binary with a slightly eccentric orbit ($e \simeq 0.01$) and a rather longer orbital period about 10.4 days. This system was selected as a possible candidate for the study of the apsidal motion (Giménez 1994) and thus it was also included to our long-term observational project of monitoring of eclipsing binaries with eccentric orbits (f.e. Wolf et al. 1998).

RW Lac was discovered to be a variable star photographically by Gaposchkin (1932). Later Martinoff (1938) derived the correct period of 10.36922 days and recognized the eccentric orbit. See also history of work on this binary in Lacy et al. (2005). Due to the relatively long orbital period and slow magnitude changes this variable was not often observed visually. Recently, Lacy et al. (2005, hereafter LTCV) in their comprehensive spectroscopic and photometric study derived the absolute dimensions of the components with high precision. They obtained $M_1 = 0.928 \pm 0.006\ M_\odot$ and $M_2 = 0.870 \pm 0.004\ M_\odot$ for masses and $R_1 = 1.186 \pm 0.004\ R_\odot$ and $R_2 = 0.964 \pm 0.004\ R_\odot$ for radii of primary and secondary component, respectively. They also derived the following linear light elements:

$$\text{Pri. Min.} = \text{HJD } 24\ 52253.66551(37) + 10\overset{\rm d}{.}3692046(17) \times \text{E}.$$

Our new CCD photometry of RW Lac was carried out during three nights between November 2003 and October 2005 at the Ondřejov and Brno observatories and the private observatory of L.B. in Pec pod Sněžkou, Czech Republic. A 65-cm reflecting telescope with a CCD camera Apogee AP7, 25-cm reflector with a CCD camera SBIG ST7 and 20-cm Cassegrain with a camera SBIG ST8 were used in Ondřejov, Brno and Pec, respectively. The measurements were done using the standard R filter with 35 or 60 s exposure time. The nearby stars GSC 3629.0796 ($V = 11.2$ mag) on the same frame as RW Lac served as a primary comparison star. See also http://nyx.asu.cas.cz/~lenka/dbvar/ for more information. The new times of primary minimum and their errors were determined using the least squares fit of the data, by the bisecting chord method or by the

Table 1: New times of primary minimum of RW Lac.

JD Hel.- 24 00000	Epoch	Error (days)	N	Telescope, camera, filter
52948.40127	67.0	0.00015	250	65-cm, AP7, R
53259.47934	97.0	0.00030	40	25-cm, ST7, R
53653.5130	135.0	0.0015	145	20-cm, ST8, R
53653.5147	135.0	0.0002	200	25-cm, ST7, R

Kwee-van Woerden algorithm. These times of minimum are presented in Table 1. In this table, N stands for the number of observations used in the calculation of the minimum time. The epochs were calculated according to the light elements of LTCV. Figure 1 shows the differential R magnitudes during the primary minimum observed at JD 24 52948.

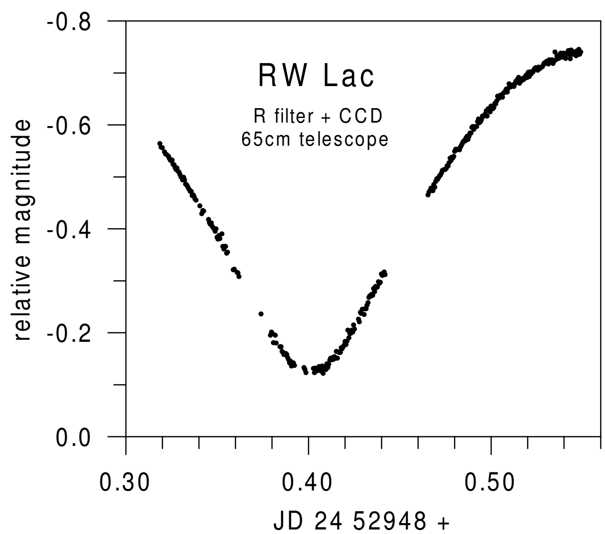

Figure 1. A plot of differential R magnitudes obtained during primary eclipse of RW Lac on November 4, 2003 at Ondřejov.

The change of period and possible apsidal motion of RW Lac were studied by means of an $O-C$ diagram analysis. We can confirm the result of LTCV, that the apsidal motion is not clearly detectable in this eccentric system. We adopted only the relativistic contribution $\dot{\omega}_{rel} = 0.000\ 17$ deg/cycle according to the eccentricity and masses of both components (Giménez 1985). Our reduction procedure was following:

1. For the orbital period P, zero epoch T_0 and the corresponding position of periastron ω_0 of the eclipsing pair we took in consideration all visual and photographic times of minima found in the literature (see Kreiner et al. 2001) as well as new times given in LTCV and our results (see also current $O-C$ diagram on Fig. 1 in LTCV). We found

$$\begin{aligned} T_0 &= \text{HJD } 24\ 52253.6332(8) \\ P &= 10.369209(3) \text{ days} \\ \omega_0 &= 161.3\ (2.5) \\ e &= 0.0118\ (2) \end{aligned}$$

2. Subtracting the influence of the eccentric orbit and very slow apsidal motion, sinusoidal deviations of the $O-C$ values are well remarkable and could be caused by a light-time effect. For its solution we used only the new photoelectric or CCD timings obtained after JD 24 51000 given originally in Lacy et al. (1999), Lacy et al. (2001) and Lacy (2002) - recalculated in LCTV - and our own CCD times given in Table 1. A preliminary analysis of the third body circular orbit gives the following parameters:

P_3 (period)	$= 2670 \pm 240$ days
	$= 7.2 \pm 0.7$ years
T_3 (time of conjunction)	$=$ J.D. 2450925 ± 40
A (semi amplitude)	$= 0.0052 \pm 0.0006$ day
e_3 (eccentricity)	$= 0$ (fixed)

These values were obtained by the least squares method. The $O-C_2$ diagram is plotted in Fig. 2. Only the primary minimum at HJD 24 52253.66687 - given first in Lacy (2002) and recalculated in LTCV - has a relatively large $O-C$ deviation of about $-$ 0.0029 days, i.e. approx. 15 times of the given error.

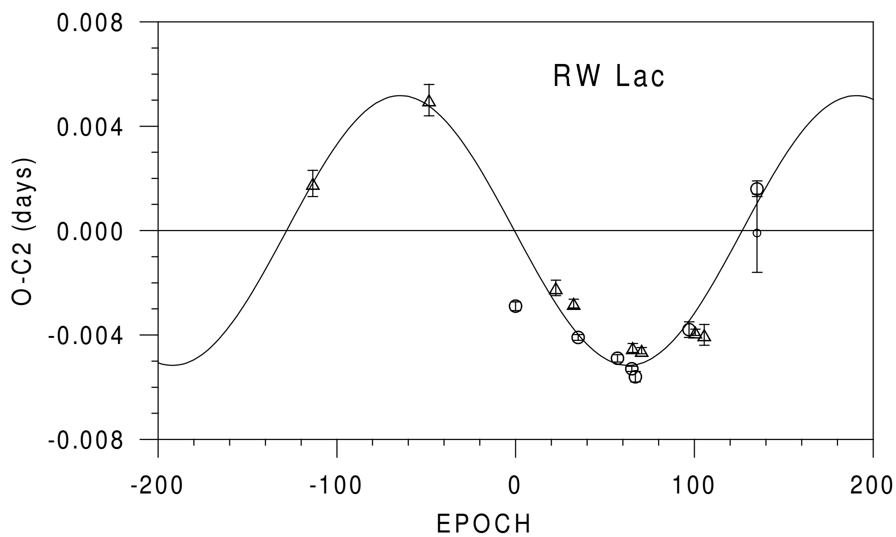

Figure 2. $O-C2$ diagram for RW Lac after removing the influence of the eccentric orbit. The individual times of primary and secondary minimum are denoted by circles and triangles, resp. For very precise timings the error bars are inside the circles. The curve corresponds to the third body orbit.

Assuming a coplanar orbit ($i_3 = 90°$) and a total mass of the eclipsing pair with G5 primary and G7 secondary, $M_1 + M_2 = 1.798\ M_\odot$ (LTCV), we can obtain a lower limit for the mass of the third component $M_{3,\mathrm{min}}$. The present explanation is supported by the quite reasonable value of the mass function $f(M) = 0.0137\ M_\odot$, from which the minimum mass of the third body follows as 0.41 $M_\odot$. A possible third component of spectral type M1 with the bolometric magnitude of $m_3 = 8.3$ mag (Harmanec 1988) produces the third light of $L_3 = 1.8\%$. Moreover, this value is in good agreement with the third light contribution of about 2% resulting from the light-curve analysis of LTCV.

Our result indicates, that RW Lac is probably next member of an interesting group of triple eccentric eclipsing binaries (f.e. RU Mon, U Oph, YY Sgr and DR Vul) deserving a regular monitoring. Only a relatively small part of the third body orbit is well-covered by the precise observations. Therefore, new high-accuracy timings of this eclipsing system are necessary in order to confirm the light-time effect and its parameters given above.

Acknowledgements. This investigation was supported by the Grant Agency of the Czech Republic, grant No. 205/04/2063. This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France, and of NASA's Astrophysics Data System.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5683

Konkoly Observatory
Budapest
1 February 2006

HU ISSN 0374 – 0676

VRI LIGHT CURVE OF V1647 Ori IN THE PERIOD AUGUST 2004 – NOVEMBER 2005

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The Pre-Main-Sequence (PMS) object V1647 Ori (IRAS 05436-0007) is located in the dark cloud Lynds 1630 - a region of active star formation in the Orion B complex. V1647 Ori attracted a great interest in the past two years because of the sudden outburst documented by McNeil (2004). According to Briceño et al. (2004) the outburst began in November 2003 and the stellar brightness rose by 5 mag till February-March 2004. Since March 2004 the brightness of V1647 Ori slowly goes down, resembling other young eruptive variables like FUORs or EXORs (Walter et al. 2004). In our first paper (Semkov 2004) we reported data from VRI photometric observations of V1647 Ori in the period August - October 2004 suggesting for a gradual fading of the brightness. Recently, Kóspál et al. (2005) registered a rapid photometric fading of V1647 Ori since the period October - November 2005.

In this paper we present new VRI photometric data of V1647 Ori in the period November 2004 - November 2005. Our data were obtained in two observatories with three telescopes: the 2-m Ritchey-Chretien-Coude and 50/70/172 cm Schmidt telescopes of the National Astronomical Observatory Rozhen (Bulgaria) and the 1.3-m Ritchey-Chretien telescope of the Skinakas Observatory[1] of the Institute of Astronomy, University of Crete (Greece). The technical parameters for the CCD cameras used, observational procedure and data reduction process are described in Semkov (2003). All frames were taken through a standard Johnson-Cousins set of filters. Aperture photometry was performed using DAOPHOT routines. The frames obtained with the 2-m RCC and 1.3-m RC telescopes were reduced using the same aperture of $2\farcs5$ radius. The frames obtained with the Schmidt telescope were reduced with a $3\farcs3$ radius aperture.

The standard stars used for comparison are of great importance for the correct magnitude estimation. In regions of star formation like the Orion L1630 molecular cloud a great percentage of stars can be photometric variables. In our first paper (Semkov, 2004) we presented VRI photometric data for seven stars in the vicinity of V1647 Ori suitable for comparison. Using new photometric data we try to improve the VRI magnitudes of the comparison stars. Calibrations were made with the 1.3 m RC telescope during four clear nights in August and September 2005. Standard stars from Landolt (1992) were used as a reference. Table 1 contains our corrected photometric data for the VRI comparison

[1]Skinakas Observatory is a collaborative project of the University of Crete, the Foundation for Research and Technology - Hellas, and the Max-Planck-Institut für Extraterrestrische Physik.

sequence. The corresponding mean errors of the mean and the coordinates of the stars are listed, too. The finding chart of the comparison sequence is presented in Semkov (2004). Our new photometric data of the comparisons agree well with the published ones in Semkov (2004) and the corresponding mean errors were improved considerably. We consider the star A from our list as a small amplitude variable. On some of our frames the stellar brightness drop up to $0^{\mathrm{m}}_{.}2(Ic)$ from the values published in Table 1. This object was registered as a $H\alpha$ emission star (Lk$H\alpha$ 302) by Herbig & Kuhi (1963) and it is probably a PMS star (T Tauri or Herbig Ae/Be star). The star F that we mentioned as a possible variable (Semkov 2004) appears to be constant from our new data. The star B from our list is equivalent to the comparison star used by Walter et al. (2004) for differential photometry. Our VRcIc values of this star agree well with those measured by Walter et al. (2004). Some stars from our list (C, D, E and F) were also measured by Henden (2004). Comparing our magnitudes with the data reported by Henden (2004) we find a good agreement for the V and Rc values. But for Ic magnitudes there is a systematic difference of about 0.2 mag.

The results from our CCD photometric observations are given in Table 2. The table contains Date, the Julian Date, the V, Rc and Ic magnitudes. Fig. 1 shows the V, Rc and Ic light curves of V1647 Ori for the period of our photometric observations (Semkov (2004) and the present paper). Regardless of the different telescopes and CCD cameras used a continuous slight decrease of brightness ($\sim 0^{\mathrm{m}}_{.}9$ mag for 1 year) can be observed. Our photometric data obtained in November 2005 show a big drop of the brightness of about $1^{\mathrm{m}}_{.}5$ (I) that supports the rapid fading of V1647 Ori in the period October - November 2005 reported by Kóspál et al. (2005). Therefore, the observed outburst of V1647 Ori extends at least two years.

Table 1. Photometric data for VRI comparison sequence.

Star	RA (J2000)	DEC (J2000)	V	σ_V	Rc	σ_R	Ic	σ_I
A	05 46 22.43	−00 08 52.5	15.177	.091	14.168	.073	13.154	.083
B	05 46 22.50	−00 03 35.9	15.640	.028	14.875	.034	14.247	.028
C	05 46 00.30	−00 08 25.5	16.902	.018	15.452	.015	13.619	.036
D	05 46 09.03	−00 02 15.0	17.847	.033	16.074	.041	14.038	.042
E	05 46 05.84	−00 02 39.4	17.926	.019	16.386	.023	14.703	.035
F	05 46 11.62	−00 02 19.8	18.646	.042	16.881	.041	14.608	.044
G	05 46 21.41	−00 09 06.4	18.839	.033	17.830	.051	16.236	.035

There are only a few papers (Briceño et al. 2004, Walter et al. 2004, McGehee et al. 2004, Semkov 2004, Kóspál et al. 2005) containing optical photometry of V1647 Ori and the construction of its light curve is difficult at the moment. There is a sizable discrepancy in the data published by different authors produced by various methods of brightness estimation, comparison stars and photometric systems used. In the case of a larger aperture the measurements include more light from the nebulous background around the object. In spite of these discrepancies the available photometric data suggests that the light curve of V1647 Ori resembles the well-studied FUOR objects (a short time brightness increase followed by a slight decrease). The light curve of the FUOR object V1515 Cyg also shows a rapid fading in 1980 (Hartmann & Kenyon 1996), as observed on V1647 Ori by Kóspál et al. (2005).

Table 2. Photometric observations of V1647 Ori in the period November 2004 - November 2005

Date	J.D.(245...)	*Ic*	*Rc*	*V*	Tel.
2004 Nov 19	3328.502	14.68	16.76	–	Schmidt
2004 Nov 21	3330.547	14.64	16.59	–	Schmidt
2004 Dec 08	3348.360	14.92	16.97	–	Schmidt
2004 Dec 10	3350.391	14.95	17.01	–	Schmidt
2005 Feb 10	3412.370	14.86	16.79	–	Schmidt
2005 Feb 11	3413.374	14.83	16.74	–	Schmidt
2005 Mar 12	3442.286	15.27	17.32	18.86	2m RCC
2005 Apr 03	3464.245	14.86	17.04	–	Schmidt
2005 Aug 14	3596.607	15.55	17.76	–	1.3m RC
2005 Aug 27	3609.592	15.59	17.76	19.47	1.3m RC
2005 Aug 28	3610.589	15.40	17.49	19.03	1.3m RC
2005 Aug 29	3611.587	15.64	17.76	19.35	1.3m RC
2005 Sep 03	3616.603	15.50	17.63	19.31	1.3m RC
2005 Sep 10	3623.604	15.77	–	19.31	1.3m RC
2005 Sep 11	3624.603	15.87	17.94	19.60	1.3m RC
2005 Sep 15	3628.581	15.88	18.02	19.57	1.3m RC
2005 Sep 19	3632.568	15.73	17.97	–	1.3m RC
2005 Sep 20	3633.585	15.86	18.04	19.70	1.3m RC
2005 Sep 25	3638.578	15.89	18.09	–	1.3m RC
2005 Oct 03	3646.580	15.82	17.94	19.48	1.3m RC
2005 Nov 03	3678.442	17.29	19.43	>21.0	2m RCC
2005 Nov 26	3701.349	17.43	–	–	Schmidt

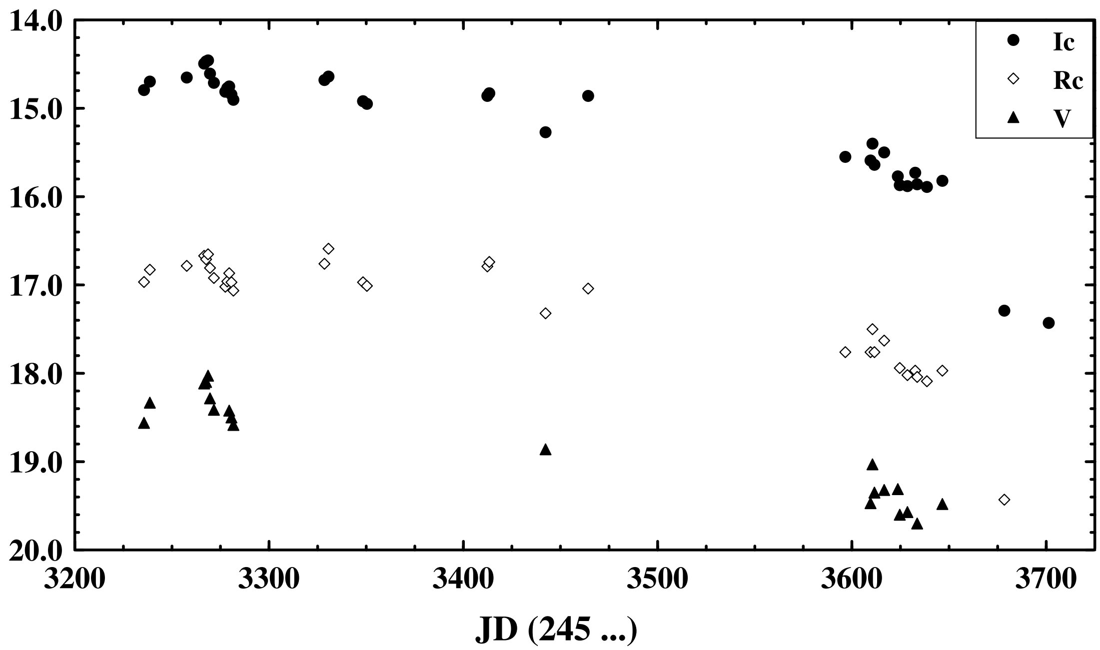

Figure 1. V, Rc and Ic light curves of V1647 Ori

The type of the observed outburst of V1647 Ori (FUOR or EXOR) is still undefined. The prototypes of FUORs and EXORs seem to be T Tauri stars with massive circumstellar disks. In both cases the observed outburst is explained by increased accretion from the circumstellar disk. While the EXORs spend only a few weeks or months in the maximum brightness, the outbursts of FUORs extend to some decades (Herbig 1989). This is only an empirical difference and the presence of an intermediate type (1-2 years long outburst) can be expected.

Acknowledgements: The author thanks the Director of Skinakas Observatory Prof. I. Papamastorakis and Prof. I. Papadakis for the telescope time.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5684

Konkoly Observatory
Budapest
3 February 2006

HU ISSN 0374 – 0676

NEW TIMES OF MINIMA OF ECLIPSING BINARY SYSTEMS AND OF MAXIMUM OF SXPHE TYPE STARS

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Observatory and telescope:
50-cm $f/8.4$ Ritchey–Chrétien telescope (Ba50) of the Baja Astronomical Observatory (Hungary) 50-cm $f/15$ Cassegrain telescope (Pi50), 60/90/180 Schmidt telescope (Pi90) and 1m $f/13.3$ RCC telescope (Pi100) of the Konkoly Observatory at Piszkéstető Mountain Station (Hungary) 12, 25, and 40-cm Newton telescopes (Be12, Be25, Be40, respectively; Belgium)

Detector:	512×512 Apogee AP-7 CCD camera (Ba50) uncooled UBV Photometer (Pi50u) cooled UBVRI Photometer (Pi50c) 1340×1300 Princeton Instr. CCD camera (Pi100) 2184×1472 SBIG ST10XME with filterwheel (filters Bessell specifications) (Bexx) 1536×1024 Photometrics CCD-camera (Pi90)

Method of data reduction:
Reduction of Baja and Piszkéstető CCD frames was made with a customly developed IRAF[1] package, while the others were reduced by Mira-AP (6) software

[1]IRAF is distributed by the National Optical Astronomical Observatories, operated by the Association of the Universities for Research in Astronomy, inc., under cooperative agreement with the National Science Foundation

Method of minimum determination:
The minima times were computed with parabolic fitting, and in some cases with linearized Pogson-method or Kwee-van Woerden method (Kwee & van Woerden, 1956). Maxima times reported here of the three SXPHE type stars was determined by a low-order (3-4) polynomial fit.

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
Times of minima of selected eclipsing binary stars					
RT And	53649.40304	7	I	R	Bír/Ba50
EP And	53652.54279	7	I	V	Csz/Pi100
OO Aql	52813.45965	4	I	–	Heg/Ba50
IM Aur	53336.4052	6	I	B, V, R	Bír/Ba50
	53376.3151	3	I	V	Heg/Ba50
	53629.5232	6	I	R	Bor/Ba50
	53697.502	1	II	V	Kov+Reg+Bor/Pi50c
	53760.4894	1	I	R	Bor/Ba50
IU Aur	52927.5161	4	I	V	Bor+Pál/Pi100
	53026.2503	3	II	R, B	Bír/Ba50
	53026.2514:	4	II	V	Bír/Ba50
	53053.4217	17	II	V, R	Bor/Ba50
	53360.4672	2	I	V	Bor/Ba50
	53379.486	1	II	V	Bor/Ba50
	53380.3904	4	I	V	Bor/Ba50
	53744.4947	4	I	R	Kis/Ba50
	53765.3244	1	II	R	Kis/Ba50
SV Cam	44614.6147	2	I	B, V	Pat/Pi50u
	44980.5406	1	I	B, V	Pat/Pi50u
	47547.3624	2	I	B, V	Pat/Pi50u
	49255.4148	3	I	B, V	Pat/Pi50u
AS Cam	53679.4436	6	II	R	Bor/Ba50
	53760.25497	5	I	R	Bor/Ba50
RZ Cas	53454.3881	6	I	R	Heg/Ba50
OX Cas	53655.4201	4	II	V	Be25
PV Cas	53197.5062	5	II	V	Bor/Ba50
VW Cep	52799.49503	5	I	–	Heg/Ba50
	53663.3715	3	I	V, R	Bor+Kov+Reg/Pi50c
	53663.3722	4	I	B	Bor+Kov+Reg/Pi50c
EK Cep	53636.5875	1	I	V	Be25
AH Cnc	53765.3982	4	I	V, I	Csz/Pi90
ES Cnc	53765.4321	6	I	V, I	Csz/Pi90
XZD1[a] (Cnc)	53765.5186	8	I	V, I	Csz/Pi90
AQ Com[b]	53081.347	1	II	V	Bír/Ba50
	53081.4897	2	I	V	Bír/Ba50
	53081.6283	4	II	V	Bír/Ba50
	53464.386	1	I	R	Heg/Ba50
	53464.5183	7	II	V, R	Heg/Ba50
LS Del	53229.4800	9	I	R	Heg/Ba50
	53559.4814	4	I	V	Csz/Pi100
U Gem	53654.5002	1	I	I	Csz/Pi100
HS Her	53208.4059	3	I	R	Bor/Ba50
V994 Her	52937.4701	1	II	R	Heg/Ba50
AU Lac	53660.3536	3	I	V	Be40
Y Leo	53408.3460	3	I	V	Be12
UZ Leo	53462.3788	18	I	V, R	Heg/Ba50
V404 Lyr	53235.4508	7	II	V	Bor/Ba50
BX Peg	53250.50843	5	II	V	Csz/Pi100
AG Per	53319.333	2	II	V	Bor/Ba50
	53335.561	1	II	V	Bor/Ba50

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
Times of minima of selected eclipsing binary stars					
β Per[c]	53403.3738	2	I	$V, R+N$	Bor+Kov/Pi50c
	53658.5729	7	I	$V+N$	Bor+Kov+Reg/Pi50c
WZ Sge	53654.2756	1	I	I	Csz/Pi100
	53654.3324	1	I	I	Csz/Pi100
DW UMa	53036.6561	1	I	R	Bor/Ba50
	53095.3973	5	I	R	Bor/Ba50
	53375.57700	6	I	V	Bor/Ba50
	53375.6520	1	II?	V	Bor/Ba50
	53465.32885	35	I	V, R	Bor/Ba50
	53465.4021	12	II?	V, R	Bor/Ba50
	53465.4652	5	I	V, R	Bor/Ba50
	53465.6019	2	I	V, R	Bor/Ba50
LP UMa[d]	53036.6476	4	I	R	Bor/Ba50
	53375.5212	5	II	V	Bor/Ba50
	53465.391	3	II	V, R	Bor/Ba50
	53465.5545	25	I	V, R	Bor/Ba50
TV UMi	53445.319	2	I	B, V, R	Bír/Ba50
	53445.5207	10	II	B, V, R	Bír/Ba50
Times of maxima of some SXPHE stars					
CY Aqr	53566.5233	7		V	Csz/Pi90
XX Cyg	53567.4231	5		V	Csz/Pi90
AE UMa	53716.5170	2		B, V, R, I	Kla/Pi100

Explanation of the remarks in the table:

Observer(s)/Instrument

[a]:XZD 1: The variability of this star was independently discovered by Xin et al. (2002) and by Sandquist & Shetrone (2003). Xin et al. (2002) made astrometry and their position was different from the one of star S 757, therefore SIMBAD Database[2] lists these objects as XZD 1 and S 757 (this later designation was used by Sandquist & Shetrone‘s paper and it refers to Sanders' (1977) star catalogue) so it seems to be two different stars in the SIMBAD. Comparing the positions and the finding chart of Xin et al. to each other, to our CCD frame and to Aladin picture we concluded that Xin et al. and Sandquist & Shetrone discovered the variability of the same star. The following cross-identifications are valid: S 757 = XZD 1 = Cl* NGC 2682 FBC 2976 = Cl* NGC 2682 MMJ 5405. [b]:AQ Com: In the night HJD 2453081, the secondary minima were approx. 0.1 mag deeper than the primary one. The period of this star seems to be constant, nevertheless, it is necessary to improve its value determined previously in Csizmadia & Borkovits (2001). The following new ephemeris was calculated: $MIN_I = 2451925.4991 + 0.2813312056 \times E$.

[c]: β Per: Due to the brightness of the system we had to use an additional neutral filter (denoted by N)

[d]: LP UMa: In the night HJD 2453465 especially strong asymmetry and O'Connell effect was observed

Acknowledgements:

P.L. and P.V.C. thank Patrick Wils for providing us with software. Part of these data were acquired with equipment purchased thanks to a research fund financed by the Belgian National Lottery (1999).

T.B. thank Dr. Miklós Rácz for supporting us with the neutral filter in order to make it possible to observe Algol itself with $Pi50$ telescope.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5685

Konkoly Observatory
Budapest
8 February 2006

HU ISSN 0374 – 0676

Z Gru AND GSC 9092-1397 ARE DOUBLE-MODE RR LYRAE VARIABLE STARS

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Recently a number of Galactic field double-mode RR Lyrae stars (type RRd) have been discovered in the publicly available data from the Northern Sky Variability Survey (*NSVS*; Wozniak et al., 2004) and the All Sky Automated Survey (*ASAS-3*; Pojmanski, 2002). The most recent discoveries were announced by Oaster, Smith & Kinemuchi (2005) and Wils, Lloyd & Bernhard (2006). Still, the number of field RRd stars is much lower than for example in the Large Magellanic Cloud (Alcock et al., 2000).

Further examination of the southern RR Lyrae stars listed by the *ASAS-3* survey, has revealed two more previously unknown double-mode RR Lyrae stars: Z Gru and GSC 9092-1397.

Table 1 lists fundamental light curve parameters for these stars, derived from the *ASAS-3* data. It includes values for the invariant Fourier parameters and for the generalized phase differences $G_{1,1}$ and $G_{-1,1}$ of the cross coupling terms $f_0 + f_1$ and $f_1 - f_0$ respectively as defined by Poretti and Pardo (1997). Formal uncertainties are given between parentheses in units of the last significant decimal. Also listed are the Galactic latitude b in degrees, the position and the total proper motion μ derived from the *UCAC2* catalogue (Zacharias et al., 2004), and the *2MASS* (Cutri et al., 2003) colour index. The electronic version of the IBVS contains direct links to the *ASAS-3* source data.

The plots in Figs. 1 to 4 give the phase diagrams for both stars for the fundamental mode and the first overtone mode, in both cases prewhitened for the other mode and its harmonics.

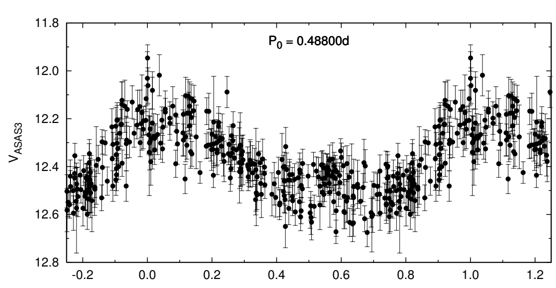

Figure 1. *ASAS-3* phased light curve for the fundamental period of Z Gru.

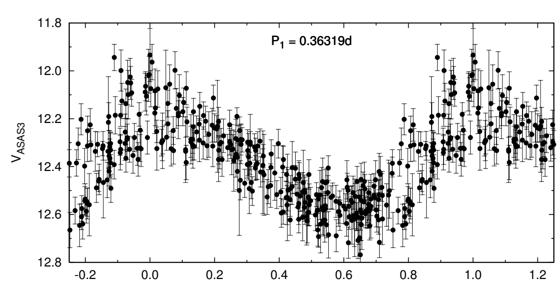

Figure 2. *ASAS-3* phased light curve for the first overtone period of Z Gru.

Table 1: Characteristics of the two new double-mode RR Lyrae stars

Star	GSC 9092-1397	Z Gru
V_{ASAS-3}	12.91-13.71	12.01-12.70
HJD Maximum	2452535.59	2452909.70
Period F (d)	0.49152(5)	0.48800(5)
Period 1O (d)	0.36574(3)	0.36319(3)
Period ratio	0.7441(1)	0.7442(1)
R_{21}(F)	0.23(5)	0.26(3)
R_{21}(1O)	0.21(4)	0.17(2)
Φ_{21}(F)	3.92(9)	3.65(10)
Φ_{21}(1O)	4.84(19)	4.99(10)
Amplitude ratio 1O/F	1.17(7)	1.30(5)
$G_{1,1}$	3.97(11)	3.92(8)
$G_{-1,1}$	3.56(18)	3.82(8)
b	−29.5	−46.5
RA (2000)	$19^{h}39^{m}33\overset{s}{.}50$	$21^{h}34^{m}37\overset{s}{.}12$
Dec (2000)	$-65°28'51\overset{''}{.}1$	$-49°07'28\overset{''}{.}6$
μ (mas/yr)	22.3	33.6
$J-K_s$	0.28	0.29

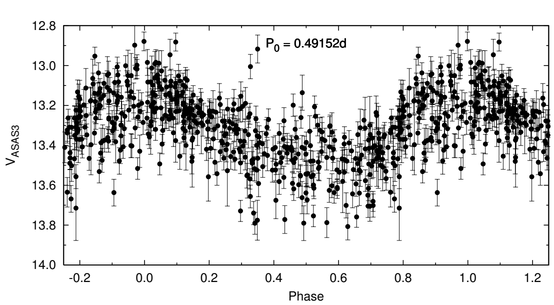

Figure 3. *ASAS-3* phased light curve for the fundamental period of GSC 9092-1397.

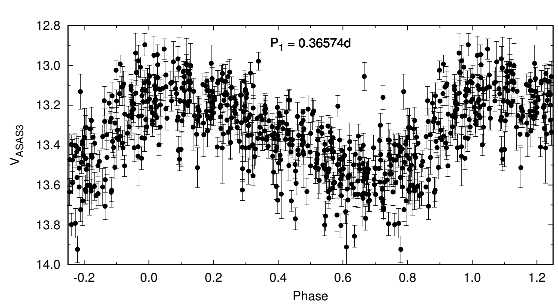

Figure 4. *ASAS-3* phased light curve for the first overtone period of GSC 9092-1397.

