COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Nos. 1701-1800
1979 November - 1980 June

EDITOR: B. SZEIDL, KONKOLY OBSERVATORY
1525 BUDAPEST, Box 67, HUNGARY
HU ISSN 0374-0676

CONTENTS

1979

1980

AUTHOR INDEX

INDEX OF VARIABLES

WZ	1709
XY	1709
XZ	1709

RW Cet	1702
SS	1709
W	1727, 1792
Omicron Ceti (=Mira)	1754

S Cir	1709
V	1708
Z	1748
AE	1748

CoD -35d 13422=Gl 755	1788
CoD -30d 529AB=Gl 60	1788
CoD -21d 1377=Gl 229	1788

RW Com	1715

RW CrA	1702
UU	1709
WX	1748

U CrB	1777
RT	1737
RW	1709, 1751

RS Crt	1708

W Cru	1709
WX	1708
AE	1709
CSV 8853= Wr 136	1767

SY Cyg	1709
UW	1709
VV	1709
VW	1709
WZ	1709
BR	1708
CI	1759
DL	1709
LO	1709
V 442	1704
V 448	1709
V 470	1777
V 478	1709
V 541	1708
V 809	1709
V 836	1751
V 1016	1721

RR Del	1709
TY	1709

Z Dra	1709
RR	1709
RX	1709
SX	1709
WW	1709

AI	1751
BS	1794

RZ Eri	1709
UX	1781
CW	1709
Nu	1761

Flare Stars :

near Gamma Cyg (1)	1750
three new	1779
in NGC 7000 and IC 5070(5)	1746
in Orion (27)	1725
in Orion (14)	1726
in Pleiades (5)	1749
in Pleiades (5)	1780
in Praesepe=S 10834	1731

TX Gem	1709
AF	1709
DN=Nova Gem 1912	1711

GJ 1208	1788
GJ 2108	1788
GJ 2158=HX Peg	1788
Gl 48	1788
Gl 60=CoD -30d 529AB	1788
Gl 83.3	1765, 1797
Gl 105=BD +6d 398 B	1788
Gl 136= Zeta^1 Ret	1788
Gl 179	1788
Gl 229= CoD -21d 1377	1788
Gl 299	1788
Gl 402	1788
Gl 450= BD+36d 2219	1788
Gl 526= BD+15d 2620	1788
Gl 596.2= Alpha Ser	1788
Gl 678.1= BD+5d 3409A	1788
Gl 755= CoD -35d 13422	1788
Gl 809= BD+61d 2068	1788
Gl 829	1788
Gl 867A	1788
Gl 871.1B	1788
Gl 880=BD+15d 4733	1788
Gl 895.2=ZZ Psc	1788
Gl 908=BD+1d 4774	1788

U Gru	1708
W	1709
X	1709
RV	1708

HD 5601	1763
HD 17576	1770
HD 19712	1763
HD 25267	1763
HD 30849	1763
HD 30861	1763
HD 31587	1763
HD 33474	1772

93	1798
V Lep	1709
EI Lib	1709
SW Lyn	1751
UZ Lyr	1709
FL	1704
HP	1708
MV	1776
AU Mic	1768
BB Mon	1708
FW	1709
Y Mus	1748
BP	1702

New and Suspected Variables:
(see also Flare Stars)

Ap Stars (8)	1755
Ap Stars (8)	1763
BD +4d 4009=HD 179315	1719
HD 17576	1770
HD 30861	1763
HD 31587	1763
HD 33474	1772
HD 55892	1763
HD 91948	1733
HD 166181	1791
HD 219150	1742
HR 2258=HD 43819	1796
HR 5110=HD 118616	1745
HR 5171	1796
HR 6392	1796
with large parallax	1788
93 Leo	1798
in M13 (3)	1769
a nebulous object (5h44.1m +46d 26' [1855])	1789
near NGC 6352	1758
Iota Tri	1764
Rho Vir	1753
in a field at alpha=13h, delta=-70d (22)	1760
Z Nor	1702
RT	1748
RZ	1748
TV	1702, 1709

Novae:

Nova Gem 1912= DN Gem	1711
Nova Sgr 1978	1706
in M31(in August, 1978)	1775

RZ Oph	1709
SW	1709
V 986	1716
Omega=HD 148898	1755
52=HD 159376	1755
Z Ori	1709
W	1712
DN	1709
U Peg	1751
TY	1709
AW	1800
BX	1708
DI	1739
EE	1704
HX=GJ 2158	1788
RV Per	1709
RW	1709
RY	1709
AB	1709
AG	1712
Beta (=Algol)	1712, 1787
SX Phe	1756
SZ Psc	1741, 1742
UU	1709
ZZ (=Gl 895.2)	1788
X PsA	1708
RR Pup	1709
Zeta^1 Ret=Gl 136	1788
FG Sge	1722
RS Sgr	1702, 1709
RY	1748
SX	1702
WY	1709
XZ	1702
ZZ	1702, 1709
BQ	1709
GU	1748
MV	1748
V 523	1702
V 524	1709
V 525	1709
V 777	1708
V 1860	1748
U Sco	1707, 1738
FV	1702
V 381	1708
V 906	1704
SZ Scl	1708
U Sct	1709

AZ	1709
BO	1709
CD	1709

Weber Variable:

Wr 136=CSV 8853	1767
15h35.7m +19d 01' (1950)	1720,1743
17h40m 32.6s -36d 02'07" (1950)	1714

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1701

Konkoly Observatory
Budapest
1979 November 5

PHOTOELECTRIC MINIMA OF AW UMa AND W UMa

Photoelectric observations of eclipsing systems AW UMa and W UMa were made on twelve nights from February through April 1979 using the 38 cm. reflector at the Villanova University Observatory. Complete light curves were obtained for both stars. A pair of wide and narrow interference filters centered on the Hα feature were used, their characteristics are: Hαw (max = 6595; HW FH = 270Å), Hαn (max = 6569; HWFH = 36 A). A further description of the equipment and system is given by Guinan and Tomczyk (1979).

The usual sky-comp.-var.-comp.-sky observing sequence was used in the collection of the data. The tracing paper method (Szafraniec, 1948) was used to determine the time of minimum light for data collected through the Hαw filter. The ephemeris for AW UMa was JD Hel. 2438044.7815 + 0.4387318 (Kalish, 1965) and for W UMa it was JD Hel. 2433282.6828 + 0.3336379 (Rigterink, 1972).

Star	Time of Min. (JD Hel.)	O - C	Observer
AW UMa	2443945.7220	-0.0022	McNamara
	2443948.7927	-0.0026	Stoke
W UMa	2443924.7296	-0.0021	Hart
	2443949.7516	-0.0029	King
	2443941.7443	-0.0029	Seaman

M. KEVIN HART
KENNETH KING
BRIAN R. McNAMARA
ROBERT L. SEAMAN
JOHN STOKE

Department of Astronomy
Villanova University
Villanova, Pennsylvania 19085

References:

Guinan, E.F., and Tomczyk, S., 1979, I.B.V.S., No. 1623.
Kalish, M.S., 1965, Publ. Astron. Soc. Pacific, 77, 36.
Rigterink, P.V., 1972, Astron. J., 77, 230.
Szafraniec, R., 1948, Acta Astron., 4, 81.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1702

Konkoly Observatory
Budapest
1979 November 7

MINIMA OF SOUTHERN ECLIPSING VARIABLES, 1975 - 1979

SIDING SPRING

The programme of multiband photoelectric observation of neglected Southern eclipsing variables was initiated by the author in 1975 with the 41 cm reflecting telescope and UBV photometer (1P21) at Siding Spring Observatory, New South Wales, Australia. Timing of minima has been the first task of the programme. This paper contains several times of minima as a preliminary result to make them available for further spectroscopic and photometric observations. Several stars showed such a high shift of the time of minimum with respect to the ephemeris (GCVS) that there is no doubt about the variation of the period. The detailed results concerning period variations will be published shortly.

Table I contains the times of primary and secondary minima in heliocentric Julian days. The errors are of the same order as the last digit given in the table but not larger than 0.002 day. The original observational data for all stars will be published as the full reduction of data proceeds. The same applies for the observation of stars with well known variability of their periods observed at the same time span (GL Car, SV Cen, V 523 Sgr, AO Vel). Requests for more detailed data before publication may be directed to the author.

Since 1977 this programme has been supported by the grant of the Australian Research Grant Commission.

Z. KVÍZ

Broken Hill Division,
The University of N.S.W.

Table I

Star and Min.			T min (HJD) 2400000.+
V	646 Cen	I	43916.1946
TV	Nor	II	43337.1050
RW	Cet	I	43459.121
RW	CrA	I	43342.9212
RW	CrA	II	43331.977
RS	Sgr	I	42953.2052
RS	Sgr	II	43336.097
ZZ	Sgr	I	43344.9859
X	Car	I	42771.1012
X	Car	II	42777.0550
AS	Vel	I	42781.070
Z	Nor	I	43343.9897
Z	Nor	II	43710.909
XZ	Sgr	I	43335.1574
FV	Sco	I	42954.0424
SX	Sgr	I	44048.161
BP	Mus	I	43928.138

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1703

Konkoly Observatory
Budapest
1979 November 8

LIGHT ELEMENTS OF V 757 Cen

The variability of V757 Cen=SAO 204919=HD 120734=CoD-36°8903= CPD-36°6160 was discovered by Bond (PASP <u>82</u>,489,1065,1970) on Curtiss-Schmidt objective prism plates. From photoelectric observations in the "y" Strömgren filter Bond, in the same article, derived a period $P=0^{d}.3432$, an amplitude $\Delta y=0^{m}.4$, the magnitude at maximum $V=8^{m}.3$, and confirmed the W UMa type of the star as indicated by the spectra.

This variable was listed by Kukarkin et al. (2nd Suppl.GCVS, 1974) and kept as current program by M. de Groot (IAU, Comm.42, 1973).

In this note we present times of minimum light obtained from about 1000 photoelectric observations in the UBV system made between March and August 1979 at the Bosque Alegre Station of Cordoba Observatory with the 154 cm reflecting telescope, and at El Leoncito Station of Felix Aguilar Observatory (San Juan, Argentine) with the 76 cm Perrine reflecting telescope.

Table I

Times of minima

JD hel.2440000+

V	B	U
3940.80745(09)	3940.80938(07)	3940.80774(18)
3970.83333(14)	3970.83340(11)	3970.83536(23)
3973.75011(07)	3973.74914(04)	3973.74863(07)
4024.54094(20)	4024.54095(03)	4024.54101(14)
4025.74068(15)	4025.74100(06)	4025.74043(05)
4027.62836(13)	4027.62837(14)	4027.62845(14)
4031.74757(13)	4031.74580(16)	4031.74574(15)
4033.46211(33)	4033.46325(08)	4033.46127(23)
4033.63356(08)	4033.63336(25)	4033.63310(13)
4069.49467(09)	4069.49513(11)	4069.49396(18)
4069.66343(22)	4069.66170(30)	4069.66108(20)

Individual minima are listed in Table I. The standard errors are given in parenthesis; they were determined from the light curves on each pass-band. A least squares linear ephemeris using the mean values of the minima in the UBV bands, gives

$$\text{Min I} = \text{JD hel.}2444024\overset{d}{.}53970 + 0\overset{d}{.}3431629\cdot E$$
$$\pm.00030 \quad \pm.0000034$$

Table II

Times of maxima
JD hel.2440000+

V	B	U
3973.83800(28)	3973.83683(41)	3973.83539(08)
4025.65636(15)	4025.65618(11)	4025.65448(15)
4033.54585(31)	4033.54580(13)	4033.54700(13)
4069.57990(21)	4069.57975(17)	4069.57690(16)

Also in Table II are listed four times of maximum light which were handled in a similar way as the minima. The corresponding ephemeris is

$$\text{Min I} = \text{JD hel.}2444024\overset{d}{.}53893 + 0\overset{d}{.}3431609\cdot E$$
$$\pm.00046 \quad \pm.0000051$$

Table III

Mean times of maxima and minima

JD hel. 2440000+	w	cycles	(O-C)
0653.760	1	-4822.50	-0.0008
0654.788	1	-4819.50	.0007
0656.676	1	-4814.00	.0002
3940.80819(60)	1	4756.00	- .0019
3970.83403(67)	1	4843.50	- .0005
3973.74929(43)	1	4852.00	.0012
3973.83674(75)	1	4852.25	- .0004
4024.54097(02)	4	5000.00	- .0014
4025.65567(60)	1	5003.25	- .0008
4025.74070(16)	2	5003.50	- .0001
4027.62839(03)	3	5009.00	- .0003
4031.74637(60)	1	5021.00	- .0003
4033.46221(57)	1	5026.00	- .0003
4033.54622(39)	2	5026.25	.0015
4033.63334(13)	2	5026.50	.0002
4069.49459(34)	1	5131.00	.0001
4069.57885(98)	1	5131.25	.0017
4069.66207(70)	1	5131.50	.0042

Since both solutions are in close agreement within the errors we constructed a new one including the minima and the maxima:

$$\text{Min I} = \text{JD hel. } 2444024^{d}.53953 + 0^{d}.3431622 \cdot E$$
$$\pm .00025 \quad \pm .0000028$$

Finally, the ephemeris representing these seasonal minima and those of the discovery, derived from the observations supplied by Bond (private communication, 1971) gives the values

$$\text{Min I} = \text{JD hel. } 2442308^{d}.69312 + 0^{d}.34316929 \cdot E$$
$$\pm .00106 \quad \pm .00000021$$

In Table III are listed the epochs, their standard errors, the assigned weights, the cycles and the residuals (O-C) of the last ephemeris. We see that the secondary minimum is centered at phase 0.5. An inspection of the light curves (not given in the text) indicates that V757 Cen is an A-type W UMa system, exhibing a flat secondary minimum of about 15 minutes, a primary minimum of amplitude $0^{m}.47$ in V and the light in the maximum preceding the Min I slightly exceeding the other. Differential colours are almost constant throughout the period.

MIGUEL A. CERRUTI

Fellow of the CONICET
at the Instituto de
Astronomía y Física
del Espacio (IAFE)

C.C. 67 Suc. 28
1428 Capital Federal
Argentina

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1704

Konkoly Observatory
Budapest
1979 November 13

NEW ECLIPSING BINARY RESULTS OBTAINED WITH A RETICON DETECTOR

For approximately the last year we have been using the self-scanned Reticon detector of the McDonald Observatory 2.7 m and 2.1 m coude spectrographs to observe eclipsing binaries. The 2.7 m detector consists of a linear array of 1024 photodiodes, and has been described by Vogt, Tull, and Kelton (1978). We discuss below some of our results which may be of immediate interest to other observers.

KP Aql - This faint system ($9^{m}.7$ pg) is strongly double-lined on our Reticon scans. Cailliatte (1951) reported spectral types of A in primary minimum and K in maximum light. Our 4.4 Å/mm scans of this system indicate a pair of nearly equal early F stars. Ibanoglu and Gulmen (1974) have published a photometric orbit.

CW CMa - UBV colors indicate a slightly reddened A0V, and this is consistent with our Reticon scans. Williamon (1976) has published a photometric orbit with a derived light ratio of 1.26 in the blue, which may not be consistent with the observed near-equality of line strengths in our double-lined scans.

YZ Cas - Kron (1942) determined the light ratios of this system (A2V+F5V) to be 15 in the blue and 9 in the red. Lines of the secondary are easily seen on Reticon scans having signal-to-noise ratios (S/N) in excess of 300 taken in the 6400 Å region. The maximum depth of the secondary absorption lines is about 2% which is consistent with Kron's light ratio. Linewidths of the two components differ by a factor of about 2.

V442 Cyg - In the photographic study of this system, Ikauniex (1946) suggested that the period was probably twice the one he derived, which is the period given in the GCVS. Our scans of this faint ($10^{m}.0$ pg) system are strongly double-lined, indicating that this suggestion is correct and the period is about 2.386 days. The light ratio based on the line strengths is about 1.2. The GCVS spectral type of F4 may be slightly too early, but is close to correct. A new photometric study of this system based on photoelectric data is badly needed.

TX Leo - In the 6400 Å region no sign of the secondary is seen on scans with S/N in excess of 1000.

FL Lyr - Cristaldi (1965) had to assume third light ($L_3 = 0.335$) to get a photometric solution to his photoelectric data. This assumption has been criticized by Koch, Plavec and Wood (1970). Our scans are strongly double-lined, but show no sign of a third component. The inferred light ratio is about 1.5. The photometric orbit should be redetermined from new photoelectric data.

EE Peg - This system is similar to YZ Cas in the sense that it consists of an early A and an early F main sequence pair. Linnell's (1973) solution to Ebbighausen's (1971) data gives a light ratio in the blue of 9. Lines of the secondary are easily seen on 6400 Å Reticon scans having S/N greater than 300. The deepest lines of the secondary are about 2%.

V906 Sco - A double-lined orbit was computed from low-dispersion spectrograms by Abt *et al*. (1970), but our high-resolution scans show that the system is triple-lined. The orbit of Abt *et al*. (1970) is therefore suspect since at low-resolution the third component would blend with lines of the other two. At 4481 Å Mg II the third component is about 0.3 the width of the other two components and has the same depth. The period of the third component is not yet known. The photometric orbit of Leung and Schneider (1975) needs to be recomputed with allowance for third light.

TX UMa - Weak (1 %), broad lines of the secondary are seen in scans of the 6400 Å region having S/N greater than 300. Some emission is present at Hα.

We intend to continue observing these and several other systems in the future, and eventually to obtain absolute properties of the component stars.

CLAUD H. LACY
DAVID S. EVANS

Department of Astronomy
and McDonald Observatory
University of Texas
Austin, TX 78712
U.S.A.

References:

Abt, H. A., Levy, S. G., Baylor, L. A., and Hayward, R. R. 1970. Ap.J., 159, 919.

Cailliatte, M. Ch. 1951. J. Obs., 34, 57.

Cristaldi, S. 1965. Pub. Catania, N.S., 68, 6 .

Ebbighausen, E. G. 1971. A.J., 76, 460.

Ikauniex, J. J. 1946. Var. Stars, 6, 16.

Kron, G. E. 1942. Ap. J., 96, 173.

Leung, K. and Schneider, D. P. 1975. Ap. J., 201, 792.

Linnell, A. P. 1973. Ap. Sp. Sci., 22, 13.

Vogt, S. S., Tull, R. G., and Kelton, P. 1978. Applied Optics, 17, 574.

Williamon, R. M. 1976. A. J., 81, 1134.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1705

Konkoly Observatory
Budapest
1979 November 15

VARIABILITY OF SS433

Photoelectric photometry of SS433 was obtained on three consecutive photometric nights in June 1979 using the 150 cm telescope of The Pennsylvania State University. A broadband interference filter with a FWHM of 700 Å and centered at 5500 Å was used to isolate a relatively line free region near the V band. The instrumental magnitudes were adjusted in zeropoint to the nearby comparison star with V = 13.7, B-V = 0.7 (IAUC 3379). Study of published spectra indicated that, with the expected velocity shifts, the strong emission lines in SS433 could contribute only a few percent of the signal. On June 26.140-26.335 and 27.115-27.322 UT the magnitude of SS433 was constant at 15.11 within ± 0.15 mag on timescales down to minutes. Observations over a shorter period on June 25 gave a result 0.3 mag brighter.

S. HOWELL
R. J. PANEK

Department of Astronomy
The Pennsylvania State University
University Park, PA 16802

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1706

Konkoly Observatory
Budapest
1979 November 19

THE 1978 NOVA IN Sgr

The object at $\alpha=18^h14^m20\overset{s}{.}6$, $\delta=-27^\circ59'51''$ (1900) was discovered by Stenholm and Lundstrom (1979) to have had the spectrum of a declining nova on an objective prism plate taken 1978 Mar. 8. The star is visible on Maria Mitchell plates taken between 1978 June 30 and 1978 Oct. 3 but not seen in 1977 or 1979 on plates with a limiting magnitude near $m_{pg}=15$. There are no plates of the field between 1977 Oct. 1 and 1978 June 30 or between 1978 Oct. 3 and 1979 May 2.

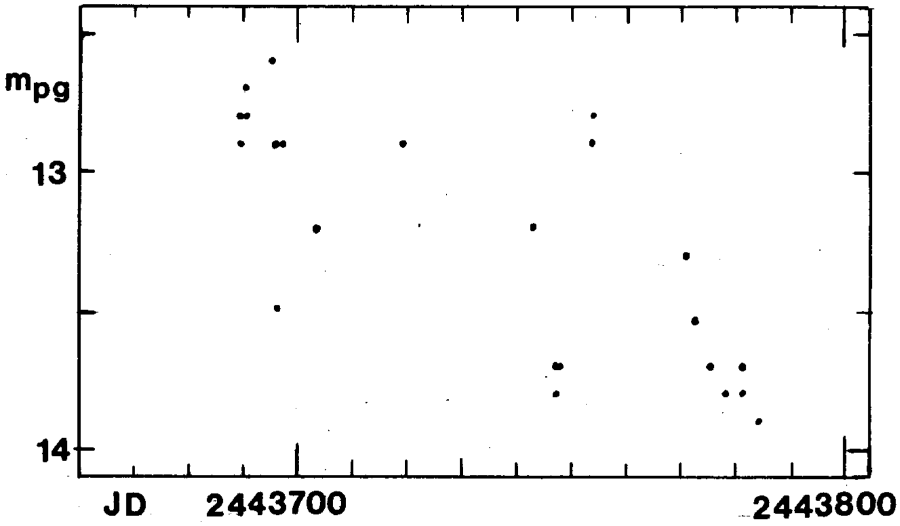


Fig. 1. A photographic light curve for the 1978 Nova in Sgr

The photographic light curve is shown in Fig. 1. Magnitudes are from eye estimates relative to the sequence stars identified on the finding chart, Fig. 2. Preliminary magnitudes of the sequence stars are listed in Table 1. They are based on photographic transfer from photoelectric B magnitudes (Bok and Bok

Table 1

a	$12\overset{m}{.}2$
b	12.7
c	13.0
d	13.6
e	14.2

1960) and photographic IPg magnitudes (Pickering et al. 1923) in Selected Area 158, transformed to m_{pg} according to:

$$m_{pg} = B - 0.2$$

and $$m_{pg} = 12.18 + 1.34(\mathrm{IPg} - 12) \quad .$$

The first relation is a simple zero-point adjustment. The second comes from a linear least squares fit involving five of the seven faintest stars which the two sequences have in common (leaving out two discordant red stars).

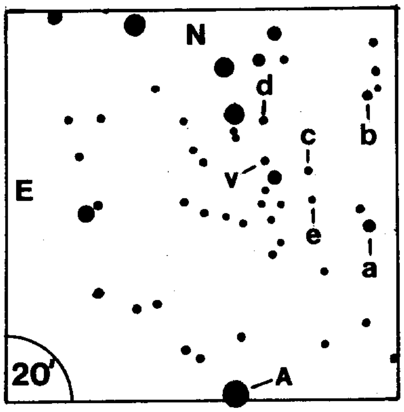


Fig. 2. Field of the 1978 Nova in Sgr. Preliminary magnitudes of the sequence stars are given in Table 1. The star marked "A" is CoD -28°14475.

I am grateful to Earthwatch, of Belmont, Massachusetts, for support of this work and to volunteers Clifford Spohn for estimates of the nova and Mary Fletcher for the photographic transfer.

EMILIA P. BELSERENE
Maria Mitchell Observatory
Nantucket, Mass. 02554 USA

References:
Bok, B.J., Bok, P.F. 1960, Monthly Notices of the R.A.S. 121, 531
Pickering, E.C., Kapteyn, J.C., van Rhijn, P.J. 1923, Harv.Ann. 102
Stenholm, B., Lundström, I. 1979, IAUC 3411

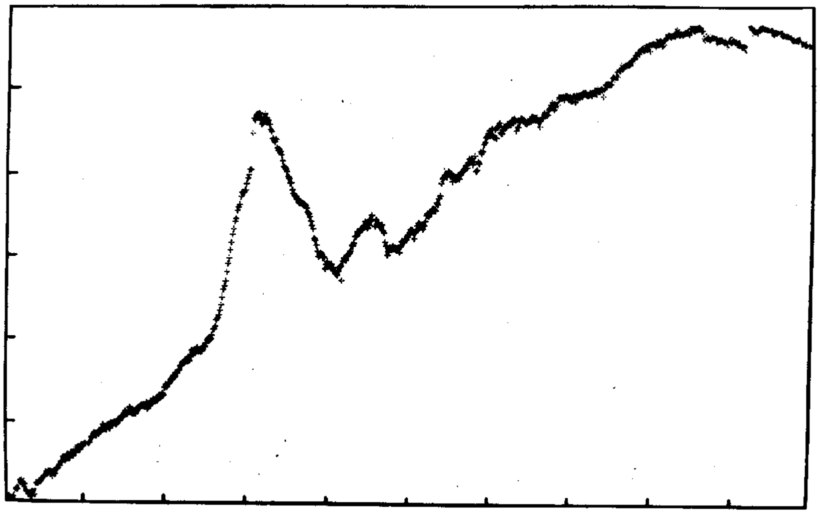
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1707

Konkoly Observatory
Budapest
1979 November 23

HIGH SPEED PHOTOMETRY OF U Sco

The recent outburst (I.A.U. telegram received June 27, 1979) of the recurrent nova U Sco provided the first opportunity for photoelectric photometry of this species with the benefit of superior time resolution (we here relegate the 1978 eruption of WZ Sge to an outburst of a dwarf nova (Warner 1976; Robinson *et al.* 1978)).

Announcement of this event coincided with an observing run by the writer on the 40-inch (1016 mm) telescope at the South African Astronomical Observatory. The first occasion on which the nova could be observed was 29 June, and it was consequently honoured with five second integrations, in white light (i.e. no filter: photomultiplier with S11 response) starting at 18:40:47 U.T, and lasting for nearly 5 hours. It emerged that this amount of attention was superfluous: there was no activity on a timescale of seconds. We can therefore exclude U Sco from the class of ultra-short orbital period, hyper-long outburst dwarf novae personified by WZ Sge. There was, however, activity on a timescale of 10 minutes, as is shown by the light curve (in which we have added contiguous integrations to furnish a record with 25 seconds resolution). In this light curve, abscissa carets mark time intervals of 0.02 days and ordinate carets are in steps of 3000 counts per second, commencing at 42,000 c.p.s. (these are rates obtained after removal of extinction). The mean visual magnitude during the observation was about 11.5 (c.f. Bortle, I.A.U. Circ. 3378).



As can be seen from the Figure, there was a general increase in brightness during the observation, reaching maximum shortly before termination, on which there were significant variations of order 10-20 minute duration.

The spectroscopic observations reported by Hill and by Pringle and Whelan (I.A.U. Circ. 3378) are stated to indicate that U Sco was "not unlike TCrB", which, if interpreted as meaning that U Sco resembled TCrB, agree in excluding this object from the WZ Sge class. The timescales of the variations reported here have considerable relevance to the processes occurring in the star a few days after its outburst.

BRIAN WARNER
Department of Astronomy
University of Cape Town

References:

B. Warner, 1976. In *I.A.U. Colloquium No. 73*, Cambridge, p. 85.

Robinson, E.L., Nather, R.E. and Patterson, J., 1978. *Astrophys. J., 219*, 168.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1708

Konkoly Observatory
Budapest
1979 November 27

A SELECTION OF OBSERVATIONALLY ATTRACTIVE CLOSE BINARIES

The present authors have recently edited A Finding List for Observers of Close Binaries and this volume is to be published shortly. A brief presentation concerning the Finding List at the IAU General Assembly in Montreal emphasized that curious characteristics appear to be associated with some close binaries which have been relatively neglected up to now. In response to a request, we offer a selection of these objects in this note, commenting upon their intrinsic interest or the matters of confusion concerning them.

AM Aqr:	This short-period object may be a cool contact binary. If it is such, the 1.4-mag depth of primary eclipse is uncommon. However, a secondary minimum has not yet been reported, and it is possible the object has dis-similar temperature components. Two distinct changes of the form of the light curve have been reported.
DV Aqr:	A claim has been made that the one star of this binary shows δ Sct-type pulsation in the β-index. Shell structure and activity have also been announced. The Keplerian period is $\simeq$1.6 days.
V1182 Aql:	A Keplerian period of only $\simeq$ 1.6 days binds this apparently very massive O-type system.
UX Boo:	Spectral classifications of G8 III and G2 V are given for this 10-mag system, but the Keplerian period is not yet known.
BW Boo:	It is not clear whether the secondary eclipse is displaced from the half-period phase truly indicating an eccentric orbit or whether one component pulsates. This binary is quite bright, but unfortunately the Keplerian period is very close to 3.33 days. Cooperation between two or three stations substantially separated in longitude should resolve the confusion.

CE CMa: Apparently a measurably eccentric, 27-day orbit defines the binary motion. Color indices or a spectral classification are desirable to indicate whether the object is a relatively familiar main sequence pair or, more interestingly, somewhat evolved.

FL Car: It is surely unusual to see a C-type star in a ≈0.9-day eclipsing binary. Since Carina is such a rich constellation, it is worthwhile confirming that the spectral classification does not refer to some neighboring star.

V338 Car: No light curve has yet been published for this 9-mag system containing a B9 star. The Keplerian period has been reported to be ≈74 days; if this is correct and if the components are main sequence stars, one can expect a light curve essentially free of complications.

AB Cas: The δ Sct-type pulsation of the A3 member is reported to be rigorously synchronized with the ≈1.4-day Keplerian period, yet two changes of the latter have been described. It would be most interesting to determine if the pulsation period remains constant.

V523 Cas: This is one of the small, but growing, number of K-type contact binaries and merits attentive monitoring.

V Cir: The very deep primary eclipse suggests this binary to be in the slow interval of mass transfer but, in fact, only an apparently large multiple of the Keplerian period is known.

RS Crt: Supposedly at least one G0 star moving in an ≈0.8-day eclipsing orbit, but one observer reported finding no variability over an interval of 13 months.

WX Cru: Although fainter than 13-mag photographically, this object has an IR mag of about 8. It surely contains a C-type star (making a much stronger case than does FL Car) and the companion may be of very different temperature. The Keplerian period is ≈60 days, and the eclipses might be complete. All types of observing programs are of great importance.