Table 2: Galactic field double-mode RR Lyrae stars

Star	f_0	f_1	Ratio	A_1/A_0	Ref.
GSC 4868-0831	1.7733	2.3764	0.7462	2.45	1
AQ Leo	1.8182	2.4369	0.746	1.65*	2
CU Com	1.8377	2.4645	0.7457	2	3
GSC 4421-1234	1.8491	2.4802	0.7456	2.25*	4
GSC 8936-2145	1.9335	2.5960	0.7448	1.37	1
EN Dra	1.9537	2.6228	0.7449	2.03	5
GSC 3059-0636	2.0243	2.7255	0.7427	0.38	6
GSC 9092-1397	2.0345	2.7342	0.7441	1.17	7
BS Com	2.0463*	2.7544*	0.7429*	1.42*	8
Z Gru	2.0492	2.7534	0.7442	1.30	7
V458 Her	2.0673	2.7780	0.7442	2.17*	4
GSC 3047-0176	2.1070	2.8330	0.7437	1.29*	9
V372 Ser	2.1220	2.8507	0.7444	1.4	10
GSC 8403-0647	2.1376	2.8754	0.7434	1.05	1
EM Dra	2.1518	2.8953	0.7432	1.18	5
V2493 Oph	2.1582	2.9050	0.7429	1.58	11
GSC 7411-1269	2.1680	2.9199	0.7425	0.98	1

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[1] Wils & Otero, 2005
[2] Jerzykiewicz & Wenzel, 1977
[3] Clementini et al., 2000
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[5] Clement, Kinman & Suntzeff, 1991
[6] Oaster, Smith & Kinemuchi, 2005
[7] This paper
[8] Bragaglia et al., 2003
[9] Koppelman et al., 2004
[10] García-Melendo, Henden & Gomez-Forrellad, 2001
[11] García-Melendo & Clement, 1997

Table 2 lists all isolated Galactic field double-mode RR Lyrae stars known in the literature, in the order of increasing fundamental frequency. The table also gives the first overtone frequency and the frequency and amplitude ratio. Missing values in the literature were derived from *NSVS* or *ASAS-3* data when possible and are marked with an asterisk. This list does not include the double-mode RR Lyrae stars found in the Galactic Bulge (Moskalik & Poretti, 2003; Pigulski et al., 2003; Mizerski, 2003), nor the Galactic foreground stars to the Sagittarius dwarf galaxy (Cseresnjes, 2001).
The double-mode nature of BS Com was suggested by Bragaglia et al. (2003), but *ASAS-3* and *NSVS* data demonstrate its reality.

Acknowledgements: Ennio Poretti and John Greaves are acknowledged for helpful comments. This research has utilised the *ASAS-3* public photometry catalogue and the SIMBAD and VizieR databases operated at the *Centre de Données Astronomiques (Strasbourg)* in France. Use was made of the data products from the *Two Micron All Sky Survey*, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5686

Konkoly Observatory
Budapest
15 February 2006

HU ISSN 0374 – 0676

THE GEOS RR Lyr SURVEY

Fourth list of maxima of RR Lyr stars observed by the automated telescope TAROT

(GEOS Circular RR 26)

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We present here the fourth list of light maxima of RR Lyrae stars from the GEOS RR Lyr Survey, a GEOS program (`http://www.upv.es/geos/`) (Boninsegna et al., 2002) of automated observations of RR Lyr stars started in January 2004. We are using the 25cm automatic telescope TAROT (`http://tarot.obs-hp.fr`) (Boër et al., 2001, Bringer et al., 1999) located in Calern Observatory (Observatoire de la Côte d'Azur, Nice University, France). Images are obtained by a 2048×2048 Marconi 42-40 thin back illuminated CCD. Field of view is $1^{\circ}\!.86\times1^{\circ}\!.86$. Data reduction, from bias subtraction and flatfielding to photometry using SExtractor (Bertin and Arnouts, 1996), is performed automatically. The aim of this legacy project for the study of period variations of RR Lyr stars is to monitor maxima of light of these stars in order to feed the GEOS RR Lyr web database (`http://dbRR.ast.obs-mip.fr`).

The present list contains 178 maxima observed with no filter between July and December 2005 (Table 1). The maxima are determined by fitting a polynomial function on the data points. The uncertainties on individual maxima are estimated from the data sampling of each maximum. The nominal sampling (two consecutive 30s exposures taken every 10 minutes on a time baseline of 2 hours centered around the predicted maximum time) may be altered by local events (weather or telescope operation). This results uncertainties from 0.002 to 0.010 day. For a well observed star, the mean uncertainty on maxima is about 0.003 day (4.3 minutes). The $O-C$'s are computed with the GCVS elements (Kholopov et al. 1985) and are displayed in table 1 in column "$O-C$". When no elements are available in the GCVS, the reference of the elements is given as a footnote of Table 1. XZ Cyg is also an exception for which we use the elements from Baldwin and Samolyk (2003).

Table 1: maxima of RR Lyrae stars

Variable	Maximum HJD 24...	$O-C$ (days)	E	Variable	Maximum HJD 24...	$O-C$ (days)	E
SW And	53613.478±0.002	−0.298	80223.	BH Aur	53704.637±0.002	−0.002	24015.
SW And	53624.535±0.003	−0.298	80248.	BH Aur	53715.582±0.003	−0.003	24039.
SW And	53644.439±0.002	−0.297	80293.	AH Cam	53614.532±0.002	−0.004	40368.
SW And	53667.437±0.002	−0.297	80345.	AH Cam	53624.491±0.004	−0.001	40395.
SW And	53671.416±0.002	−0.299	80354.	AH Cam	53655.466±0.006	0.000	40479.
SW And	53682.471±0.004	−0.301	80379.	AH Cam	53696.400±0.002	0.005	40590.
SW And	53695.300±0.003	−0.298	80408.	AH Cam	53723.301±0.002	−0.012	40663.
SW And	53710.334±0.002	−0.301	80442.	AH Cam	53725.500±0.002	−0.025	40669.
SW And	53721.391±0.002	−0.301	80467.	RW Cnc	53712.549±0.002	0.197	25870.
XX And	53597.527±0.003	0.218	20076.	RW Cnc	53718.570±0.002	0.199	25881.
XX And	53623.538±0.005	0.211	20112.	TT Cnc	53705.586±0.002	0.094	24423.
XX And	53644.508±0.002	0.221	20141.	TT Cnc	53714.597±0.002	0.090	24439.
XX And	53699.435±0.002	0.219	20217.	TT Cnc	53718.543±0.004	0.092	24446.
XX And	53712.442±0.003	0.217	20235.	AN Cnc	53714.508±0.002	0.133	28139.
XX And	53720.393±0.002	0.217	20246.	AN Cnc	53733.514±0.004	0.128	28174.
XX And	53733.402±0.002	0.217	20264.	AS Cnc	53715.546±0.003	−0.285	23506.
AT And	53588.541±0.003	−0.002	18228.	EZ Cnc [1]	53691.632±0.005	−0.023	11979.
AT And	53614.454±0.010	0.001	18270.	EZ Cnc [1]	53708.544±0.002	−0.030	12010.
AT And	53630.489±0.003	−0.004	18296.	EZ Cnc [1]	53714.544±0.003	−0.033	12021.
AT And	53669.361±0.010	0.003	18359.	AL CMi	53714.497±0.010	0.445	31093.
AT And	53698.345±0.005	−0.008	18406.	IU Cas	53695.516±0.010	−0.143	38417.
AT And	53701.436±0.004	−0.002	18411.	V363 Cas	53616.384±0.005	0.512	31971.
AT And	53711.303±0.003	−0.006	18427.	V363 Cas	53657.364±0.005	0.502	32046.
CI And	53644.402±0.003	0.094	36982.	V363 Cas	53669.392±0.005	0.506	32068.
CI And	53669.607±0.003	0.094	37034.	RR Cet	53623.538±0.004	0.002	36964.
CI And	53670.578±0.002	0.096	37036.	RR Cet	53644.556±0.005	0.005	37002.
CI And	53671.546±0.003	0.094	37038.	RR Cet	53669.439±0.005	0.001	37047.
CI And	53723.406±0.002	0.089	37145.	RR Cet	53695.435±0.005	0.005	37094.
DR And	53615.472±0.003	−0.028	29115.	RR Cet	53699.307±0.003	0.006	37101.
DR And	53624.489±0.006	−0.020	29131.	RR Cet	53705.388±0.001	0.004	37112.
DR And	53699.398±0.002	−0.006	29264.	RR Cet	53710.363±0.005	0.001	37121.
DR And	53703.341±0.002	−0.005	29271.	RR Cet	53720.318±0.003	0.002	37139.
DR And	53708.405±0.002	−0.009	29280.	UY Cyg	53558.504±0.002	0.055	55510.
DR And	53712.342±0.002	−0.014	29286.	UY Cyg	53581.489±0.003	0.051	55551.
SW Aqr	53570.505±0.005	0.005	61992.	UY Cyg	53595.507±0.003	0.051	55576.
SW Aqr	53581.522±0.003	−0.001	62016.	UY Cyg	53613.448±0.003	0.050	55608.
SW Aqr	53587.497±0.002	0.003	62029.	XZ Cyg [2]	53587.461±0.002	0.005	10752.
SW Aqr	53598.520±0.002	0.003	62053.	XZ Cyg [2]	53608.449±0.003	−0.004	10797.
SW Aqr	53616.429±0.002	−0.001	62092.	XZ Cyg [2]	53614.516±0.004	−0.003	10810.
SX Aqr	53585.509±0.003	−0.101	25740.	XZ Cyg [2]	53615.451±0.002	−0.001	10812.
SX Aqr	53643.365±0.005	−0.102	25848.	XZ Cyg [2]	53630.388±0.005	0.005	10844.
TZ Aqr	53583.466±0.003	0.000	28072.	DM Cyg	53568.522±0.004	0.059	26165.
TZ Aqr	53615.467±0.002	0.014	28128.	DM Cyg	53600.426±0.003	0.054	26242.
CP Aqr	53566.486±0.008	−0.099	33841.	DM Cyg	53616.378±0.003	0.051	26280.
CP Aqr	53585.481±0.002	−0.104	33882.	DM Cyg	53671.382±0.002	0.054	26411.
CP Aqr	53598.457±0.006	−0.103	33910.	V939 Cyg [3]	53608.518±0.005	0.031	9857.
AA Aql	53567.508±0.002	0.032	80766.	V939 Cyg [3]	53615.492±0.003	0.029	9875.
AA Aql	53583.426±0.003	0.032	80810.	BV Del	53558.489±0.005	0.022	66197.
V341 Aql	53566.498±0.002	0.029	21401.	DU Del	53596.497±0.010	0.185	43160.
V341 Aql	53581.521±0.003	0.024	21427.	DU Del	53613.450±0.010	0.200	43186.
V920 Aql	53581.520±0.002	−0.260	38412.	DX Del	53595.521±0.003	0.054	30105.
X Ari	53698.352±0.005	0.305	24748.	DX Del	53596.467±0.002	0.055	30107.
X Ari	53705.514±0.002	0.304	24759.	DX Del	53613.480±0.004	0.054	30143.
X Ari	53711.377±0.002	0.307	24768.	RW Dra	53554.425±0.004	0.147	32008.
TZ Aur	53705.531±0.001	0.013	86304.	BC Dra	53566.501±0.006	0.069	15687.
BH Aur	53648.538±0.004	−0.002	23892.	BC Dra	53597.455±0.005	0.082	15729.
BH Aur	53699.619±0.004	−0.003	24004.	BC Dra	53615.436±0.003	0.073	15755.

Table 1 (cont.): maxima of RR Lyrae stars

Variable	Maximum HJD 24...	$O-C$ (days)	E	Variable	Maximum HJD 24...	$O-C$ (days)	E
BC Dra	53630.550±0.010	0.076	15776.	X LMi	53712.556±0.003	0.190	21207.
BC Dra	53643.484±0.010	0.058	15794.	TT Lyn	53701.506±0.004	−0.029	28538.
BC Dra	53669.400±0.010	0.069	15830.	TT Lyn	53719.426±0.002	−0.032	28568.
BC Dra	53695.313±0.010	0.077	15865.	TW Lyn	53705.626±0.002	0.051	18020.
BC Dra	53705.387±0.002	0.077	15880.	TW Lyn	53718.637±0.002	0.052	18047.
BD Dra	53597.464±0.005	0.160	20071.	RZ Lyr	53597.407±0.003	−0.005	24282.
BD Dra	53643.408±0.008	0.158	20149.	CN Lyr	53598.467±0.004	0.015	22150.
BD Dra	53699.393±0.003	0.183	20244.	NQ Lyr	53567.480±0.002	0.006	60762.
BD Dra	53705.293±0.002	0.193	20254.	V452 Oph	53557.527±0.003	0.005	30332.
BD Dra	53712.344±0.004	0.175	20266.	VV Peg	53583.444±0.003	−0.024	29063.
BD Dra	53715.271±0.003	0.157	20271.	VV Peg	53624.468±0.004	−0.025	29147.
BD Dra	53719.395±0.005	0.158	20278.	VV Peg	53669.397±0.003	−0.027	29239.
BD Dra	53727.671±0.005	0.187	20292.	AV Peg	53582.571±0.002	0.096	25084.
BK Dra	53582.488±0.002	−0.151	47391.	AV Peg	53616.533±0.005	0.095	25171.
BK Dra	53585.447±0.002	−0.153	47396.	AV Peg	53643.471±0.002	0.098	25240.
BK Dra	53601.435±0.003	−0.151	47423.	BH Peg	53587.530±0.004	−0.103	22188.
BK Dra	53608.540±0.002	−0.151	47435.	BH Peg	53596.511±0.004	−0.096	22202.
RR Gem	53690.573±0.002	−0.345	31043.	BH Peg	53612.525±0.002	−0.106	22227.
RR Gem	53711.635±0.002	−0.340	31096.	CG Peg	53557.477±0.002	−0.043	30944.
RR Gem	53715.610±0.002	−0.339	31106.	CG Peg	53599.517±0.002	−0.046	31034.
GI Gem	53690.610±0.002	0.071	53879.	CG Peg	53613.534±0.002	−0.043	31064.
GI Gem	53733.502±0.002	0.070	53978.	CV Peg	53616.447±0.005	−0.057	51293.
VZ Her	53554.443±0.003	0.061	38075.	CV Peg	53643.464±0.008	−0.058	51341.
VZ Her	53557.526±0.003	0.061	38082.	DZ Peg	53595.529±0.003	0.156	32443.
GO Hya	53733.513±0.010	−0.049	44127.	DZ Peg	53612.535±0.002	0.157	32471.
CQ Lac	53698.459±0.010	0.109	30098.	DZ Peg	53696.342±0.004	0.150	32609.
RR Leo	53708.666±0.004	0.075	23018.	ES Peg	53558.462±0.003	0.147	29066.
RR Leo	53718.614±0.002	0.070	23040.	AR Per	53696.324±0.002	0.051	62177.
V LMi	53708.589±0.002	0.029	62837.	AR Per	53723.563±0.003	0.055	62241.
V LMi	53714.573±0.002	0.030	62848.	AB UMa	53733.590±0.020	0.100	29196.
V LMi	53720.556±0.002	0.029	62859.	BN Vul	53546.450±0.005	0.060	13492.
X LMi	53701.601±0.003	0.184	21191.	BN Vul	53587.450±0.004	0.065	13561.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5687

Konkoly Observatory
Budapest
15 February 2006

HU ISSN 0374 – 0676

THE FIRST LIGHT CURVE ANALYSIS OF HD 162905

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Wils and Dvorak (2003) were reported ten short period eclipsing binaries discovered on the images from Stardial system. HD 162905 is one of these eclipsing systems. Its spectral type was given as K0 in different catalogues like SAO and HD. According to the TYCHO catalog (ESA 1997), HD 162905 has a colour index of $0^{\rm m}_{.}587$, which it corresponds to the spectral type G0 (Gray 1992). Wils and Dvorak (2003) reported that HD 162905 is a W UMa type eclipsing binary, and they determined the light elements of this system as follows,

$$HJD\ (\mathrm{Min\ I}) = 24\ 52369.95 + 0^{\rm d}_{.}42651 \times E. \tag{1}$$

The poorly studied system HD 162905 is observed during the total of 9 nights in the years 2003 and 2005 using Johnson B, V and R filters with high-speed three-channel photometer attached to 48 cm Cassegrain type telescope of Ege University Observatory. HD 162776 and HD 162775 are chosen as the comparison and the check stars, respectively. Following traditional reduction procedure, we obtained differential magnitudes, in the sense variable minus comparison, and corrected for atmospheric extinction. The extinction coefficients were calculated for each filter using the observed magnitudes of the comparison star. The times were also reduced to the Sun's center. The nightly mean standard errors were $0^{\rm m}_{.}009$, $0^{\rm m}_{.}008$ and $0^{\rm m}_{.}007$ in B, V, and R filters, respectively. It is also observed the standard stars BD $-00^\circ 3356$ ($V = 10^{\rm m}_{.}353$, $B - V = 0^{\rm m}_{.}609$) and BD $-00^\circ 3353$ ($V = 9^{\rm m}_{.}332$, $B - V = 1^{\rm m}_{.}462$) from the list of Landolt (1992) during the observing run. The standard magnitudes of the stars obtained from observations were listed in Table 1. These values contain the effect of the interstellar reddening. In Table 2, we presented the depths of the light minima for B, V, and R colours. As can be seen from Table 2 the depths for both minima are nearly same for each colour, and they become shallower at longer wavelengths. The continuous light change throughout whole phases implying the proximity of both components in all colours, the reddening of the colours during the minima, and the similarity of the depths of the minima reflects the characteristics of W UMa type binaries. The light curves obtained in the years 2003 and 2005 do not show O'Connell effect, and there is no difference in the brightness level of the light curves during the observing years.

During the observing season, we observed one time of mid-primary and one time of mid-secondary minimum during the 2005 observation season (in B, V, and R filters) and listed in Table 3. The times of minima obtained in the year 2003 were published by Taş et al. (2004). A linear ephemeris (Eq. 1) was applied to obtain differences between the observed and the computed times. To correct the light elements, we applied the linear least-squares method to $O-C$ (I) values of the primary and the secondary minima using equal weights for each. We determined the new light elements as follows, and we used to calculate the orbital phases,

Table 1: The standard magnitudes for the stars of observing program.

Star	HD	V	$B-V$	$V-R$
Comparison	162776	$9^{m}_{.}423$ (±5)	$0^{m}_{.}487$ (±7)	$0^{m}_{.}315$ (±3)
Check	162775	$7^{m}_{.}510$ (±2)	$1^{m}_{.}362$ (±4)	$0^{m}_{.}715$ (±3)

Table 2: The depths of the minima for HD 162905.

Filter	MIN I	MIN II
B (mag)	0.170	0.165
V (mag)	0.163	0.151
R (mag)	0.159	0.147

Table 3: New times of the light minima of HD 162905.

HJD (24 00000 +)	E	$O-C$ (I) (days)	$O-C$ (II) (days)	Filter	Type
53558.4221 (±5)	−16.5	−0.0004	0.0010	B, V, R	II
53565.4591 (±5)	0.0	−0.0008	0.0006	B, V, R	I

Table 4: The synthetic light curve parameters for HD 162905.

Parameter	The solution results
$x_{1B}=x_{2B}$	0.789
$x_{1V}=x_{2V}$	0.684
$x_{1R}=x_{2R}$	0.582
g_1 , g_2	0.32, 0.32
A_1 , A_2	0.500, 0.500
i (°)	54.22 (20)
T_1, T_2 (K)	5720 (fixed), 5636 (17)
$\Omega_1=\Omega_2$	3.022 (7)
q (m_2/m_1)	0.55 (fixed)
$L_1/(L_1+L_2)$	0.661 (57)(B), 0.655 (43)(V), 0.652 (35)(R)
r_1, r_2 (pole)	0.398 (1), 0.299 (1)
r_1, r_2 (point)	0.498 (5), 0.377 (6)
r_1, r_2 (side)	0.421 (2), 0.311 (2)
r_1, r_2 (back)	0.446 (2), 0.339 (2)

$$HJD \text{ (Min I)} = 24\ 53565.4585\ (\pm 21) + 0^{d}_{.}426511\ (\pm 1) \times E. \qquad (2)$$

We used all averaged observing points obtained in each filter during two years for the light curve analysis, after we normalized to the light maximum, namely with the flux at phase 0.25. B, V, and R light curves consisting of the normal points obtained in the years 2003 and 2005 were solved simultaneously by using the latest version of Wilson - Devinney code (Wilson and Van Hamme 2003). Starting with the assumption that the system is detached (Mode 2), the differential corrections always converged to a Mode 3 solution (contact mode). Since there is no spectroscopic classification of the components and neither primary nor secondary minimum is not total eclipse, we assumed that the temperature for Star 1 (T1) is 5720 K, determined from the colour index of $B-V = 0^{\rm m}.648$ at phase 0.25 using Tables of Flower (1996), and we fixed it during the analyse. We started to solve the light curve using different values for the mass ratio of the system. Then, we obtained the light curve solutions for the specific values of the mass ratio between 0.1 and 2.0. However, all fits in the range of q obtained between 0.4 and 0.8 give similar residuals, the resulting sum of square of residuals of the converged solutions for each value of q indicates that the fitting is the best for $q = 0.55$, and thus, the other adopted parameter was q during the light curve analysis. In final solution we also adjusted l_3. Although the results of the Wilson-Devinney code always gives the positive luminosity value of the third light, its error from solution is fairly large respect to the contribution to the total light, and therefore, we decided to omit it from analyse.

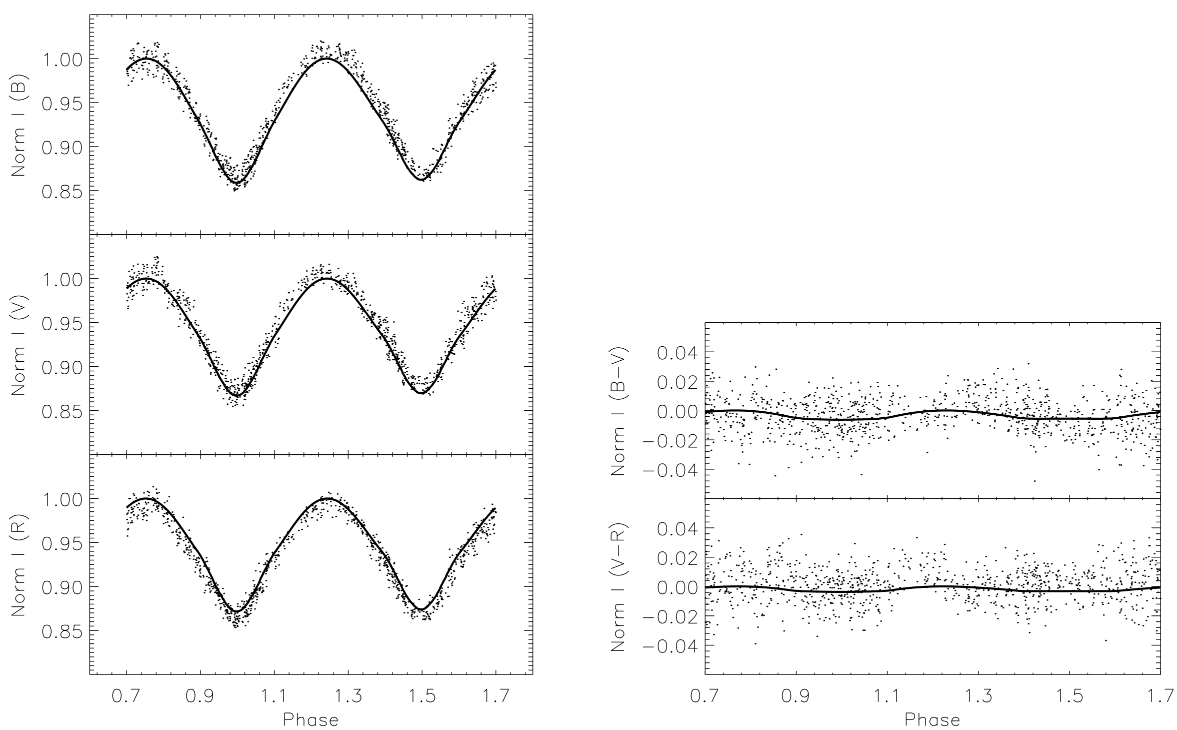

Figure 1. The comparison of the observed and synthetic light curves in the filters B, V and R, normalized to unity at phase 0.25, top to bottom, respectively, are shown in the left panel. In the right panel, the normalized colour curves of the system are compared with calculated synthetic ones.

The final results of the light curve analyse are presented in Table 4. The computed light and colour curves are compared with the observations in Fig. 1. The parameters of our solution indicate that the hotter component is larger and massive star, while the cooler component is smaller and less massive one. This indicate that HD 162905 is an A-subtype W UMa system according to the classification of Binnendijk (1970). Although it is an eclipsing binary exhibiting an EW-type light curve according to our observations, the results of the photometric solution reveal that HD 162905 is both components are almost filling their Roche lobes. Therefore, the system should be at the out of contact phase of the thermal - relaxation oscillation of W UMa type stars like BL Eri (Yamasaki et al. 1988) and TW CrB (Zhang and Zhang 2003).

Acknowledgement: The authors would like to thank to K. Oláh and T. Borkovits for their useful comments and advices.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5688

Konkoly Observatory
Budapest
2 March 2006

HU ISSN 0374 – 0676

THE FIRST GROUND-BASED PHOTOMETRY OF V1123 TAURI

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Equatorial coordinates:	**Equinox:**
R.A.= $03^h34^m58^s.55$ **DEC.=** $+17°42'38''$	2000.0

Observatory and telescope:
Ege University Observatory, 48 cm Cassegrain telescope.

Detector:	High Speed Three-Channel Photon counting photometer (HSTCP).

Filter(s):	UBVR

Date(s) of the observation(s):
2003.11.19, 2003.11.20, 2003.12.02, 2005.09.10, 2005.09.11, 2005.10.05, 2005.10.14

Comparison star(s):	BD +17°567

Check star(s):	BD +17°568

Transformed to a standard system:	Yes
Standard stars (field) used:	HD 24537 (Landolt 1983) HD 285703 (Oja 1996)

Availability of the data:
upon request

Type of variability:	EW

Remarks:

V1123 Tau is a Beta Lyrae type eclipsing binary (G0, V_{max}=$9^{m}_{.}87$) according to the Hipparcos catalogue (ESA 1997), and it is listed as a W UMa type binary by Kazarovets et al. (1999). We obtained two times of mid-primary and two times of mid-secondary eclipse during the 2005 observing season (in U, B, V, and R filters), and listed in Table 1. Because the times of minima obtained in 2003 has been already published by Taş et al. (2004), they are not included in Table 1. The $O-C$ was represented by a linear ephemeris, and least-squares solution leads to the following ephemeris,

$$\text{HJD Min I} = 24\,53658.5149(4) + 0^{d}_{.}3999478\ (2) \times E$$

We calculated the phases corresponding to the new light elements and presented the light and colour variations of V1123 Tau for 2003 and 2005 in Figures 1 and 2, respectively. The continuous light variation reflects the proximity of the components. The colour curves get redder for both primary and secondary minima. The primary and secondary minima have similar depths. These are common properties of W UMa type contact systems. The depths of primary and secondary minima are listed in Table 2. In the 2003 light curve, Max II is brighter than Max I by 0.032, 0.023, 0.021, and 0.013 mags in U, B, V, and R filters, respectively. In the 2005 light curves the magnitudes of the maxima are nearly equal. The values of V magnitude and colours at phase 0.75 for both observing years are nearly the same; $V = 9^{m}_{.}667$ and $U-B = 0^{m}_{.}226$, $B-V = 0^{m}_{.}684$, $V-R = 0^{m}_{.}407$. This $B-V$ colour corresponds to the spectral type G6 V (Gray 1992).

Table 1: The times of light minima of V1123 Tau.

HJD (24 00000 +)	E	$O-C$ (I) (day)	$O-C$ (II) (day)	Filter	Type	Reference
53624.5198(±3)	−85.0	0.0011	0.0004	UBVR	I	This study
53625.5179(±3)	−82.5	−0.0008	−0.0014	UBVR	II	This study
53649.5159(±3)	−22.5	−0.0002	−0.0002	UBVR	II	This study
53658.5151(±4)	0.0	0.0000	0.0002	UBVR	I	This study

Table 2: The depths of the eclipses with respect to the second maximum.

	2003		2005	
	Min I	Min II	Min I	Min II
U (mag)	0.413	0.405	0.409	0.408
B (mag)	0.389	0.363	0.371	0.365
V (mag)	0.368	0.367	0.344	0.339
R (mag)	0.352	0.335	0.333	0.328

Acknowledgements:

This study has been partly supported by EBILTEM (Ege Universitesi Bilim Teknoloji Uygulama ve Araştırma Merkezi).

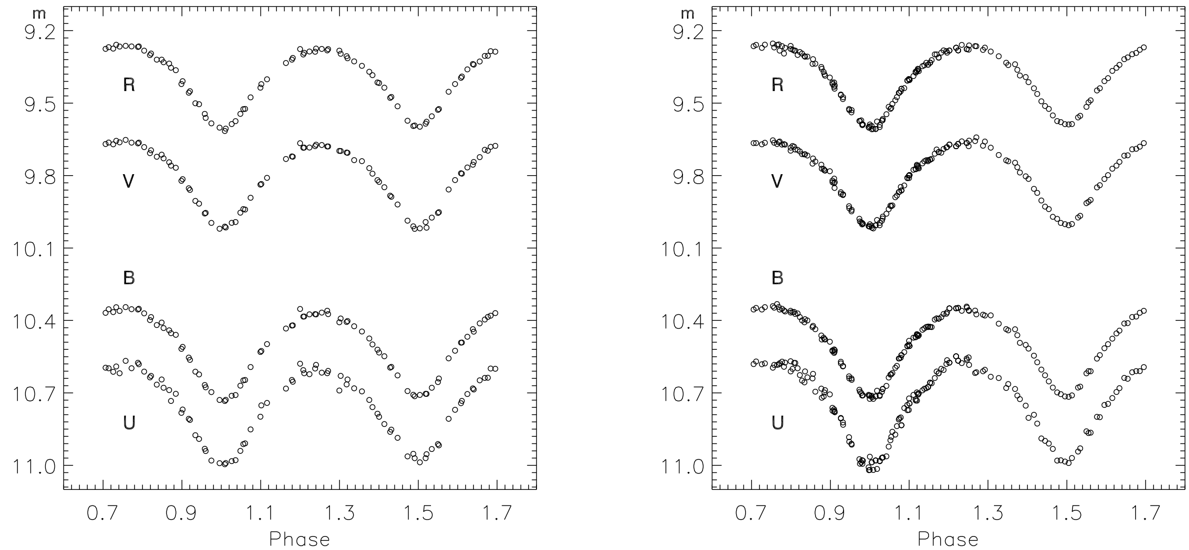

Figure 1. The light variations of V1123 Tau obtained using U, B, V, and R filters in the years 2003 (the left panel) and 2005 (the right panel).

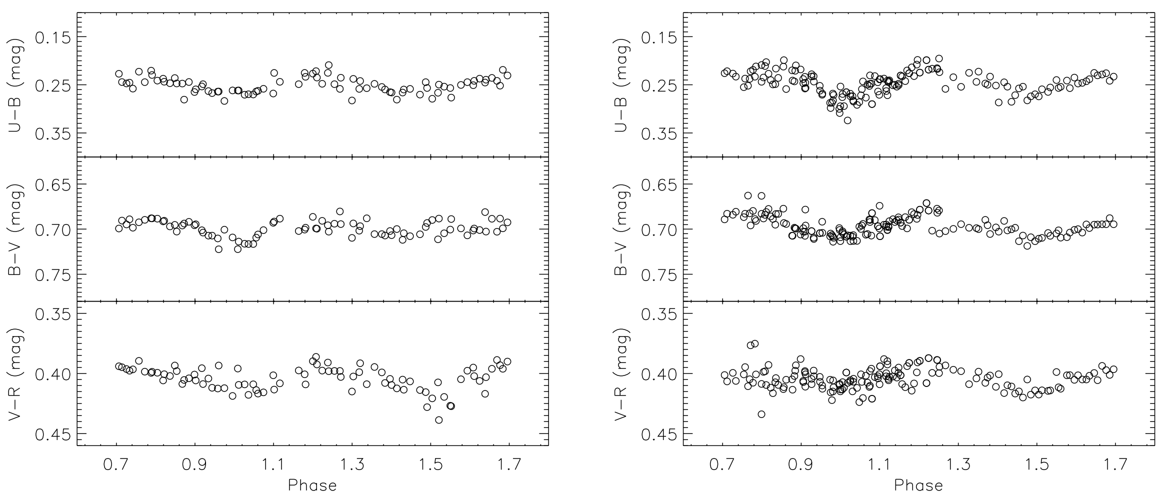

Figure 2. The colour curves of V1123 Tau belong to the years 2003 (the left panel) and the 2005 (the right panel).

References:

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5689

Konkoly Observatory
Budapest
2 March 2006

HU ISSN 0374 – 0676

PHOTOMETRIC ANALYSIS OF THE CONTACT BINARY V513 HERCULIS

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Hoffmeister (1959) discovered variability in the light of V513 Herculis (Son 5300, GSC 2076-01720, $\alpha(2000) = 17^{\rm h}40^{\rm m}22^{\rm s}$, $\delta(2000) = +24^\circ 15' 47''$) and classified it as a W UMa system. He observed 50 times of minimum (Hoffmeister 1960) and gave an ephemeris of $2430024.654 + 0.3037689 \cdot \mathrm{E}$. Two times of minimum by Krajci (see Nelson 2004) in 2004 complete the list of previous observations. Apparently, no other observations have been published prior to 2005 and no study of the light curve has ever been done.

Photometric observations of V513 Her were made on seven nights between June 18 and August 19, 2004, using the 46-cm Ritchey-Chrétien telescope with attached Santa Barbara Instrument Group (SBIG) ST-8XE CCD camera equipped with standard Johnson UBVRI filters. An SBIG ST-4 camera attached to the finder served as the tracking camera.

The images were calibrated and the magnitudes extracted using standard image reduction procedures with MIRA Pro (Mirametrics Inc.). Differential magnitudes in the natural system are available upon request of author NLM. Approximately 170 observations were made in each of the R, I, and V filters of V513 Her.

The comparison and check star data for V513 Her were as follows: comparison star (C)(GSC 02076-01849, $\alpha(2000) = 17^{\rm h}40^{\rm m}18\overset{\rm s}{.}6$, $\delta(2000) = +24^\circ 16' 3\overset{''}{.}6$); check star (K1) (GSC 02076-01976, $\alpha(2000) = 17^{\rm h}40^{\rm m}24\overset{\rm s}{.}74$, $\delta(2000) = +24^\circ 15' 11\overset{''}{.}2$); and check star (K2) (GSC 02076-01885, $\alpha(2000) = 17^{\rm h}40^{\rm m}25\overset{\rm s}{.}1$, $\delta(2000) = +24^\circ 16' 43^{\rm s}$). These stars are labeled in Figure 1.

We observed two primary and three secondary minima for V513 Her. The mean epochs of minimum light were determined from these eclipses using the bisection of chords. Table 1 contains the average times of minima for the three observed colors. The five minima of Table 1, together with the previously minima yield the following new ephemeris.

$$\mathrm{HJD\ Tmin\ I} = 2453282.58088 + 0.3037690\ \mathrm{d} \times \mathrm{E}. \qquad (1)$$

We have calculated models for the light curves of V513 Her using the Wilson-Devinney code (Wilson 1993). Common parameters that were varied include inclination of the orbit (i), temperature of the secondary star (T_2), modified potential of the stars ($\Omega_1 = \Omega_2$), mass ratio (q), relative luminosity of the primary star (L_1), and monochromatic linear limb darkening coefficient of the primary star ($x_1 = x_2$). We assumed the star to be a

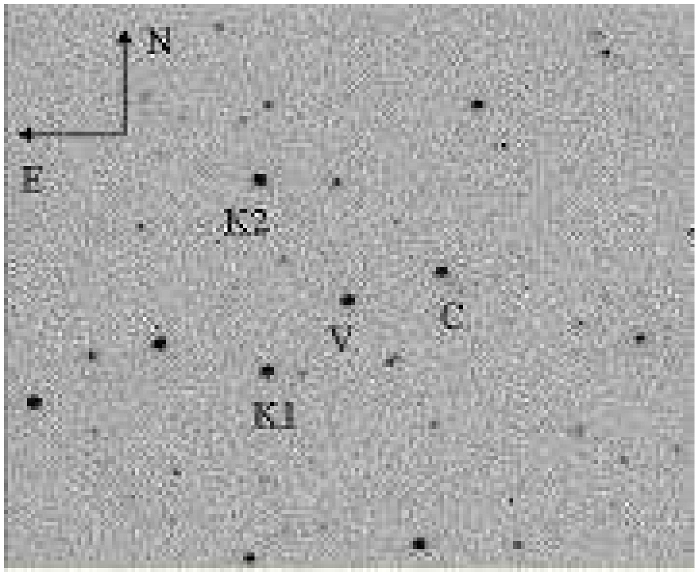

Figure 1. Finder chart V513 Her

Table 1. Times of Minimum Light

JD Hel. 2450000+	Min	O-C (days)
3175.8112	II	0.0023
3188.7198	I	0.0008
3192.6689	I	0.0009
3193.7325	II	0.0013
3200.7194	II	0.0015

contact binary system (Mode 3). The values of gravity brightening and bolometric albedo were set at their suggested values for convective atmospheres (Lucy 1968), i.e., $G_1 = G_2 = 0.32$, $A_1 = A_2 = 0.5$. Synchronous rotation was assumed for each star ($F_1 = F_2 = 1.0$). Linear limb darkening coefficients were initialized at the model atmosphere values of Carbon and Gingerich (1969). The model atmosphere option was employed for each star.

Since no previous analytical work has been done on V513 Her (in particular, no spectroscopy), we devised a method to estimate the temperature of the primary star (T_1). We observed the cluster IC 4665, computing all available color indices for stars of known spectral type (Henden and Kaitchuck 1982). This cluster was chosen for having stars of widely ranging spectral types. We then compared these color indices to the observed color indices for V513 Her. We used color index values observed near secondary minimum for V513 Her in order to minimize contributions from the secondary star. From these comparisons, we estimate the spectral type of primary star to be F5, resulting in a temperature of 6600 K (Johnson 1965).

The solution presented here comes from careful examination of the matrix of correlation coefficients and the use of the method of multiple subsets (Wilson and Biermann 1976). Solution was taken to be achieved when the parameter corrections all fell below their probable errors for all subsets. The errors listed in Table 2 are the formal errors of the partial differential least squares technique employed in the Wilson-Devinney method. The values of the errors are used as a guide in determining the number of decimal places each parameter is given. We should note that the actual errors of the parameter determination may be higher.

The solution makes V513 Her a typical, A-type W UMa system. A steady period, a temperature of 6600 K for the primary star, and no evidence of spots supports the stable environment associated with A-type systems. The solution indicates only a slightly over contact system with a fill out factor of 10.3%.

Table 2. Wilson-Devinney Solution for V513 Her

Wavelength Independent Parameters - Mode3

i	T_1	T_2	Ω_1	Ω_2	q	F_1	F_2	G_1	G_2	A_1	A_2
74.80	6600 K	6071 K	3.436	3.436	0.840	1.00	1.00	0.32	0.32	0.5	0.5
±0.34		±65	±0.021		±0.010						

Wavelength Dependent Parameters

Band	L_1	L_2	x_1	x_2
Vis	0.623	0.377	0.6	0.6
	±0.014		±0.1	
Red	0.606	0.393	0.6	0.6
	±0.011		±0.1	
IR	0.594	0.406	0.6	0.6
	±0.008		±0.1	

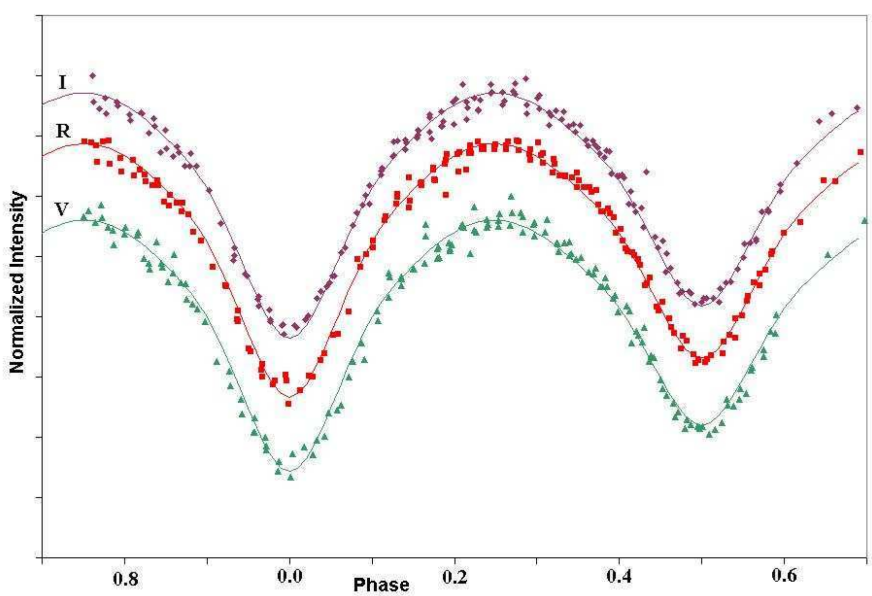

Figure 2. Light curves for V513 Her

Solid curves are the Wilson-Devinney solution given above

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5690

Konkoly Observatory
Budapest
2 March 2006

HU ISSN 0374 – 0676

PHOTOELECTRIC MINIMA OF SOME ECLIPSING BINARY STARS

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Observatory and telescope:
Observations were initially conducted in Albuquerque, New Mexico from an urban yard under moderate light pollution, and later in Cloudcroft, New Mexico under dark skies. 28cm Schmidt-Cassegrain, 2640 mm focal length. German equatorial mount.

Detector:	SBIG ST-7E, −25°C, covering 8×5 arcminutes, 18 micron pixels (binned 2×2). Unfiltered.

Method of data reduction:
All CCD frames calibrated with bias, dark, and flat frames using AIP4WIN software. Differential aperture photometry performed using AIP4WIN software†.

Method of minimum determination:
Digital tracing paper method, bisection of chords, curve fitting, and (occasionally) Kwee and van Woerden (1956).

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
UU And	53390.6446	0.0001	I	None	
HU And	53383.6564	0.0010	II	None	
HU And	53386.6583	0.0006	I	None	
HV Aqr	53562.9286	0.0002	I	None	
V0936 Aql	53551.8549	0.0003	I	None	
V1647 Aql	53552.8633	0.0004	II	None	
V1647 Aql	53554.9500	0.0006	I	None	
SZ Ari	53303.9399	0.0003	I	None	
DO Aur	53290.9805	0.0002	I	None	
DO Aur	53296.8987	0.0005	II	None	
FV Aur	53341.9457	0.0004	I	None	
II Aur	53295.0000	0.0004	I	None	
V0355 Aur	53359.6683	0.0028	I	None	Period 17.6437d
CP Cam	53364.7472	0.0002	I	None	
XZ Cnc	53398.9169	0.0004	I	None	
AC Cnc	53496.6341	0.0002	I	None	
AH Cnc	53437.7466	0.0012	I	None	
BI CVn	53422.9478	0.0002	I	None	
DM CVn	53406.0036	0.0006	I	None	

† AIP4WIN software available at: `http://www.willbell.com/aip/index.htm`

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
SZ CMa	53441.7343	0.0003	I	None	
AD CMa	53438.7463	0.0004	I	None	
CZ CMa	53472.6424	0.0006	I	None	Period 0.819000d
TX CMi	53320.9432	0.0002	I	None	
TX CMi	53353.8320	0.0002	II	None	
AV CMi	53354.8487	0.0002	II	None	Secondary displaced to phase 0.567
AV CMi	53364.9467	0.0002	I	None	
AQ Cap	53558.8997	0.0005	I	None	
RZ Cas	53431.6769	0.0001	I	None	
GK Cas	53370.6791	0.0002	I	None	
MR Cas	53349.6018	0.0003	I	None	Period 0.435222d
MR Cas	53359.6116	0.0002	I	None	
MR Cas	53364.6170	0.0003	II	None	
NU Cas	53362.5623	0.0004	I	None	
V0361 Cas	53288.8869	0.0002	I	None	
FH Cep	53379.6191	0.0020	I	None	
GW Cep	53363.6701	0.0002	I	None	
NR Cep	53365.5746	0.0004	I	None	
WY Cet	53377.5879	0.0002	I	None	
YY Cet	53388.6423	0.0005	I	None	
DY Cet	53370.5634	0.0003	I	None	
CM Com	53430.8923	0.0002	I	None	Period 0.554515d
EK Com	53405.0020	0.0002	II	None	
NU Cyg	53309.5762	0.0003	I	None	
NU Cyg	53315.6228	0.0003	II	None	
QW Cyg	53301.5852	0.0005	I	None	
QW Cyg	53303.6435	0.0004	II	None	
V0490 Cyg	53256.6755	0.0001	I	None	
V0490 Cyg	53260.6752	0.0003	II	None	Secondary displaced to phase 0.508
V0693 Cyg	53308.6092	0.0003	I	None	
V0693 Cyg	53312.5802	0.0004	II	None	
V0803 Cyg	53327.5486	0.0006	I	None	
V0842 Cyg	53302.6309	0.0004	I	None	
V0842 Cyg	53336.5620	0.0015	II	None	
V0842 Cyg	53339.5750	0.0020	I	None	
V0884 Cyg	53340.5786	0.0002	I	None	
V0907 Cyg	53277.6193	0.0006	I	None	Period 0.541365d
V0907 Cyg	53335.5456	0.0005	I	None	
V0907 Cyg	53345.5604	0.0004	II	None	
V0931 Cyg	53297.5772	0.0005	II	None	
V0931 Cyg	53306.6318	0.0005	I	None	
V0979 Cyg	53286.6933	0.0003	I	None	
V0979 Cyg	53290.6178	0.0003	II	None	
V1045 Cyg	53271.6341	0.0002	I	None	
V1045 Cyg	53273.6476	0.0012	II	None	
V1189 Cyg	53321.5616	0.0004	I	None	
V1189 Cyg	53335.6270	0.0004	II	None	
FR Del	53275.6673	0.0006	I	None	
FR Del	53279.6834	0.0012	II	None	
LU Dra	53554.6673	0.0025	I	None	
AM Eri	53410.6157	0.0002	I	None	
GZ Gem	53342.9039	0.0002	I	None	Period 0.612503d
GZ Gem	53383.9423	0.0004	I	None	
V0501 Her	53511.8879	0.0003	II	None	Secondary displaced to phase 0.479
V0501 Her	53550.7611	0.0010	I	None	
V0513 Her	53280.6102	0.0003	II	None	
V0513 Her	53282.5837	0.0008	I	None	

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
V0731 Her	53265.5900	0.0010	II	None	
V0731 Her	53266.6510	0.0008	I	None	
V0731 Her	53269.6381	0.0002	I	None	
V0742 Her	53254.6583	0.0002	I	None	
VX Lac	53394.5872	0.0001	I	None	
AG Lac	53320.6757	0.0004	I	None	
AG Lac	53337.6005	0.0007	II	None	
LU Lac	53348.6273	0.0004	I	None	
LU Lac	53383.5881	0.0010	I	None	
LU Lac	53384.6334	0.0005	II	None	
BW Leo	53385.9134	0.0008	I	None	
BW Leo	53399.9136	0.0003	II	None	
T LMi	53502.6573	0.0001	I	None	
RV Lib	53479.7613	0.0018	I	None	
SS Lib	53526.8560	0.0004	I	None	
TY Lib	53509.7925	0.0001	I	None	
VZ Lib	53438.8952	0.0003	I	None	Period 0.358255d
AA Lib	53540.6664	0.0004	I	None	
AE Lib	53512.7166	0.0007	I	None	
BW Lib	53515.7327	0.0003	I	None	
ES Lib	53439.9745	0.0008	I	None	Period 0.883042d
ES Lib	53466.9120	0.0010	II	None	
FU Lib	53481.8796	0.0002	I	None	
FW Lib	53552.7437	0.0003	I	None	Period 2.24278d
GI Lib	53511.7209	0.0001	I	None	
GK Lib	53473.9609	0.0001	I	None	Period 2.116464d
GV Lib	53540.7386	0.0003	I	None	
GV Lib	53553.6436	0.0008	II	None	Secondary displaced to phase 0.510.
GY Lib	53528.6759	0.0002	I	None	
HQ Lib	53551.6482	0.0006	I	None	
IL Lib	53526.6623	0.0015	I	None	
IT Lib	53527.6762	0.0010	I	None	
WW Lyn	53377.0729	0.0080	I	None	Period 5.81237d
V0417 Lyr	53287.6162	0.0003	II	None	
V0417 Lyr	53288.6689	0.0005	I	None	
V0429 Lyr	53355.5560	0.0004	I	None	
DW Mon	53385.7150	0.0004	I	None	
FV Mon	53377.7700	0.0004	I	None	
HM Mon	53331.9214	0.0004	I	None	
HP Mon	53398.7696	0.0001	I	None	
IM Mon	53432.6380	0.0015	I	None	
V0383 Mon	53439.7277	0.0100	I	None	
V0383 Mon	53474.6296	0.0003	I	None	
V0384 Mon	53396.7042	0.0009	I	None	
V0384 Mon	53410.6861	0.0006	II	None	
V0457 Mon	53389.6872	0.0004	I	None	
V0457 Mon	53399.6724	0.0003	II	None	
V0464 Mon	53473.6687	0.0006	I	None	
V0515 Mon	53441.6251	0.0002	I	None	
V0524 Mon	53431.6135	0.0002	I	None	
V0635 Mon	53405.7374	0.0009	I	None	
V1016 Oph	53544.7038	0.0003	II	None	Period 0.407161d
V1016 Oph	53552.6465	0.0005	I	None	
V1022 Oph	53432.9905	0.0003	I	None	Period 0.239497d
V1022 Oph	53472.8668	0.0002	II	None	
V1120 Oph	53461.9671	0.0003	I	None	
V1120 Oph	53474.9337	0.0003	II	None	
V1677 Oph	53469.9700	0.0003	I	None	
V1677 Oph	53472.9871	0.0005	II	None	

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
V1811 Oph	53482.8990	0.0009	II	None	
V1811 Oph	53495.9456	0.0019	I	None	
V2377 Oph	53272.6344	0.0013	I	None	
VV Ori	53422.6298	0.0010	I	None	
ES Ori	53358.8185	0.0004	I	None	
FK Ori	53308.9866	0.0002	I	None	
V0641 Ori	53430.6416	0.0002	II	None	
V0645 Ori	53348.9153	0.0001	I	None	
V0667 Ori	53294.0073	0.0004	I	None	
V1016 Ori	53352.2943	0.0080	I	None	
V1027 Ori	53442.7711	0.0025	II	None	Secondary displaced to phase 0.555
BQ Peg	53368.6013	0.0005	I	None	
CF Peg	53341.5907	0.0003	II	None	
CF Peg	53342.6239	0.0003	I	None	
EY Peg	53280.7213	0.0004	I	None	
HI Peg	53346.6818	0.0010	I	None	
DV Per	53261.9751	0.0003	I	None	
DX Per	53362.6586	0.0004	I	None	
FW Per	53404.5994	0.0001	I	None	
V0364 Per	53260.9584	0.0002	I	None	Correct coords $02^h44^m01^s+36°17'29''$. Also known as GSC 2337-0333
V0364 Per	53302.8795	0.0004	II	None	
V0434 Per	53297.9262	0.0004	I	None	
V0434 Per	53301.9482	0.0005	II	None	
SU Psc	53257.8957	0.0002	I	None	Correct coords $01^h29^m25^s+19°37'41''$
DV Psc	53258.8140	0.0002	I	None	
DV Psc	53258.9677	0.0003	II	None	
DF Pup	53481.6175	0.0002	I	None	
KW Pup	53437.6524	0.0003	II	None	
UU Sge	53343.5779	0.0003	I	None	
GN Sge	53293.6231	0.0004	II	None	
GN Sge	53298.6549	0.0004	I	None	
BK Sgr	53553.8302	0.0004	I	None	
V1068 Sgr	53514.9055	0.0007	I	None	
V1068 Sgr	53521.9351	0.0002	I	None	
V1068 Sgr	53526.9289	0.0002	II	None	
V1068 Sgr	53538.9530	0.0005	I	None	
V4197 Sgr	53543.8560	0.0004	I	None	
V4202 Sgr	53559.7963	0.0020	I	None	
V0784 Sco	53460.9640	0.0001	I	None	Period 1.52629d
V1044 Sco	53549.7020	0.0004	I	None	
V1054 Sco	53559.7037	0.0020	I	None	
EZ Sct	53525.9314	0.0004	I	None	
FG Sct	53528.9414	0.0001	I	None	
CQ Ser	53515.9580	0.0007	I	None	
CQ Ser	53522.7975	0.0006	I	None	
LX Ser	53500.8030	0.0002	I	None	
LX Ser	53500.9613	0.0003	I	None	
LX Ser	53501.7540	0.0006	I	None	
LX Ser	53501.9116	0.0002	I	None	
LX Ser	53504.7636	0.0002	I	None	
LX Ser	53504.9238	0.0009	I	None	
MX Ser	53539.7019	0.0015	I	None	
MX Ser	53544.7983	0.0030	II	None	
MX Ser	53551.7110	0.0003	I	None	
Y Sex	53498.6604	0.0013	II	None	
BN Tau	53306.8512	0.0003	I	None	
GQ Tau	53333.9579	0.0001	I	None	
RW Tri	53256.8545	0.0002	I	None	
ST Tri	53262.8958	0.0002	I	None	Variable GSC 2336-0821 in the same field

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
XY UMa	53405.8661	0.0002	I	None	
XY UMa	53501.6629	0.0002	I	None	
DN UMa	53499.6511	0.0014	II	None	
DN UMa	53550.7037	0.0017	I	None	
VV Vir	53513.6967	0.0003	I	None	
AG Vir	53506.6780	0.0003	I	None	
AK Vir	53515.6819	0.0002	I	None	
CM Vir	53479.9081	0.0006	I	None	
CX Vir	53522.7266	0.0002	I	None	
DL Vir	53499.7582	0.0005	I	None	
DM Vir	53508.7609	0.0002	I	None	
FO Vir	53510.6967	0.0006	I	None	
FQ Vir	53538.7821	0.0002	I	None	Period 0.749604d
GK Vir	53410.9183	0.0005	I	None	
HT Vir	53437.9029	0.0002	II	None	
MR Vir	53554.6963	0.0018	I	None	
MS Vir	53520.7484	0.0002	I	None	
GSC 2336-0821	53262.9265	0.0002	II	None	Period 0.374220d. Variable ST Tri in same field
GSC 3449-0680	53404.8768	0.0003	I	None	
GSC 3449-0688	53404.8790	0.0002	II	None	
GSC 1874-0399	53691.8644	0.0002	I	None	
GSC 1874-0399	53691.9882	0.0004	II	None	
GSC 1874-0399	53693.8707	0.0002	I	None	
GSC 1874-0399	53693.9938	0.0004	II	None	
GSC 1874-0399	53694.8739	0.0002	I	None	
GSC 1874-0399	53694.9977	0.0004	II	None	
GSC 1874-0399	53696.0003	0.0004	II	None	
GSC 1874-0399	53696.8803	0.0002	I	None	
GSC 1874-0399	53700.8936	0.0002	I	None	
GSC 1874-0399	53701.0173	0.0004	II	None	
GSC 1874-0399	53702.8996	0.0002	I	None	
GSC 1874-0399	53703.7766	0.0004	II	None	
GSC 1874-0399	53703.9033	0.0002	I	None	
GSC 1874-0399	53704.7796	0.0004	II	None	
GSC 1874-0399	53704.9062	0.0002	I	None	
GSC 1874-0399	53705.7839	0.0004	II	None	
GSC 1874-0399	53705.9096	0.0002	I	None	
GSC 1874-0399	53706.7864	0.0004	II	None	
GSC 1874-0399	53706.9131	0.0002	I	None	
GSC 1874-0399	53709.7966	0.0004	II	None	
GSC 1874-0399	53709.9229	0.0002	I	None	
GSC 1874-0399	53710.7999	0.0004	II	None	
GSC 1874-0399	53710.9260	0.0002	I	None	
GSC 1874-0399	53711.8032	0.0004	II	None	
GSC 1874-0399	53711.9294	0.0002	I	None	
GSC 1874-0399	53712.8065	0.0004	II	None	
GSC 1874-0399	53712.9325	0.0002	I	None	
GSC 1874-0399	53713.8096	0.0004	II	None	
GSC 1874-0399	53713.9360	0.0002	I	None	
GSC 1874-0399	53719.8307	0.0007	II	None	
GSC 1874-0399	53719.9559	0.0003	I	None	
GSC 1874-0399	53725.5988	0.0004	II	None	
GSC 1874-0399	53725.7241	0.0002	I	None	
GSC 1874-0399	53725.8495	0.0004	II	None	
GSC 1874-0399	53725.9747	0.0002	I	None	
GSC 1874-0399	53729.6121	0.0004	II	None	
GSC 1874-0399	53729.7376	0.0002	I	None	
GSC 1874-0399	53729.8621	0.0004	II	None	

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
GSC 1874-0399	53729.9880	0.0002	I	None	
GSC 1874-0399	53730.6152	0.0004	II	None	
GSC 1874-0399	53730.7404	0.0002	I	None	
GSC 1874-0399	53730.8654	0.0004	II	None	
GSC 1874-0399	53730.9907	0.0002	I	None	
GSC 1874-0399	53731.6184	0.0004	II	None	
Ha0242-2802	53744.5613	0.0002	I	None	Coordinates $02^h42^m35^s -28°02'44''$
Ha0242-2802	53744.6360	0.0002	I	None	
Ha0242-2802	53744.7105	0.0005	I	None	
Ha0242-2802	53745.6067	0.0002	I	None	
Ha0242-2802	53745.6813	0.0002	I	None	
SDSS J040714-064425	53740.5981	0.0002	I	None	Coordinates $04^h07^m15^s -06°44'25''$
SDSS J040714-064425	53740.7682	0.0002	I	None	
SDSS J040714-064425	53741.6192	0.0002	I	None	
SDSS J040714-064425	53741.7894	0.0002	I	None	
SDSS J040714-064425	53742.6409	0.0002	I	None	
SDSS J040714-064425	53742.8111	0.0002	I	None	
SDSS J040714-064425	53746.5548	0.0002	I	None	
SDSS J040714-064425	53746.7253	0.0002	I	None	
SDSS J040714-064425	53748.5970	0.0002	I	None	
SDSS J040714-064425	53753.7037	0.0002	I	None	
SDSS J040714-064425	53756.5973	0.0002	I	None	

Acknowledgements:

This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France (see references).

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SIMBAD astronomical database `http://cdsweb.u-strasbg.fr/Simbad.html`

ERRATUM FOR IBVS 5690

The remark for ST Tri should read: Variable GSC 2336-0281 in the same field.

The Editors

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5691

Konkoly Observatory
Budapest
31 March 2006

HU ISSN 0374 – 0676

RECENT OUTBURST OF V1118 Ori (2004-2006)

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Name of the object:
V1118 Ori

Equatorial coordinates:	**Equinox:**
R.A.= $5^h34^m44\overset{s}{.}2$ **DEC.=** $-5°33'40''$	2000

Observatory and telescope:
Private obs., Sevilla (Spain) with 28 cm Schmidt-Cassegrain telescope

Detector:	CCD
Filter(s):	V
Comparison star(s):	Parenago 1492, 1518, 1540, 1600, 1641
Transformed to a standard system:	No

Availability of the data:
5691-t1.txt

Type of variability:	EXor

Remarks:
Since 1983, the discovery, V1118 Ori became known as an EXor or Subfuor (Parsamian and Gasparian, 1987, Herbig, 1990). We have information concerning its outbursts for the periods 1983-84 (Kosai, 1983, Hurst et al., 1984, Parsamian and Gasparian, 1987), 1988-90 (Parsamian et al., 1993, Parsamian et al., 1996), 1992-94 (Mampaso and Parsamian, 1995, Parsamian et al., 2002), 1996-98 (Hayakawa et al., 1998, Garcia Garcia and Parsamian, 2000), 2004-06 (Waagen et al., 2005, Williams et al., 2005 and present article). New observations of the star during the period 2003-2006 show that the star, till to our last observations in February 2006, is still in outburst. According to our observations, the brightening to the maximum (7 December 2004 - 20 January 2005), with some fluctuations of brightness, lasted about 1.5 months and then until 14 October 2005 (about 9 months) the star brightness was near 13.8 magnitude. After that till now (5 February 2006, V=15.2) the star is still in outburst, in the decreasing stage. The observations on 17 March 2005 and 21 March 2005 were made with IAC80 telescope, at Observatorio del Teide, operated by the Institute de Astrofisica de Canarias.

Acknowledgements:

The authors are thankfull to Dr. A. Mampaso for his help in the realization of observations in IAC.

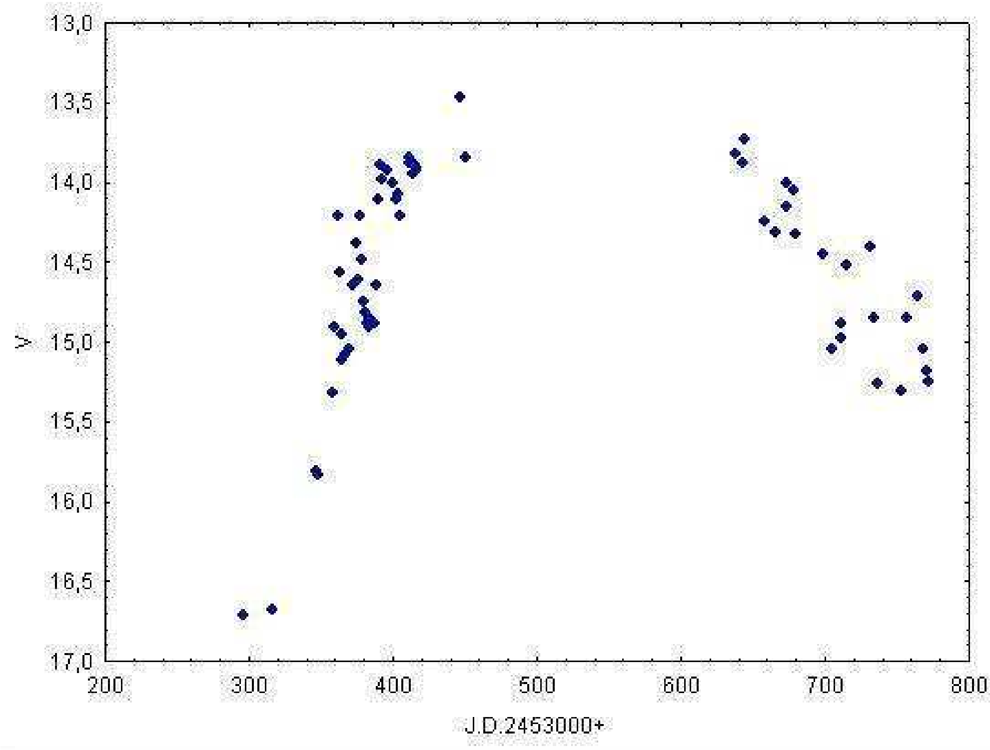

Figure 1. The light curve of the outburst

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5692

Konkoly Observatory
Budapest
3 April 2006

HU ISSN 0374 – 0676

THE FIRST COMPLETE BVRI LIGHT CURVES OF THE NEAR-CONTACT BINARY V370 Cyg

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Name of the object:
V370 Cyg = GSC 02660-02075

Equatorial coordinates:	**Equinox:**
R.A.= $19^{h}43^{m}38\overset{s}{.}1$ **DEC.=** $+32^{\circ}47'35''$	2000

Observatory and telescope:
National Observatory of Athens Kryonerion Station, 1.22 m Cassegrain telescope

Detector:	PMIS CCD camera, Peltier & water cooled at -40° C, 528×528 pixels binned to 264×264, $2.5' \times 2.5'$ FOV.

Filter(s):	BVRI

Date(s) of the observation(s):
2005.07.09, 2005.07.10, 2005.07.11, 2005.07.12, 2005.07.13

Comparison star(s):	Uncatalogued fainter star 1.5′ NNW of the variable

Check star(s):	Uncatalogued fainter star 22″ ESE of the variable

Transformed to a standard system:	No

Availability of the data:
Available upon request

Type of variability:	EB

Remarks:
The heights of the two maxima are equal in all bands, i.e. no O'Connell effect is present. The curves are symmetric within the limits of the observational error. The secondary minimum is very shallow and deepens considerably at longer wavelengths, indicating a large temperature difference between the components. V370 Cyg is known to have a spectral type of A0 and a period of 0.77454388 day.