BR Cyg:	It is remarkable that the bizarre, color-dependent eclipse morphology has not attracted much subsequent photometric effort.
V541 Cyg:	Since the eclipses are complete, this ≃15-day eccentric system should yield a very determinate photometric analysis.
U Gru:	The very deep primary eclipse and the shallow secondary, each eclipse possibly being complete, suggest a system in the interval of slow mass exchange.
RV Gru:	The Keplerian period of just over 6 hours strongly suggests a K-type contact pair.
VY Lac:	A displaced secondary, and inferentially an eccentric orbit, have been reported for this ≃1-day system. This unlikely possibility should be checked.
AG Lac:	Both eclipses have been detected, the secondary measurably displaced from the half-period phase, in this ≃0.8-day Keplerian orbit. Although the binary is quite faint, this system should command attention because the orbital dynamics would be most interesting if the behavior already reported is confirmed.
V345 Lac:	Apsidal rotation may be detectable for this relatively bright, B-type binary.
HP Lyr:	Formerly thought an SR variable, the object is apparently a pair of A1 stars moving with a ≃140-day Keplerian period. The eclipses are likely to be partial but could be complete. It is interesting to note that the orbit is apparently circular.
BB Mon:	The Keplerian period is given as ≃0.7-days, but may be longer than that value. A displaced secondary and a conspicuous reflection effect have been reported for a visual light curve. Since the system is not faint, these curious light curve details can easily be checked.
BX Peg:	One might expect the spectral type to be somewhat later than G4.5 for this contact pair.

X PsA: The ranges of both eclipses are given as 1.3-mag making the light curve comparable to that of OO Aql although the Keplerian period of X PsA is distinctly shorter than that for OO Aql. It is regrettable that X PsA is so faint.

V777 Sgr: Except that the hot member is of A-, rather than B-, type, this object strongly resembles ζ Aur and is not very faint.

V381 Sco: This is a rather faint supergiant system and may bear some resemblance to ε Aur. For that reason alone, it is worth studying.

SZ Scl: Most likely this is a G-type contact binary. Interest concerning it centers around the remarkable difference between UBV magnitudes and the CoD estimate. Apparently it does not appear in the CPD, which omission is consistent with the photoelectric results.

CX Ser: This object is said to be similar to old novae and shows peculiarities in the light curve. The Keplerian period is $\simeq$ 1-day.

ROBERT H. KOCH
Department of Astronomy & Astrophysics
University of Pennsylvania

F.B. WOOD
DAVID R. FLORKOWSKI
JOHN P. OLIVER
Department of Astronomy
University of Florida

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1709

Konkoly Obsetvatory
Budapest
1979 November 27

PHOTOELECTRICALLY-NEGLECTED ECLIPSING BINARIES

When compared to photoelectric light curves, light curves derived from photographic (e.g., iris photometer) or visual (e.g., polarizing photometer) measurements may be described relatively as "imprecise". This arises typically because the random errors of the photographic or visual measurements are larger than are the random errors for photoelectric measurements. Similarly, when compared to photoelectric data, light curves derived from visual estimates of a photographic plate or directly at the telescope may be described relatively as "inaccurate". Not only are the accidental errors of the estimates larger than are those of photoelectric measures, but typically systematic errors working on assorted scales remain in the estimates.

The present authors recently served as editors of a Finding List of Close Binaries and found, as expected, a gratifying increase in the number of close binaries for which the photometric analyses rest upon photoelectric measures. They were surprised, however, to note the significant number of binaries for which the most recent photometric analyses are those of photographic or visual measurements or estimates as described above. When this was reported at a session of Commission 42 during the IAU General Assembly at Montreal, a request was made to publicize the names of these binaries in advance of the printing of the new Finding List. Hence, the attached list of such systems arrayed alphabetically by constellation. Within this list no distinction is made by observing technique, but most of the analyses are based upon photographic estimates. The compilation of this list is not meant to disparage photographic and visual procedures, for these will continue to be used indefinitely for discovery and first-epoch light curves. Rather, it is intended to suggest that photometrists need not confine attention to familiar systems; with moderate-size telescopes they can profitably study rather bright close binaries which have received essentially no photoelectric attention for decades.

And: TT, WZ, AA, AP

Aqr: RY, BQ

Aql: FK, QY, V343

Ara: UW

Ari: RS

Aur: RZ, ZZ, AK

Cam: SS, SZ

Cnc: RU

CMa: RX

Cap: RW

Car: X, SS, ST, CV, DO, EM, EZ, FP, GN, GW, HH, HI, KU

Cas: TX, XX, ZZ

Cen: RZ, SS, ST, SU, SW, SY, BF, KT, LT, V346, V350, V377, V380, V384, V495, V644, V646

Cep: RS, WZ, XY, XZ

Cet: SS

Cir: S

CrA: UU

CrB: RW

Cru: W, AE

Cyg: SY, UW, VV, VW, WZ, DL, LO, V448, V478, V809

Del: RR, TY

Dra: Z, RR, RX, SX, WW

Eri: RZ, CW

Gem: TX, AF

Gru: W, X

Her: TU, DH, MM

Hya: RX, SX, TT, VY

Lac: SS, UW, CN

Leo: RW

Lep: V

Lib: EI

Lyr: UZ

Mon: FW

Nor: TV

Oph: RZ, SW

Ori: Z, DN

Peg: TY

Per: RV, RW, RY, AB

Psc: UU

Pup: RR

Sgr: RS, WY, ZZ, BQ, V524, V525

Sct: U, W, RS, RY, BN, ER

Tau: SV

Tri: V

UMa: RW

Vel: RR, TT, AL

Vir: UW, BD

Vol: W

Vul: RR, XZ, AT, AZ, BO, CD

The attached list contains a great variety of binary configurations: several contact systems, a few ZAMS binaries, numerous evolved pairs, and a very few systems with moderate supergiant properties. The distribution of Keplerian periods peaks between 1 and 3 days and the histogram for the spectral types of the hot members favors B8 to A5 classifications.

It is necessary to observe two cautions in using this list. First, Nos. 30, 31, and 32 of the IAU Comm. 42 Bibliography and Program Notes on Close Binaries show that photoelectric analyses have been presented after April, 1978 (the cutoff date for the Finding List) for a few binaries. Thus, these systems do not appear in the present list. Secondly, there may be unanalyzed photoelectric light curves of some of these systems presently known only to their observers.

ROBERT H. KOCH
Department of Astronomy & Astrophysics
University of Pennsylvania

F.B. WOOD
DAVID R. FLORKOWSKI
JOHN P. OLIVER
Department of Astronomy
University of Florida

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1710

Konkoly Observatory
Budapest
1979 December 3

PHOTOMETRIC OBSERVATIONS OF TT Ari

During the nights of 22nd, 23rd, 24th, 25th November 1978, photoelectric observations in B light have been carried out of the nova-like variable TT Ari (=BD+14°341). Observations were made with the 60 cm Cassegrain telescope of the Observatory of Bulgarian Academy of Sciences at Belogradchik (Bulgaria).

A single channel photoelectric photometer with an FEU 64 photomultiplier and a pulse photon counter were used. The sky was measured after each 10 minute interval. Observed light variations are shown in Figures 1-4, where the starting points are marked for each night and delta mag. is with respect to the comparison star (=BD+14°336).

The analysis of the observational data was carried out by making a least square fitting of the sine-waves

$$A \cdot \sin\left(\frac{2\cdot\pi}{P}\cdot t+\varphi\right) +B$$

with a range of values for the period. For the 3-hour variations the resulting value of the period is $P=0.1326 \pm 0.0002$ and the amplitude is about 0.2 mag. A similar value of $P=0.1329$ was given by Smak and Stępień (1968) also (1975). In a similar way the fast variations were also analysed and it was found that quasi-periodic component with an amplitude of about 0.2 mag. was present with periods of 13.6, 13.1, 14.4, and 13.5 minutes for the four nights, respectively. This is in agreement with the results given by Williams (1966). Finally, using the same method (with a pre-whitening technique), a strong quasi-periodicity with an amplitude of about 0.1 mag. and P around 40 seconds was found. This is in good agreement with Mardirossian et al.(1979).

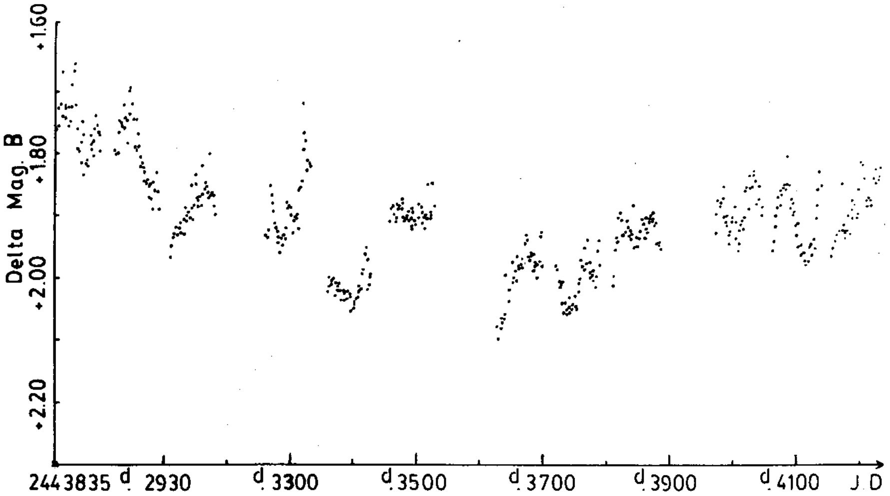

Delta Mag. B
+1.60
+1.80
+2.00
+2.20
2443835 d 2930
d 3300
d 3500
d 3700
d 3900
d 4100
J.D

Fig. 1

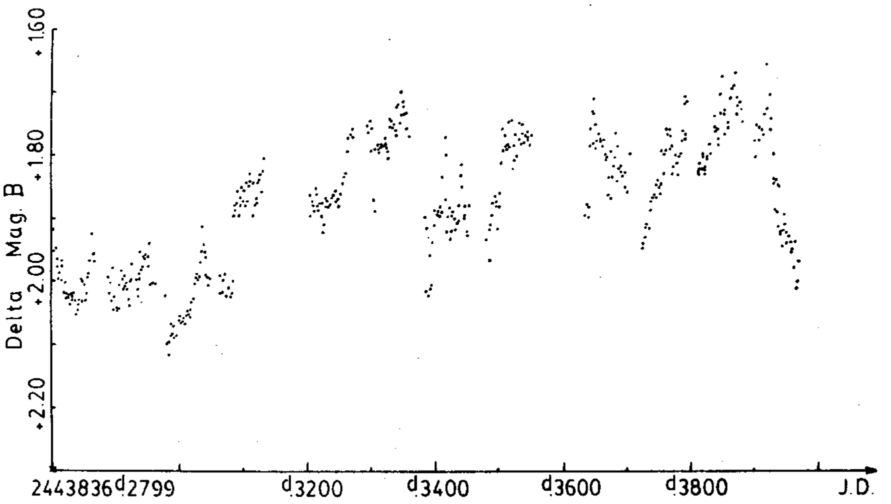

Delta Mag. B
+1.60
+1.80
+2.00
+2.20
2443836 d 2799
d 3200
d 3400
d 3600
d 3800
J.D.

Fig. 2

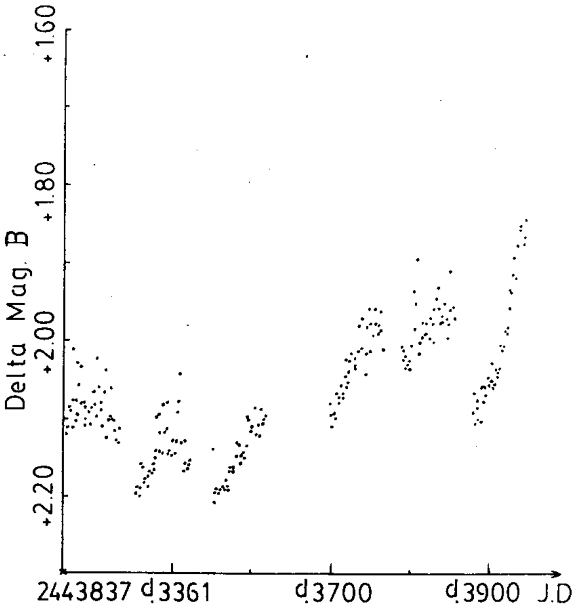

Delta Mag. B
+1.60
+1.80
+2.00
+2.20
2443837
d 3361
d 3700
d 3900
J.D

Fig.3

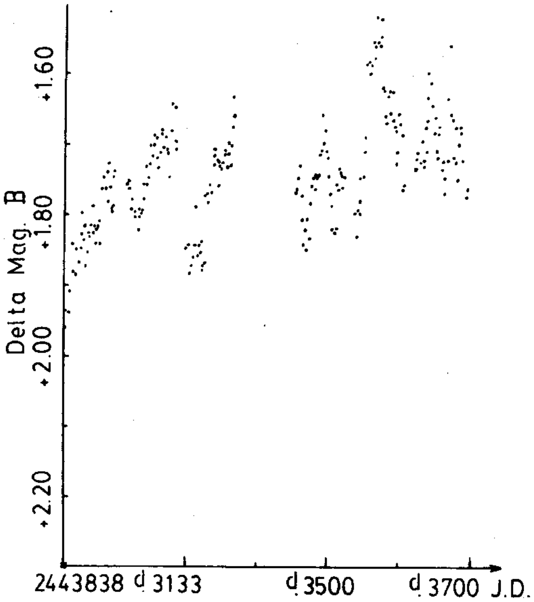

Delta Mag. B
+1.60
+1.80
+2.00
+2.20
2443838
d 3133
d 3500
d 3700
J.D.

Fig.4

On the first three nights the observations reported here were simultaneous with those of Mardirossian et al. (1979). A comparison of the two sets of data shows that the star was more active in B than in white light.

The photometric period of P=0.1326 is significantly different from the spectroscopic period of P=0.1375 found by Cowley et al. (1975). It is possible that in this star we have two different periods connected with its photometric and spectroscopic activity.

Acknowledgements:
The author wishes to express his gratitude to Prof.J. Smak for critical evaluation the elaborated results and deeply indebted to Dr. M. Popova for enabling the photoelectrical observations at the Observatory of Bulgarian Academy of Sciences.

MIROSŁAW SZTAJNO

N.Copernicus Astronomical Center
Polish Academy of Sciences
18 Bartycka Str., 00-716 Warsaw,

Visiting astronomer from
Astronomical Observatory of
Jagiellonian University,Cracow,
Poland.

References:

Cowley, A.P., Crampton, D., Hutchings, J.B., Marlborough, J.M., 1975, Ap.J., 195, 413

Mardirossian, F., Mezzetti, M., Pucillo, M., Santin, P., Sedmak, G., Cester, B.,Giuricin, G., 1979, I.B.V.S., No.1622

Smak, J., Stępień, K., 1969, Non-Periodic Phenomena in Variable Stars,ed.L.Detre(Budapest: Academic Press) p.335

Smak, J., Stępień, K.,1975, Acta Astr., 25, 379

Williams, J.O., 1966, Publ.Astr.Soc.Pacific 78, 279

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1711

Konkoly Observatory
Budapest
1979 December 3

INTERSTELLAR LINES IN THE SPECTRUM OF NOVA DN GEMINORUM (1912)

Distance determinations of novae are fairly scarce and often inaccurate. A rediscussion of existing material is especially rewarding for those old novae, whose spectroscopic and photometric history is thoroughly investigated, whose distances, however, could not be obtained because of lack of observable expanding shells. Since the nature of the "stationary calcium lines" was not yet clearly established, their distances were not (or only later) estimated from the strength of the interstellar lines.