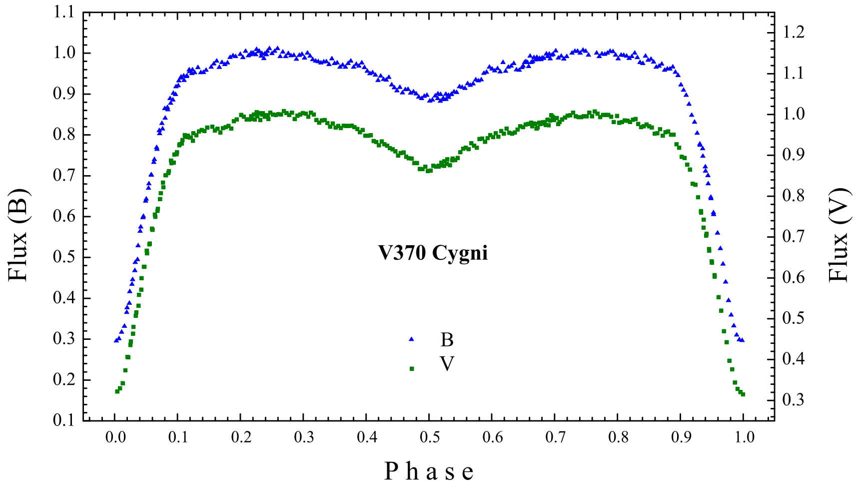

Figure 1. The complete B (upper) and V (lower) light curves of V370 Cyg. The flux is normalised to the maximum level.

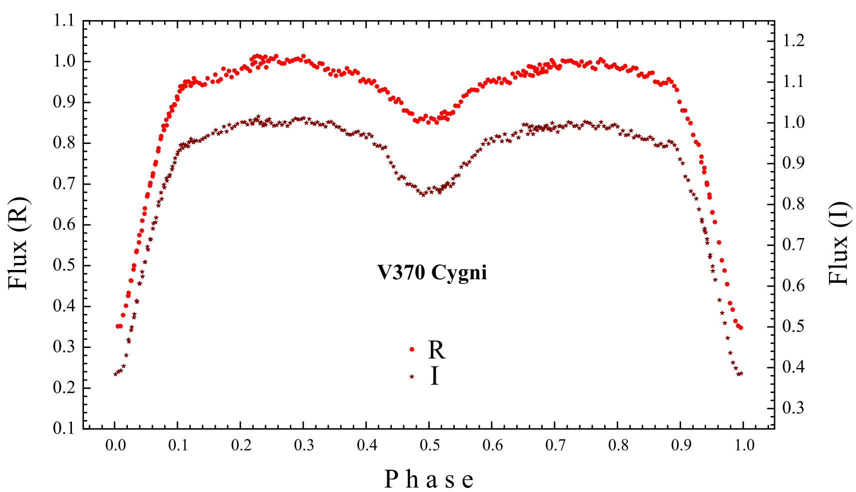

Figure 2. The complete R (upper) and I (lower) light curves of V370 Cyg. The flux is normalised to the maximum level.

Acknowledgements:

This research was included in the *PYTHAGORAS* project for the support of research groups in the universities, co-funded by the EPEAEK program and the European Social Fund (ESF).

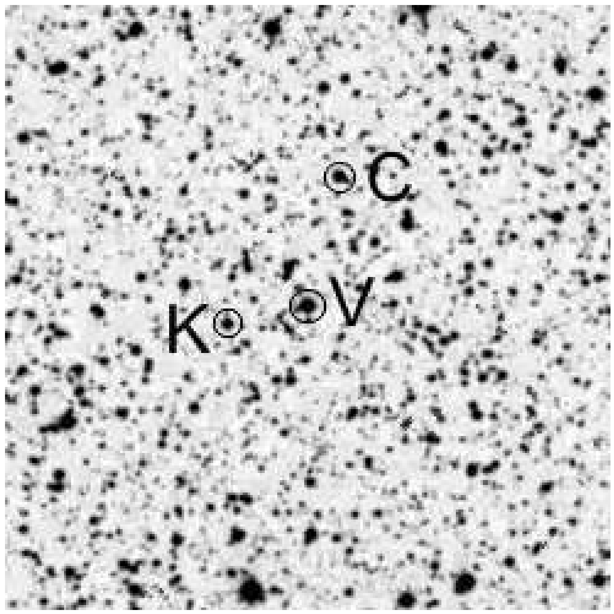

Figure 3. $7' \times 7'$ finding chart with the comparison (C) and check (K) stars marked; V370 Cyg is marked with a V.

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5693

Konkoly Observatory
Budapest
4 April 2006

HU ISSN 0374 – 0676

NEW LIGHT ON THE PECULIAR STAR HD 108

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HD 108 is a very rare specimen in the stellar population: it is one of the only three Of?p stars known in the Galaxy. Recently, a long-term observing campaign undertaken at the Haute-Provence Observatory revealed the peculiar behaviour of this star (Nazé et al. 2001, 2004). HD 108 displays large variations of its H and HeI line profiles that are evolving from P Cygni profiles to pure absorptions. A comparison with data from the literature suggests that this modulation is recurrent (Nazé et al. 2001). However, there were some gaps in the reported observations of this object, and the exact timescale of the phenomenon was therefore somewhat uncertain. In this context, archival data can provide important information, and are especially suited to uncover long-term trends in celestial objects.

The Asiago Observatory (Italy) has a long history of observations: its archives contain approximately 70000 photographic plates, taken since 1950 and including spectroscopic data of early-type stars. However, this treasure of valuable old data could have been lost if nothing was done. This is why a program was undertaken to make an inventory of the old photographic plates and to digitize them, with the aim to preserve this precious documentation and make it available to the worldwide astronomical community (Barbieri et al. 2003).

During this inventory, it appeared that some unpublished Asiago spectra allow us to fill some of the gaps in the observations of HD108. Table 1 reports these observations and therefore completes Table 6 from Nazé et al. (2001). During the 1950s and 1960s, HD108 displayed a smooth evolution, just as is seen now. These additional data thus confirm the putative 50-60 yr period of HD108. 1958 marks the transition for the Hβ line: before that date, it appeared as a pure absorption; after, it appeared with a P Cygni profile; in 1958, it displayed a very weak P Cygni (nearly non-existent) line. In addition, we note that the apparent spectral type of HD108 was O8.5-O9 around 1953. This is the latest type ever observed for this star.

Table 1. Aspect of the Hβ, Hγ and HeIλ4471 lines.
This complements Table 6 from Nazé et al. (2001).

Date	Hβ	Hγ	HeIλ4471
1955	Abs.	Abs.	Abs.
1956	Abs.	Abs.	Abs.
1957	Abs.	Abs.	Abs.
1958	weak	Abs.	Abs.
1964	P Cyg.	P Cyg.	Abs.
1965	P Cyg.	P Cyg.	Abs.
2001	Abs.	Abs.	Abs.
2002	Abs.		Abs.
2003	Abs.		Abs.
2004	Abs.		Abs.
2005	Abs.		Abs.

The monitoring of HD 108 continues at the Haute-Provence and Asiago Observatories. The recent data reveal that HD 108 has not yet reached its minimum state. Fig. 1 presents these spectra, and the continuously declining H and HeI lines are clearly visible. The equivalent widths (EWs) and radial velocities (RVs) of some lines are shown in Fig.2. The spectral type of HD 108 is currently O8.5 and if we compare this situation with that revealed by the archives, we expect that the star is still a few years ahead of reaching the minimum state.

Although the behaviour of HD 108 is similar to that of another Of?p star, HD 191612 (Walborn et a. 2004), we may note some differences: the period is much longer (50-60yr vs. 538d) and the RVs are varying more 'randomly' for HD 108 (Nazé et al. 2006, in preparation).

Observatory and telescope:

Haute-Provence Observatory, 1.52m telescope, Aurélie spectrograph;
Asiago Observatory, 1.22m tel, Cassegrain spectrograph and camera III or VII+S1

Acknowledgements:

The authors acknowledge the support of the FNRS (Belgium), the 'Communauté Française' (Belgium) and of the Scientific Cooperation Program 2005-2006 between Italy and the Belgian 'Communauté Française' (Project 05.02). The Italian digitization project was partly supported by the Ministery of University and Research (MUIR).

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Nazé, Y., Rauw, G., Vreux, J.-M., & De Becker, M., 2004, A&A, **417**, 667
Walborn, N. R., Howarth, I. D., Rauw, G., et al., 2004, ApJ, **617**, L61

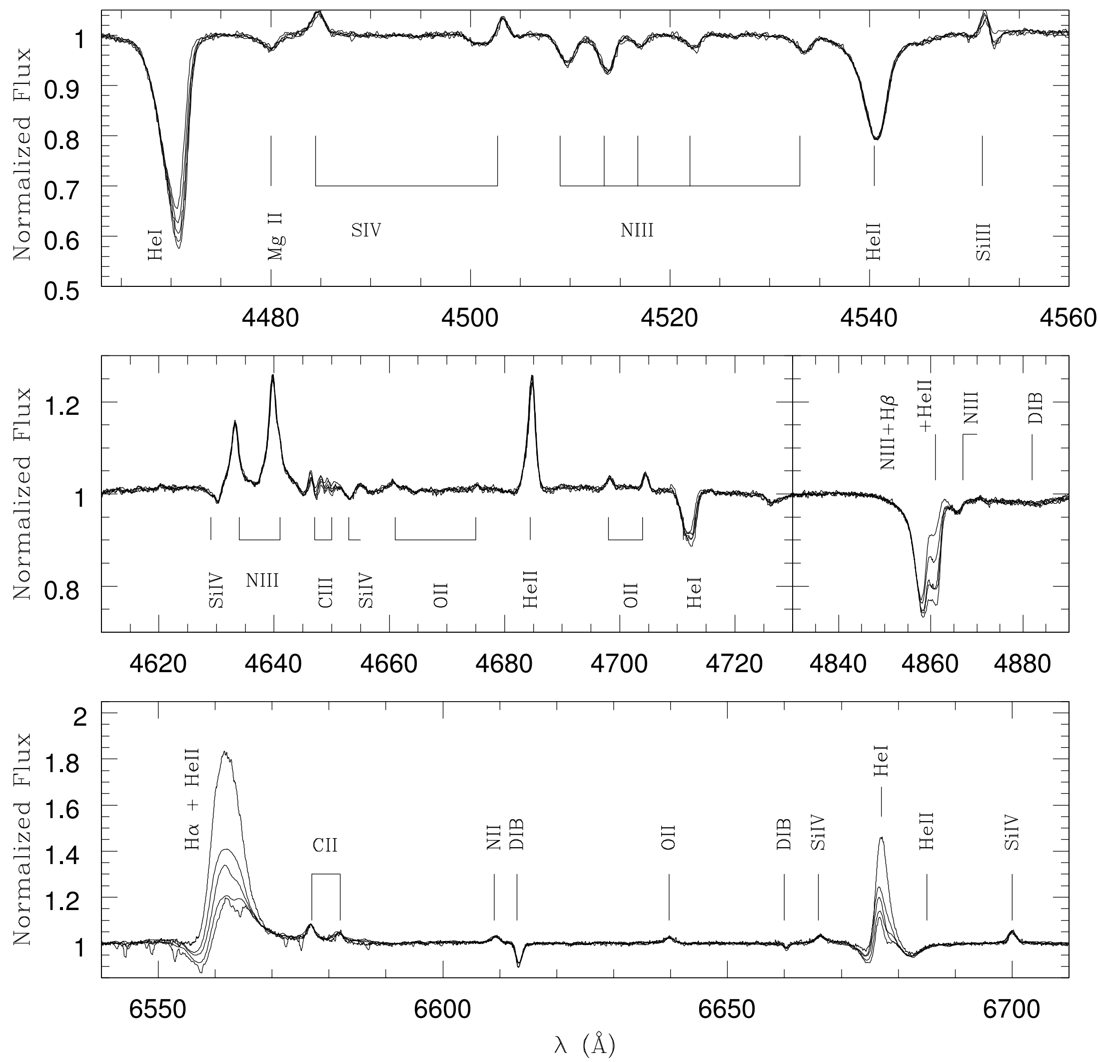

Figure 1. The evolution of the spectrum of HD 108 from 2002 to 2005 for the 4460-4560Å range, 2001 to 2005 for 4610-4890Å, and 1997 to 2005 for 6545-6705Å. The weakest lines always correspond to the most recent data.

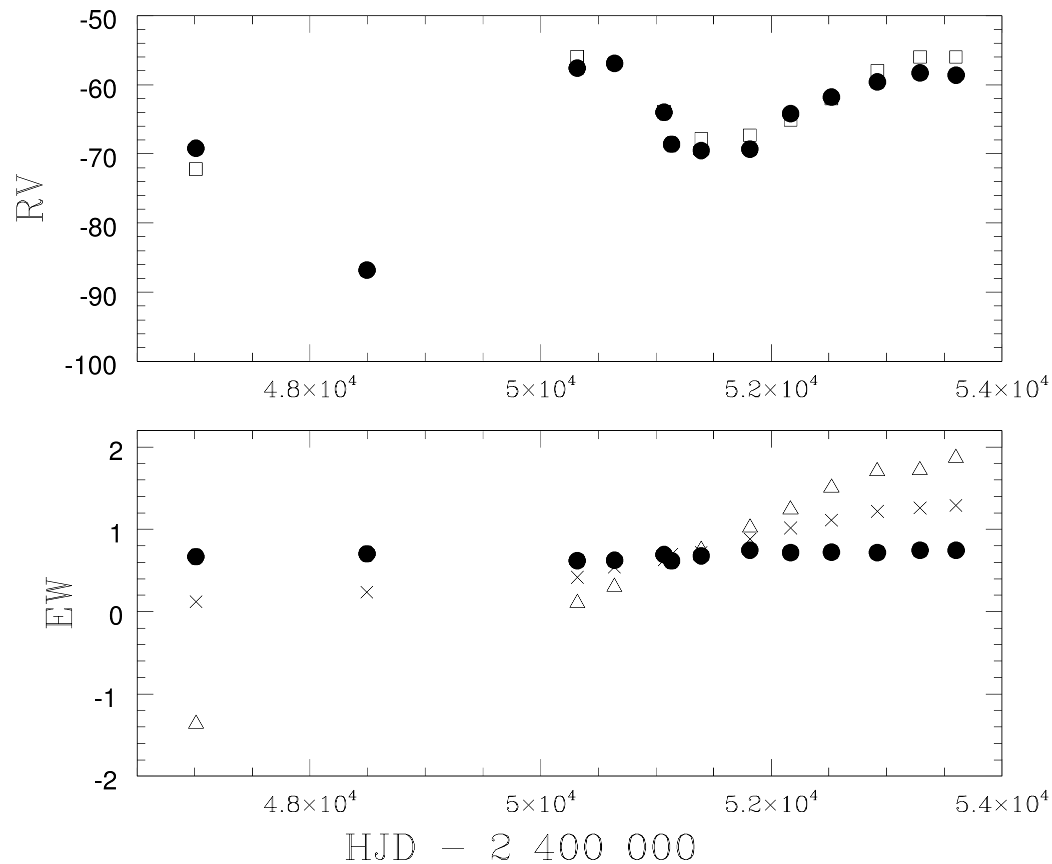

Figure 2. RV and/or EW of HeIλ4471 (crosses), HeIIλ4542 (filled circles), HeIIλ4686 (open squares), and Hβ (open triangles, excluding the DIB, i.e. evaluated from 4845 to 4870Å). The rest wavelengths were taken from Conti et al. (1977)

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5694

Konkoly Observatory
Budapest
4 April 2006

HU ISSN 0374 – 0676

NEW CCD TIMES OF MINIMA OF ECLIPSING BINARY SYSTEMS

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Observatory and telescope:
Chungbuk National University Observatory (CBNUO): 14-inch $f/11$ Schmidt–Cassegrain tube on a Paramount GT-1100s mount

Detector:	SBIG ST-8 CCD camera, $f/7$ focal reducer, $19' \times 12'$ FOV

Method of data reduction:
Reduction of all CCD frames was made with a customly developed IRAF[1] package.

Method of minimum determination:
Times of minimum light were computed with the Kwee-van Woerden method (Kwee & van Woerden 1956).

[1]IRAF is distributed by the National Optical Astronomical Observatories, operated by the Association of the Universities for Research in Astronomy, inc., under cooperative agreement with the National Science Foundation

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
AA And	52929.0038	2	I	*V*	
	52949.1039	23	II	*V*	
	52950.0489	9	II	*V*	
BD And	53345.1917	2	I	–	
	53347.0419	1	I	–	
	53347.9676	1	I	–	
	53352.1361	4	I	–	
	53638.2096	1	I	–	
	53675.2413	1	I	–	
	53690.0535	2	I	–	
	53696.0723	6	I	–	
	53696.9980	2	I	–	
BL And	52947.1761	5	I	–	
BX And	53307.2186	3	I	–	
	53323.9965	1	I	–	
CO And	53302.0420	2	I	–	
CP And	53674.2847	3	I	–	
EP And	53310.2549	4	I	–	
GZ And	53309.0268	6	I	–	
OO Aql	52904.1768	2	I	–	
RX Ari	52911.2006	2	I	–	
	52923.0394	22	II	–	
AH Aur	52654.0523	4	I	*V*	
	53453.0208	1	I	–	
V534 Aur	52654.0041	5	I	*V*	
HL Aur	53375.2080	1	I	–	
HP Aur	53436.02843	6	I	–	
IM Aur	53366.9627	6	II	–	
SX Aur	52923.2405	8	II	–	
	53432.0841	2	I	–	
AC Boo	52764.2895	1	I	–	
	52771.1622	2	II	–	
	53492.9818	8	II	–	
	53509.1857	3	II	–	
TZ Boo	53428.2224	2	I	–	
	53509.0476	5	I	–	
XY Boo	53483.0532	1	II	–	
CV Boo	53511.02437	6	I	–	
SV Cam	53331.00654	9	I	–	
	53333.9720	2	I	–	
	53415.2239	3	I	–	
	53484.0196	1	I	–	
	53691.0038	6	I	–	
UU Cam	53450.0349	4	I	–	
WW Cam	53434.1063	3	I	–	
AL Cam	53326.18745	7	I	–	
AV Cam	53667.2011	7	I	–	
AW Cam	52687.0950	1	II	–	
	53302.2444	1	I	–	
	53384.0069	1	I	–	

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
AZ Cam	52709.2692	2	I	–	
	52793.0362	1	I	–	
	53333.2630	2	I	–	
	53494.2091	3	I	–	
TX Cnc	52711.9677	2	II	–	
	53422.9820	3	II	–	
WX Cnc	53492.0290	4	I	–	
TW Cas	53404.96907	9	I	–	
TX Cas	53413.999	2	I	–	
ZZ Cas	53388.0081	2	II	–	
AB Cas	53305.0782	2	I	–	
AL Cas	52944.2483	3	I	–	
	52950.2548	2	I	–	
	53334.1833	2	I	–	
	53347.1970	1	I	–	
	53663.0499	4	I	–	
	53667.0542	1	I	–	
	53670.0583	6	I	–	
BS Cas	53638.0055	1	I	–	
	53667.9583	3	I	–	
BU Cas	53686.2859	3	I	–	
CW Cas	52939.2389	1	II	–	
	53318.2059	1	I	–	
DN Cas	53314.2254	5	II	–	
DO Cas	52686.9869	1	I	–	
	52904.0261	3	I	–	
	53310.0345	5	I	–	
	53342.2138	2	I	–	
V380 Cas	53700.2809	3	I	–	
V445 Cas	53640.0067	2	I	–	
V523 Cas	52910.0360	1	I	–	
	53369.00991	4	I	–	
	53369.12641	6	II	–	
	53669.1890	1	II	–	
	53669.3070	3	I	–	
V541 Cas	53330.2640	1	I	–	
V651 Cas	53640.2400	3	I	–	
VW Cep	52760.2534	1	I	–	
	53313.9518	6	II	–	
	53314.0924	3	I	–	
	53316.0408	4	I	–	
	53316.1783	4	II	–	
VZ Cep	53366.0195	2	I	–	
WY Cep	52837.1523	1	I	–	
DV Cep	52931.1107	1	I	–	
	53325.02105	7	I	–	
	53484.21172	9	I	–	
	53704.98701	8	I	–	
EG Cep	52717.2809	1	I	–	
	52744.2396	2	II	–	

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
EG Cep	52757.3094	3	II	–	
	52769.2918	2	II	–	
	52776.1003	4	I	–	
	53329.98078	9	I	–	
	53510.25101	9	I	–	
	53683.98597	8	I	–	
GK Cep	52912.2368	3	I	–	
	52919.2645	13	II	–	
GW Cep	53322.2222	1	I	–	
	53378.01792	8	I	–	
	53378.17693	8	II	–	
	53378.33681	8	I	–	
	53380.2497	2	I	–	
	53385.9887	5	I	–	
	53407.98776	7	I	–	
	53619.05443	6	I	–	
NN Cep	52935.1430	3	II	–	
SU Cep	53326.03819	6	I	–	
CC Com	52800.01649	5	I	–	
	53460.1993	1	I	–	
	53460.3101	1	II	–	
EK Com	53401.2687	1	I	–	
	53473.2735	7	II		
	53474.0735	1	I	–	
TW CrB	53448.1887	3	I	–	
BR Cyg	53499.2292	1	I	–	
	53495.23149	6	I	–	
Z Dra	53428.00202	2	I	–	
	53482.29943	4	I	–	
RZ Dra	53464.22773	7	I	–	
	53475.2454	2	I	–	
	53641.05893	8	I	–	
TZ Dra	53466.27003	7	I	–	
AR Dra	53384.2775	1	I	–	
	53443.0753	1	I	–	
AX Dra	53456.0073	1	I	–	
	53459.98414	7	I	–	
	53474.18777	6	I	–	
	53487.2564	2	I	–	
BE Dra	53456.2452	3	I	–	
	53469.3077	3	I	–	
BS Dra	53333.0237	2	I	–	
	53692.97265	8	I	–	
BV Dra	52717.0030	1	I	–	
	52717.1784	1	II	–	
BW Dra	52717.1309	1	I	–	
SX Gem	52709.01784	6	II	–	
SZ Her	52864.0214	2	II	–	
AK Her	52734.2157	2	I	–	
	52795.1275	2	II	–	

Times of minima:

Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
V359 Her	52718.2410	2	II	–	
XZ Leo	53421.26869	7	I	–	
CE Leo	53450.2847	1	I	–	
SX Lyn	53405.9336	26	I	–	
UV Lyn	53422.3014	3	I	–	
TZ Lyr	53477.27155	6	I	–	
FL Lyr	52911.0235	4	I	–	
FZ Ori	52957.2938	7	I	–	
RT Per	53686.97209	6	I	–	
DK Per	53299.1241	5	II	–	
DM Per	53306.0503	2	I	–	
IQ Per	52594.9767	4	I	V	
	52601.0264	6	II	V	
	52601.9503	5	I	V	
	52606.2572	5	II	V	
	53329.0185	1	I	–	
KW Per	53328.01223	9	I	–	
	53690.2701	5	I	–	
LS Per	53335.0314	8	I	–	
V432 Per	53317.2568	2	I	–	
	53686.00387	7	I	–	
	53689.0702	1	I	–	
	53693.28634	8	I	–	
DV Psc	52920.0394	1	I	–	
	52920.1955	3	II	–	
	52920.9653	5	I	–	
	52921.2735	1	I	–	
CU Sge	52933.9727	3	I	–	
RZ Tau	52580.20673	6	I	–	
AH Tau	52947.27886	7	II	–	
CT Tau	53356.2366	1	I	–	
GR Tau	53348.9474	3	I	–	
	53351.9559	2	I	–	
V781 Tau	52712.0279	6	II	–	
	53362.0065	1	I	–	
RV Tri	53676.2181	1	I	–	
	53683.00102	5	I	–	
W UMa	52687.1720	1	II	–	
	53414.99501	7	I	–	
	53420.0002	2	I	–	
	53425.0045	1	I	–	
	53425.1715	2	II	–	
	53459.0344	8	I	–	
	53461.0366	5	I	–	
XY UMa	52726.1693	1	I	–	
	53328.2676	1	I	–	
	53683.1991	2	I	–	
ZZ UMa	53352.2813	1	I	–	
AA UMa	53433.28029	5	I	–	
	53503.0298	4	I	–	

Times of minima:					
Star name	Time of min. HJD 2400000+	Error	Type	Filter	Rem.
AA UMa	53510.0508	2	I	–	
W UMi	53543.1916	2	I	–	
	53680.9835	4	I	–	
RU UMi	53492.2019	1	I	–	
	53493.25151	2	I	–	
DL Vir	52726.27194	6	I	–	
AW Vul	53511.26086	8	I	–	
GP Vul	52947.9597	3	I	–	

Remarks:

We present a total of 208 CCD timings for 103 eclipsing binaries which have been observed with a semi-automatic 35cm telescope at the Campus site of the Chungbuk National University Observatory, South Korea. The telescope equipped with a SBIG ST-8 camera has been recently established to observe systematically times of minimum light of eclipsing binaries since November, 2002.

Most of the stars in the table are members listed in the Atlas of Kreiner et al. (2001). Updated ephemeris for V534 Aur, which was recently discovered by Han et al. (2000), is as follows:

$Min.I = \mathrm{HJD}2451570.2412(3) + 4.^{\mathrm{d}}2836529(18)E.$

Acknowledgements:

This work was supported by Korea Research Foundation Grants (KRF-2002-015-CPO150, KRF-2005-015-C00188)

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Kreiner, J. M., Kim, C.-H., & Nha, I.-S. 2001, *An Atlas of (O-C) Diagrams of Eclipsing Binary Stars* (Krakow: Wydawn. Nauk. Akad. Pedagogicznej)

Kwee, K. K., & van Woerden, H., 1956, *Bull. Astron. Inst. Neth.*, **12**, 327

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5695

Konkoly Observatory
Budapest
5 April 2006

HU ISSN 0374 – 0676

V380 CYGNI - REQUEST FOR NEW OBSERVATIONS

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The eclipsing binary system V380 Cygni is considered as having a long periodic apsidal motion. Semeniuk (1968) and Battistini et al. (1974) have determined U=2019 and U=1470 years, respectively, for the apsidal period. Therefore, in this case a sudden change in the longitude of periastron, ω, must be postulated. In the last time, Guinan et al. (2000), based on ,,a linear fit to observed time differences between primary and secondary minima" have reconsidered the apsidal motion for V380 Cygni, their result being U=1490 years. Nevertheless, nothing is said about an eventual variation of the apsidal motion. Consequently, before we can draw some important conclusions concerning the predictions of an independent test for stellar models, we have to re-examine the corresponding result.

Now we consider that a combination of the photometric and spectroscopic observations could help us with a greater number of observed values for the longitude of periastron, ω. With this in mind we performed the following two tables, where the epoch E is referring to the linear formula:

$$Min.hel.\ I = J.D.2441255.973 + 12^{\rm d}\!.425612 \times E.$$

Table 1: Photometric observations

$\mathbf{T}_{II}$-$\mathbf{T}_I$	**E**	ω	**w**	**References**
$5^{\rm d}\!.381 \pm 0^{\rm d}\!.008$	−1422	$117^\circ \pm 2^\circ\!.9$	3.4	Guinan et al. (2000), p. 417
$5^{\rm d}\!.199 \pm 0^{\rm d}\!.0115$	−240	$124^\circ \pm 4^\circ\!.1$	2.4	Guinan et al. (2000), p. 417
$5^{\rm d}\!.079 \pm 0^{\rm d}\!.0035$	0	$129^\circ \pm 1^\circ\!.26$	7.9	Guinan et al. (2000), p. 417
$5^{\rm d}\!.004 \pm 0^{\rm d}\!.010$	+204	$133^\circ \pm 3^\circ\!.6$	2.8	Guinan et al. (2000), p. 417
$4^{\rm d}\!.995 \pm 0^{\rm d}\!.005$	+506	$133^\circ \pm 1^\circ\!.8$	5.6	Guinan et al. (2000), p. 417
$4^{\rm d}\!.908 \pm 0^{\rm d}\!.005$	+706	$138^\circ \pm 1^\circ\!.8$	5.6	Guinan et al. (2000), p. 417

In order to obtain the values of ω from the difference $T_{II} - T_I$ we have used Eq.(6) from Todoran (1972). We have adopted the following ,,constant" orbital parameters: $e = 0.22$, $i = 82^\circ 24'$, $P = 12^{\rm d}\!.4257$.

Table 2: Spectroscopic observations

E	ω	w	References
−1740	$115\overset{\circ}{.}8$ –	0	Batten, (1962), p. 100
−1680	$121^\circ \pm 3\overset{\circ}{.}0$	3.33	Popper and Guinan, (1998), p. 573
−1524	$120\overset{\circ}{.}1 \pm 2\overset{\circ}{.}0$	5.0	Batten, (1962), p. 103
−1524	116 –	0	Popper, (1949), p. 105
−1333	$118\overset{\circ}{.}5 \pm 3\overset{\circ}{.}3$	3	Batten, (1962), p. 103
−737	$118^\circ \pm 9\overset{\circ}{.}0$	1.1	Popper and Guinan, (1998), p. 573
−732	$118^\circ \pm 6\overset{\circ}{.}0$	1.7	Batten, (1962), p. 100
−306	$127\overset{\circ}{.}2 \pm 2\overset{\circ}{.}1$	4.8	Batten, (1962), p. 100
−306	$129\overset{\circ}{.}0 \pm 3\overset{\circ}{.}8$	2.6	Popper and Guinan, (1998), p. 573
+663	$133\overset{\circ}{.}2 \pm 3\overset{\circ}{.}2$	3	Popper and Guinan, (1998), p. 573

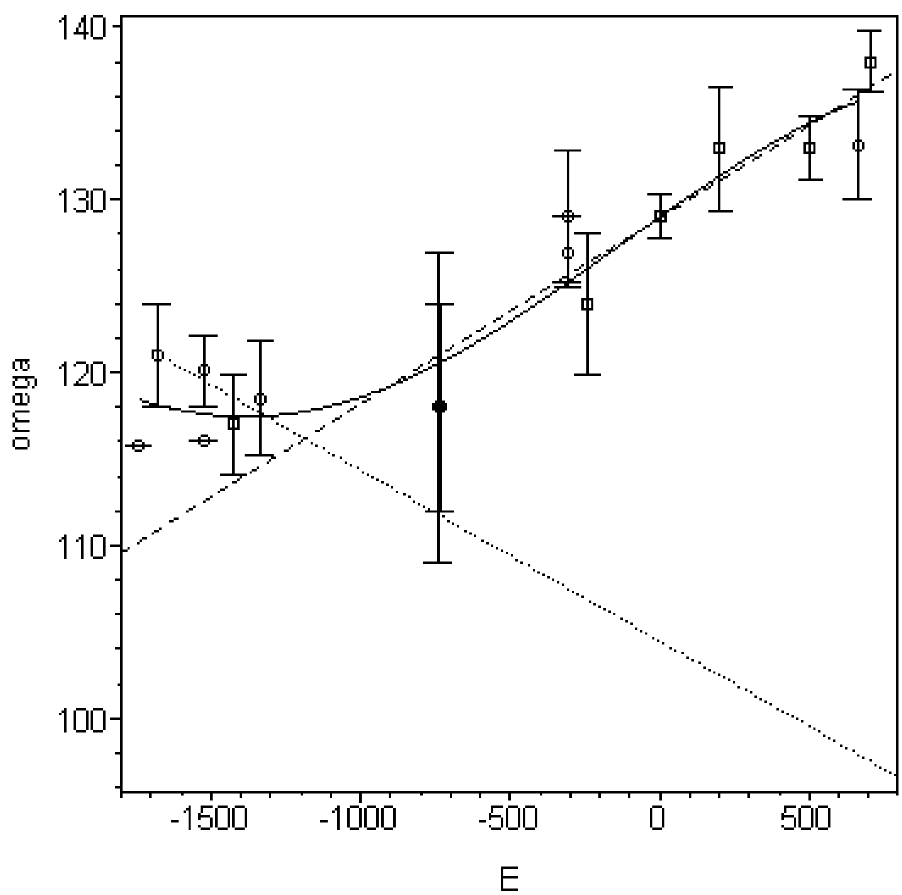

Figure 1. The nonlinear dependence $\omega = f(E)$. With squares are represented the photometric observations and with circles the spectroscopic observations.

The function $\omega = f(E)$ is illustrated in Figure 1.

Here we can put in evidence the following three possible situations:

a) We can divide the points into two series: for $-1740 \leq E \leq -1333$, and $-737 \leq E \leq 706$. Then the functions:

$$(i) \quad \omega = 104.473 - 0.009880 \times E$$

$$(ii) \quad \omega = 128.927 + 0.010751 \times E$$

obtained with the least squares method, are fitted well the points. These lines are represented in Figure 1 by dot-line and dash-dot-line. But, in such a case, a sudden change in the function $\omega = \omega(E)$ must be postulated, even if the corresponding reason, nowadays, cannot be interpreted.

b) If we accept a periodic function for $\omega = \omega(E)$, the existence of a third body could be assumed and the corresponding perturbations could be investigated. But for such a distinguished problem, we must be sure of the existence of the corresponding periodicity. In Figure 1 the curve:

$$\omega = 9.773 \times sin(0.001256 \times E) + 1.644 \times cos(0.001256 \times E) + 127.355$$

obtained with the least squares method, is used to fit all the points (the solid curve).

c) If the first series of observations ($-1740 \leq E \leq -1333$) is ignored, then, from the second series of observations ($-737 \leq E \leq 706$) it would be possible to determine an apsidal period, but, even in such a case, we must be sure that the relationship (ii) remains also valuable even if $E > 706$. In addition, we do not have a well-founded reason to ignore the first series of observations.

Therefore, in our days, it is very difficult to speak about a habitual apsidal motion in the binary system V380 Cygni. This is why we are considering that, very likely, a new series of observations could help us to solve such an ambiguous problem.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5696

Konkoly Observatory
Budapest
3 May 2006

HU ISSN 0374 – 0676

BVRI CCD OBSERVATIONS AND ANALYSIS OF THE WUMa CONTACT BINARY, AR BOOTIS

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AR Bootis (GSC 1999 11, $\alpha(2000) = 07^{\rm h}03^{\rm m}2\overset{\rm s}{.}89$, $\delta(2000)$=$0^\circ13'49\overset{''}{.}1$) was observed as a part of our study of solar type near contact binary candidates. It was discovered by Kurochkin (1960) in the remote neighbourhood of M3. The initial period was calculated as 0.416718 d. Houck and Polluck (1986) reported a photographic B light curve, and corrected the period, $P = 0.34470\,{\rm d} \pm 0.00001$. Their curve shows unequal eclipse depths and an asymmetry in maxima of 0.1 mag. The solution by Milano et al. (1989) indicated that both stars were very slightly under-filling their respective Roche lobes. However, they showed no light curves nor gave any observations. Wolf et al. (1998) observed B, V curves and conducting a period study with 44 eclipse times. This gave an ephemeris with a positive quadratic term. Additional timings have been reported by Zejda (2002, 2004), Diethelm (1996, 1997, 1998, 2001), Bakis et al. (2005a, b), Hübscher et al. (2005), Krajci (2005), Wolf et al. (1998), Blättler (2002, 2005), Milano et al. (1989) and Safár & Zejda (2000, 2002).

The present observations were taken in Kitt Peak, AZ, at the Southeastern Association for Research in Astronomy Observatory (SARA) using a remote link. The 0.9-m reflector was used with the AP7 camera with $UBVR_cI_c$ filters on 5, 9 May and 8 June 2004, by RGS and TSL. We took 130, 132, 127, 128 observations $BVRI$, respectively. The observations are given in electronic Table 1, available on the IBVS website as `5696-t1.txt`. The comparison and check stars were GSC 162 1551 ($\alpha(2000) = 07^{\rm h}02^{\rm m}59\overset{\rm s}{.}60$, $\delta(2000)$= $0^\circ14'32\overset{''}{.}8$) and GSC 162 1709 ($\alpha(2000) = 07^{\rm h}03^{\rm m}12\overset{\rm s}{.}16$, $\delta(2000)$= $0^\circ14'31\overset{''}{.}1$), respectively. A finding chart of AR Boo (V), the comparison star (C), and check star (K) is given as Figure 1. The light curves are given in Figures 2 and 3, as normalized flux versus phase.

Three mean epochs of minimum light were determined from eclipse timings in all four pass bands, using parabola fits: HJD Tmin I = 2453131.8527(±0.0003), and
HJD Tmin II = 2453165.8238(±0.0003) and 2453135.81834(±0.0013).

From all 66 available timings of minimum light, we calculated the following linear and quadratic ephemerides:

$$\text{HJD TMin I} = 2450182.49268(\pm 0.00181) + 0.3448710186(\pm 0.0000001947)\text{d} \times \text{E} \quad (1)$$

$$\text{HJD TMin I} = 2450182.47781(\pm 0.00036) + 0.344874262(\pm 0.000000056)\text{d} \times \text{E} + 0.000000000128(0.000000000002) \times \text{E}^2 \quad (2)$$

Electronic Table 2 (available on the IBVS website as `5696-t2.txt`) gives the $O-C$ residuals of Equation 1 and 2. We note that the quadratic term is highly significant. The recent precision timings show this effect also. The period is increasing. A sine curve was also fit to the curve. Both of the curves have a 'goodness of fit' R value of 0.96 and look very similar. It is impossible to determine from the fit alone which characterizes the system. However, the amplitude of the sine curve is 0.11 ± 0.03d or about 19 AU and the period is 342 ± 60 years. A three star system producing such an orbital motion would have a minimum mass of only 0.06 solar masses, so it is unlikely that a third body is present.

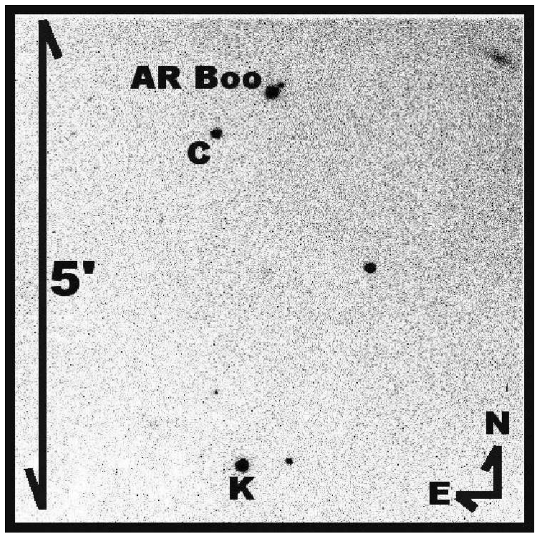

Figure 1.

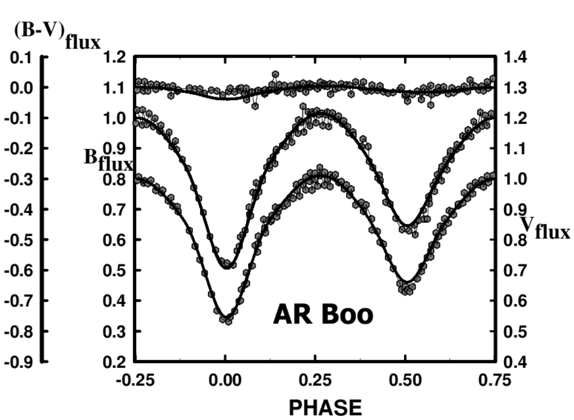

Figure 2.

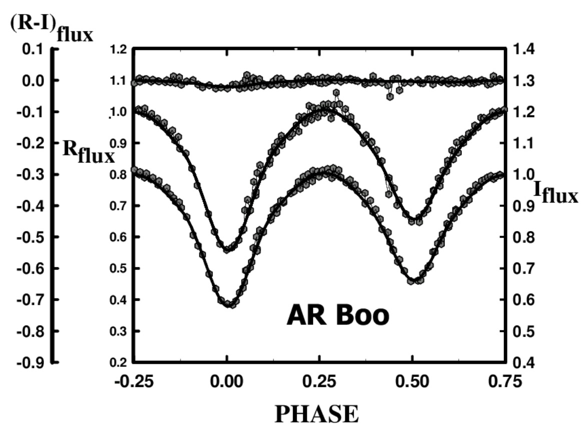

Figure 3.

Standard magnitudes of AR Boo, comparison and check were determined from our observations from measurements of Landolt standard stars G44 27, PG1034+001, SA103 302, SA104 306, SA104 444 and SA104 335. Electronic Table 3 (available on the IBVS website as `5696-t3.tex`) gives our results. The comparison and check magnitudes were determined from the averages of 38-40 individual measurements while the phase averages for the variable were determined from 3-5 measurements determined about the phase in question. From these measurements, we estimated the temperature of the the primary, more massive component to be 4750 ± 150 K.

Our B and V curves were individually fit with Binary Maker 2.0 (Bradstreet 1992). We attempted both A and W-type and contact configurations. The best Binary Maker fits were of W-Type (the primary, more massive component was cooler.) with a single spot region. Using the results as starting parameters, we calculated a Wilson code (Wilson and Devinney 1971, Wilson 1990, Wilson 1994) *BVRI* simultaneous synthetic light curve solution. It gave similar results. The solution is given as Electronic Table 4 (available on the IBVS website as `5696-t4.tex`), and the synthetic light curves overlying the observations are given in Figure 2 and 3. The Roche-lobe surface is shown in Figure 5. The binary is a W-Type W UMa shallow contact system. The W-type designation indicates heavy, saturated magnetic activity on the primary star. The shallow contact and the sizable difference in temperatures of the components may indicate that AR Boo just recently reached contact as two quite different mass stars. Alternatively, the period increase and mass ratio would suggest that it is coming out of the contact phase of thermal relaxation oscillations and that the binary is somewhat evolved. Further study, including spectroscopy may determine which is the best scenario. We note here that errors given in the table are formal errors. Also, the mode that we used in conjunction with the mass ratio (>1.0) forced us to adjust the cooler star's temperature, T2. So we set the initial T1 so that T2 would be near the 4750 K value set by the photometry.

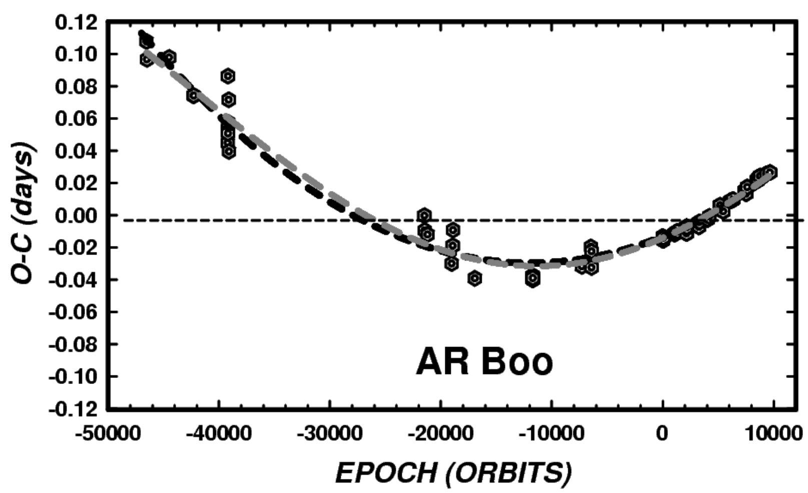

Figure 4.

We wish to thank the SARA TAC for their allocation of observing time and Bob Jones University for their support with computational and observational facilities for remote observing.

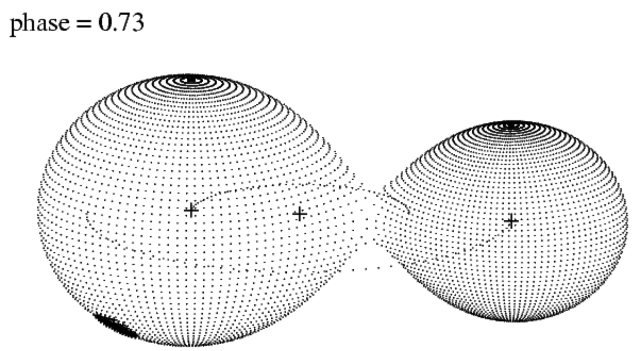

Figure 5.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5697

Konkoly Observatory
Budapest
3 May 2006

HU ISSN 0374 – 0676

GSC 1419 0091, AN EXTREME MASS RATIO CONTACT BINARY

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As a part of our study of solar-type eclipsing binaries with extreme mass ratios (EMRB), we observed the variable GSC 1419 0091 [Brh V132, $\alpha(2000)=10^{\rm h}11^{\rm m}59^{\rm s}.15$, $\delta(2000)=+16^\circ52'30''.28$]. This binary was discovered by Bernhard (2003, 2004) and identified as GSC 1419 0091. An unfiltered CCD light curve taken by Frank (2005) shows that the variable is unmistakably a low amplitude short period totally eclipsing system. That is the light curve character of an EMRB sometimes referred to as an AW UMa-type star. He gave the ephemeris:

$$\text{HJD Tmin I} = 2452754.4602 \pm 0.266727\text{d} \times \text{E} \quad (1)$$

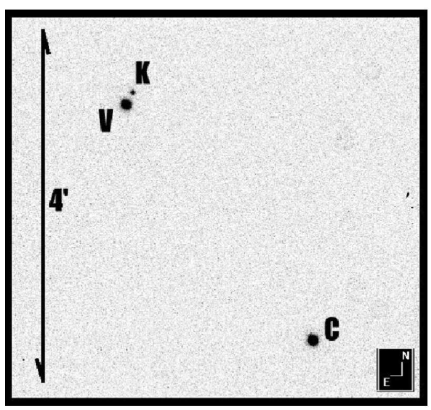

Figure 1.

Our B, V, R_c, I_c light curves were taken with the Lowell 31 inch reflector in Flagstaff with the LN cooled CCD camera and a metachrome coated TEK 512 × 512 chip and standard BVR_cI_c filters. The light curves were taken on 7, 11 and 12, March 2005 by NCH , RGS, and DRF. The individual observations included 59 B, 63 V, 59 R and 59 in I. The stars [GSC 1419 0805, $\alpha(2000)=10^{\rm h}11^{\rm m}51^{\rm s}.30$, $\delta(2000)=+16^\circ50'13''.1$], and [$\alpha(2000)=10^{\rm h}11^{\rm m}58^{\rm s}.88$, $\delta(2000)=+16^\circ52'40^{\rm s}.1$] were used as the comparison and check stars, respectively. The delta magnitudes are given in electronic Table 1 available on the IBVS website as `5697-t1.txt`. A finding chart of GSC 1419 0091 (V), the comparison

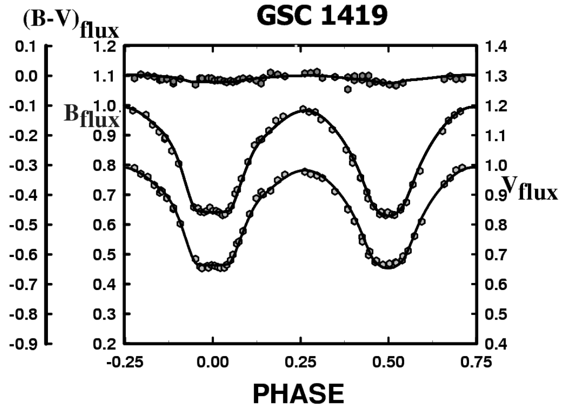

Figure 2.

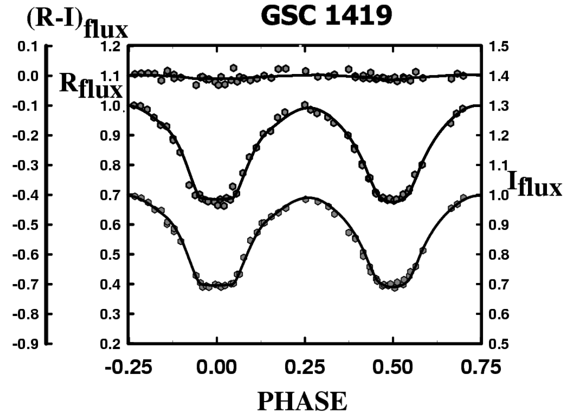

Figure 3.

star (C), and check star (K) is given in Figure 1. The light curves are displayed in Figure 2 and 3, as normalized flux versus phase.

Three precision mean epochs of minimum light were determined from eclipse timings in B, V, R_c, I_c using parabola fits: HJD Tmin I = 2453437.8293 d ± 0.0003, 2453441.8291d ± 0.0019 and HJD Tmin II = 2453437.6973 ± 0.0012. Other times of minimum light were determined by Hübscher (2005) and by Frank (Bernhard 2003, 2004). We also took times of low light from Rotse observations to extend the observational history for our period study.

A linear fit to all available timings of minimum light gives:

$$\text{HJD TMin I} = 2453437.8207\ (\pm 0.0024) + 0.2667249\ (\pm 0.0000007)\text{d} \times \text{E} \qquad (2)$$

A quadratic trend is apparent so we also calculated the following ephemeris:

$$\begin{aligned}\text{HJD TMin I} = 53437.82924\ (\pm 0.00079) + 0.26673640\ (\pm 000000059)\text{d} \times \text{E} \\ +0.00000000153\text{d} \times \text{E}^2\ (\pm 0.00000000007)\end{aligned} \qquad (3)$$

In addition, we used the Wilson code to calculate a linear ephemeris using our present observations for the purpose of phasing the light curves (van Hamme and Wilson 1998):

$$\text{HJDTminI} = 2453437.82835 \pm 0.00029 + 0.266749 \pm 0.000010\text{d} \times \text{E} \qquad (4)$$

The $O-C$'s for the linear and quadratic fit are given in electronic Table 2 (available on the IBVS website as `5697-t2.txt`) and the plot of $O-C$ residuals for Equation 2 and overlaid by a quadratic fit is given as Figure 4.

It is typical for W UMa binaries to have continuously decreasing or increasing periods. In the stage of shallow contact, binaries may undergo thermal relaxation oscillations (TRO) so, theoretically, the period will alternately increase and decrease. (Cyclic changes can also result from stellar magnetic cycles or from a third body.) When binary components reach firm contact, after TRO cycles, the solar type binary will steadily lose angular momentum via stellar winds and its period will be characterized by a continuous decrease. We found from our light curve solution that the fill-out is still somewhat shallow so TRO may still be acting here. In that case, and the period can be on the increase as suggested by the quadratic ephemeris. Further observations are needed to confirm the trend suggested by our preliminary period study.

Standard magnitudes were determined from observations of Landolt standard stars SA 106 700, PG 1323 086, ,PG 1323 086B, PG 1323 086C, and PG 1407-013 on March 7,

2005. They indicate the variable is a 12th magnitude binary which varies from a $V = 11.78 \pm 0.03$ to 12.28 ± 0.07. The comparison and check stars have a V magnitude of 11.64 ± 0.08 and 15.28 ± 0.08, respectively. The color indices indicate that GSC 1419 091 is of late G to early K-type. The check is late F to early G while the comparison is late K to early M. Details are given in electronic Table 3, available on the IBVS website as `5697-t3.tex`.

We began by pre-modeling the binary in Binary Maker 3.0 (Bradstreet 2002) and then used Our results as starting values for the 5-color synthetic light curve solution in the newest 2004 Wilson Code.(Wilson & Devinney 1971, Wilson 1990, 1994).

Our solution indicates that GSC 1419 0091 is a short period AW UMa-type contact binary. The primary component is the more massive, slightly cooler star. The primary component is over five times the mass of the secondary component ($m_2/m_1 = 0.19$) the Roche lobe fillout is 23%. We would expect this to increase with time. Other parameters include the temperatures, $T_1 = 5000 \pm 300$K (fixed, error from photometry) and $T_2 = 5014 \pm 3$K (formal error, so the actual error is still about ± 300). The orbital inclination was $84^\circ\!.7 \pm 0^\circ\!.1$. The eclipses are total, so we believe our solution is definitive. We note here that errors given in the Table are formal errors.

The observed O'Connell effect is evidence for magnetic spot activity; our model includes two weak but broad magnetic regions. Both of the magnetic regions were of high latitude which is indicative of strong magnetic activity.

Our solution is given as electronic Table 4 (available on the IBVS website as `5697-t4.tex`) and the synthetic light curves are shown overlaying the phased, flux-normalized data in Figure 3. Our geometrical representation of GSC 1419 0091 is given in Figure 5.

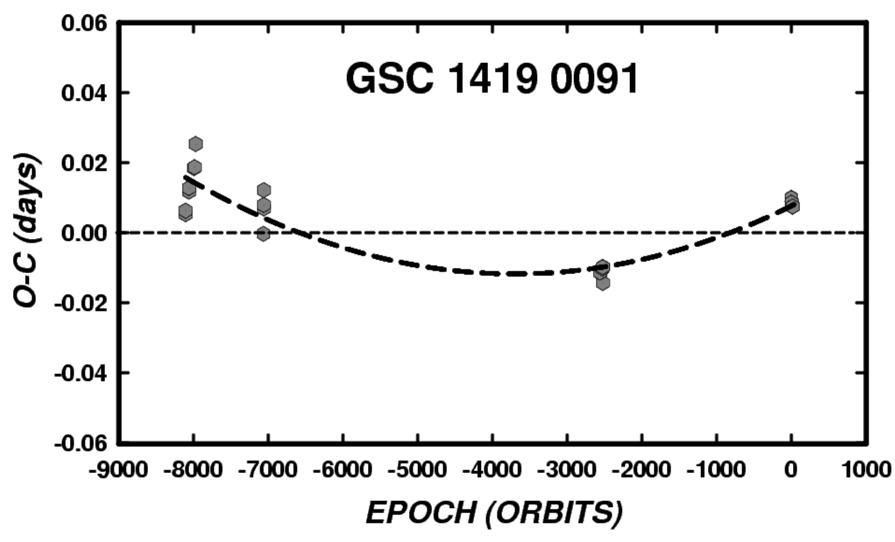

Figure 4.

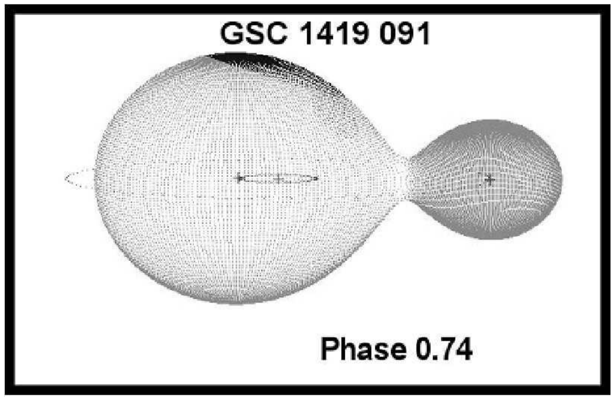

Figure 5.

We wish to thank the National Undergraduate Research Observatory (NURO) and Lowell Observatory for their allocation of observing time, as well as NASA and the American Astronomical Society for their continued support of our undergraduate research programs through their small research grants.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5698

Konkoly Observatory
Budapest
3 May 2006

HU ISSN 0374 – 0676

SEVEN NEW DOUBLE-MODE RR LYRAE STARS

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The number of known Galactic field double-mode RR Lyrae stars (type RRd) has grown rapidly (Wils, 2006) thanks to the automatic surveys such as the Northern Sky Variability Survey (*NSVS*; Wozniak et al., 2004) and the All Sky Automated Survey (*ASAS-3*; Pojmanski, 2002). The number of known RRd stars south of the equator is however still lower than in the northern sky, while the study of Wils, Lloyd & Bernhard (2006) has shown that the number of RRab stars brighter than magnitude 14, is about one third higher in the southern hemisphere, based on the above mentioned surveys.

A search for multiperiodicity in all the RR Lyrae stars found by *ASAS-3* was therefore carried out to identify the "missing" RRd stars. It was possible to identify seven more RRd stars for which Table 1 lists the fundamental light curve parameters. It includes values for the invariant Fourier parameters and for the generalized phase differences $G_{1,1}$ and $G_{-1,1}$ of the cross coupling terms $f_0 + f_1$ and $f_1 - f_0$ respectively, as defined by Poretti and Pardo (1997). Formal uncertainties are given between parentheses in units of the last significant decimal. Also listed are the *2MASS* (Cutri et al., 2003) colour index, the Galactic latitude b in degrees and the position and the total proper motion μ derived from the *UCAC2* catalogue (Zacharias et al., 2004). The position for GSC 8758-1831 was taken from *2MASS*. The electronic version of the IBVS contains direct links to the *ASAS-3* source data.

The stars GSC 6368-0742 and GSC 8833-1048 are also known as NSV 13710 and NSV 14764 respectively.

The plots in Fig. 1 give the phase diagrams for the new double-mode RR Lyrae stars for the fundamental mode and the first overtone mode, in both cases prewhitened for the other mode and its harmonics and linear combinations of the frequencies. The fundamental mode of GSC 6108-0220 has an especially low amplitude.

The Petersen diagram in Fig. 2 with the known Galactic field double-mode RR Lyrae stars (from Wils, 2006 and this paper) together with those found in the Galactic Bulge (Moskalik & Poretti, 2003; Pigulski et al., 2003; Mizerski, 2003) and the Galactic foreground stars to the Sagittarius dwarf galaxy (Cseresnjes, 2001) shows a clear trend with an almost constant period ratio at longer periods and a rapidly decreasing period ratio towards smaller periods. Two stars stand out with a larger period ratio than expected. These are bul_sc39_1568 (Mizerski, 2003) and vd5f715 (Cseresnjes, 2001), both probably have a quite different metallicity (Popielski et al., 2000).

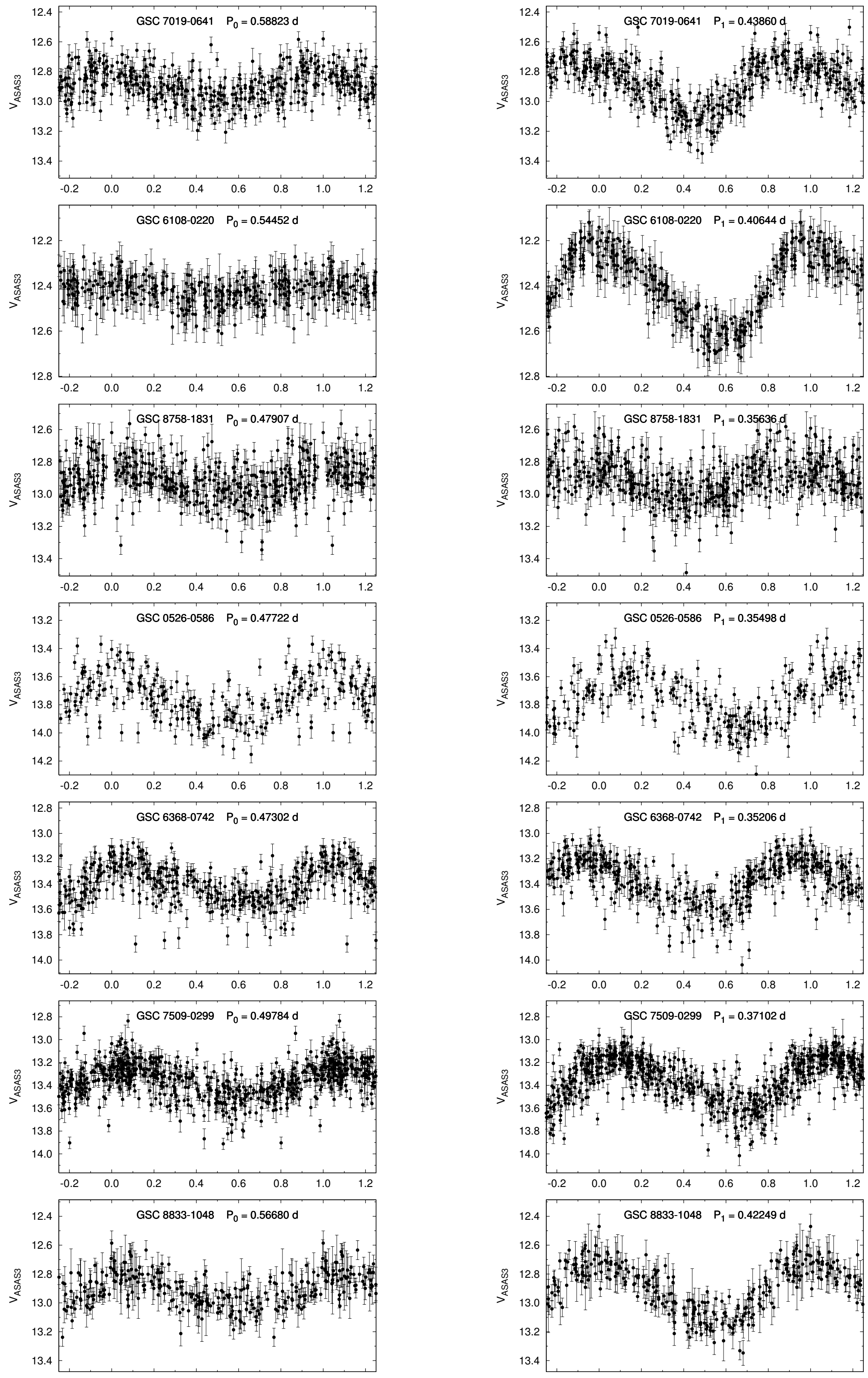

Figure 1. Phased light curves for the fundamental mode (left panels) and first overtone (right panels) periods of the new RRd stars, based on *ASAS-3* data.

Table 1: Characteristics of the new double-mode RR Lyrae stars

GSC	7019-0641	6108-0220	8758-1831	0526-0586	6368-0742	7509-0299	8833-1048
V_{ASAS3}	12.43-13.42	11.93-12.74	12.27-13.42	13.01-14.22	12.87-14.22	12.79-14.04	12.39-13.41
Period F (d)	0.58823(7)	0.54452(6)	0.47907(5)	0.47722(5)	0.47302(5)	0.49785(6)	0.56680(7)
Period 1O (d)	0.43860(4)	0.40644(4)	0.35636(3)	0.35498(3)	0.35206(3)	0.37102(3)	0.42249(4)
Period ratio	0.7456(1)	0.7464(1)	0.7439(1)	0.7438(1)	0.7443(1)	0.7452(1)	0.7454(1)
Amplitude ratio 1O/F	2.2(2)	6.0(10)	1.5(2)	1.3(1)	1.5(1)	1.6(2)	1.9(2)
R_{21}(F)	0.22(9)	–	–	–	0.29(8)	0.15(8)	0.16(8)
R_{21}(1O)	0.22(4)	0.19(3)	–	0.17(7)	0.10(5)	0.25(5)	0.17(4)
Φ_{21}(F)	3.57(33)	–	–	–	4.24(18)	4.99(31)	3.99(34)
Φ_{21}(1O)	5.21(17)	4.82(6)	–	5.23(19)	4.52(3)	4.82(19)	4.64(25)
$G_{1,1}$	4.23(37)	4.86(17)	3.64(9)	4.35(10)	4.26(5)	4.64(14)	3.87(3)
$G_{-1,1}$	3.49(9)	–	2.81(14)	4.85(24)	3.11(53)	3.52(12)	3.37(10)
b	−60.6	+40.8	−20.1	−29.2	−42.7	−66.2	−61.7
RA (2000)	$03^h05^m27\overset{s}{.}64$	$12^h25^m09\overset{s}{.}50$	$18^h40^m35\overset{s}{.}32$	$21^h07^m26\overset{s}{.}08$	$21^h27^m21\overset{s}{.}17$	$23^h04^m49\overset{s}{.}09$	$23^h56^m21\overset{s}{.}77$
Dec (2000)	$-30^\circ58'38\overset{''}{.}7$	$-21^\circ39'52\overset{''}{.}5$	$-53^\circ50'32\overset{''}{.}1$	$+01^\circ10'17\overset{''}{.}6$	$-19^\circ07'59\overset{''}{.}1$	$-33^\circ45'14\overset{''}{.}3$	$-53^\circ29'21\overset{''}{.}9$
μ (mas/yr)	25	7	–	22	43	29	14
$J-K_s$	0.30	0.29	0.25	0.24	0.25	0.27	0.27

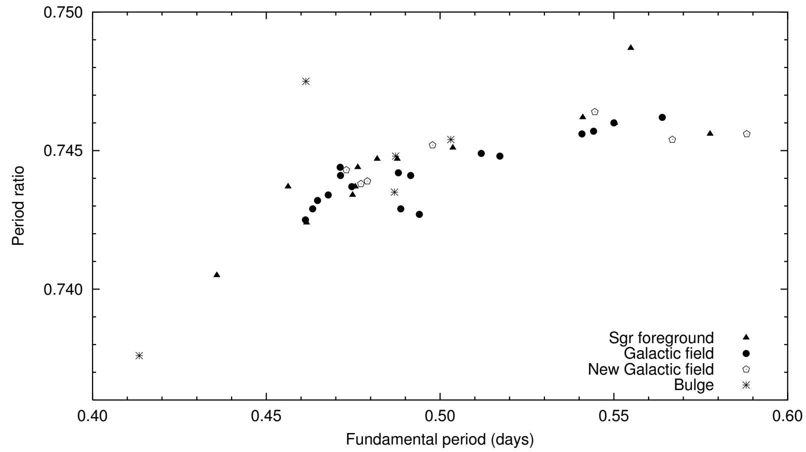

Figure 2. Petersen diagram for the known Galactic RRd stars.

With these newly identified RRd stars, there are now 9 known in the northern sky brighter than magnitude 14, compared to 13 south of the equator. The latter does not take into account the stars near the centre of Milky Way, which are fainter and in a crowded region so that they are not detectable by either *ASAS-3* or *NSVS*. The fainter stars EM and EN Dra have not been included in the number for northern RRd's. These numbers are in line with the ratio found for the RRab stars.

The total number of RRd stars brighter than magnitude 14 depends on the completeness of the search for RR Lyrae variables in general, especially for RRc variables, among which most RRd variables will be found. Wils et al. (2006) give an estimated 75% for the completeness ratio of *ASAS-3* RRc variables (and 92% for RRab variables). The completeness ratio for the RRc stars found in *NSVS* data is lower, but in the northern sky more RRd stars have been found that could not be identified in the *NSVS* data. Overall, it may be assumed that at least 75% of all RRd stars brighter than magnitude 14 have been discovered.