The intensity of the interstellar lines in nova DN Gem was obviously never quantitatively studied, as noted by McLaughlin (1965), while extensive discussions of the spectroscopic and photometric evolution were published by Stratton (1920) and McLaughlin (1965).

We have used tracings of the spectra Nos. 1865, 1867, 1870, and 1873 obtained by F. Küstner with the Bonn 0.30 m refractor and the Toepfer 3-prism spectrograph in March and April, 1912. The photometric calibration was established by measuring the strength of different iron arc comparison lines belonging to the same multiplet, as proposed by Hogg (1929). While the Ca II K line was always weakly exposed, the Ca II H line was clearly seen and measured against the broad, diffuse Hε + Ca II H emission. Since the distance relations are always given for the Ca II K line strength only, a conversion factor 1.78 (Binnendijk 1952) was applied:

$$\begin{aligned} W_K &= 1.78\ W_H \\ &= 0.165\ \text{Å} \\ &\quad \pm .022\ \text{m.e.} \end{aligned}$$

Using distance relations by Allen (1973), Beals and Oke (1953), and Binnendijk (1952), a distance

$$d = 450 \pm 70\ \text{pc}$$

is obtained. Taking into account the inaccuracies of the distance and the plate calibrations, the error is probably twice as high.

The method of the residual radial velocity of the interstellar lines, interpreted as being due to differential galactic rotation, and successfully applied by McLaughlin (1941) to three novae, yields in the case of DN Gem (r.v.helioc. of Ca II = + 4.8 km/s; McLaughlin, 1965):

$$v_r = - 14.7 \text{ km/s}$$

This value indicates a distance of the order of 10 kpc, which cannot be reconciled with the observed strength of the interstellar lines, and the known absolute magnitude range of galactic novae - a fact which obviously prevented McLaughlin from applying his 1941 method in his 1965 study on DN Gem. The observed residual radial velocity must be interpreted as being due to the peculiar motion of interstellar Ca II in the direction of DN Gem.

Thus we will rely only on the distance determination by the inferred strength of the Ca II K line. Interstellar absorption may be estimated by using the studies of Neckel (1967), Gottlieb and Upson (1969), and Deutschman et al. (1976). For a distance of 450 pc,

$$A_V = 0.27 \pm 0.13$$

DN Gem reached $m_{pg} = 3.6$ at maximum light. Assuming $C_o = 0.25$ around maximum light, an absolute visual magnitude

$$M_V = - 5.3 \pm 0.5$$

is derived. While it is possible that the absolute magnitude, due to the many uncertainties entering the calculations, may be as high as -6.5, the estimates of -7.2 ... -7.6 given by McLaughlin are certainly too high.

H.W. DUERBECK

Observatorium Hoher List
der Universitäts-Sternwarte Bonn
D-5568 Daun, F.R.G.

B. LEMKE and E. WILLERDING

Astronomisches Institut der Universität Münster
Steinfurter Str. 107
D-4400 Münster, F.R.G.

References :

Allen, C.W., 1973, Astrophysical Quantities (3rd ed.), London: Athlone Press

Beals, C.S., Oke, J.B., 1953, Mon. Not. R. astr. Soc. 113, 530

Binnendijk, L., 1952, Astrophys. J. 115, 428

Deutschman, W.A., Davis, R.J., Schild, R.E., 1076, Astrophys. J. Suppl. 30, 97

Gottlieb, D.M., Upson, W.L., 1969, Astrophys. J. 157, 611

Hogg, F.S., 1929, Harvard College Obs. Circ. 337

McLaughlin, D.B., 1941, Astrophys. J. 93, 417

McLaughlin, D.B., 1965, Publ. Obs. Univ. Michigan 9 (5), 113

Neckel, Th., 1967, Veröff. Landessternwarte Heidelberg-Königstuhl 19

Stratton, F.J.M., 1920, Ann. Solar Phys. Obs. Cambridge 4 (1)

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1712

Konkoly Observatory
Budapest
1979 December 5

TIMES OF MINIMA OF SIX ECLIPSING VARIABLES

Since 1975 observations of the times of minimum light of eclipsing variables have been frequently made at the Yonsei University Observatory in Seoul. Altogether 22 times of minima for six variable stars, RZ Cas, AR Lac, VV Ori, β Per, AG Per and W UMa, were reported in several sources available only in Korea. As they were never distributed widely these data are essentially unknown material to those who are not in Korea. It is, thus, our purpose to collect these obervations and to report them so that they may be useful to others.

Table I

List of times of minimum light

Stars	J.D. Hel. 2440000+	E	O-C	Meth.	Source of Information
RZ Cas	2691.133	10722	0.001	Pe	Lee, Y.S. (1975)
RZ Cas	2697.110	10727	0.002	Pe	Lee, Y.S. (1975)
RZ Cas	2703.086	10732	0.002	Pe	Lee, Y.S. (1975)
RZ Cas	2704.281	10733	0.002	Pe	Lee, Y.S. (1975)
AR Lac	3084.077	1869.5	-0.008	Pe	Nha and Kang(1979)
AR Lac	3420.227	2039	-0.011	Pe	Nha and Kang(1979)
AR Lac	3427.170	2042.5	-0.009	Pe	Nha and Kang(1979)
AR Lac	3428.163	2043	-0.007	Pe	Nha and Kang(1979)
VV Ori	2459.072	0	-0.007	Pg	Lee and Nha (1975)
β Per	2453.063	2702	0.003	Pg	Jeong (1975)
AG Per	1628.7524	8223	-0.0074	Pe	Nha et al. (1975)
AG Per	1680.500	8248.5	0.008	Pe	Nha et al. (1975)
W UMa	2456.061	61741	0.002	Pg	Jeong (1975)
W UMa	2458.230	61747.5	0.002	Pg	Jeong (1975)
W UMa	2461.231	61756.5	0.000	Pg	Jeong (1975)
W UMa	3196.062	63959	-0.005	Pe	Lee, Y.B. (1977)
W UMa	3196.227	63959.5	-0.007	Pe	Lee, Y.B. (1977)
W UMa	3209.241	63998.5	-0.005	Pe	Lee, Y.B. (1977)
W UMa	3212.245	64007.5	-0.004	Pe	Lee, Y.B. (1977)
W UMa	3213.077	64010	-0.006	Pe	Lee, Y.B. (1977)
W UMa	3225.089	64046	-0.005	Pe	Lee, Y.B. (1977)
W UMa	3246.107	64109	-0.006	Pe	Lee, Y.B. (1977)

Table II

Light elements used above

Star	Epoch	Period	Reference
RZ Cas	2429875.6902	1.1952473	Herczeg and Frieboes-Conde (1974)
AR Lac	2439376.4955	1.9831987	Chambliss (1976)
VV Ori	2442459.0787	1.4853789	Eaton (1975)
β Per	2434705.5493	2.86732442	Frieboes-Conde et al.(1970)
AG Per	2424946.5153	2.02872973*	Semeniuk (1968)
W UMa	2421856.9401	0.333637665	Huffer (1934)

*Period is adopted from Nha et al. (1975)

The data shown in Table I are all made either with the f/5 astrograph or with photoelectric photometer attached to the 40-cm reflector at the Yonsei University campus observatory, except for AG Per which was observed with the 72-cm reflector at the Flower and Cook Observatory of the University of Pennsylvania.

Columns 3 and 4 of Table I are derived from the light elements collected in Table II for each star.

IL-SEONG NHA
Department of Astronomy
and Meteorology
Yonsei University
Seoul, Korea

JANG HAE JEONG
National Astronomical Observatory
Seoul, Korea

References:

Chambliss, C.R. 1976. Publ.A.S.P. 88, 762
Eaton, J.A. 1975, Astrophys. J. 197, 379
Frieboes-Conde,H.,Herczeg,T.,and Hogg,E,1970,A.and AP. 4, 78
Herczeg, T.and Frieboes-Conde, H. 1974. A. and AP. 30, 259
Huffer,C.M. 1934, Astrophys. J. 79, 369
Jeong, J.H. 1975, Master's thesis, Yonsei University
Lee, W.B. and Nha, I.S. 1975, J.Korean Astron.Soc. 8, 25
Lee, Y.B. 1977, Master's thesis, Yonsei University
Lee, Y.S. 1975, Master's thesis, Yonsei University
Nha, I.S. and Kang, Y.W. 1979, to be published
Nha, I.S.,Oh, K.D. and Jeong, J.H. 1975, Yonsei Nonchong 12, 97
Semeniuk, C. M. 1968, Acta Astron. 18, 1

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1713

Konkoly Observatory
Budapest
1979 December 7

RY INDI : LIGHT ELEMENTS

RY Indi (CoD-46°13772, CPD-46°10113) has been observed in the UBV system at the Bosque Alegre Station of Córdoba Observatory; 72 and 146 observations were obtained by one of us (JC) in 1973 and 1979. The observations of the two runs are shifted by $0^d.1906$ when the phases are computed with Hoffmeister's elements (KVBB, 27, 1943) as given in the GCVS (1968). Therefore these elements should be improved.

From a mean light curve in each colour four times of minimum light were derived; the mean values are given in Table I, errors were computed from the individual minima in each pass-band. Also in Table I the epoch of Hoffmeister's light elements is listed.

Table I

Minima of RY Indi

JD Hel. 2400000+	E	O-C	Remarks
27993.574	-21101.0	-0.0007	1
41900.8057	-1571.5	+0.0006	2
41901.1653	-1571.0	+0.0042	2
44139.6880	+1572.5	-0.0035	2
44140.0469	+1573.0	-0.0006	2

(1) Hoffmeister, KVBB, 27, 1943
(2) Present observations.

A least squares linear solution yields:

$$\text{Min.I} = \text{Hel.J.D. } 2443019.8922 + 0^d.71211400 \cdot E$$
$$\pm .0016 \quad \pm .00000017 \text{ m.e.}$$

which gives an up today ephemeris with an improved period.

The light curves show the general characteristics of an EB variable. The observations were made differentially in relation to HD 199264(FO), whose colour indices are almost the same of the variable star and its apparent position is very close to it. The UBV values of the comparison star are: V=9.066, B-V=0.327, and U-B=0.097, while the variable displays:

Maximum: V = 10.826, B-V = 0.277, and U-B = 0.097
Min. I.: V = 11.446, B-V = 0.301, and U-B = 0.115
Min.II.: V = 11.040, B-V = 0.258, and U-B = 0.092.

The location of the variable at maximum light in the colour-colour diagram is consistent with the spectral type A8 slightly reddened by E(B-V)=0.05 and E(U-B)=0.04; similar values, E(B-V)= 0.07 and E(U-B)= 0.05 were found for the comparison star (FO). The colours of RY Indi at primary minimum are somewhat later (A9) than at maximum light.

J.J. CLARIÁ
R.F. SISTERÓ

Observatorio Astronómico
Laprida 854
5000 Córdoba,Argentina

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1714

Konkoly Observatory
Budapest
1979 December 10

THE ERUPTIVE VARIABLE IN SCORPIUS: A SYMBIOTIC STAR

Sanduleak, Stephenson and MacConnell (1978) have reported the discovery of an "eruptive variable" in Scorpius (α $17^{h}40^{m}32^{s}.6$ δ $-36^{\circ}02'07''$ (1950)). They found it to show a strong emission spectrum (Balmer lines, [O III] lines and the 4640-68 A blend) and to be about 14th magnitude.

The object was observed with the infrared photometer on the 0.75m telescope at the SAAO at Sutherland on 1978 July 10 with the following results:

$J(1.2\mu) = 10.05 \pm .08$ $H(1.6\mu) = 8.79 \pm .05$ $K(2.2\mu) = 8.28 \pm .04$

The infrared colours show that a cool component is present in this object. The photometry is consistent with the presence of a late M giant having an A_V of about 3 magnitudes (using intrinsic colours from Lee 1970). Since for such a star M_K is about -7, the distance of the system is about 10 kpc. The object is thus best interpreted as a symbiotic system in the general region of the nuclear bulge of our Galaxy. The fact that the object had not apparently been detected in previous objective prism surveys suggests that it may have been unusually bright at the time of the work of Sanduleak et al.

B.S. CARTER
M.W. FEAST
S.A. Astronomical Observatory, Cape
PO Box 9, Observatory
7935 South Africa

References:

Lee, T.A., 1970. Ap. J. 162, 217.

Sanduleak, N., Stephenson, [illegible] and MacConnell, D.J., 1978, I.B.V.S. No.1376

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1715

Konkoly Observatory
Budapest
1979 December 10

PHOTOELECTRIC OBSERVATIONS OF RW COMAE BERENICIS

RW Com is a W UMa binary with a very short period, $0^{\mathrm{d}}.237$. Hence it shows extreme W-type properties: Ca II emission lines (Struve, 1950), and variable and strongly asymmetrical light curves (O'Connell, 1951, Milone, 1976). The star has been observed photoelectrically with the double beam photometer at the 106cm telescope of Hoher List Observatory in 1976. Comparison star has been BD+27°2145. The B and V light curves are shown in Figs. 1 and 2,

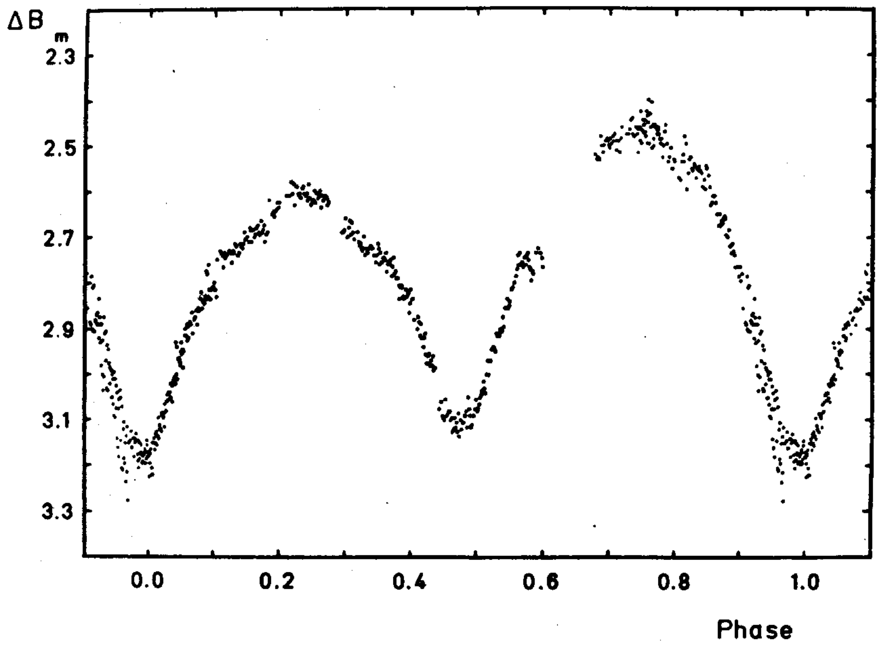


Fig. 1 B measurements of RW Com relative to BD+27°2145.

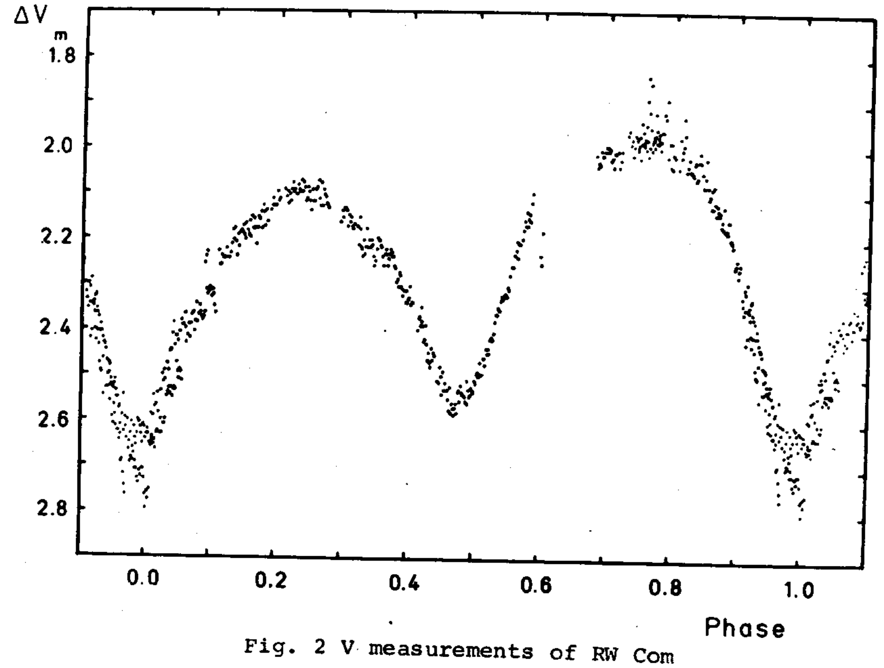


Fig. 2 V measurements of RW Com

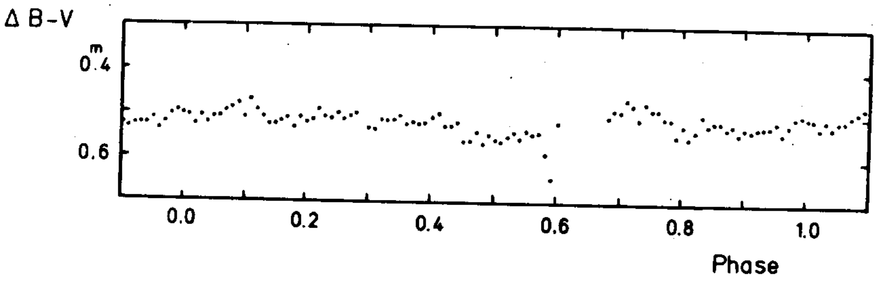


Fig. 3 B-V normal points of RW Com

the B-V curve is shown in Fig. 3.
The bluest part of the light curve is the brighter second maximum, indicating the aspect of highest mean surface temperature. The reddest minimum is the secondary minimum, which fact seems to be an unusual but common property of the shortest period contact binaries. The peculiarities in RW Com's light curves prohibit an analysis of the system's constants, but for a description

the Fourier coefficients of the light curve outside the eclipses (phases 0.16...0.34, 0.66...0.84) shall be given.

$$\ell_v = 0.7965 + 0.0284 \cos \phi - 0.1373 \cos 2\phi$$
$$- 0.0587 \sin \phi - 0.0031 \sin 2\phi$$
$$\ell_b = 0.7768 + 0.0093 \cos \phi - 0.1551 \cos 2\phi$$
$$- 0.0632 \sin \phi + 0.0092 \sin 2\phi$$

Though these formulae are impossible for a "rectification", they reveal a section of constant light between phases 0.98 and 0.02. The eclipses of RW Com seem to be complete therefore, with the occultation at primary minimum. The ratio of the "radii" of the components may be of the order of 0.3, that of the luminosities of the order of 0.2.

Minima times could be determined from the observations as follows:

Min I	JD	2442841.3740
Min I		2442842.3215
Min II		2442842.4370

They are close to the ephemeris given in the GCVS, Suppl. 1 of 1971. So a conclusion of considerable mass loss to the system, as proposed by Milone (l.c.) is not supported by any obvious period change between 1968 and 1976. Much more frequent observations of this object are necessary for a solution of the problems associated with it.

The individual measurements have been sent to the IAU files of unpublished observations of variable stars. The partly support of this study by DFG grant Schm 167/12 shall be gratefully acknowledged.

M. HOFFMANN

Observatorium Hoher List
der Universitätssternwarte Bonn,
5568 Daun, F.R.G.

References:

O'Connell, D.J.K., 1951, Riverview Publ. 2, 85
Milone, E.F., 1976, Bull. American Astron. Soc. 8, 521
Struve, O., 1950, Astrophys. J. 111, 658

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1716

Konkoly Observatory
Budapest
1979 December 14

THE NATURE OF V986 OPHIUCHI

The photometric variability of the early type star V986 Ophiuchi (HD 165174, HR 6747, 18 02 05 + 01 55 (1950), Sp 09.5 III) is well documented (Jerzykiewicz, 1975) although its true nature and interpretation remain elusive. Photometry has revealed a dominant variation of amplitude $0\overset{m}{.}014$ in both B and V with a period of $0\overset{d}{.}2907$. The amplitude is not constant and whilst its behaviour is reminiscent of the beat phenomenon seen in some β Cephei variables, Jerzykiewicz (1975) was unable to account satisfactorily for his observations in this way.

In 1978 we obtained both photometric and spectroscopic observations of V986 Ophiuchi. The photometric data are rather sparse but from them we conclude that the amplitudes of the $0\overset{d}{.}2907$ variation on JD 2443729 in the Strömgren system were $\Delta u = 0\overset{m}{.}021$, $\Delta v = 0\overset{m}{.}017$, $\Delta b = 0\overset{m}{.}017$ and $\Delta y = 0\overset{m}{.}015$ (each $\pm\ 0\overset{m}{.}002$) although the data do not cover a full period. There are indications that the data obtained on JD 2443732 and 2443733 would require a period nearer $0\overset{d}{.}4$.

During seven nights we obtained 53 spectra at a reciprocal dispersion of 15 Å/mm using the coudé spectrograph of the 1.9 metre reflector at the South African Astronomical Observatory. The high rotational velocity of this star ($v\sin i \sim 290$ km/s, Watson 1972) which is apparent in Figure 1 makes accurate radial velocity determination difficult. However highly broadened systems have been successfully investigated (cf Pike et al.1978 for investigation of α Trianguli).

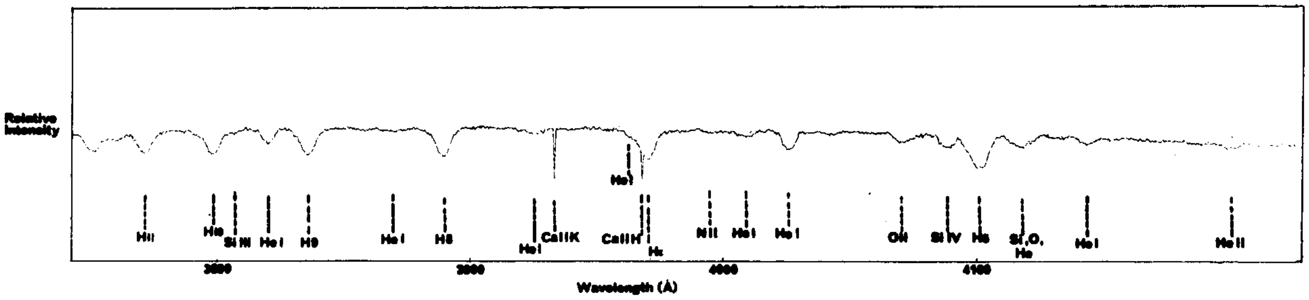


Fig.1 Part of the spectrum of V986 Ophiuchi. This plot is the intensity summation of nine spectra.

The spectra were measured on a PDS microdensitometer and analysed using the techniques described by Pike (1977). Fifteen lines including interstellar Ca II H and K were measured in each spectrum by fitting parabolae to density scans of the line profiles. The standard error of a single plate using 13 stellar lines is on average 15 km/s although the error on each nightly mean velocity is always < 2 km/s. The radial velocities of the interstellar lines are equally consistent. The errors on individual plates might be expected to mask any velocity variations associated with the $0^{d}.2907$ period. However on JD 2443732 a downward trend in the velocities was observed. A free-hand attempt to reconcile this with a sinusoidal variation of 10 km/s full amplitude and period of $0^{d}.2907$ yields a date for the downward crossing of zero relative velocity as JD 2443732.33±0.01. Photometry was also obtained on this night and shows maximum light also occurring at JD 2443732.33±0.01. This follows the known relationship between photometric and radial velocity variations of β Cephei stars. The velocities on other nights show no significant trends. On the two other nights for which we have photometry the star was on the descending branch of the light curve and therefore by the relationship mentioned above no significant velocity variations would be expected.

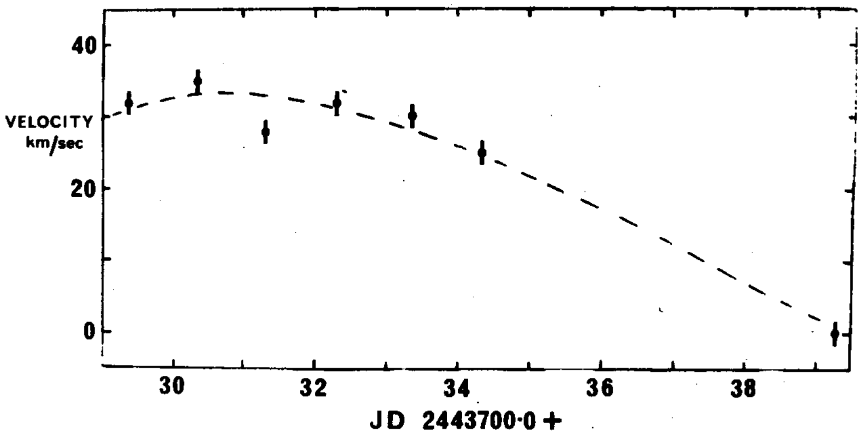


Fig. 2 The nightly mean velocities of V986 Ophiuchi.

We have calculated the nightly mean velocities of V986 Ophiuchi and plotted these in Figure 2. Radial velocities of this star published by Plaskett and Pearce (1931) show a very similar range. We conclude that V986 Ophiuchi is contained in a binary system with a period of approximately 20 days and a total amplitude $2K \sim 40$ km/s. This interpretation may account for the complicated light curve by providing for tidally induced effects as described by Fitch (1969).

At this stage our conclusions are tentative but we intend to pursue the matter in the forthcoming observing season. It is clear that much would be gained by having observations that cover a longer continuous period than is possible from one site. We would therefore be pleased to hear from anyone able to obtain data at a different longitude and who would be willing to collaborate in observing this star.

C.D. PIKE and C.LLOYD
Royal Greenwich Observatory
Herstmonceux Castle
Hailsham
East Sussex.

References :

Fitch, W. S., 1969 Astrophys. J. 158, 269.

Jerzykiewicz, M., 1975. Acta Astronomica 25, 81.

Pike C. D., 1977. Mon Not. R. ast Soc. 184, 265.

Pike C. D., Lloyd C. and Stickland, D. J. 1978. Acta Astronomica 28, 235.

Plaskett, J. S. and Pearce, J. A., 1931. Publ. Dom. Astrophys. Obs. Victoria, 5.1.

Watson, R. D., 1972. Astrophys. J. Suppl. 24, 167.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1717

Konkoly Observatory
Budapest
1979 December 14

ON THE LIGHT VARIATION OF HD 209813 = HK Lac

The light variability of the single line spectroscopic binary HD 209813 was discovered by Blanco and Catalano (1968). On the basis of their 1967 observations they gave the preliminary elements: 2439766.5 + $25\overset{d}{.}98$E and supposed that the star was probably a cepheid. Each of the amplitudes of the light variations was about $0\overset{m}{.}1$ in U,B and V.

Fernie et al. (1968) questioned this assumption remarking that the characteristics of the light curves as well as the spectral type of the star (K0III, Halliday, 1955) were unusual for a pulsating variable. They thought that the star was an eclipsing binary.

The orbital period of the binary system was given first by Northcott (1947) as 24.431 days and corrected by Gorza and Heard (1971) to 24.4284 days, both mentioning that the CaII H and K lines had emission cores.

In 1968 Blanco and Catalano (1970) reobserved the star and published excellent light curves in their instrumental system close to UBV, with the new elements: 2440100.8 + $25\overset{d}{.}3$E. The orbital period of the system did not fit their photometric observations. They concluded that the shape of the light curve of 1967 differed from that of 1968.

Searching for variability among a few strong CaII emission binaries Herbst (1973) also observed HK Lac in the V band. He determined a mean period of 25.75 days but stated that "the light variation of HD 209813 is somewhat variable in its period".

Hall (1976) classified HK Lac as a member of the "long period group" of RS CVn stars defined by himself.

As one of the members subjected to a survey program seeking BY Dra or possible similar stars, HK Lac was observed at the Konkoly Observatory on 26 nights between 1976-1979 with the 60 cm telescope. The comparison stars, HD 208728 (C1) and HD 210731 (C2), were the same as used by Blanco and Catalano. All the observations were corrected for atmospheric extinction and transformed to the international UBV system.

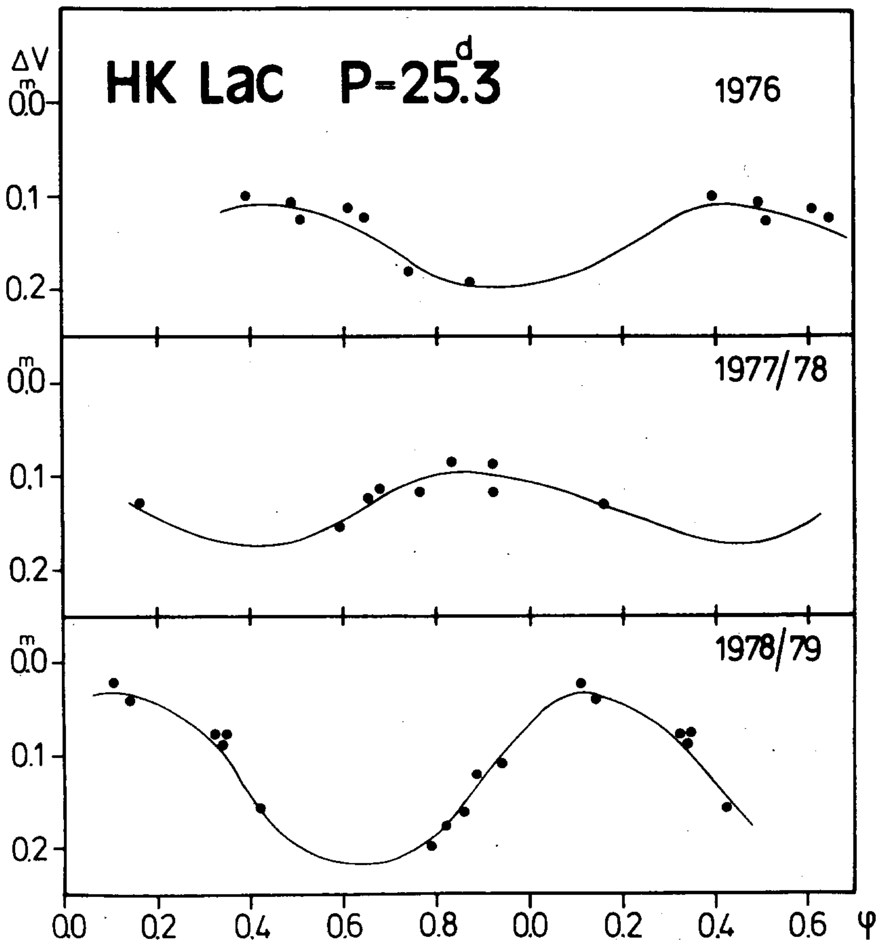


Figure 1 shows the light curves in V colour separately for each observational season. The phases were computed using Blanco and Catalano's (1970) elements.