The distribution of all Galactic RRd stars across the sky in Galactic coordinates is given in Fig. 3.

Acknowledgements: This research has utilised the *ASAS-3* public photometry catalogue and the SIMBAD and VizieR databases operated at the *Centre de Données Astronomiques (Strasbourg)* in France. Use was made of the data products from the *Two Micron All Sky Survey*, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.

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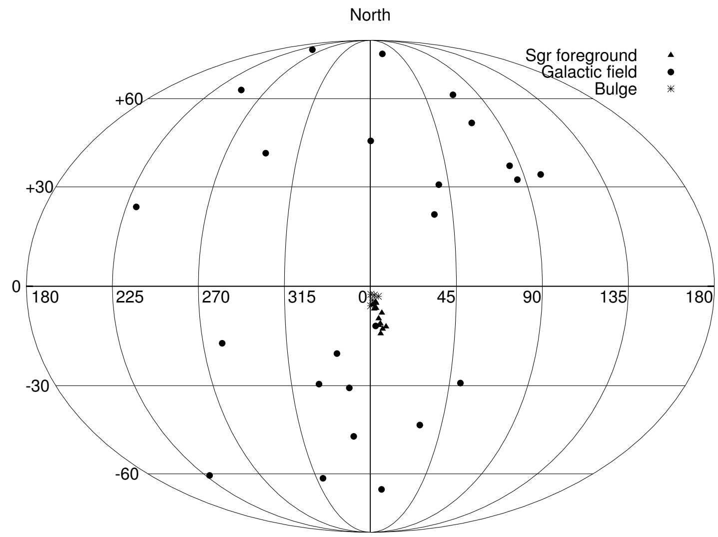

Figure 3. Distribution of the Galactic RRd stars in Galactic coordinates (the central horizontal line represents the Galactic equator).

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5699

Konkoly Observatory
Budapest
3 May 2006

HU ISSN 0374 – 0676

OBSERVATIONS OF VARIABLES

The last but one issue of the volume publishes new observations, and results on known variable stars. Figures and data files are available electronically.

Previous reports can be found in IBVS No. 5599.

The Editors

Date: 4 March 2005
Reported by: Otero, S. - Grupo Wezen 1 88 & CEA, Argentina, varsao@fullzero.com.ar

Name of the object:
NSV 14773 = HD 224355 = HIP 118077
Remarks:
Hipparcos data (Perryman et al., 1997) confirm that NSV 14773 is an EA-type eclipsing binary with the elements: HJDminI = 2449040.829 + 12.1564 d X E. V-magnitude range (Otero, 2003) is 5.57 to at least 5.68. This is probably an eccentric system with a secondary eclipse at phase 0.67. The 5th edition of the Bright Star Catalogue (Hoffleit and Warren Jr., 1991) gives F1/6V+F3V as spectral types and 12.156153 days as the spectroscopic period. The NSV Catalog (Kukarkin and Kholopov, 1982) lists it as a suspected eclipsing binary with an amplitude of only 0.05 mag.

Date: 4 March 2005
Reported by: Frank, P.- BAV, Germany, frank.velden@t-online.de Bernhard, K.- BAV, Austria, klaus.bernhard@liwest.at

Name of the object:
GSC 0733-0252 = Brh V104
Remarks:
GSC 0733.0252 (RA: 06 32 15.3 DEC: +08 54 20.3, J2000) is an EA variable with the ephemeris: HJDminI = 2452364.390 + 4.2925 x E, range (unfiltered, near V): 12.4-12.8 .

Name of the object:
GSC 1331-0726 = Brh V146

Remarks:
GSC 1331.0726 (RA: 06 55 57.5 DEC: +15 35 32.9, J2000) is a WUMa star with the ephemeris: HJDminI = 2453381.5558 + 0.350606 x E, range (unfiltered, near V): 12.4-12.7 .

Date: 8 March 2005

Reported by:
Samus, Nikolai N. - Inst. of Astron. (Russian Acad. Sci.), 48, Pyatnitskaya Str., Moscow 119017, Russia and Sternberg Astron. Inst. (Moscow Univ.), samus@sai.msu.ru
Antipin, Sergei V. - Inst. of Astron. (Russian Acad. Sci.), 48, Pyatnitskaya Str., Moscow 119017, Russia and Sternberg Astron. Inst. (Moscow Univ.)

Name of the object:
V337 Ori = S 03747 = GSC 01320-00167 = Tyc2 1320 167 1 = NSVS 9627247 = ASAS 055921+2002.1

Remarks:
The star was considered irregular (Ahnert, 1951) and red (spectral type M5, Neckel, 1958). In an e-mail message from Skiff (2004), it was noted that the spectral type referred to a neighbor, GSC 01320-01109, whereas it was V337 Ori (GSC 01320-00167) that actually varied according to ASAS3 data. This finding agrees with that of G. Richter (1965) that the star was white. Our analysis of the ASAS3 and ROTSE1/NSVS data shows that the star is a high-amplitude Delta Scuti variable with the light elements: Max = 2453068.586 + 0.201261 d x E, range 10.90 - 11.45 (V), M-m = 0.35 P (ASAS3), range 11.2 - 11.6 (ROTSE1).

Date: 18 March 2005

Reported by:
Krajci, Tom - 9605 Goldenrod Circle, Albuquerque, NM 87116, loukrajci@comcast.net
Lloyd, Chris - Chilton, Didcot, Oxon. OX11 0QX, UK, cl@astro1.bnsc.rl.ac.uk

Name of the object:
SZ Lib = NSVS 13399063 = ASAS 151718-0543.5

Remarks:
SZ Lib is currently listed in the GCVS as type EB: with a period of 6.65 days. According to Chris Lloyd's analysis of ROTSE1 data it is an RRAB star with the following elements: JDmax = 2451275.295 + 0.540286(15) d X E, range 14.0 - 14.8 (R). This conclusion is also supported by ASAS data, but with a period of 0.540313(5)d. The incorrect GCVS period is probably an aliasing artifact.

Date: 12 April 2005
Reported by: Nawrocki, K. - SINS Warsaw Sokolowski, M. - SINS Warsaw Wrochna, G. - SINS Warsaw, wrochna@fuw.edu.pl Mankiewicz, L. - CTP PAS Warsaw Krupska, K. - UKSW Warsaw Kwiecinska, K. - UKSW Warsaw Pilecki, B. - Warsaw University Cwiok, M. - Warsaw University Piotrowski, L.W. - Warsaw University Szczygiel, D. - Warsaw University "Pi of the Sky" collaboration - http://grb.fuw.edu.pl

Name of the object:
CN Leo = GSC 00261-00377 = ASAS 105629+0700.8
Remarks:
"Pi of the Sky" automatic trigger has detected a bright flare of CN Leo at 2005.04.02 1:13:42 UT. The magnitude of the star has risen by Delta_m=4.5 from m=13.5 (ASAS data) to m_max=9.0 (unfiltered).

Date: 5 May 2005
Reported by: Khruslov, A.V. - Tula, Russia, khruslov@bk.ru SkyDOT team - http://skydot.lanl.gov

Name of the object:
CC Aqr = SVS 0325 = GSC 5772-00175 = NSVS 17237250
Remarks:
CC Aqr is currently listed in the GCVS as type S:. According to ROTSE1 ROTSE data, it is an RRAB star with the following elements: JDmax = 2451420.114+0.46829 d xE, range 14.1 - 15.4 (R), M-m = 0.2: P.

Name of the object:
AL Cap = GSC 6330-01608 = NSVS 17176197
Remarks:
AL Cap is currently listed in the GCVS as type L. According to ROTSE1 ROTSE data, it is an RRAB star with the elements: JDmax = 2451415.853+0.6812 d xE, range 13.0 - 13.8 (R), M-m = 0.18 P. A one-day alias period, 0.4050 d, is not excluded.

Name of the object:
V568 Cas = AN 1936.0631 = GSC 4309-00238 = NSVS 227057 = NSVS 272580 = NSVS 310117
Remarks:
According to Schmidt (1996), V568 Cas is an RRAB star with the elements: JDmax = 2451475.08 +0.51404 d xE. From ROTSE1 data, we confirm these findings, with the following new elements derived taking into account the published maximum: JDmax = 2451475.08+0.514043 d xE, range 12.0 - 13.1 (R), M-m = 0.10 - 0.15 P. Blazhko effect is pronounced.

Name of the object:
SX Del = GSC 1656-00544 = NSVS 11599377
Remarks:
SX Del is an I: star in the GCVS. The star actually belongs to the RRAB type with the following elements: JDmax = 2451416.545+0.61336 d xE, range 13.0 - 13.8 (R), M-m = 0.15: P according to ROTSE1 data.

Name of the object:
NR Her = AN 1931.0184 = GSC 2084-01066 = SVS 8009333
Remarks:
NR Her is currently listed in the GCVS as type IS:. According to ROTSE1 ROTSE data, it is an RRC star with the following elements: JDmax = 2451393.848+0.269135 d xE, range 14.0 - 14.7 (R), M-m = 0.36 P.

Name of the object:
V408 Oph = GSC 1014-00083 = NSVS 10955592
Remarks:
V408 Oph is an RR: star in the GCVS (spectral type F5), without light elements. According to ROTSE1 data, it is an RRAB star with the following elements: JDmax = 2451392.380+0.43591 d xE, range 11.4 - 11.9 (R), M-m = 0.12 P.

Name of the object:
NSV 573 = GSC 2297-01073 = GR 108 = NSVS 6456202 = NSVS 6466505
Remarks:
NSV 573, type not indicated in the NSV catalog, is an RRAB star with the elements: JDmax = 2451477.01+0.6525 d xE, range 14.1 - 15.1 (R), M-m = 0.15 P according to ROTSE1 data.

Name of the object:
NSV 3449 = CSV 006560 = Weber 083 = NSVS 9934090
Remarks:
NSV 3449, an RR star in the NSV catalog, is an RRAB star with the following elements: JDmax = 2451536.396+0.7244 d xE, range 13.6 - 14.5 (R), M-m = 0.15 P according to ROTSE1 data.

Name of the object:
NSV 4017 = NSVS 12853552
Remarks:
NSV 4017, type not indicated in the NSV catalog, is an RRAB star with the elements: JDmax = 2451546.970+0.5508 d xE, range 13.7 - 14.8 (R), M-m = 0.25: P according to ROTSE1 data.

Name of the object:
NSV 4034 = TYC 4133 560 1 = GSC 4133-00560 = NSVS 2462144
Remarks:
NSV 4034, an L star in the NSV catalog (spectral type A), is actually an RRAB star with the elements: JDmax = 2451522.68+0.59905 d xE, range 10.75 - 11.35 (R), M-m = 0.2 P according to ROTSE1 data.

Name of the object:
NSV 4745 = AN 1935.0204 = GSC 1971-00401 = NSVS 7496253
Remarks:
NSV 4745, type not indicated in the NSV catalog, is an RRAB star with the elements: JDmax = 2451464.555+0.4614 d xE, range 13.1 - 14.4 (R), M-m = 0.15: P according to ROTSE1 data.

Name of the object:
NSV 5043 = AN 1927.0012 = SVS 0111 = NSVS 13083830
Remarks:
NSV 5043 has its type not indicated in the NSV catalog. According to ROTSE1 data, it is an RRAB star with the following elements: JDmax = 2451516.47+0.6245 d xE, range 13.0 - 13.5 (R), M-m = 0.15: P.

Name of the object:
NSV 5171 = S 09613 = GSC 3831-00719 = NSVS 2600797
Remarks:
NSV 5171, an S: star in the NSV catalog, is an RRAB star with the elements: JDmax = 2451406.145+0.51907 d xE, range 14.2 - 15.4 (R), M-m = 0.15 P according to ROTSE1 data.

Name of the object:
NSV 6461 = GSC 0903-00571 = NSVS 10484859
Remarks:
NSV 6461, type not indicated in the NSV catalog, is an RRAB star with the elements: JDmax = 2451427.42+0.6193 d xE, range 14.35 - 15.05 (R), M-m = 0.15: P according to ROTSE1 data.

Name of the object:
NSV 6881 = HV 10439 = GSC 1491-01141 = NSVS 10582966
Remarks:
NSV 6881 is currently listed in the NSV catalog as type RR. According to ROTSE1 data, it is an RRAB star with the following elements: JDmax = 2451414.522+0.52930 d xE, range 14.0 - 15.1 (R), M-m = 0.15: P.

Name of the object:
NSV 6940 = HV 10441 = GSC 1492-00562 = NSVS 10586519
Remarks:
NSV 6940 is currently listed in the NSV catalog as type RR. According to ROTSE1 data, it is an RRAB star with the following elements: JDmax = 2451388.922+0.47451 d xE, range 14.4 - 15.4 (R), M-m = 0.18: P.

Name of the object:
NSV 7999 = S 09620 = GSC 0396-01823 = NSVS 13574369
Remarks:
NSV 7999 is currently listed in the NSV catalog as type S:. Häussler (2004) finds it to be an RRAB star with the period 0.456 d, which failed to represent, however, some of his photographic observations. According to ROTSE1 data, NSV 7999 is an RR: star with the elements: JDmax = 2451377.81+0.45666 d xE, range 14.5 - 15.6 (R), M-m = 0.2 P.

Name of the object:
NSV 8569 = HV 10930 = GSC 0404-01956 = NSVS 13687029
Remarks:
NSV 8569 is currently listed in the GCVS as type RR According to ROTSE1 data, it is an RRAB star with the following elements: JDmax = 2451398.165+0.73580 d xE, range 13.4 - 14.1 (R), M-m = 0.20 P.

Name of the object:
NSV 9872 = AN 1930.0210 = GSC 1015-01354 = NSVS 10919329
Remarks:
NSV 9872, type not indicated in the NSV catalog, is an RRAB star with the elements: JDmax = 2451348.725+0.56353 d xE, range 13.8 - 15.0 (R), M-m = 0.12 P according to ROTSE1 data.

Name of the object:
NSV 11317 = S 09663 = GSC 3926.00508 = NSVS 3043060
Remarks:
NSV 11317, an RR: star in the NSV catalog, is an RRAB star with the elements: JDmax = 2451402.853+0.52919 d xE, range 13.3 - 14.1 (R), M-m = 0.15 P according to ROTSE1 data.

Name of the object:
NSV 13519 = SVS 0495 = NSVS 8609914
Remarks:
NSV 13519, an RR: star in the NSV catalog, is a RRAB star with the following elements: JDmax = 2451401.45+0.4759 d xE, range 13.6 - 14.8 (R), M-m = 0.2 P according to ROTSE1 data.

Name of the object:
NSV 14723 = Ross 226 = GSC 1725-01459 = NSVS 9052681
Remarks:
NSV 14723, type not indicated in the NSV catalog, is an RRAB star with the elements: JDmax = 2451458.130+0.60373 d xE , range 13.9 - 15.1 (R), M-m = 0.13 P according to ROTSE1 data.

Name of the object:
NSV 17902 = NSVS 4812548
Remarks:
NSV 17902, type not indicated in the NSV supplement, is an RRAB star with the following elements: JDmax = 2451513.52+0.62945 d xE , range 14.3 - 15.1 (R), M-m = 0.15 P according to ROTSE1 data.

Name of the object:
NSV 18027 = GSC 2982-00235 = NSVS 4820870
Remarks:
NSV 18027, type not indicated in the NSV supplement, is an RRAB star with the elements: JDmax = 2451565.12+0.6249 d xE, range 13.4 - 14.0 (R), M-m = 0.2 P according to ROTSE1 data.

Name of the object:
V534 Her = S 05461 = NSVS 11015122
Remarks:
V534 Her, an SR: star in the GCVS, is actually an RRAB star with the elements: JDmax = 2451398.037 + 0.59977 d xE, range 12.7 - 13.6 (R), M-m = 0.2:P according to ROTSE1 data.

Name of the object:
NSV 2763 = S 08009 = CSV 006413 = NSVS 4493603
Remarks:
NSV 2763 is currently listed in the NSV catalog as type E:. According to ROTSE1 data, it is an RRAB star with the following elements: JDmax = 2451509.693 + 0.57979 d xE, range 13.4 - 14.1 (R), M-m = 0.15 P.

Name of the object:
NSV 4369 = S 10230 = NSVS 12962969
Remarks:
NSV 04369 is currently listed in the NSV catalog as type E:. According to ROTSE1 data, it is an RRAB star with the following elements: JDmax = 2451553.70 + 0.49691 d xE, range 12.35 - 13.25 (R). Blazhko effect is possible.

Name of the object:
NSV 6948 = HV 08668 = HV 10442 = NSVS 7792784
Remarks:
NSV 6948 is an E: star in the NSV catalog. The star actually belongs to the RRC type with the following elements: JDmax = 2451408.102 + 0.33730 d xE, range 14.3 - 15.1 (R), M-m = 0.33 P according to ROTSE1 data.

Name of the object:
NSV 8170 = AN 1934.0372 = NSVS 10767118
Remarks:
NSV 8170 is currently listed in the NSV catalogue as a type E: star. According to ROTSE1 data, it is an RRAB star, most probably with the following elements: JDmax = 2451357.772+0.5510 d xE, range 12.1 - 13.2 (R), M-m = 0.15 P. A one-day alias period, 0.3551 d, is not excluded. I suspect Blazhko effect with the possible period 38.4 d.

Name of the object:
NSV 9631 = S 09821 = NSVS 10904025
Remarks:
NSV 9631, an CEP: star in the NSV catalog, is an RRAB star with the elements: JDmax = 2451331.646 + 0.46262 d xE , range 13.4 - 14.7 (R), M-m = 0.15 P according to ROTSE1 data.

Date: 6 May 2005

Reported by: Khruslov, A.V., Tula, Russia, khruslov@bk.ru SkyDOT team - http://skydot.lanl.gov

Name of the object:
V1788 Cyg = NSV 13250 = AN 1936.0544 = NSVS 5752997 = NSVS 5753047
Remarks:
V1788 Cyg is a CEP: star in the GCVS. Locher (1983) considered is either a 14-day Cepheid or a 28-day EB eclipsing star. According to ROTSE1 data, it is actually a classical Cepheid (DCEP) with the elements: JDmax = 2451414.1 + 14.10 d xE, range 11.07 - 11.68 (R) or 10.94 - 11.51 (R).

Name of the object:
PQ Her = S 4246 = GSC 03106-00264 = ROTSE1 J180733.25+401530.1 = NSVS 5373030 = 1RXS J180732.1+401531
Remarks:
PQ Her was considered by Akerlof et al. (2000) to be a Cepheid with P = 4.54563093 d. From the NSVS data, we prefer the star's classification as an RS CVn star without eclipses, with the elements: JDmax = 2451401.81 + 4.5739 d xE, range 12.4 - 12.6 (R). This classification is in a better agreement with the spectral type (G8, Bond, 1978) for the given period, with the star's relatively small amplitude, and our suggested identification with the X-ray source 1RXS J180732.1+401531.

Name of the object:
NSV 1444 = AN 1939.0021 = CSV 000373 = GSC 3722-00702 = NSVS 1990170 = NSVS 2092272
Remarks:
NSV 1444, an S: star in the NVS catalog, is actually a DCEPS star with the elements: JDmax = 2451500.77+3.25 d xE , range 11.3 - 11.7 (R), M-m = 0.4 P according to ROTSE1 data.

Name of the object:
NSV 2748 = BV 0018 = CSV 006410 = GSC 4353-00370 = NSVS 655117 = NSVS 559464
Remarks:
NSV 2748, type not indicated in the NSV catalog (spectral type F4), is a CWA or SRD star with the elements: JDmax = 2451517 +35.0 d xE, range 11.1 - 11.9 (R) , M-m = 0.35 P according to ROTSE1 data.

Name of the object:
NSV 4019 = NSVS 722222 = NSVS 745957
Remarks:
NSV 4019, type not indicated in the NSV catalog, is a DSCT star with the elements: JDmax = 2451555.057+0.082417 d xE, range 13.1 - 13.5 (R), M-m = 0.35 P according to ROTSE1 data.

Name of the object:
NSV 7777 = AN 1935.0061 = TYC 1510 01091 1 = NSVS 10699946 = NSVS 10706505

Remarks:
NSV 7777, type not indicated in the GCVS, is a DSCT star with the elements: JDmax = 2451391.964+0.094683 d xE , range 11.5 - 11.8 (R), M-m = 0.4 P according to ROTSE1 data.

Name of the object:
NSV 15367 = LD 100 = GSC 3683-00393 = NSVS 1810833

Remarks:
NSV 15367, type not indicated in the NSV Supplement, is a DCEP star with the elements: JDmax = 2451495.29+3.845 d xE, range 12.27 - 12.70 (R), M-m = 0.25 P according to ROTSE1 data.

Date: 09 May 2005

Reported by:
Khruslov, A.V., Tula, Russia, khruslov@bk.ru SkyDOT team - http://skydot.lanl.gov

Name of the object:
V466 Lyr = S 09886 = GSC 2627-00926 = NSVS 8103911

Remarks:
V466 Lyr, an E:/SD: star in the GCVS (Min JD 2439945.526), is actually an EA/RS star with the elements: JDminI = 2451390.77+7.18 d xE, range in 12.75 - 13.6 (R), D = 0.07P according to ROTSE1 data (P = 7.1802 d taking into account the GCVS epoch).

Name of the object:
AC Psc = GR 263 = GSC 0584-01274 = NSVS 14605916

Remarks:
AC Psc, an L star in the GCVS, is actually an EA star with the following elements: JDminI = 2451458.768+0.3353 d xE, range 13.6 - 14.6 - 14.1 (R) according to ROTSE1 data.

Name of the object:
NSV 1495 = CSV 006080 = GSC 4510-00423 = GSC 4510-02644 = NSVS 448912

Remarks:
NSV 1495, type not indicated in the NSV catalog (spectral type F5), is a W UMa star with the elements: JDminI = 2451497.718+0.43075 d xE, range 12.2 - 13.0 - 12.9 (R) according to ROTSE1 data.

Name of the object:
NSV 1719 = CSV 000440 = HV 10397 = GSC 0096-00175 = NSVS 12231532

Remarks:
NSV 1719, an S: star in the NSV catalog, is actually an EW star with the elements: JDminI = 2451524.829+0.29031 d xE, range 12.9 - 13.7 - 13.8 (R) according to ROTSE1 data.

Name of the object:
NSV 3771 = AN 1937.0213 = NSVS 685415 = NSVS 738923 = NSVS 767639
Remarks:
NSV 3771 is currently listed in the NSV catalog as type S:. According to ROTSE1 data, it is an EB star with the following elements: JDminI = 2451473.49 + 0.90733 d xE, range 12.9 - 13.5 - 13.2 (R).

Name of the object:
NSV 4399 = S 09609 = GSC 0230-01604 = NSVS 12967358
Remarks:
NSV 4399 is currently listed in the NSV catalog as type E. According to ROTSE1 data, it is an EW star with the following elements: JDminI = 2451553.492+0.47226 d xE, range 11.2 - 11.7 - 11.6 (R).

Name of the object:
NSV 4638 = BV 0371 = TYC 4631 1042 1 = GSC 4631-01042 = NSVS 96494 = NSVS 851359
Remarks:
NSV 4638 is currently listed in the NSV catalog as type E (spectral type F4). According to ROTSE1 data, it is an EW star with the elements: JDminI = 2451434.388 + 0.69005 d xE, range 10.75 - 11.15 - 11.05 (R).

Name of the object:
NSV 6813 = HV 10429 = GSC 1484-00865 = NSVS 10535470
Remarks:
NSV 6813 is an E: star in the NSV catalog. According to ROTSE1 data, it is an EW star with the elements: JDminI = 2451417.346+0.31597 d xE, range 13.25 - 13.85 - 13.70 (R).

Name of the object:
NSV 7901 = BV 0166 = HD 150364 = BD +06 3270 = TYC 395 1818 1 = GSC 0395-01818 = NSVS 13562337
Remarks:
NSV 7901, an L star in the NSV catalog, is actually an EB star with the elements: JDminI = 2451419.83+0.72341 d xE, range 10.05 - 10.54 - 10.27 (R) according to ROTSE1 data.

Name of the object:
NSV 12777 = S 07859 = NSVS 3109417 = NSVS 3212575 = NSVS 5659774
Remarks:
NSV 12777 is currently listed in the NSV catalog as type RR:. According to ROTSE1 data, it is an W UMa star with the following elements: JDminI = 2451414.105+0.28254 d xE, range 13.6 - 14.3 - 14.1 (R).

Name of the object:
NSV 12845 = S 08362 = TYC 1622 1106 1 = GSC 1622-01106 = NSVS 11409703
Remarks:
NSV 12845 is an E: star in the NSV catalog. According to ROTSE1 data, it is an EB star with the elements: JDminI = 2451426.62+0.83334 d xE, range 11.90 - 12.45 - 12.18 (R).

Name of the object:
NSV 14514 = SVS 0943 = GSC 2764-01417 = NSVS 9023162
Remarks:
NSV 14514, type not indicated in the NSV catalog, is an EB star with the elements: JDminI = 2451446.889+0.406095 d xE, range 12.15 - 13.05 - 12.50 (R) according to ROTSE1 data.

Name of the object:
NSV 20007 = GSC 3855-00208 = NSVS 2731044
Remarks:
NSV 20007, type not indicated in the NSV supplement, is a W UMa star with the elements: JDminI = 2451432.173+0.283356 d xE, range 13.0 - 13.7 - 13.6 (R) according to ROTSE1 data.

Name of the object:
V1941 Cyg = S 10902 = NSVS 5943885
Remarks:
V1941 Cyg is currently listed in the GCVS as a type E: star. According to ROTSE1 data, it is an EB star with the following elements: JDminI = 2451420.91+1.0119 d xE, range 12.5 - 13.2 - 12.8 (R) .

Name of the object:
V2291 Cyg = GSC 3560-01105 = NSVS 5605052 = NSVS 5628840
Remarks:
V2291 Cyg is an EA: star in the GCVS. Diethelm (2001) gives the period 0.8170d, which is wrong. According to ROTSE1 data, it is an EB or EA star with the elements: JDminI = 2451407.72 + 1.3814 d xE, range 11.4 - 11.7 - 11.6 (R).

Name of the object:
NO Per = S 08551 = NSVS 4252925
Remarks:
NO Per is an EA: star in the GCVS, without light elements. According to ROTSE1 data. the light elements are: JDminI = 2451516.17 + 5.694 d xE, range 12.2 - 12.7 - 12.5 (R), D = 0.10 P. An eccentric binary, the phase of minII is 0.35 P.

Name of the object:
CC Tau = HV 10395 = NSVS 12227503
Remarks:
CC Tau , an E star without light elements in the GCVS, is an EB star with the elements: JDminI = 2451525.305 + 0.47966 d xE , range 12.8 - 13.5 - 13.1 (R) according to ROTSE1 data.

Name of the object:
NSV 320 = S 10449 = GSC 3659-00509 = NSVS 1714450
Remarks:
NSV 320, an E: star in the NSV catalog, is actually an EB star with the elements: JDminI = 2451486.57+0.7845 d xE, range 12.30 - 12.65 - 12.50 (R), according to ROTSE1 data.

Name of the object:
NSV 517 = GSC 3670-00387 = NSVS 1744880 = NSVS 3869926

Remarks:
NSV 517, type CEP: in the NSV catalog, is actually an EW star with the elements: JDminI = 2451497.062 + 0.8553 d xE, range 12.6 - 13.3 - 13.07 (or 12.7 - 13.4 - 13.17) (R), according to ROTSE1 data.

Name of the object:
NSV 3008 = GSC 2422-00224 = Weber 191 = NSVS 7163291

Remarks:
NSV 3008, an E: star in the GCVS, is an EA star with the elements: JDminI = 2451532.88+4.398 d xE, range 13.6 - 15.2 - 13.9 (R), D = 0.09 P according to ROTSE1 data.

Name of the object:
NSV 3715 = AN 1937.0212 = NSVS 684593 = NSVS 763679

Remarks:
NSV 3715 is a CEP: star in the NSV catalog. The star actually belongs to the W UMa type with the following elements: JDminI = 2451489.223 + 0.36209 d xE , range 13.1 - 13.8 - 13.65 (R) according to ROTSE1 data.

Name of the object:
NSV 11888 = NSVS 11214873

Remarks:
NSV 11888 is currently listed in the NSV catalog as type E:. According to ROTSE1 data, it is an EB star with the following elements: JDminI = 2451393.53+0.75183 d xE, range 11.80 - 12.25 - 12.05 (R).

Date: 6 June 2005

Reported by:
Lloyd, C. - RAL, Chilton, Didcot, Oxon. OX11 0QX, UK, cl@astro1.bnsc.rl.ac.uk Krajci, T. - 9605 Goldenrod Circle, Albuquerque, NM 87116, USA, loukrajci@comcast.net

Name of the object:
KY Hya = NSV 4469 = BD -17 2838

Remarks:
KY Hya is listed in the GCVS as EA, with an epoch but no period. Using observations from ROTSE-1 and ASAS3 it is confirmed as an Algol-type eclipsing binary with an ephemeris of HJDminI = 2453125.5485(8) + 3.072466(4) x E. The range in V is 10.5 - 11.0. The secondary eclipse is 0.3 mag deep and lies at phase 0.5. There is no Tycho epoch photometry of this system.

Date: 10 June 2005
Reported by: Krajci, Tom - 9605 Goldenrod Circle, Albuquerque, NM 87116, USA, loukrajci@comcast.net

Name of the object:
RZ Crv
Remarks:
RZ Crv is currently listed in the GCVS as type EW/KE with a period of 0.663756 days. It is actually an RRc star with the following elements: $JDmax = 2453387.359 + 0.33187d \times E$. The incorrect GCVS period is twice the true period.

Name of the object:
AS Lib
Remarks:
AS Lib is currently listed in the GCVS as type EW with a period of 0.5538091 days. It is actually an RRc star with the following elements: $JDmax = 2453507.087 + 0.27692d \times E$. The incorrect GCVS period is twice the true period.

Date: 21 June 2005
Reported by: Lloyd, C. - Rutherford Appleton Laboratory, Chilton, Didcot, Oxon. OX11 0QX, UK cl@astro1.bnsc.rl.ac.uk

Name of the object:
GSC 02102-01349
Remarks:
GSC 02102-01349 lies in the field of AU Her and was originally identified as a variable by Brown & Benson (1997). It is given as an LPV in the ROTSE-1 list of new variables (Akerlof et al. 2000). Further analysis of the ROTSE-1 data shows that it is a complex small-amplitude red variable (SARV) with at least two frequencies. These are 0.0320 and 0.0280 cycles/day corresponding to periods of 30.9 and 35.7 days. The closeness of the periods produces an amplitude modulation but there is also other activity. The 2MASS colours of J-H=0.88 and H-K=0.23 suggest that this is a very cool object.

Date: 23 June 2005
Reported by: Krajci, Tom - 9605 Goldenrod Circle, Albuquerque, NM 87116, USA, loukrajci@comcast.net

Name of the object:
V1002 Oph
Remarks:
V1002 Oph is currently listed in the GCVS as type EW:/KE with a period of 0.682818 days. It is actually an RRc star with the following elements: JDmax = 2453489.448 + 0.341415 d X E. The incorrect GCVS period is twice the true period.

Date: 20 July 2005

Reported by:
Blättler, E. - BBSAG, Switzerland, blaettler-wald(at)bluewin.ch
Diethelm, R. - BBSAG, Switzerland, rdiethelm(at)gmx.ch

The following stars were reported by Akerlof et al. (2000) as newly discovered eclipsing binaries. Blättler has performed unfiltered CCD observations with a SBIG ST-7 camera attached to his 0.15-m Starfire refractor in Wald, Switzerland, during 6 nights between JD 2453382 and JD 2453517.

Name of the object:

GSC 2013-288 = ROTSE1 J140846.30+292910.1 = NSVS 7727589

Remarks:

A total of 176 measurents were obtained, using GSC 2013-418 (11.44 mag) as comparison and GSC 2013-121 (12.64 mag) as check star. A linear regression of the 10 times of minima with the ROTSE1 data yields the following results: Type: EW; JD(min I, hel) = 2453382.6264 + 0.303119 * E; range (unfiltered, near R): 11.42 - 11.76 (11.69) mag.

Name of the object:

GSC 2544-1090 = ROTSE1 J135843.25+312510.1 = NSVS 7708849

Remarks:

A total of 172 measurents were obtained, using GSC 2544-324 (11.73 mag) as comparison and GSC 2544-924 (13.62 mag) as check star. A linear regression of the 7 times of minima with the ROTSE1 data yields the following results: Type: EW; JD(min I, hel) = 2453502.5459 + 0.385946 * E; range (unfiltered, near R): 12.93 - 13.37 (13.33) mag.