Table 1

UBV observations of HK Lac

2443000+	ΔV	Δ(B-V)	Δ(U-B)
045.437	+0.100	-0.113	-
048.522	.126	.137	-
073.303	.107	.105	-
076.286	.112	.114	-0.093
077.230	.122	.104	.071
079.217	.180	.143	.079
108.254	.192	.099	.118
368.503	.130	.106	.114
385.525	.086	.142	-
432.316	.115	.132	.121
434.322	.117	.129	.101
438.356	.113	.120	.105
455.286	.152	.138	.121
482.276	.124	.148	.113
514.222	.088	.117	.159
713.473	.199	.103	.098
727.547	.078	.112	.133
739.464	.177	.112	.090
740.412	.162	.103	.136
742.456	.111	.102	.047
747.497	.039	.140	-
766.378	.122	.106	.079
777.461	.077	.125	.104
797.304	.022	.135	-0.112
879.209	.091	.102	-
881.232	+0.157	-0.118	-

The following remarks can be made:

1. The 25.3 day period well represents the observations of each season separately but strong phase-shifts exist between the maxima. With a period of 25.9 days the phases of the maxima can be brought together but in this case the data on the light curves (especially on the 1978/79 light curve) are more scattered. What is more, the 1978/79 observations can best be fitted by the even shorter period of 25.0 days.

2. In 1976 the amplitude was about the same ($0\overset{m}{.}10$-$0\overset{m}{.}11$) as of 1967/68 and 1970/71 (Blanco and Catalano, 1970; Herbst, 1973); in 1977/78 it decreased to $0\overset{m}{.}07$-$0\overset{m}{.}08$; finally in 1978/79 it increased to $0\overset{m}{.}20$-$0\overset{m}{.}22$ (in each colour).

3. For the years 1976-1979 the median brightness of the star became fainter by about $0\overset{m}{.}15$-$0\overset{m}{.}20$ relative to the 1967-1971 observations.

Table 2

		1967/68	1970/71	1978/79
median brightness in	U	-0.32		-0.11
	B	-0.18		0.0
	V	-0.04	0.0	+0.13

The magnitude differences between the comparison stars (C2-C1) are +0.598 in V, +0.027 in B and -0.742 in U which differ from the Catania observations by about $0^{m}.06$ which is probably due to the fact that our observations were transformed into the UBV system. Nevertheless, this relatively small discrepancy between the Catania and Budapest observations for the comparison stars shows, that the $0^{m}.15$-$0^{m}.20$ difference between the median brightnesses seems to be real. This fact indicates a long term variability of this star.

4. Each year the variations in (B-V) and (U-B) are less than $0^{m}.05$ and $0^{m}.07$, respectively.

It might be interesting to compare the light variations of the two stars HK Lac and the RS CVn binary UX Ari, investigated by Evans and Hall (1974) and Hall (1977). In UX Ari it was observed that the overall brightness of the star decreased by $0^{m}.1$. Both stars exhibit amplitude variations too, but in contrast to HK Lac, UX Ari shows decreasing amplitude with the decreased overall brightness.

Grateful acknowledgments are due to Mrs. K. Barlai for making some of the observations.

K. OLÁH
Budapest
Konkoly Observatory

References:

Blanco, C., Catalano, S., 1968, IBVS No. 253
1970, Astron. Astrophys. 4.482
Evans, C.R., Hall, D.S., 1974, IBVS No. 945
Fernie, J.D., Hube, J.O., Schmitt, J.L., 1968, IBVS No. 263
Gorza, W.L., Heard, J.F., 1971, Publ. David Dunlap Obs. 3.107
Hall, D.S., 1976, IAU Coll. No. 29, Multiple Periodic Variable Stars, ed. by W. Fitch, Part I, p.287
1977, Acta Astron. 27.281
Halliday, I., 1955, Astrophys. J. 122.222
Herbst, W., 1973, Astron. Astrophys. 26.137
Northcott, R.J., 1947, Publ. David Dunlap Obs. 1.369

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1718

Konkoly Observatory
Budapest
1979 December 18

RADIAL-VELOCITY VARIATIONS OF DY HERCULIS

Joy (1950) was the first to measure the radial velocity of DY Her. From three spectra he obtained a mean velocity of $\gamma=-50$ km s^{-1} and estimated a radial velocity amplitude of 70 km s^{-1}. Later on Bonsack (1957) obtained complete radial velocity curves of some of the short-period variable stars. DY Her was also included in his programme in which he made 11 spectra for radial velocity measurements of this star on four nights in 1955 and 1956. The radial velocity curve of DY Her determined by him differed in shape from that of other short-period variables. Using Bonsack's radial velocity curve Hardie and Lott (1961) have already attempted to determine the radius of this star by Baade's and Wesselink's method. Their results, however, were very much affected by the lack of sufficient precision of photoelectric photometry and radial velocity measurements. It is thus hardly surprising that they failed to get a reliable radius.

Radial velocity measurements were secured from a single-trail spectrogram of DY Her by McNamara (1978). Utilizing the high precision uvbyβ photometry of Breger et al. (1978) he found a radius of 2.7 $R_\odot$ using Wesselink's method. This value is considerably smaller than the value one would expect from McNamara and Feltz's (1976) expression for the dependence of the radius on the period derived from surface gravity measurements. McNamara (1978) remarks that "increasing the velocity amplitude of DY Her to 35 km s^{-1} would lead to a Wesselink radius near to this (expected) value". Comparing the total velocity amplitude 2k=30 km s^{-1} of DY Her obtained by McNamara (1978) with the total velocity amplitudes of other dwarf cepheids (e.g. 2k=45.5 km s^{-1} for EH Lib and 44 km s^{-1} for SZ Lyn given by McNamara and Feltz, 1976) we suspect that it has been underestimated.

In order to clarify this problem it seems to be worth publishing our radial velocity measurements. In 1971 five spectrograms (at a reciprocal dispersion of 60 Å mm^{-1}) were secured with the Cassegrain spectrograph of the 72 inch telescope of the Dominion Astrophysical Observatory on baked IIa-O plates on two nights. The plates were measured on the DAO Arcturus measuring machine. Spectrograms of a number of standard-velocity stars were also secured on both nights and measured to check on possible systematic errors. None were found. In Table I we list the plate number, the date and Julian day of each spectrogram, the number of lines measured, the radial velocity and the phase.

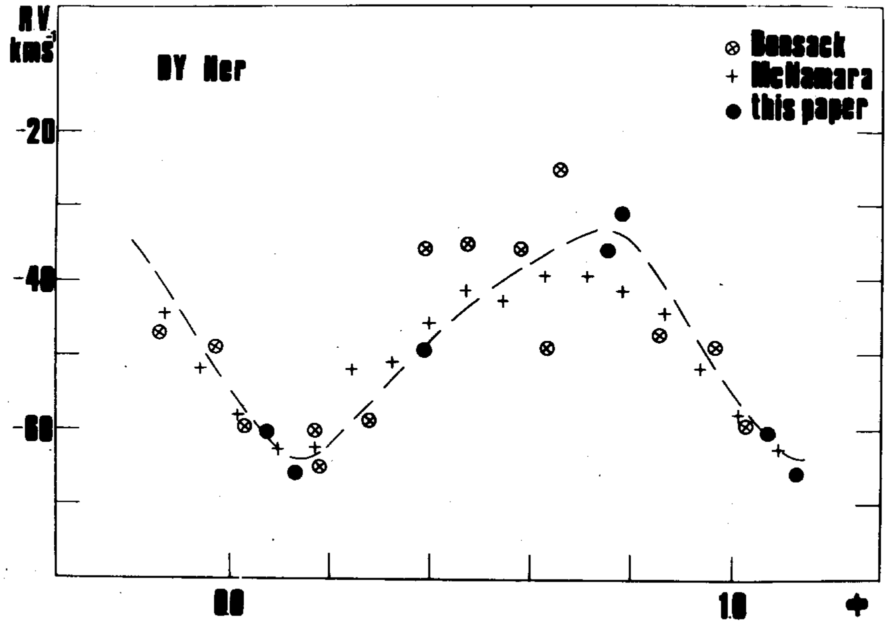
Table I

Radial velocities of DY Her

Plate No.	Date	Heliocentric J.D.	No.of lines	R.V. kms^{-1}	Phase
71321	1971.06.30	2441132.757	19	-30.9 ± 3.8	0.7850
71322		.800	16	-60.6 ± 4.7	0.0743
71323		.847	13	-49.4 ± 3.4	0.3906
71415	1971.07.22	2441154.750	12	-36.0 ± 4.6	0.7554
71416		.806	13	-65.8 ± 4.6	0.1322

The phases were calculated using our elements with a quadratic term (Szeidl and Mahdy, 1979):

$$\text{Max.hel.}=\text{J.D. } 2433439.4865+0\overset{d}{.}148631349\times E-$$
$$-18\overset{d}{.}04\times10^{-13}\times E^2.$$



In Figure 1 we have plotted Bonsack's, McNamara's and our radial velocity measurements against phase; a free-hand velocity curve has been drawn through our observations. A mean velocity of about $\gamma=-47$ km s^{-1} was found from our velocity data. (Bonsack obtained a mean value of -45.8 km s^{-1}; McNamara gave the mean velocity as $\gamma=-49$ km s^{-1}) Relying on our own data we fix the maximum and minimum velocities of the DY Her velocity curve at about -32 km s^{-1} and -66 km s^{-1}, respectively, which yield a velocity amplitude of 34 km s^{-1}.

Although our results confirm that the radial velocity amplitude of DY Her is smaller than the amplitudes of EH Lib and SZ Lyn, these results nevertheless suggest a larger Wesselink radius for DY Her than the value obtained by McNamara (1978).

New radial velocity measurements of DY Her with higher dispersion and higher time resolution are needed to obtain a more reliable radius of this star.

B. SZEIDL
Konkoly Observatory
Budapest, Hungary

References:

Bonsack, W., 1957, Astrophys. J. 126, 291
Breger, M., Campos, A.J. and Roby, S.W., 1978, Publ.Astr. Soc. Pacific 90, 754
Hardie, R.H. and Lott, S.H., 1961, Astrophys.J. 133, 71
Joy, A.H., 1950, Publ.Astr.Soc.Pacific 62, 60
McNamara, D.H., 1978, Publ.Astr.Soc.Pacific, 90, 759
McNamara, D.H. and Feltz, A.Jr., 1976, Publ.Astr.Soc. Pacific 88, 164
Szeidl, B. and Mahdy, H.A., 1979, Mitteilungen Sternw. Budapest, Nr. 75

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1719

Konkoly Observatory
Budapest
1979 December 20

BD +4° 4009, A NEW BRIGHT CEPHEID VARIABLE

While observing the cepheid variable FN Aql, the star BD +4° 4009 = HD 179315 served as a check star for verifying the constancy of the comparison star BD +3° 3938. These observations revealed the variability of BD +4° 4009. The observations were made with the 24 inch reflector of the Konkoly Observatory using an uncooled EMI 9502B photomultiplier and standard B and V filters. 56 differential BV observations were made with respect to BD +3° 3938 (see Table 1). The adopted magnitudes of this comparison star are as follows:

$V = 9\overset{m}{.}31$, $B-V = 1\overset{m}{.}26$.

Frequency analysis of the data set was performed by using Deeming's (1975) technque of Fourier analysis of unequally spaced data. The calculation of the spectral window enabled us to identify the alias peaks in the power spectrum due to data sampling.

There were no prominent peaks in the power spectrum (from 0.01 c/d to 0.5 c/d) other than the peak at 0.133725 c/d and its aliases at the frequencies 0.131060 c/d and 0.136169 c/d (see Fig. 1). These subsidiary frequencies are due to the just

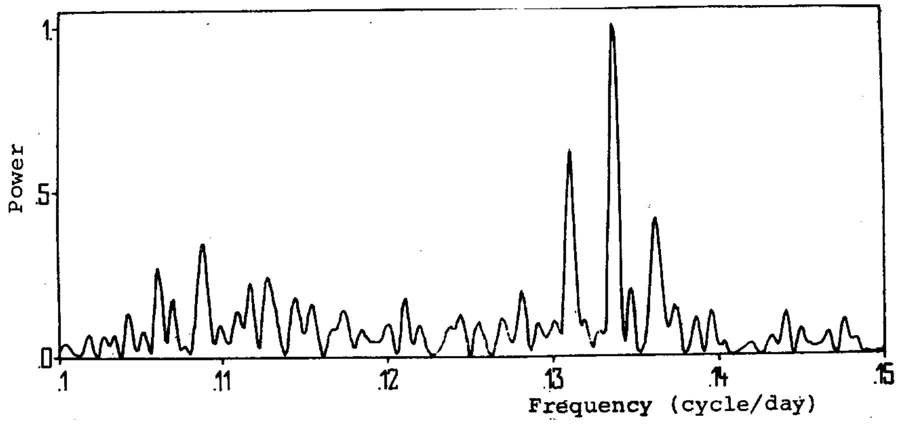


Figure 1

over one year's periodicity (368.75 days) in the data sampling. All the other smaller peaks (not exceeding one half of the value of the largest peak) can easily be explained due to aliasing of the main period by other smaller (lower than 0.18) peaks in the spectral window. Though the frequency of the data sampling was less than 1 c/d the power spectrum was computed up to 2 c/d. There were some peaks with considerable power value in the interval 0.5 - 2.0 c/d but all these all these are 1 day and 1 year aliases of the fundamental frequency. Moreover, the only reliable light curve, when using different frequencies, is the one plotted with f=0.133725 c/d, that is, with a period of $7\overset{d}{.}47803$.