Name of the object:

GSC 2545-970 = ROTSE1 J140146.66+320847.5 = NSVS 7710072

Remarks:

A total of 186 measurents were obtained, using GSC 2545-240 (11.03 mag) as comparison and GSC 2545-1027 (11.91 mag) as check star. A linear regression of the 9 times of minima with the ROTSE1 data yields the following results: Type: EW; JD(min I, hel) = 2453502.5478 + 0.366986 * E; range (unfiltered, near R): 10.15 - 10.45 (10.41) mag.

Name of the object:

GSC 3034-299 = ROTSE1 J140509.23+385417.9 = NSVS 7711399 = NSVS 5098960

Remarks:

A total of 191 measurents were obtained, using GSC 3034-497 (11.11 mag) as comparison and GSC 3034-404 (11.32 mag) as check star. A linear regression of the 9 times of minima with the ROTSE1 data yields the following results: Type: EW; JD(min I, hel) = 2453382.6919 + 0.395010 * E; range (unfiltered, near R): 11.46 - 12.20 (12.13) mag.

Date: 20 July 2005

Reported by:
Pejcha, Ondrej - Nicholas Copernicus Observatory and Planetarium, Brno, Czech Republic, pejcha@astro.sci.muni.cz

Name of the object:
ROTSE1 J175239.04+434936.7 = GSC 3101-0683 = Pej 026
Remarks:
ROTSE1 gives position in between GSC 3101-0683 and GSC 3101-1186 and the catalogue entry is obviously a blend of these two stars. CCD observations revealed that the true variable star is GSC 3101-0683. Other information given in ROTSE1 catalogue, especially variability type (EW) and period (0.31630(6) days) remain likely valid. Clearly, the amplitude is higher, at least 0.6 mag. Nearby X-ray source 1RXS J175245.6+435128 is probably associated with this star.

Date: 20 July 2005

Reported by:
Caton, D. B. - Dark Sky Observatory, Dept. Physics and Astronomy, Appalachian State University, Boone, North Carolina 28608, U.S.A., catondb@appstate.edu
Smith, A. B. - Dark Sky Observatory, Dept. Physics and Astronomy, Appalachian State University, Boone, North Carolina 28608, U.S.A.

Name of the object:

V1898 Cyg

Remarks:

V1898 Cygni was identified as a spectroscopic binary by Abt et al. (1972), who proposed a period of 2.9258 days. The system was then studied by Halbedel (1985), who established the eclipsing nature and concluded that it had a period of 3.0239 days, with similar depth primary and secondary eclipses. We observed V1898 Cygni at Appalachian State University's Dark Sky Observatory. Observations obtained on JD 2452169 revealed a previously undiscovered secondary eclipse, meaning the true period is about half that proposed by Abt or by Halbedel.

Times of minimum light.

Time of minimum (HJD-2400000)	Error	Filter(s)	Type
50690.6948	0.0018	V	I
52169.7772	0.0010	V	II
52185.6636	0.0006	VBR	I
52928.6107	0.0014	V	I
53207.7802	0.0002	V	II
53226.6966	0.0002	V	I
53270.5757	0.0002	V	I

A linear regression analysis of minima resulted in a new period of 1.5131273 days (+/- 0.0000006 days). The secondary may be slightly displaced to earlier than phase 0.5 but asymmetries in the eclipses make this uncertain. Our original choice of comparison star, HD 200830, was revealed to be variable. On the night of JD 2452143 it was found to be about 0.2 magnitudes fainter in the V than usual, and it showed variations on other nights as well. It is listed in the literature as having H-alpha emission.

Date: 2 September 2005

Reported by:
Otero, S. - Grupo Wezen 1 88 & CEA, Argentina, varsao@fullzero.com.ar

Name of the object:

NSV 8266 = GSC 6812-0691 = ASAS 171139-2328.0

Remarks:

NSV 8266 was classified as an EB in IBVS 5480 (Otero, 2003) and is listed in the NSV (Kukarkin and Kholopov, 1982) as EA:. The ASAS catalogue (Pojmanski, 2004) subsequently classified it as DCEP-FU with a period of 26.601734 d. The star is actually a CWA star with the following elements: HJD Max = 2453135.79 + 26.56 d x E, range 11.5 - 12.7 (V).

Date: 15 September 2005

Reported by:

Bedient, J. - Honolulu, Hawaii, USA, bedient@hawaii.rr.com

Name of the object:

NSV 2490 = IRAS 05355-1549 = 2MASS 05375005-1548114 = USNO-B1.0 0741-0060555 = NSVS 15039799

Remarks:

This star was first detected as a variable by Ross (1929). It was selected from the 2MASS catalog as a candidate nearby ultracool dwarf star by Cruz et al. (2003), though it was noted in that paper that its association with an IRAS source indicated it was probably a dusty AGB star. A light curve computed with AVE v2.51 from combined ASAS (Pojmanski 2002) and NSVS (Wozniak et al. 2004) data confirms this star's type as a Mira, the elements are JD_max = 2452737 + 347.5 x E. The accurate position of the variable (from 2MASS) is RA 05h 37m 50s.1, Dec -15d 48m 11s.5.

Name of the object:

NSV 8638 = IRAS 17232-1414 = 2MASS J17260771-1416595

Remarks:

This star was first reported as variable by F. E. Ross (1925). Photometric data are available in both the ASAS (Pojmanski 2002) and NSVS (Wozniak et al. 2004) databases, though the star is not included in either the list of Red AGB Variables of NSVS or the ASAS online catalogue of variables. A phased light curve computed from the combined data with AVE v2.51 confirms this star's type as a Mira, the elements are JD_max = 2451295.0 + 285.0 x E. The star may show light curve variations similar to R Cygni, but as yet only 3 maxima and 1 minimum have been observed. The accurate position of the variable (from 2MASS) is RA 17h 26m 07.71s, -14d 16m 59.6s.

Date: 10 October 2005

Reported by:

Greaves, J. - Borrowdale Walk, Northampton, UK

Name of the object:

NSV 04727 = HD 87643 = IRAS 10028-5825 = MSX6C G282.6578-02.5260 = MWC 198

Remarks:

This B2ep or B2[e] star with a large NIR excess (2MASS J-Ks = +2.8, DENIS J-Ks = +2.6) as well as known strong stellar wind outflow and associated nebulosity is in fact an SDOR eruptive variable (akin to the eta Carinae style variables also sometimes known as LBVs or luminous blue variables) which is showing increased activity in recent times. ASAS-3 and NSV range combined is 8.68 - 9.83 V.

Date: 18 October 2005

Reported by:
Blättler, E. - BBSAG, Switzerland, blaettler-wald(at)bluewin.ch
Diethelm, R. - BBSAG, Switzerland, rdiethelm(at)gmx.ch

The following stars were reported by Akerlof et al. (2000) as newly discovered eclipsing binaries. Blttler has performed unfiltered CCD observations with a SBIG ST-7 camera attached to his 0.15-m Starfire refractor in Wald, Switzerland, during 7 nights between JD 2453303 and JD 2453600.

Name of the object:
GSC 3523-505 = ROTSE1 J175304.11+512910.9 = NSVS 5397530

Remarks:
A total of 159 measurents were obtained, using GSC 3523-1654 (12.91 mag) as comparison and GSC 3523-361 (13.13 mag) as check star. A linear regression of his 13 times of minima with the ROTSE1 data yields the following results: Type: EW; JD(min I, hel) = 2453326.3302 + 0.23891 33 * E; range (unfiltered, near R): 13.40 - 13.70 (13.66) mag. The variable is the northern component of a close pair of 13th magnitude stars which were not resolved with the current photometry. Therefore, the actual amplitude is larger than given above.

Name of the object:
GSC 3532-553 = ROTSE1 J181058.13+491052.5 = NSVS 5430728 = NSVS 5410963

Remarks:
A total of 188 measurents were obtained, using GSC 3533-2060 (11.20 mag) as comparison and GSC 3532-492 (13.19 mag) as check star. A linear regression of his 9 times of minimum with the ROTSE1 data yields the following results: Type: EW; JD(min I, hel) = 2453600.4877 + 0.317594 * E; range (unfiltered, near R): 13.27 - 13.82 (13.69) mag.

Name of the object:
GSC 3552-321 = ROTSE1 J185550.32+510009.7 = NSVS 5467662 = NSVS 5563914

Remarks:
A total of 186 measurents were obtained, using GSC 3552-760 (12.21 mag) as comparison and GSC 3552-448 (12.23 mag) as check star. A linear regression of his 6 times of minimum with the ROTSE1 data yields the following results: Type: EW; JD(min I, hel) = 2453325.2793 + 0.437414 * E; range (unfiltered, near R): 12.53 - 12.82 (12.81) mag.

Name of the object:
GSC 3905-60 = ROTSE1 J183113.57 = NSVS 3031679 = NSVS 2952578 = NSVS 5423871 = NSVS 5447893

Remarks:
A total of 218 measurents were obtained, using GSC 3905-2491 (10.83 mag) as comparison and GSC 3905-2124 (12.02 mag) as check star. A linear regression of his 7 times of minimum yields the following results: Type: EW; JD(min I, hel) = 2453600.3847 + 0.413036 * E; range (unfiltered, near R): 11.54 - 11.88 (11.87) mag. Incorporating the ROTSE1 data would indicate a slightly smaller value for the period (0.413027 d), but our CCD data can not be presented to a satisfactory degree with this value. The period might be variable.

Date: 14 November 2005

Reported by:

Osborn, W. H. - Central Michigan Univ., Mt. Pleasant, MI 48859, U.S.A., Wayne.Osborn@cmich.edu

Lee, K. M. - Dept. Physics and Astron. & Center for Science, Mathematics and Computer Science, Univ. Nebraska, Lincoln, NE 68588-0111

Name of the object:

AM Leo = HIP 53937

Remarks:

Light curves of AM Leo are of increased interest since Albayrak et al. (2005) and Qian et al. (2005) independently concluded its period changes are caused by a third body in a large-eccentricity orbit. Differential UBV photometry obtained in 1983 are given. Observations and reductions followed the procedures used by Hiller et al. (2004) for their 1991 data. AM Leo has a close visual companion and most measures included the companion's light, but a few excluded it. The 1983 B and V light curves agree well those of Hiller et al. (2004) but the U magnitudes are systematically 0.13 mag fainter.

Date: 14 December 2005

Reported by:

Atila Poro - P.O.Box 71645-181, Shiraz, Iran

Name of the object:

44i Boo

Remarks:

The eclipsing binary 44i Bootis was observed in May 2004 at Biruni Observatory (52°34' East and 29°38' North, Shiraz University) with an 51 cm Cassegrain reflector, using B and V filters. 47k Bootis (HD 133962) was used as comparison star, and HIP 73100 (HD 132254) as check star.

Date: 9 January 2006

Reported by:
Nelson, Robert H. - 1393 Garvin Street, Prince George, BC, Canada, V2M 3Z1, bob.nelson@shaw.ca

Name of the object:

V1157 Aql, CG Aur, V357 Cas, EL CMa, V1147 Cyg, DW Dra, AS Hya, AL Leo, V530 Mon, EF Ori

Remarks:

In the course of maintaining the database Eclipsing Binaries O-C Files for the AAVSO (Nelson, 2005a), the author found a number of periods that did not give a rational fit for the existing published periods. Random deviations – sometimes as large as 0.1 days – could not be plausibly explained by observer error. For nine such stars, inserting the existing times of minima (ToM) into software 'ToMcat' led to the discovery of new periods giving much better O-C relations. (This software, which uses a modified Fourier transform, is available at the author's website – see Nelson, 2005b.) The remaining star, V1157 Aql, had too few points for ToMcat; Excel solver was used instead. These new periods and other information, are given in the accompanying table. The O-C plots (in Excel format) may be examined on the AAVSO database (Nelson 2005a), or by request from the author.

Star Name	GCVS Type	Previous Period (days)	Previous Period Reference	New Period (days)	RMS dev'n	No. of ToMs
V1157 Aql	EA/SD:	na	na	0.58075	0.003	4
CG Aur	EA/DM	1.804855	GCVS	0.63114	0.011	497
V0357 Cas	EB	0.760747	GCVS	0.79434	0.004	10
EL CMa	EA	na	na	2.62803	0.004	5
V1147 Cyg	E	1.097382	IBVS 4455	1.69459	0.024	14
DW Dra	EA/SD	na	na	1.22636	0.008	74
AS Hya	EA	15.99	GCVS	1.06359	0.004	16
AL Leo	EA/D	4.1444	GCVS	1.60552	0.006	19
V0530 Mon	EW	0.525529	GCVS	0.52522	0.003	11
EF Ori	EA	3.7012	GCVS	1.61946	0.002	7

Acknowledgement: This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France.

Date: 18 January 2006

Reported by:
Hiroyuki Naito - Nishi-Harima Astronomical Observatory, naito@nhao.go.jp
Noritaka Tokimasa - Nishi-Harima Astronomical Observatory, tokimasa@nhao.go.jp
Hitoshi Yamaoka - Kyushu University, yamaoka@rc.kyushu-u.ac.jp

Name of the object:

V2361 Cyg

Remarks:

Our spectrum of V2361 Cyg taken on 2005 Feb. 11.8 UT at Nishi-Harima Astronomical Observatory, (60cm reflector, spectrograph: range=400-850nm, R=150@500nm, CCD detector:ST6) has "Fe II type" features. The light curve of V2361 Cyg had an unexpectedly rapid decline. Our spectrum reveals it had normal features in the early phase. See IAUC reports by Nakano et al. (2005), Naito et al. (2005) and Waagen et al. (2005).

Date: 28 February 2006

Reported by:
Bedient, J. - Honolulu, Hawaii, USA, bedient@hawaii.rr.com

Name of the object:

ASAS J002511+1217.2

Remarks:

ASAS J002511+1217.2 was identified as a WZ Sge-type dwarf nova by Golovin et al. (2005) after a first-ever observed outburst in September, 2004. A search of the Harvard College Observatory Photographic Plate Collection was undertaken, and one additional outburst discovered from September, 1938:

RH Series Plate	JD	Photographic Magnitude
BM925	2429168.71	10.6

Temporally adjacent plates taken 19 days before and 22 days after this outburst show no sign of the star to the plate limit.
This additional outburst places an upper limit on the maximum duration between outbursts at 66 years.
My thanks go to Alison Doane, Curator of Astronomical Photographs at the Harvard College Observatory.

Date: 3 March 2006

Reported by:

Diethelm, R. - BBSAG, Switzerland, rdiethelm@gmx.ch

Name of the object:

AS And

Remarks:

While trying to find a time of minimum light of the little observed eclipsing binary AS And we got aware of the fact that the elements of variation given in the GCVS do not represent our CCD observations. During 30 nights between JD 2452500 and JD 2453674 we obtained a total of 291 CCD observations using the 35cm RC reflecting telescope of R. Szafraniec observatory, Switzerland. The data up to JD 2453324 were collected with a SBIG ST-6 camera without filter, while starting with that date a SBIG ST-10 camera and a V-filter were used. The corrected elements of variation are found to be:

JD(hel,min) = 2452548.5944 + 2.42063 * E.

The range of variation is 12.65 - 14.10 (12.80) R-mag.

Date: 8 March 2006

Reported by:

Blättler, E. - BBSAG, Switzerland, blaettler-wald@bluewin.ch
Diethelm, R. - BBSAG, Switzerland, rdiethelm@gmx.ch

Name of the object:

GSC 1830-1432 = NSVS 6780089 = BrhV129

Remarks:

Automated sky surveys have led to many newly discovered variable stars in recent times. The star BrhV129 = GSC 1830-1432 was reported as a variable by Bernhard (2003). Blättler has performed unfiltered CCD observations with a SBIG ST-7 camera attached to his 0.15-m Starfire refractor in Wald, Switzerland. During 7 nights between JD 2453683 and JD 53768 a total of 326 measurements were obtained, using GSC 1830-2063 (10.78 mag) as comparison and GSC 1830-1729 (11.67 mag) as check star. A linear regression of his 20 times of minimum with the ROTSE1 data as well as minima reported in IBVS No. 5599 and IBVS No. 5643 yields the following results: Type: EW (RRc?); JD(min I, hel) = 2453686.6648 + 0.2718255 * E; range (unfiltered, near R): 11.58 - 11.79 (11.78) mag.

Name of the object:

GSC 1848-1264 = NSVS 6923420 = TYC 1848-1264-1 = 1RXS J053021.5+235116 = ASAS 053019+2351.4

Remarks:

Blättler has performed unfiltered CCD observations on GSC 1848-1264 with a SBIG ST-7 camera attached to his 0.15-m Starfire refractor in Wald, Switzerland. During 7 nights between JD 2453683 and JD 53768 a total of 344 measurements were obtained, using GSC 1848-753 (12.42 mag) as comparison and GSC 1848-1576 (12.63 mag) as check star. A linear regression of his 15 times of minimum with the ROTSE1 data as well as the ASAS data yields the following results: Type: EW; JD(min I, hel) = 2453705.6839 + 0.347677 * E; range (unfiltered, near R): 11.29 - 11.63 (11.61) mag.

Name of the object:
GSC 2393-680 = NSVS 6855651
Remarks:
Blättler has performed unfiltered CCD observations on GSC 2393-680 with a SBIG ST-7 camera attached to his 0.15-m Starfire refractor in Wald, Switzerland. During 7 nights between JD 2453683 and JD 53768 a total of 378 measurements were obtained, using GSC 2393-594 (10.98 mag) as comparison and GSC 2393-433 (12.58 mag) as check star. A linear regression of his 15 times of minimum with the ROTSE1 data yields the following results: Type: EW; JD(min I, hel) = 2453686.4414 + 0.316535 * E; range (unfiltered, near R): 11.67 - 11.96 (11.91) mag.

Name of the object:
GSC 2903-237 = NSVS 4364281
Remarks:
Blättler has performed unfiltered CCD observations on GSC 2903-237 with a SBIG ST-7 camera attached to his 0.15-m Starfire refractor in Wald, Switzerland. During 7 nights between JD 2453683 and JD 53768 a total of 380 measurements were obtained, using GSC 2903-1976 (11.66 mag) as comparison and GSC 2903-659 (13.10 mag) as check star. A linear regression of his 14 times of minimum with the ROTSE1 data yields the following results: Type: EW; JD(min I, hel) = 2453686.5780 + 0.397885 * E; range (unfiltered, near R): 11.83 - 12.29 (12.27) mag.

Date: 3 May 2006
Reported by: Greaves, J. - Northampton, UK SkyDOT team - http://skydot.lanl.gov

Name of the object:
WR 143 = HD 195177 = EM* Hen 3-1901 = ALS 11371 = LS II +38 90 = MSX 6C 077.4993-00.0459
Remarks:
The Wolf-Rayet star WR 143 (HD 195177) was assumed to be binary since its first classification as WC5+(OB) (Smith, 1968). Recent spectroscopic and photometric observations strengthened this assumption (Varricatt & Ashok, 2006). The NSVS light curve of WR 143 clearly shows its ellipsoidal or eclipsing binary nature. The figure shows the phased NSVS light curve according to the following elements: $T_min[HJD] = 2451187.5 + 139 \times E$ The significant noise superimposed on the light curve, originated from the erratic flux of the Wolf-Rayet star and that of the Be companion, does not allow us to decide wether the binary is ellipsoidal or eclipsing type.

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COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5700

Konkoly Observatory
Budapest
3 May 2006

HU ISSN 0374 – 0676

REPORTS ON NEW DISCOVERIES

The last issue of the volume publishes a list of newly discovered variables. Figures (finding charts and light curves) and data files are available electronically. Previous reports can be found in
IBVS No. 5600.

The Editors

Date: 10 February 2005

Observer(s) and affiliation(s):
Martignoni, Massimiliano - via Don Minzoni 26/d, I-20020 Magnago (Milano), Italy

RA(J2000)	Dec(J2000)	type	Mag.
$5^h8^m46^s.76$	$+32°2'9''.20$	EW	$12^m.0 - 12^m.35$ (V)

Period	Epoch
0.31657 d	2453354.396

Cross-identification(s):
GSC 02393-00680 = USNO A2.0 1200-02907218

Date: 18 February 2005

Observer(s) and affiliation(s):
Khruslov, A.V., Tula, Russia, khruslov@bk.ru
SkyDOT team - http://skydot.lanl.gov

RA(J2000)	Dec(J2000)	type	Mag.
$03^h33^m00^s.93$	$+58°31'53''.3$	EW	$12^m.9 - 13^m.2 - 13^m.15$ (R)

Period	Epoch
0.42555 d	2451453.283

Cross-identification(s):
GSC 3715-01039 = NSVS 1964450

RA(J2000)	Dec(J2000)	type	Mag.
$03^{h}51^{m}52\overset{s}{.}72$	$+54^{\circ}10'01\overset{''}{.}4$	EW	$12\overset{m}{.}75$ – $13\overset{m}{.}10$ – $13\overset{m}{.}05$ (R)

Period	Epoch
0.38736 d	2451488.468

Cross-identification(s):
GSC 3717-00834 = NSVS 1980279

RA(J2000)	Dec(J2000)	type	Mag.
$06^{h}07^{m}49\overset{s}{.}8$	$+72^{\circ}46'37\overset{''}{.}1$	EA/RS	$11\overset{m}{.}35$ – $12\overset{m}{.}05$ – $11\overset{m}{.}90$ (R)

Period	Epoch
3.070 d	2451521.79

Cross-identification(s):
TYC 4353-00302-1 = 1RXS J060751.0+724636 = NSVS 656714

Date: 18 February 2005

Observer(s) and affiliation(s):
Krajci, Tom - 9605 Goldenrod Circle, Albuquerque, NM, 87116 loukrajci@comcast.net
Nelson, R. H. - 1393 Garvin St., Prince George, BC, Canada bob.nelson@shaw.caa
Dvorak, S. W. - Rolling Hills Observatory, Clermont, FL sdvorak@rollinghillsobs.org

RA(J2000)	Dec(J2000)	type	Mag.
$10^{h}45^{m}54\overset{s}{.}7$	$+52^{\circ}16'26''$	EA:	$14\overset{m}{.}2$ – $14\overset{m}{.}9$

Period	Epoch
0.560644 d	2453404.8768

Cross-identification(s):
GSC 03449-00680

Date: 2 March 2005

Observer(s) and affiliation(s):
Brat L. - Velka Upa 193, 542 21 Pec pod Snezkou, Czech Republic, brat@pod.snezkou.cz
Smelcer L. - Valaske Mezirici Observatory, Czech Republic, lsmelcer@astrovm.cz
Motl D. - Brno Observatory, Czech Republic, dmotl@volny.cz

RA(J2000)	Dec(J2000)	type	Mag.
$08^{h}20^{m}59\overset{s}{.}84$	$+00^{\circ}31'0\overset{''}{.}6$	EW	$12\overset{m}{.}7$ – $13\overset{m}{.}2$ (V)

Period	Epoch
0.414468 d	2453386.4658

Cross-identification(s):
GSC 0196-0894

Date: 11 March 2005
Observer(s) and affiliation(s):
Hund, Friedhelm - Hakos Guest Farm, Namibia, hakos@mweb.com.na
Dreveny, Radek - BRNO, Czech Republic, radek.dreveny@volny.cz
Paschke, Anton - Rüti, Switzerland, Anton@Paschke.com

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$16^h10^m19\overset{s}{.}332$	$-76°52'04\overset{''}{.}52$	EW	$14\overset{m}{.}3 - 14\overset{m}{.}7$

Period	**Epoch**
0.2947 d	2453200.3081

Cross-identification(s):
GSC2.2 S21011104703

Date: 21 March 2005
Observer(s) and affiliation(s):
Brat, L. - Velka Upa 193, 542 21 Pec pod Snezkou, Czech Republic, brat@pod.snezkou.cz
Motl, D. - Brno Observatory, Czech Republic, dmotl@volny.cz
Smelcer, L. - Valaske Mezirici Observatory, Czech Republic, lsmelcer@astrovm.cz

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$01^h41^m36\overset{s}{.}5$	$+80°04'19\overset{''}{.}4$	EW	$12\overset{m}{.}2 - 12\overset{m}{.}85$ (V)

Period	**Epoch**
0.3929 d	2453433.6360

Cross-identification(s):
GSC 4502-0138

Date: 5 April 2005
Observer(s) and affiliation(s):
Kim, Yonggi - University Observatory, Chungbuk National University, Korea, ykkim153@chungbuk.ac.kr
Andronov, Ivan L. - Department of Astronomy, Odessa National University, Ukraine, il-a@mail.od.ua
Park, Sung-Su - University Observatory, Chungbuk National University, Korea
Kim, Chun-Hwey - University Observatory, Chungbuk National University, Korea

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$06^h25^m58\overset{s}{.}2$	$+73°31'15\overset{''}{.}4$	EW	$13\overset{m}{.}05 - 13\overset{m}{.}46$ R

Period	**Epoch**
$0\overset{d}{.}4421(18)$	2453062.17715(11)

Cross-identification(s):
GSC 04370-00206

Date: 6 April 2005

Observer(s) and affiliation(s):
Ying-Tung Chen - Inst. of Astronomy, National Central University, Chung Li 320, Taiwan
Wen-Ping Chen - Inst. of Astronomy, National Central University, Chung Li 320, Taiwan
Wen-Shan Hsiao - Inst. of Astronomy, National Central University, Chung Li 320, Taiwan
Xiaojun Jiang - National Astronomical Observatories, Chinese Academy of Sciences, 100012, Beijing, PRC

RA(J2000)	Dec(J2000)	type	Mag.
$09^{h}16^{m}05^{s}.47$	$-23^{\circ}39'19''.8$	M	$11^{m}.60 - 14^{m}.07$ (R)

Period	Epoch
200 d	-

Cross-identification(s):
GSC2.2 S131223223372

Date: 14 April 2005

Observer(s) and affiliation(s):
Robertson, Jeff - Arkansas Tech University, Russellville, AR 72801 USA

RA(J2000)	Dec(J2000)	type	Mag.
$00^{h}40^{m}46^{s}.23$	$+43^{\circ}23'57''.9$	RRc	$15^{m}.3$ (V)

Period	Epoch
0.46614 d	2448400.0

Cross-identification(s):
[HH95] HV And-7

Date: 11 May 2005

Observer(s) and affiliation(s):
Jan Polster - N. Copernicus Observatory in Brno, Czech Republic, jpolster@email.cz
Miloslav Zejda, N. Copernicus Observatory in Brno, Czech Republic, mzejda@volny.cz
Jan Safar, N. Copernicus Observatory in Brno, Czech Republic

RA(J2000)	Dec(J2000)	type	Mag.
$07^{h}40^{m}33^{s}$	$+04^{\circ}42'17''$	EW	$14^{m}.3$ (R GSC2.2)

Period	Epoch
0.30755 d	2451965.2876 +- 0.0009

Cross-identification(s):
GSC2.2 N22123134124

Date: 11 May 2005

Observer(s) and affiliation(s):
Krajci, Tom - 9605 Goldenrod Circle, Albuquerque, NM 87116, loukrajci@comcast.net
SkyDOT team - http://skydot.lanl.gov
Pojmanski, G. - ASAS, http://www.astrouw.edu.pl/ gp/asas

RA(J2000)	Dec(J2000)	type	Mag.
$06^h12^m17\overset{s}{.}15$	$+14°56'41\overset{''}{.}4$	EB	$10\overset{m}{.}4 - 10\overset{m}{.}7$

Period	Epoch
0.810979 d	2451496.8519

Cross-identification(s):
GSC 0742-0237 = HD 253252

Date: 18 May 2005

Observer(s) and affiliation(s):
Krajci, Tom - 9605 Goldenrod Circle, Albuquerque, NM 87116, loukrajci@comcast.net

RA(J2000)	Dec(J2000)	type	Mag.
$09^h47^m53\overset{s}{.}00$	$+33°17'02\overset{''}{.}1$	DSCT	$11\overset{m}{.}4$

Period	Epoch
0.0542 d	2453502.7684

Cross-identification(s):
GSC 2504-0252 = TYC 2504-252-1

Date: 1 June 2005

Observer(s) and affiliation(s):
Khruslov, A.V., Tula, Russia, khruslov@bk.ru SkyDOT team - http://skydot.lanl.gov

RA(J2000)	Dec(J2000)	type	Mag.
$04^h02^m53\overset{s}{.}78$	$+54°10'33\overset{''}{.}5$	DCEP	$13\overset{m}{.}7 - 14\overset{m}{.}3$ (R)

Period	Epoch
3.082 d	2451498.24

Cross-identification(s):
NSVS 2089887 = NSVS 1988845 = GSC2.2 N31221237874 = USNO-A2.0 1425-04786178

Date: 21 June 2005

Observer(s) and affiliation(s):
Krajci, Tom - 9605 Goldenrod Circle, Albuquerque, NM 87116, loukrajci@comcast.net Lloyd, Chris - RAL, Chilton, Didcot, Oxon. OX11 0QX, UK, cl@astro1.bnsc.rl.ac.uk

RA(J2000)	Dec(J2000)	type	Mag.
$18^h08^m41\overset{s}{.}9$	$-14°18'59\overset{''}{.}0$	DSCT	$12\overset{m}{.}3$

Period	Epoch
0.06527(1) d / [0.06985(1) d]	2453527.926(2)

Cross-identification(s):
USNO-B1.0 0756-0474662

Date: 21 June 2005

Observer(s) and affiliation(s):
Bernhard, K.- BAV, Austria, klaus.bernhard@liwest.at
Lloyd, C. - Rutherford Appleton Laboratory OX11 0QX, UK, cl@astro1.bnsc.rl.ac.uk
Frank, P.- BAV, Germany, frank.velden@t-online.de

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$12^h45^m01\overset{s}{.}59$	$+07°57'05''.0$	EW	$10\overset{m}{.}1 - 10\overset{m}{.}3$ (V)

Period	**Epoch**
0.37371	2453523.383

Cross-identification(s):
GSC 875-978 = 1RXS J124501.5+075644

Date: 11 July 2005
Observer(s) and affiliation(s): Nakajima, K. - Mie, Japan, K.Nakajima@ztv.ne.jp Yoshida, S. - MISAO Project, comet@aerith.net Ohkura, N. - Okayama, Japan, HAE00500@nifty.ne.jp

RA(J2000)	Dec(J2000)	type	Mag.
$22^h45^m58\overset{s}{.}71$	$+56°28'31\overset{''}{.}6$	EB	$12\overset{m}{.}25 - 12\overset{m}{.}78$
Period 0.7655 d	**Epoch** 2453294.9863		
Cross-identification(s): MisV1287 = GSC 3992-02510 = USNO-A2.0 1425-14023389			

RA(J2000)	Dec(J2000)	type	Mag.
$06^h02^m07\overset{s}{.}58$	$+52°31'44\overset{''}{.}1$	EW	$12\overset{m}{.}52 - 13\overset{m}{.}25$
Period 0.3280 d	**Epoch** 2453285.2664		
Cross-identification(s): MisV1288 = GSC 3751-00178 = USNO-A2.0 1425-06384643			

RA(J2000)	Dec(J2000)	type	Mag.
$23^h29^m47\overset{s}{.}18$	$+59°43'52\overset{''}{.}2$	EW	$15\overset{m}{.}59 - 16\overset{m}{.}37$
Period 0.7053 d	**Epoch** 2453295.2354		
Cross-identification(s): MisV1289 = USNO-A2.0 1425-15158282			

RA(J2000)	Dec(J2000)	type	Mag.
$05^h54^m43\overset{s}{.}38$	$+52°43'38\overset{''}{.}2$	EW	$14\overset{m}{.}01 - 14\overset{m}{.}85$
Period 0.3571 d	**Epoch** 2453318.3104		
Cross-identification(s): MisV1290 = USNO-A2.0 1425-06316627			

RA(J2000)	Dec(J2000)	type	Mag.
$00^h01^m38\overset{s}{.}41$	$+52°54'14\overset{''}{.}0$	EB	$12\overset{m}{.}68 - 13\overset{m}{.}15$
Period 1.0996 d	**Epoch** 2453294.0289		
Cross-identification(s): MisV1291 = GSC 3652-00756 = USNO-A2.0 1425-00042638			

RA(J2000)	Dec(J2000)	type	Mag.
$00^h37^m11\overset{s}{.}93$	$+53°01'32\overset{''}{.}8$	EB	$13\overset{m}{.}29 - 14\overset{m}{.}18$
Period 0.6616 d	**Epoch** 2453300.9578		
Cross-identification(s): MisV1292 = USNO-A2.0 1425-00875743			

RA(J2000)	Dec(J2000)	type	Mag.
$02^{\mathrm{h}}57^{\mathrm{m}}09\overset{\mathrm{s}}{.}95$	$+53^{\circ}18'03\overset{''}{.}2$	EA	$13\overset{\mathrm{m}}{.}91 - 15\overset{\mathrm{m}}{.}27$