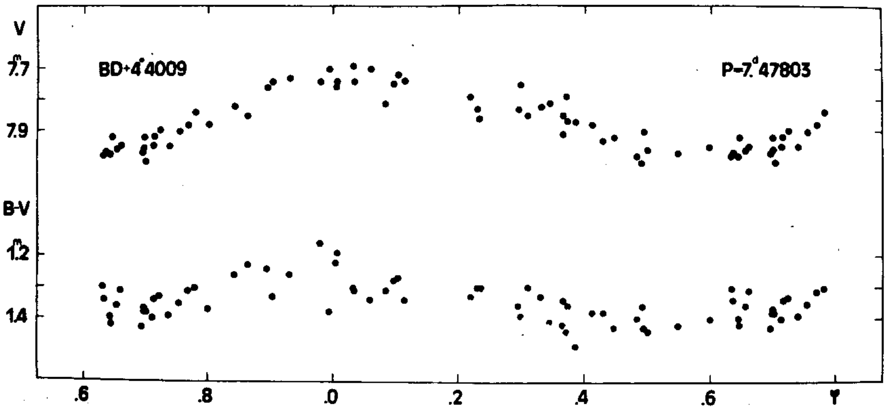


Figure 2

According to the light and colour curves in Fig. 2 the new variable is a cepheid. Though the amplitudes of the light and colour variations are smaller than would be expected for a cepheid with a period of $7\overset{d}{.}5$, a small bump is suspected on the descending branch of the light curve ($0\overset{P}{.}3$ after the maximum), the presence of which is characteristic of cepheid variables with such a value of the period. The reduced amplitudes ($A_V = 0\overset{m}{.}26$, $A_{B-V} = 0\overset{m}{.}16$) are likely to be due an unseen companion. The light curve is not symmetrical (or sinusoidal). This fact and the likelihood of a bump on the descending branch excludes this star belonging to the Cs subgroup of cepheids (small amplitude cepheids). The HD spectral type is K2, which is in accordance with the cepheid type variability, but more precise spectroscopic observations are desirable to prove the binary

Table 1

J.D.Hel. 2440000+	V	B-V	J.D.Hel. 2440000+	V	B-V
2297.325	7^{m}.88	1^{m}.37	3693.455	7^{m}.96	1^{m}.44
2304.329	7.95	1.39	3712.398	7.69	1.30
2523.591	7.70	1.34	3717.366	7.92	1.38
2589.449	7.85	1.23	3721.354	7.83	1.30
2620.392	7.76	1.22	3750.316	7.72	1.27
2623.440	7.88	1.38	3769.324	7.92	1.42
2669.323	7.97	1.42	3778.278	7.82	1.26
2673.330	7.81	1.31	3790.275	7.92	1.43
2675.277	7.81	1.41	3792.268	7.92	1.34
2708.253	7.90	1.35	4011.528	7.74	1.31
2871.605	7.95	1.40	4020.493	7.86	1.30
2904.570	7.74	1.19	4021.482	7.91	1.42
2960.475	7.98	1.40	4021.535	7.87	1.36
3287.538	7.79	1.33	4049.389	7.75	1.28
3304.527	8.00	1.36	4049.516	7.74	1.34
3337.523	7.74	1.33	4054.412	7.88	1.31
3340. 485	7.75	1.39	4054.501	7.84	1.30
3350.449	7.98	1.30:	4066.393	7.79:	1.44:
3363.416	7.85	1.34	4066.507	7.87	1.49:
3364.371	7.90	1.43	4083.385	7.98	1.40
3382.331	7.76	1.24	4083.463	7.96	1.36
3385.327	7.83	1.36	4088.372	7.85	1.30
3386.324	7.93	1.38	4088.518	7.82	1.33
3388.315	7.97	1.43	4108.331	7.74	1.16:
3388.363	8.00	1.38	4108.436	7.70	1.38:
3403.297	7.96	1.37	4128.388	7.95	1.31
3403.400	7.95	1.40	4130.406	7.73	1.26
3679.505	7.97	1.34	4136.324	7.90	1.33

nature of this cepheid variable.

The current elements of the light variation are:

$$\mathrm{Max.} = \mathrm{J.D.}\ 2443398.071 + 7\overset{d}{.}47803\ E \quad .$$

It is worth mentioning that the star BD +4° 4010 which is near the new variable BD +4° 4009 was reported to be variable by Kurochkin (1950). The former of the two stars was denoted SVS 1070. The new cepheid variable BD +4° 4009 was used as the only brighter comparison star during the investigation which led to the discovery of the light variations in SVS 1070. Its published photographic amplitude ($0\overset{m}{.}4$) is equal to the amplitude of BD +4° 4009 in B. It is possible that the observed light variations in SVS 1070 are not real but are (at least partly) caused by the variability of its comparison star.

G. KOVÁCS and L. SZABADOS
Konkoly Observatory
Budapest

References:
Deeming, T.J., 1975, Astrophys. Sp. Sci., 36, 137
Kurochkin, N.E., 1950, Perem. Zvezdy, 7, 256

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1720

Konkoly Observatory
Budapest
1979 December 21

OBJECT STEPANYAN 153519 POSSIBLY OF U GEMINORUM TYPE

The object at $15^h35^m.7$ $+19^\circ 01'$ (1950) was detected by J.A. Stepanyan (I.B.V.S. No.1630) as being faint ($\approx 18^m$) on the POSS prints of April 1950 and bright ($\approx 14^m$) on Byurakan objective prism plates of the spring of 1979.

The inspection of roughly one thousand Sonneberg sky patrol plates showed that the brightening of the star was not due to one eruption of unknown date, but that maxima of the star are not very seldom. Their brightness reaches $13^m.2$ pg (comparison to Mt. Wilson SA 84), their duration several weeks. In all years, for which good series of plates are available, eruptions as well as phases of invisibility ($>14^m$) can be noticed.

At my request Drs.P.Notni and G.A. Richter kindly took three grating spectrograms of 140 Å/mm with the image tube device at the 2 m telescope of Tautenburg Observatory under difficult observing conditions. These plates confirm the findings of Stepanyan (l.c.): The spectrum is characterized by broad ($\approx$50 Å) emission lines (consisting of several components each?) of $H\alpha,\beta,\gamma$,HeI 5875 and HeII 4686, typical of the U Gem stars and superposed on a fairly strong continuum. According to a crude estimate of the observers at the slit the object's visual brightness was then (1979 Oct. 13.8 and 14.7 UT) $\approx$ 15.5, about halfway between maximum and minimum level.

Some more details of the photometric behaviour will be given in Mitt. über Veränderlichen Sterne Sonneberg.

W. WENZEL
Sternwarte Sonneberg
Zentralinstitut für Astrophysik
Akademie der Wissenschaften der DDR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1721

Konkoly Observatory
Budapest
1979 December 21

UBV PHOTOELECTRIC OBSERVATIONS OF V 1016 Cyg DURING 1979

V 1016 Cyg (MHα 328-116) is considered as the prototype of a small group of unusual variable stars.

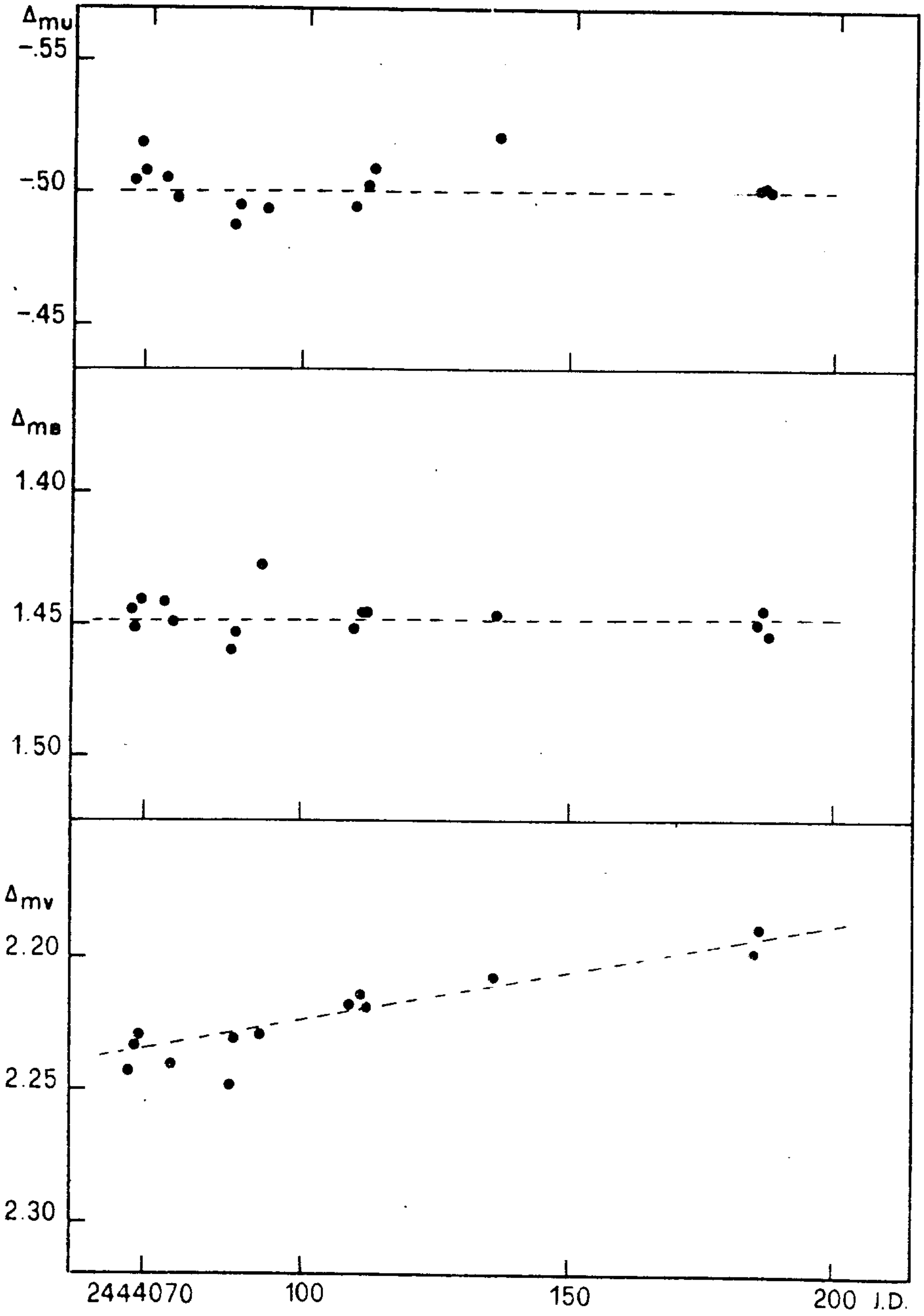
The properties of its remarkable emission-line spectrum and details on its evolution have been given in the literature (see e.g. Mammano and Ciatti (1975), Ciatti et al. (1978), Ciatti et al. (1979)). No accurate photoelectric photometry of this interesting object has been secured up today. Prior to 1963 (when unusual nova-like brightening took place) photographic observations showed the star was probably fainter than 15.5 pg. (Fitzgerald et al. 1966).In 1965 the variable reached 11.8 pg rising slowly to 10.8-10.7 at the beginning of 1968 (Ciatti et al. 1971). Since then the star has maintained a nearly constant brightness (Ciatti et al. 1978).

During 1979 UBV photoelectric observations of V 1016 Cyg have been carried out at the 91 cm Cassegrain telescope of the stellar station of the Catania Astrophysical Observatory using BD +39°3965 as comparison star and checking our measurements with a set of standard stars. The comparison star has not shown any noticeable variation. Our observations range from the 7th July 1979 (J.D. 2444067) to the 9th November 1979 (J.D.2444187).

The reduction of observations to the standard UBV system is in progress but the mean magnitudes of variable we found are V=10.46, B=10.05 and U=9.99.

In the Figure we report the magnitude differences (V 1016 Cyg - BD + 39°3965) versus Julian Day for each night of observation.

From the Figure we can see that V 1016 Cyg is increased almost constantly in its V luminosity of about 0.05 mag., from


Δmu
-.55
-.50
-.45
Δmb
1.40
1.45
1.50
Δmv
2.20
2.25
2.30
2444070
100
150
200
J.D.

$\Delta m_V \simeq 2.24$ to $\Delta m_V \simeq 2.19$, while its B and V magnitudes seem to be constant.

It is difficult to say if this V light curve is an increasing part of a long period variable or if the star is increasing indefinitely its V luminosity. There are, however, some indications for the latter hypothesis: the last photographic (1977) observations by Ciatti et al. (1978) give values of 10.8 and 10.7 for B and V magnitude, respectively. Our photoelectric observations, as we say above, give mean values of 10.85 and 10.45 for B and V magnitudes. This fact is consistent with the hypothesis that the star is increasing its V luminosity almost constantly (from 1977?) up today.

E. MARILLI, G. STRAZZULLA
Osservatorio Astrofisico di Catania
Città Universitaria
95125 Catania - Italia

References:

Ciatti, F., Mammano, A., Rosino, L.: 1971, IAU Colloquium No.15, Bamberg, 64

Ciatti, F., Mammano, A., Vittone, A.:1978, Astron.Astrophys. 68, 251

Ciatti, F., Mammano, A., Vittone, A.:1979, Astron.Astrophys. (Research Note, preprint)

Fitzgerald, M.P., Houk,N., McCuskey, S.W.: 1966, Astrophys.J. 144, 1135

Mammano, A., Ciatti, F.: 1975, Astron. Astrophys. 39, 405

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1722

Konkoly Observatory
Budapest
1979 December 27

PERIOD INCREASE IN FG Sge

The peculiar variable FG Sge is the central star of a faint planetary nebula ejected about 6000 years ago. Photometrically, the star brightened steadily until the late sixties; in the seventies the continuous reddening of the star could be observed.

Photoelectric observations have shown that a quasi-periodic light variation is superposed to the secular light variation. An increase in the period of the quasi-periodic light variation was reported by Arkhipova et al. (1978).

New photoelectric observations on FG Sge were carried out using the 24 inch reflector of the Konkoly Observatory, an uncooled EMI 9502B photomultiplier and standard B and V filters. Differential BV observations, 18 in number, were made in 1979, with respect to BD +19°4319. The magnitudes of this comparison star were taken from Arkhipova's (1975) paper:

$V = 8\overset{m}{.}68 \qquad B-V = 1\overset{m}{.}19$

The observations are listed in Table I and plotted in Fig. 1.

Table I

J.D. 2440000+	V	B-V	J.D. 2440000+	V	B-V
4049.502	$9\overset{m}{.}18$	$1\overset{m}{.}63$	4140.369	$8\overset{m}{.}95$	$1\overset{m}{.}59$
4054.481	9.15	1.64	4143.390	9.08	1.58
4066.457	9.10	1.65	4157.306	9.15	1.62
4100.504	8.86	1.52	4159.302	9.14	1.60
4101.477	8.80:	1.51:	4166.265	9.16	1.57
4108.388	8.88	1.62	4167.255	9.14	1.62
4111.446	8.91	1.61	4173.251	9.15	1.55
4113.358	8.91	1.58	4203.192	8.82	1.60
4129.366	8.93	1.54	4215.216	8.82	1.57

The magnitudes published here are not corrected for the contributions of the nebula and the faint companion. As can be seen from Fig. 1, the actual value of the period in 1979 was about 108 days.

In order to determine the numerical value of the increase in the period, all the earlier published photoelectric observations were examined. In Table II, the following data are given:

1. The mean date of the observations made during one observational season
2. The average period in the given year
3. The number of observed cycles during the season (used as a weighting of the accuracy of the period)
4. References detailing where the observational data used have been taken from.