Period	Epoch
1.1110 d	2453341.1411

Cross-identification(s):
MisV1293 = GSC 3701-00794 = USNO-A2.0 1425-04003524

RA(J2000)	Dec(J2000)	type	Mag.
$01^{\mathrm{h}}14^{\mathrm{m}}14\overset{\mathrm{s}}{.}18$	$+52^{\circ}54'38\overset{''}{.}8$	EA:	$14\overset{\mathrm{m}}{.}58$ - $16\overset{\mathrm{m}}{.}20$

Period	Epoch
1.8060 d	2453209.2340

Cross-identification(s):
MisV1294 = USNO-A2.0 1425-01693468

RA(J2000)	Dec(J2000)	type	Mag.
$01^{\mathrm{h}}51^{\mathrm{m}}15\overset{\mathrm{s}}{.}73$	$+57^{\circ}50'11\overset{''}{.}1$	EA	$12\overset{\mathrm{m}}{.}98 - 13\overset{\mathrm{m}}{.}73$

Period	Epoch
2.2002 d	2453339.1061

Cross-identification(s):
MisV1295 = GSC 3692-00847 = USNO-A2.0 1425-02533275

RA(J2000)	Dec(J2000)	type	Mag.
$04^{\mathrm{h}}23^{\mathrm{m}}59\overset{\mathrm{s}}{.}17$	$+58^{\circ}35'34\overset{''}{.}4$	EA	$13\overset{\mathrm{m}}{.}61 - 14\overset{\mathrm{m}}{.}89$

Period	Epoch
5.2633 d	2453321.9950

Cross-identification(s):
MisV1296 = GSC 3731-01703 = USNO-A2.0 1425-05161103

Date: 18 July 2005

Observer(s) and affiliation(s):
Nicholson, M.P. - Daventry, United Kingdom, newbinaries@yahoo.co.uk
International Consortium of Robotic Astronomical Researchers - http://www.icrar.org

RA(J2000)	Dec(J2000)	type	Mag.
$18^{\mathrm{h}}01^{\mathrm{m}}52\overset{\mathrm{s}}{.}46$	$+60^{\circ}06'43\overset{''}{.}37$	RRAB	$11\overset{\mathrm{m}}{.}84 - 12\overset{\mathrm{m}}{.}53$ (V)

Period	Epoch
0.5785 d	2453554.730727 (minimum)

Cross-identification(s):
TYC 4201-1737-1 = USNO-A2.0 1500-06409064 = GSC 04201-01737

RA(J2000)	Dec(J2000)	type	Mag.
$18^{\mathrm{h}}02^{\mathrm{m}}39\overset{\mathrm{s}}{.}46$	$+62^{\circ}43'08\overset{''}{.}41$	DSCT	$12\overset{\mathrm{m}}{.}68 - 13\overset{\mathrm{m}}{.}17$ (V)

Period	Epoch
0.1969 d	2453554.699818 (minimum)

Cross-identification(s):
TYC 4205-0577-1 = USNO-A2.0 1500-06412304 = GSC 04205-00577

Date: 19 July 2005

Observer(s) and affiliation(s):
Buchheim, Robert K. - Altimira Observatory, 18 Altimira, Coto de Caza, CA 92679, USA, rbuchheim@earthlink.net

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$16^{h}20^{m}2^{s}$	$+4°28'41''$	HADS	$12^{m}.58 - 13^{m}.14$ (V)

Period	**Epoch**
0.10818 d	-

Cross-identification(s):
GSC 0376-0596 = USNO-A2.0 0900-08574889

Date: 19 July 2005

Observer(s) and affiliation(s):
Nicholson, M.P. - Daventry, United Kingdom, newbinaries@yahoo.co.uk
International Consortium of Robotic Astronomical Researchers - http://www.icrar.org

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$18^{h}06^{m}19^{s}.12$	$+65°41'37''.18$	EW	$12^{m}.43 - 12^{m}.99$ (V)

Period	**Epoch**
0.7918d	2453552.75 (maximum)

Cross-identification(s):
GSC 4213-1198 = USNO-A2.0 1500-06426542 = USNO-B1.0 1556-0179120

Date: 27 July 2005

Observer(s) and affiliation(s):
Petrik, K. - Faculty of Education, Trnava University, 951 43 Trnava, Slovak Republic, kpetrik@astronyx.sk
Szasz, G. - Hlohovec Observatory, Sladkovicova 41, 920 01 Hlohovec, Slovak Republic, gszasz@nextra.sk
Chrastina, M. - Hlohovec Observatory, Sladkovicova 41, 920 01 Hlohovec, Slovak Republic, chrastina@kozmos.sk

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$21^{h}39^{m}43^{s}.38$	$+26°34'46''.48$	EA	$13^{m}.97$ (R GSC 2.2)

Period	**Epoch**
0.55623 d	2453208.34655

Cross-identification(s):
GSC2.2 N033031026576 = APM EO0286-0080691 = USNO-B1.0 1165-0560940 = USNO-A2.0 1125-18642461

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$21^{h}38^{m}22^{s}.26$	$+26^{\circ}37'38''.99$	EW	$15^{m}.63$ (R GSC 2.2)

Period	**Epoch**
0.30604 d	2453208.1840

Cross-identification(s):
GSC2.2 N033031028158 = APM EO0286-0076868 = USNO-B1.0 1166-0562907 = USNO-A2.0 1125-18616895

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$21^{h}37^{m}50^{s}.26$	$+26^{\circ}46'45''.73$	EB?	$14^{m}.77$ (R GSC 2.2)

Period	**Epoch**
0.40462 d	2453208.32453

Cross-identification(s):
GSC2.2 N033031033134 = APM EO0286-0065813 = USNO-B1.0 1167-0575621 = USNO-A2.0 1125-18606786

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$20^{h}20^{m}18^{s}.63$	$+21^{\circ}18'45''.45$	EA?	$15^{m}.22$ (R GSC 2.2)

Period	**Epoch**
0.63649 d	2453209.80723

Cross-identification(s):
GSC2.2 N031233059263

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$20^{h}21^{m}14^{s}.03$	$+21^{\circ}51'29''.28$	EW?	$15^{m}.04$ (R GSC 2.2)

Period	**Epoch**
0.31327 d	2453233.0679

Cross-identification(s):
GSC2.2 N031233361251

Date: 29 July 2005

Observer(s) and affiliation(s):
Ondrej Pejcha - N. Copernicus Observatory and Planetarium, Brno, Czech Republic, pejcha@astro.sci.muni.cz

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$19^{h}23^{m}57^{s}.35$	$+29^{\circ}37'13''.0$	EW	$13^{m}.27 - 13^{m}.84$ (V)

Period	**Epoch**
0.36880 d	2452888.3824

Cross-identification(s):
Pej 018 = GSC 2137-0222

RA(J2000)	Dec(J2000)	type	Mag.
$00^h26^m48.^s71$	$+41°50'04.''2$	EW	$14.^m6 - 15.^m1$ (V)

Period	Epoch
0.42418 d	2453266.3825

Cross-identification(s):
Pej 023 = GSC 2791-1524

RA(J2000)	Dec(J2000)	type	Mag.
$19^h02^m07.^s06$	$+02°07'27.''5$	EW	$14.^m0 - 14.^m4$ (I)

Period	Epoch
0.44014 d	2453205.4431

Cross-identification(s):
Pej 024 = GSC2.2 N02013121751

RA(J2000)	Dec(J2000)	type	Mag.
$19^h04^m29.^s17$	$+36°39'49.''1$	EW:	$14.^m9 - 15.^m2$ (C)

Period	Epoch
0.318 d	2453253.4635

Cross-identification(s):
Pej 025 = GSC2.2 N030320055368

Date: 9 August 2005
Observer(s) and affiliation(s):
Nicholson, M.P. - Daventry, United Kingdom, newbinaries@yahoo.co.uk
Sutherland, C., Vancouver, Canada, CKSutherland@yahoo.ca
International Consortium of Robotic Astronomical Researchers - http://www.icrar.org

RA(J2000)	Dec(J2000)	type	Mag.
$17^h45^m24.^s43$	$+69°18'22.''36$	EA	$12.^m28 - 13.^m33$ (V)

Period	Epoch
0.4937 d	2453579.743

Cross-identification(s):
GSC 4428-1574 = USNO-A2.0 1575-03852155 = USNO-B1.0 1593-0139373

Date: 9 August 2005
Observer(s) and affiliation(s):
Nicholson, M.P. - Daventry, United Kingdom, newbinaries@yahoo.co.uk
Varley, Q.H., Dublin, Ireland, hannahvfromdublin@yahoo.ie
International Consortium of Robotic Astronomical Researchers - http://www.icrar.org

RA(J2000)	Dec(J2000)	type	Mag.
$17^h37^m31.^s52$	$+65°20'24.''97$	E	$13.^m17 - 13.^m64$ (V)

Period	Epoch
0.3526 d	2453579.8599 (maximum)

Cross-identification(s):
GSC 4207-0123 = USNO-A2.0 1500-06313351 = USNO-B1.0 1553-0186912

Date: 9 August 2005
Observer(s) and affiliation(s): Nicholson, M.P. - Daventry, United Kingdom, newbinaries@yahoo.co.uk International Consortium of Robotic Astronomical Researchers - http://www.icrar.org

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$18^h16^m57\overset{s}{.}70$	$+69°26'46\overset{''}{.}03$	RR/E (?)	$12\overset{m}{.}45 - 12\overset{m}{.}83$ (V)

Period	**Epoch**
0.2097 d	2453579.82764 (maximum)

Cross-identification(s): GSC 4207-1658 = USNO-A2.0 1575-03937897 = USNO-B1.0 1594-0142554

Date: 17 August 2005
Observer(s) and affiliation(s): Nakajima, K. - Mie, Japan, K.Nakajima@ztv.ne.jp Yoshida, S. - MISAO Project, comet@aerith.net Ohkura, N. - Okayama, Japan, HAE00500@nifty.ne.jp

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$23^h03^m42\overset{s}{.}50$	$+53°00'14\overset{''}{.}4$	EA	$13\overset{m}{.}74 - 15\overset{m}{.}14$

Period	**Epoch**
2.6525 d	2453292.1090

Cross-identification(s): MisV1332 = USNO-A2.0 1425-14526503

Date: 17 August 2005
Observer(s) and affiliation(s): Brat, Lubos - Velka Upa 193, 542 21 Pec pod Snezkou, Czech Republic, brat@pod.snezkou.cz Smelcer,Ladislav - Valaske Mezirici Observatory, Czech Republic, lsmelcer@astrovm.cz

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$19^h53^m16\overset{s}{.}75$	$+20°33'43\overset{''}{.}9$	DSCT	$11\overset{m}{.}8 - 12\overset{m}{.}0$ (V)

Period	**Epoch**
0.135674 d	-

Cross-identification(s): GSC 1624-0705 = CzeV 99 = LBvar005 Vul

Date: 15 September 2005
Observer(s) and affiliation(s):
Nakajima, Kazuhiro - 124 Teratani, Isato, Kumano, Mie, 519-4673 Japan, K.Nakajima@ztv.ne.jpa
Nagai, Kazuo - B-305 5-9-3 Honson, Chigasaki, Kanagawa, 253-0042 Japan, PXS10547@nifty.ne.jp

Remark: GSC 01870-00458 was used as a comparison for V781 Tau by Liu et al., 2000.

RA(J2000)	Dec(J2000)	type	Mag.
$05^h50^m25\overset{s}{.}93$	$+26°56'50\overset{''}{.}5$	EB	$12\overset{m}{.}45 - 12\overset{m}{.}83$ (V)

Period	Epoch
1.084474 d	2452996.043

Cross-identification(s):
GSC 01870-00458

Date: 15 September 2005
Observer(s) and affiliation(s):
Lehky, Martin - Severni 765, 500 03 Hradec Kralove, Czech Republic, makalaki@astro.sci.muni.cz
Broz, Miroslav - Hradec Kralove Observatory, Czech Republic, mira@astrohk.cz

Remark: In the field of NW Cep.

RA(J2000)	Dec(J2000)	type	Mag.
$22^h13^m37^s$	$+55°44'28''$	EW	$11\overset{m}{.}1 - 11\overset{m}{.}3$ (V)

Period	Epoch
0.22 d	2452617.397

Cross-identification(s):
GSC 3986-1266 = HKV1

Date: 12 October 2005
Observer(s) and affiliation(s):
Nakajima, K. - Mie, Japan, K.Nakajima@ztv.ne.jp
Yoshida, S. - MISAO Project, comet@aerith.net
Ohkura, N. - Okayama, Japan, HAE00500@nifty.ne.jp
Kadota, K. - MISAO Project, kenic-k@astroarts.co.jp

Remark: MisV1306 is an eccentric binary. The secondary minimum occurs at the phase of 0.412.

RA(J2000)	Dec(J2000)	type	Mag.
$02^h03^m28\overset{s}{.}28$	$+58°54'13\overset{''}{.}8$	EA	$11\overset{m}{.}97 - 12\overset{m}{.}50$

Period	Epoch
5.3364 d	2453392.0991

Cross-identification(s):
MisV1306 = GSC 3697-01892 = USNO-A2.0 1425-02852967

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$22^h35^m00\overset{s}{.}73$	$+59°52'47\overset{''}{.}0$	EA	$14\overset{m}{.}65 - 16\overset{m}{.}18$

Period	**Epoch**
4.5899 d	2453337.0859

Cross-identification(s):
MisV1313 = USNO-A2.0 1425-13689486

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$21^h43^m29\overset{s}{.}16$	$+53°08'43\overset{''}{.}5$	EA	$13\overset{m}{.}82 - 14\overset{m}{.}80$

Period	**Epoch**
4.9478 d	2453313.0260

Cross-identification(s):
MisV1329 = USNO-A2.0 1425-12248256

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$22^h22^m47\overset{s}{.}94$	$+52°58'49\overset{''}{.}6$	EA	$14\overset{m}{.}22 - 14\overset{m}{.}71$

Period	**Epoch**
2.8610 d	2453331.0528

Cross-identification(s):
MisV1330 = USNO-A2.0 1425-13302192

Date: 21 November 2005

Observer(s) and affiliation(s):
Nakajima, K. - Mie, Japan, K.Nakajima@ztv.ne.jp
Yoshida, S. - MISAO Project, comet@aerith.net
Ohkura, N. - Okayama, Japan, HAE00500@nifty.ne.jp
Kadota, K. - MISAO Project, kenic-k@astroarts.co.jp

Remark: MisV1237 is an eccentric binary. The secondary minimum occurs at the phase of 0.484.

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$01^h03^m28\overset{s}{.}90$	$+43°01'27\overset{''}{.}6$	EA	$13\overset{m}{.}34 - 13\overset{m}{.}94$

Period	**Epoch**
7.5530 d	2453598.1280

Cross-identification(s):
MisV1237 = GSC 2807-01148 = USNO-A2.0 1275-00629576

Date: 6 December 2005

Observer(s) and affiliation(s):
McCormick J. - Farm Cove Observatory, farmcoveobs@xtra.co.nz Christie G.W. - Auckland Observatory, PO Box 24-180, Auckland, New Zealand, grant@christie.org.nz

Remark: In the field of V1082 Sgr.

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$19^h07^m26\overset{s}{.}55$	$-20°49'11\overset{''}{.}22$	E	$15\overset{m}{.}12 - 16\overset{m}{.}00$

Period	**Epoch**
0.4404 d	2453612.00596

Cross-identification(s):
USNO-A2.0 0675-31638784 = 2UCAC 23741228 = 2MASS 19072657-2049111

Date: 7 December 2005

Observer(s) and affiliation(s):
Lubos Brat - Velka Upa 193, 542 21 Pec pod Snezkou, Czech Republic, brat@pod.snezkou.cz Petr Svoboda - Vypustky 5, 614 00 Brno, Czech Republic, tribase.net@volny.cz Ladislav Smelcer - Observatory Valasske Mezirici, Czech Republic, lsmelcer@astrovm.cz Ondrej Pejcha - N. Copernicus Observatory and Planetarium, Brno, Czech Republic, opejcha@volny.cz Radek Kocin - Project Eridanus, The Observatory and Planetarium of J.Palisa, Ostrava, Czech Republic, rkocian@mmo.cz

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$22^h33^m06\overset{s}{.}2$	$+54°05'43\overset{''}{.}1$	EW	$12\overset{m}{.}6 - 12\overset{m}{.}9$ (R)

Period	**Epoch**
0.407836 d	53616.3989

Cross-identification(s):
GSC 3983-0544 = CzeV108 Lac = LBvar011 Lac

Date: 9 December 2005

Observer(s) and affiliation(s):
Nicholson, Martin - Remote Astronomical Society, Daventry, United Kingdom, newbinaries@yahoo.co.uk
Varley, Hannah - Remote Astronomical Society, Dublin, Ireland, hannahvfromdublin@yahoo.ie

Previously unreported variable stars from the publicly available data of the Northern Sky Variability Survey (NSVS, Wozniak et al., 2004).

Name	RA(J2000)	Dec(J2000)	type	Mag.	Period	Epoch
TYC 2785-938-1	$00^h09^m46\overset{s}{.}526$	$+40°11'34\overset{''}{.}86$	EB?	$10\overset{m}{.}9 - 11\overset{m}{.}6$	6.3924 d	2451511.61704
GSC 0595-0224	$00^h17^m48\overset{s}{.}56$	$+09°53'22\overset{''}{.}4$	RRAB	$11\overset{m}{.}9 - 12\overset{m}{.}6$	0.4119 d	2451462.17780
TYC 4493-1966-1	$01^h04^m47\overset{s}{.}254$	$+76°06'13\overset{''}{.}59$	EW	$11\overset{m}{.}6 - 12\overset{m}{.}3$	0.6200 d	2451578.75215
TYC 1747-967-1	$01^h09^m31\overset{s}{.}932$	$+22°39'19\overset{''}{.}26$	EW	$11\overset{m}{.}2 - 12\overset{m}{.}0$	0.4942 d	2451467.80635
TYC 620-1143-1	$01^h30^m16\overset{s}{.}464$	$+13°33'25\overset{''}{.}23$	EB?	$11\overset{m}{.}0 - 11\overset{m}{.}8$	0.3247 d	2451473.82343
TYC 2828-18-1	$01^h51^m12\overset{s}{.}582$	$+43°49'07\overset{''}{.}62$	EW	$11\overset{m}{.}2 - 11\overset{m}{.}8$	0.3831 d	2451475.61807
TYC 636-555-1	$02^h06^m38\overset{s}{.}250$	$+14°15'27\overset{''}{.}68$	EW	$10\overset{m}{.}9 - 11\overset{m}{.}6$	0.4848 d	2451463.68085
TYC 2321-257-1	$02^h07^m20\overset{s}{.}030$	$+35°38'55\overset{''}{.}40$	EW	$10\overset{m}{.}9 - 11\overset{m}{.}3$	0.3897 d	2451563.73951
TYC 1761-1246-1	$02^h12^m08\overset{s}{.}869$	$+27°08'17\overset{''}{.}50$	EW	$10\overset{m}{.}0 - 10\overset{m}{.}5$	0.3182 d	2451479.65660
TYC 2853-18-1	$02^h47^m08\overset{s}{.}209$	$+41°22'31\overset{''}{.}92$	EW	$10\overset{m}{.}8 - 11\overset{m}{.}5$	0.2949 d	2451370.87525
GSC 3736-0450	$04^h28^m46\overset{s}{.}19$	$+55°17'01\overset{''}{.}3$	EW	$12\overset{m}{.}2 - 12\overset{m}{.}6$	0.4371 d	2451420.77868
TYC 3736-417-1	$04^h30^m23\overset{s}{.}194$	$+55°04'08\overset{''}{.}78$	SR?	$11\overset{m}{.}7 - 12\overset{m}{.}0$	56.9174 d	2451536.71118
TYC 4073-766-1	$04^h33^m36\overset{s}{.}201$	$+64°05'37\overset{''}{.}95$	EW	$11\overset{m}{.}6 - 12\overset{m}{.}1$	0.7208 d	2451443.77055
GSC 3736-0376	$04^h34^m41\overset{s}{.}97$	$+55°42'32\overset{''}{.}1$	SR	$11\overset{m}{.}0 - 11\overset{m}{.}4$	˜32 d	-
GSC 3740-0495	$04^h36^m33\overset{s}{.}56$	$+57°24'04\overset{''}{.}6$	M?	$11\overset{m}{.}6 - 13\overset{m}{.}6$	˜260 d	-
GSC 4086-0052	$04^h43^m30\overset{s}{.}18$	$+63°59'12\overset{''}{.}2$	EW	$12\overset{m}{.}5 - 13\overset{m}{.}2$	0.3452 d	2451483.64058
GSC 4086-1808	$04^h45^m29\overset{s}{.}27$	$+63°57'17\overset{''}{.}0$	E	$12\overset{m}{.}9 - 13\overset{m}{.}9$	1.0792 d	2451415.81348
GSC 3355-0394	$04^h45^m35\overset{s}{.}62$	$+52°22'35\overset{''}{.}4$	EB?	$13\overset{m}{.}2 - 14\overset{m}{.}2$	0.4621 d	245537.61909
GSC 3355-0079	$04^h49^m31\overset{s}{.}07$	$+51°31'11\overset{''}{.}2$	EW	$12\overset{m}{.}4 - 12\overset{m}{.}9$	0.4173 d	2451291.67747
GSC 3357-0079	$05^h10^m57\overset{s}{.}35$	$+52°14'58\overset{''}{.}2$	EW	$12\overset{m}{.}7 - 13\overset{m}{.}4$	0.3746 d	2451403.85643

Date: 12 December 2005

Observer(s) and affiliation(s):
Nakajima, K. - Mie, Japan, K.Nakajima@ztv.ne.jp
Yoshida, S. - MISAO Project, comet@aerith.net
Ohkura, N. - Okayama, Japan, HAE00500@nifty.ne.jp
Kadota, K. - MISAO Project, kenic-k@astroarts.co.jp

RA(J2000)	Dec(J2000)	type	Mag.
$22^h12^m25\overset{s}{.}84$	$+54°53'21\overset{''}{.}2$	EA	$14\overset{m}{.}15 - 14\overset{m}{.}53$

Period	Epoch
6.6490 d	2453675.1063

Cross-identification(s):
MisV1228 = USNO-A2.0 1425-12994156

RA(J2000)	Dec(J2000)	type	Mag.
$02^h17^m07\overset{s}{.}04$	$+56°09'16\overset{''}{.}9$	EA	$12\overset{m}{.}25 - 12\overset{m}{.}97$

Period	Epoch
4.6050 d	2453359.196

Cross-identification(s):
MisV1275 = GSC 3690-02012 = USNO-A2.0 1425-03196728

RA(J2000)	Dec(J2000)	type	Mag.
$22^h02^m02^s.78$	$+56°44'43''.0$	EA	$13^m.35 - 13^m.82$

Period	Epoch
1.1205 d	2453687.0714

Cross-identification(s):
MisV1278 = GSC 3977-01772 = USNO-A2.0 1425-12687522

RA(J2000)	Dec(J2000)	type	Mag.
$04^h58^m51^s.31$	$+57°00'52''.7$	RRAB	$13^m.85 - 14^m.80$

Period	Epoch
0.53201 d	2453027.2380

Cross-identification(s):
MisV1327 = GSC 3742-00430 = USNO-A2.0 1425-05686357

Date: 14 December 2005

Observer(s) and affiliation(s):
Agerer, F. - Bundesdeutsche Arbeitsgemeinschaft für veränderliche Sterne e.V. (BAV), Munsterdamm 90, D-12169 Berlin, Germany, agerer.zweik@t-online.de
Berthold, T. - BAV & Sternwarte Sonneberg, Sternwartestr. 32, D-96515 Sonneberg, Germany, tb@4pisysteme.de

Remark: In the field of NU Cas.

RA(J2000)	Dec(J2000)	type	Mag.
$00^h31^m48^s.1$	$+57°01'34''.7$	DSCT?	$14^m.8$ (R)

Period	Epoch
0.0733 d	2453671.422

Cross-identification(s):
USNO-A2.0 1425-00752967

Date: 3 January 2006

Observer(s) and affiliation(s):
Lubos Brat - Velka Upa 193, 542 21 Pec pod Snezkou, Czech Republic, brat@pod.snezkou.cz
Petr Svoboda - Vypustky 5, 614 00 Brno, Czech Republic, tribase.net@volny.cz

RA(J2000)	Dec(J2000)	type	Mag.
$01^h42^m47^s.80$	$+80°07'52''.6$	EW	$14^m.6 - 15^m.0$ (R)

Period	Epoch
0.270416 d	2453715.410

Cross-identification(s):
GSC 4502-1040 = CzeV106 Cep = LBvar007 Cep

Date: 3 January 2006
Observer(s) and affiliation(s): Nakajima, K. - Mie, Japan, K.Nakajima@ztv.ne.jp Yoshida, S. - MISAO Project, comet@aerith.net Ohkura, N. - Okayama, Japan, HAE00500@nifty.ne.jp Kadota, K. - MISAO Project, kenic-k@astroarts.co.jp

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$03^h03^m53\overset{s}{.}37$	$+57°03'34\overset{''}{.}6$	EB	$11\overset{m}{.}90$ – $12\overset{m}{.}70$

Period	**Epoch**
1.28482 d	2453430.9584

Cross-identification(s):
MisV1317 = GSC 3709-00849 = USNO-A2.0 1425-04099502

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$23^h17^m03\overset{s}{.}96$	$+53°02'19\overset{''}{.}7$	EB:	$14\overset{m}{.}40$ – $15\overset{m}{.}10$

Period	**Epoch**
2.8271 d	2453595.1868

Cross-identification(s):
MisV1331 = USNO-A2.0 1425-14875870

Date: 3 January 2006
Observer(s) and affiliation(s): Nakajima, K. - Mie, Japan, K.Nakajima@ztv.ne.jp Yoshida, S. - MISAO Project, comet@aerith.net Ohkura, N. - Okayama, Japan, HAE00500@nifty.ne.jp

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$03^h54^m03\overset{s}{.}32$	$+59°54'11\overset{''}{.}9$	EB	$12\overset{m}{.}58$ - $13\overset{m}{.}55$

Period	**Epoch**
0.9202 d	2453709.9545

Cross-identification(s):
MisV1337 = GSC 3729-00046 = USNO-A2.0 1425-04629297

Date: 5 January 2006
Observer(s) and affiliation(s): Agerer, F. - Bundesdeutsche Arbeitsgemeinschaft für veränderliche Sterne e.V. (BAV), Munsterdamm 90, D-12169 Berlin, Germany, agerer.zweik@t-online.de

Remark: In the field of CC Peg.

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$21^h39^m43\overset{s}{.}1$	$+28°22'39\overset{''}{.}5$	EW	$14\overset{m}{.}6$ (R)

Period	**Epoch**
0.352655 d	2453233.548

Cross-identification(s):
USNO-A2.0 1125-18642389

Remark: In the field of V471 Cas.

RA(J2000)	Dec(J2000)	type	Mag.
$1^h32^m20^s.67$	$+55°13'57''.7$	EW	$14^m.1$ (R)

Period	Epoch
0.32329 d	2453388.369

Cross-identification(s):
USNO-A2.0 1425-02081650

Date: 27 January 2006

Observer(s) and affiliation(s):
Pertti Paakkonen - Seulaset ry, Joensuu, Finland, pertti.paakkonen@joensuu.fi Tommi Itkonen - Seulaset ry, Joensuu, Finland, tommi.itkonen@joensuu.fi Arto Oksanen - Jyvaskylan Sirius ry, Kyllikinkatu 1, FI-40100 Jyvaskyla, Finland, arto.oksanen@jklsirius.fi

RA(J2000)	Dec(J2000)	type	Mag.
$04^h03^m41^s.0$	$+32°27'06''$	EW	$13^m.45 - 14^m.05$ (V)

Period	Epoch
0.29768 d	2453756.34206

Cross-identification(s):
GSC 2362-2866 = USNO-A2.0 1200-01935713 = NSVS 6713581

Date: 13 February 2006

Observer(s) and affiliation(s):
Agerer, F. - Bundesdeutsche Arbeitsgemeinschaft für veränderliche Sterne e. V. (BAV), Munsterdamm 90, D-12169 Berlin, Germany, agerer.zweik@t-online.de Berthold, T. - BAV & Sternwarte Sonneberg, Sternwartestr. 32, D-96515 Sonneberg, Germany, tb@4pisysteme.de

Remark: In the field of PS Cas.

RA(J2000)	Dec(J2000)	type	Mag.
$01^h35^m44^s.46$	$+55°41'13''.7$	EW	$12^m.8$ (max)

Period	Epoch
0.29710 d	2451867.348

Cross-identification(s):
GSC 3675-1186 = USNO A2.0 1425-02155241

Date: 27 February 2006
Observer(s) and affiliation(s): Blättler, E. - Schüsselacher 1, CH-8636 Wald, Switzerland, blaettler-wald@bluewin.ch Diethelm, R. - Bahnhofstrasse 3, CH-4118 Rodersdorf, Switzerland, rdiethelm@gmx.ch

Remark: in the field of ZZ Aurigae. Already mentioned in IBVS 5653.

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$05^h45^m40\overset{s}{.}2$	$+41°06'25''$	EA	$12\overset{m}{.}03 - 12\overset{m}{.}38$ (12.32) R

Period	**Epoch**
1.503265	2453409.3330

Cross-identification(s):
GSC 2915-212

Date: 1 March 2006
Observer(s) and affiliation(s): Agerer, F. - Bundesdeutsche Arbeitsgemeinschaft für veränderliche Sterne e.V. (BAV), Munsterdamm 90, D-12169 Berlin, Germany, agerer.zweik@t-online.de

Remark: in the field of TY Boo.

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$15^h00^m47\overset{s}{.}6$	$+35°09'52''$	RRab	$14\overset{m}{.}8$ (r)

Period	**Epoch**
0.348836 d	2453151.415

Cross-identification(s):
USNO-A2.0 1200-07442272

Remark: in the field of TY Boo.

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$15^h00^m49\overset{s}{.}75$	$+35°08'35\overset{''}{.}6$	EA	$14\overset{m}{.}8$ (r)

Period	**Epoch**
1.011856 d	2452820.526

Cross-identification(s):
USNO-A2.0 1200-07442402

Remark: in the field of V587 Cyg.

RA(J2000)	Dec(J2000)	type	Mag.
$21^h15^m23\overset{s}{.}84$	$+43°32'09\overset{''}{.}5$	EB	$14\overset{m}{.}4$ (r)

Period	Epoch
0.505856 d	2453621.572

Cross-identification(s):
USNO-A2.0 1275-15134722

Remark: in the field of V587 Cyg.

RA(J2000)	Dec(J2000)	type	Mag.
$21^h15^m10\overset{s}{.}03$	$+43°27'29\overset{''}{.}8$	EA	$13\overset{m}{.}8$ (r)

Period	Epoch
6.928333 d	2452864.4059

Cross-identification(s):
USNO-A2.0 1275-15124020

Remark: in the field of V941 Cyg.

RA(J2000)	Dec(J2000)	type	Mag.
$19^h41^m22\overset{s}{.}35$	$+30°52'23\overset{''}{.}8$	EW	$12\overset{m}{.}5$ (r)

Period	Epoch
0.396808 d	2453569.476

Cross-identification(s):
USNO-A2.0 1200-12680286

Remark: in the field of V519 Cyg.

RA(J2000)	Dec(J2000)	type	Mag.
$20^h52^m13\overset{''}{.}76$	$+46°35'28\overset{''}{.}1$	EB	$11\overset{m}{.}3$ (r)

Period	Epoch
0.733803 d	2453601.5305

Cross-identification(s):
GSC 3575-3593 = USNO-A2.0 1350-13066478

Remark: in the field of AT Vul.

RA(J2000)	Dec(J2000)	type	Mag.
$19^h53^m49\overset{s}{.}7$	$+23°30'39\overset{''}{.}7$	EW	$11\overset{m}{.}7$ (r)

Period	Epoch
0.301208 d	2453579.416

Cross-identification(s):
GSC 2140-1485 = USNO-A2.0 1125-14568227

Date: 3 March 2006

Observer(s) and affiliation(s):
Agerer, F. - Bundesdeutsche Arbeitsgemeinschaft für veränderliche Sterne e.V. (BAV), Munsterdamm 90, D-12169 Berlin, Germany, agerer.zweik@t-online.de

Remark: in the field of V473 Cas.

RA(J2000)	**Dec(J2000)**	**type**	**Mag.**
$01^h35^m16\overset{s}{.}72$	$+56°44'37\overset{''}{.}9$	EA	$13\overset{m}{.}1$ (r)

Period	**Epoch**
0.798267 d	2452618.349

Cross-identification(s):
GSC 3679-1920 = USNO-A2.0 1425-02145256

References:

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ERRATUM FOR IBVS 5700

Geert Hoogeveen reported the following error:

IBVS No.	item	printed	correct
5700	identifier (# 44)	GSC 4207-1658	GSC 4433-1658

ERRATUM FOR IBVS 5700

The epoch reported in IBVS 5700 for GSC 3355-0394 should be 2451537.61909 .