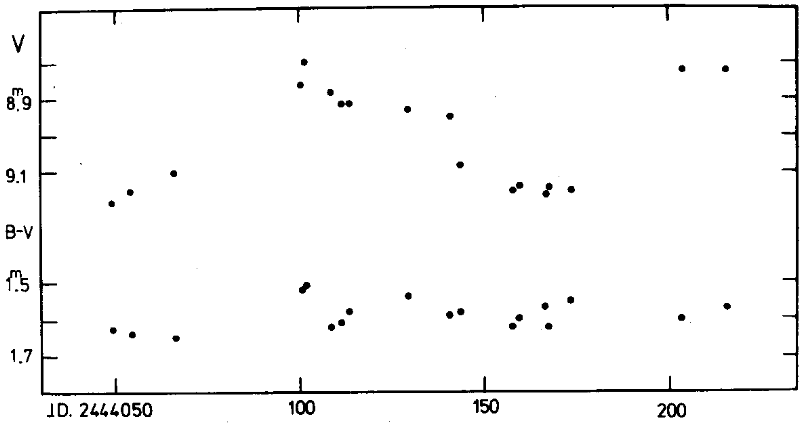


Figure 1. The 1979 light curve of FG Sge

The yearly averaged values of the period vs. the mean date of the observations are plotted in Fig. 2. This figure also shows the straight line approximation to the data points using the weighted least squares technique. The equation of the best fitting line is as follows:

$$P = 4.866 \cdot (Y - 1960.0) + 3.272 \quad ,$$

where Y is given in years and the period P in days. On the basis of this formula the increase in the period of FG Sge is about 4.9 days/year. This value is in agreement with the estimation made by Fernie (1975) who expected an enormous rate of period change in the variability, which period change is caused by the rapid change in the spectral type of FG Sge. In all probability

Table II

Year	P	weight	Reference
1962.6	15^d	9	Wenzel and Fürtig (1967)
1963.8	28	2	Wenzel and Fürtig (1967)
1969.7	49	1	Arkhipova (1971)
1970.6	65*	1	Arkhipova (1971), Wenzel and Fürtig (1971)
1971.6	56	2	Arkhipova (1975), Papousek (1972), Wenzel and Fürtig (1972)
1972.6	60	2	Arkhipova (1975)
1973.7	70	2	Arkhipova (1975), Wenzel (1974)
1975.6	80	2	Arkhipova (1975), Arkhipova and Noskova (1976), Stone (1979)
1976.7	82	1	Arkhipova et al. (1977), Whitney (1977)
1977.7	85	1	Arkhipova et al. (1978)
1979.7	108	1	this note

* with fluctuations ($P_{fluct} = 23^d$)

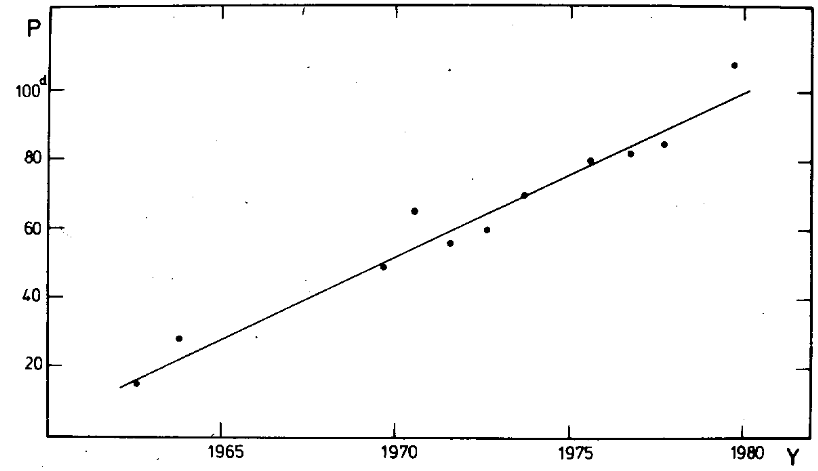


Figure 2. Value of period as a function of time

the expansion of the pulsating envelope (Whitney 1978) is the main factor contributing to the rapid period change. If we assume that FG Sge is crossing the instability strip, the time of entering the strip was about 1960. It is most unfortunate that photoelectric observations are not available from that time. Even so, when FG Sge leaves the instability strip at the low temperature side in the near future, its observation is not beyond the realms of possibility.

JOHANNA JURCSIK and L. SZABADOS
Konkoly Observatory
Budapest, Hungary

References:

Arkhipova, V.P. 1971, Perem. Zvezdy, 18, 183
Arkhipova, V.P. 1975, Perem. Zvezdy, 20, 143
Arkhipova, V.P., Noskova, R.I. 1976, Astr. Cirk., No. 901, 1
Arkhipova, V.P., Zaitseva, G.V., Noskova, R.I., Saveljeva, M.V. 1978, Astr. Cirk., No. 987, 1
Arkhipova, V.P., Zaitseva, G.V., Noskova, R.I., Saveljeva, M.V., Voroshilov, Yu.V. 1977, Astr. Cirk., No. 935, 4
Fernie, J.D. 1975, Astrophys. J., 200, 392
Papousek, J. 1972, Scripta Fac. Sci. Nat. Ujep Brunensis, Physica 2, 2, 115
Stone, R.P.S. 1979, P.A.S.P., 91, 389
Wenzel, W. 1974, Mitt. veränderl. Sterne, 6, H.6, 135
Wenzel, W., Fürtig, W. 1967, Die Sterne, 43, 19
Wenzel, W., Fürtig, W. 1971, Mitt. veränderl. Sterne, 5,H.9, 165
Wenzel, W., Fürtig, W. 1972, Mitt. veränderl. Sterne, 6,H.2, 18
Whitney, C.A. 1977, Inf. Bull. Var. Stars, No. 1268
Whitney, C.A. 1978, Astrophys. J., 220, 245

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1723

Konkoly Observatory
Budapest
1979 December 27

VARIATIONS IN THE LIGHT CURVE OF V711 TAURI (HR1099)

The $2^{d}.838$ RS CVn-type binary V711 Tau (HR1099) was observed on 13 nights from October 30 U.T. through December 04 U.T., 1979. The observations were obtained using the 38-cm Cassegrain telescope at Villanova University Observatory. The photoelectric photometer is equipped with a thermoelectrically cooled (-20°C) EMI 9558 photomultiplier tube and a microprocessor-controlled integrating system. A pair of intermediate- and narrow-band interference filters centered near the rest wavelength of the Hα line at λ6563 was used. The characteristics of the filters are similar to those used in the definition of the Villanova Hα system (Guinan and McCook 1974). The comparison star was 10 Tau and 12 Tau served as the check star. The comparison star was the same used in previous investigations of V711 Tau. The observing sequence was the usual pattern of sky-comparison-variable-comparison-sky, with each observation lasting 20 seconds. The faint K3V companion star (ADS 2265B) about 6 arc seconds from V711 Tau was included in all measurements of the variable. On a night with fine seeing conditions (November 19 U.T.) the magnitude difference between the V711 Tau and its companion was determined to be +2.31 mag through the intermediate bandpass at λ6585. The effects of differential atmospheric extinction were removed, but because of the angular proximity of the comparison star to the variable star, the extinction corrections were insignificant. Normal points were formed from the intermediate bandpass data with up to 10 observations making up a mean. These data are plotted in Figure 1 where the phases were computed according to the ephemeris:

$$\text{JD Hel. } 2442766.069 + 2.83782 \cdot E$$

from Landis <u>et al</u>. (1978) where zero phase corresponds to conjunction, with the more active component in front. The solid curve shown in the figure is a schematic representation of the λ6585 observations made from October 1977 through February 1978 at Biruni and Villanova Observatories. The α-indices also formed from the narrow- and

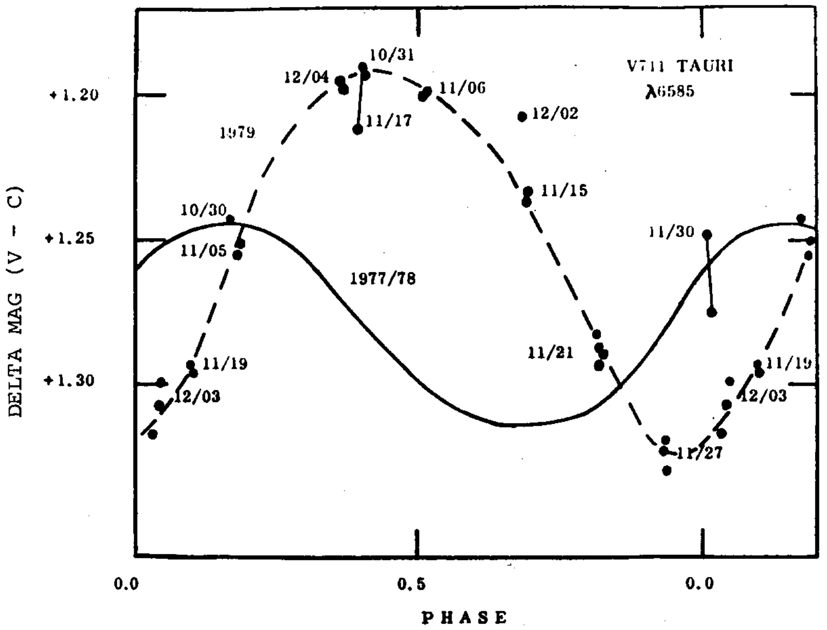


Figure 1. The intermediate-band λ6585 observations of V711 Tauri are plotted against orbital phases where 0.0 phase corresponds to the conjunction with the more active star in front. The broken-line curve is drawn through the Fall 1979 data while the solid curve represents the 1977/78 light variation.

intermediate-band observations and these will be published later together with the intermediate-band data.

As shown in the figure, the 1979 light curve is significantly different from that obtained two years earlier at the same wavelength. The amplitude of the 1977 light curve is about 0.075 mag while the present light amplitude is about 0.130 mag. In addition the wave minimum in 1977 occurred near 0.68 phase while in 1979 the minimum is near 0.95 phase. Further, V711 Tau is now brighter at maximum light by about 0.05 mag than in 1977 while the value of minimum light remains essentially unchanged between the two data sets. The present observations confirm the result of Chambliss (1979) who recently reported an increase in the light amplitude (at $\underline{V}$) from data obtained in early 1979.

A significant event appears to have occurred between November 27 and December 03 U. T. On the night of November 27 U. T. the magnitude of the system was consistent with the new curve but three nights later on November 30 U. T. the brightness was 0.06 mag above normal. The Hα index on that night was also enhanced, being about 0.03 mag above the mean, indicating a substantial increase in hydrogen emission. Two nights later on December 02 U. T. the system was only 0.02 mag above the mean curve and the emission had decreased. By December 03 U. T. the system had returned to its previous light level.

V711 Tau was observed by one of us (EFG) on one night during the Fall of 1978 and this data was found to fall on the 1977 light curve. By February 1979, however, the light curve had greatly changed character as shown by Chambliss's V-observations. The rapid migration of the wave minimum from 0.68 phase in 1977 to 0.95 phase in 1979 and the change in the nature of the light curve from 1977 to the present may be associated with the radio outbursts observed in February and March of 1978 (Feldman 1978), and again during the summer of 1979 (Feldman 1979). Assuming that the light variations are caused by star spots on the active component, it would appear that the configuration of the spotted regions has changed significantly. Modeling of both curves is underway using a starspot program developed at Villanova. We also plan to continue to monitor the system for the next few months.

EDWARD F. GUINAN
GEORGE P. McCOOK
JOSEPH L. FRAGOLA
ANDREW G. WEISENBERGER

Department of Astronomy
Villanova University
Villanova, Pennsylvania 19085
U.S.A.

References:

Chambliss, C.R. and Detterline, P.J., 1979, I.B.V.S. No. 1591.

Feldman, P.A., Taylor, A.R., Gregory, P.C., Seaquist, E.R., Balonek, T.J., and Cohen, N.L., 1978 Astron. J. 83, 1471.

Feldman, P.A., MacLeod, J.M., Andrew, B.H., 1979, I.A.U. Circ. 3385.

Guinan, E.F. and McCook, G.P., 1974, Publ. Astron. Soc. Pacific 86, 947.

Landis, H.J., Lovell, L.P., Hall, D.S., Henry, G.W., and Remer, T.R., 1978, Astron. J. 83, 176.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1724

Konkoly Observatory
Budapest
1980 January 7

LIGHT ELEMENTS OF THE ECLIPSING BINARY LY AURIGAE

Light elements of the bright O-type eclipsing variable LY Aur published by now have been based on observations which cover only a rather short time span. Therefore, elements given by Wood (1971)

$$\text{Pri.Min.} = \text{J.D. } 2440942.649+4\overset{d}{.}002521\cdot E$$

as well as by Mayer and Horak (1971)

$$\text{Pri.Min.} = \text{J.D. } 2439061.463+4\overset{d}{.}002496\cdot E$$

may not be reliable.

Observation of a primary minimum made at Hvar Observatory on November 6, 1978, allows a new determination of light elements. Measurements were made in B and V colours and HD36212 served as a comparison star. Since the star HD 35619 was used as a comparison one during former studies of LY Aur, both stars were measured on several nights in order to get differences of their brightness. From 5 nights (more than one hundred of individual measurements) the differences $\Delta V=0\overset{m}{.}781$ and $\Delta B=0\overset{m}{.}796$ were found, HD 36212 being the brighter one. The measurements of LY Aur are presented in Fig.1 as differences HD 35619 minus variable (points). In the figure the measurements obtained during a minimum on J.D.2440850 (Mayer and Horák, 1971) are also given (circles).

The time of minimum light computed from the new measurements is J.D.hel. 2443820.4324±0.0010. To get more epochs of minima, a mean primary minimum has been computed from observations by Landolt and Blondeau (1972) and Hall and Heiser (1972). All available epochs are listed in Table **I**; the first epoch is an estimation only. The column $(O-C)_{old}$ is computed from elements by Mayer and Horák (1971). Since the minimum by Wood (1971) gives a large O-C, it was not considered when applying LSM to correct the ele-

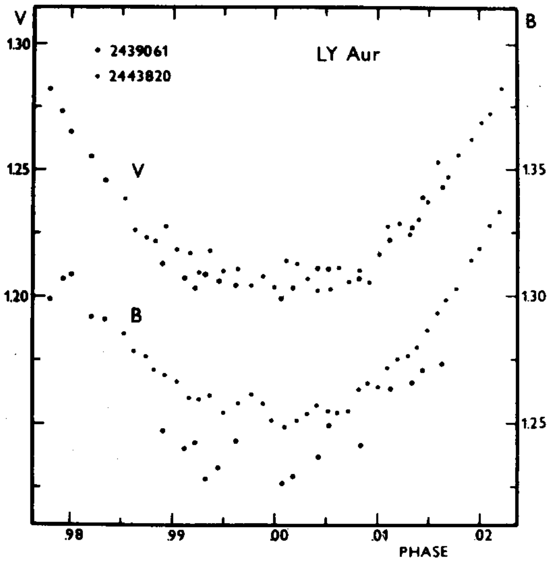


Table I

Observed time J.D. 2400000+	Mean error	Epoch	$(O-C)_{old}$	$(O-C)_{new}$	References
39061.463	$0^d.002$	0	$0^d.0$	$-0^d.0010$	
40858.5835	0.0015	449	−0.0002	−0.0004	Mayer and Horak,1971
40942.649		470	+0.0129	+0.0127	Wood, 1971
41102.7381	0.0016	510	+0.0022	+0.0021	a mean minimum (see text)
43820.4290	0.0010	1189	−0.0017	−0.0007	this note

ments. The resulting elements

$$\text{Pri.Min.} = \text{J.D. } \underset{\pm\,10}{2439061.4640} + \underset{\pm\,20}{4^d.0024943} \cdot E$$

differ only insignificantly from the elements by Mayer and Horák. The corresponding O-C are given in the column $(O-C)_{new}$.

The data presented in Fig.1 as well as data by Landolt and Blondeau (1972) and Hall and Heisèr (1972) are consistent with the estimation (Mayer and Horák, 1971) that the totality lasts about 100 minutes. The bottom level of the totality may change by $0^m.02$ to $0^m.03$ from one minimum to another one.

P. MAYER

Department of Astronomy and
Astrophysics, Charles University
Praha, Czechoslovakia

References:

Hall, D.S., and Heiser, A.M., 1972, Publ.Astr.Soc. Pacific 84,33

Landolt, A.O., and Blondeau, K.L., 1972, Publ.Astr.Soc.Pacific 84, 349

Mayer, P., and Horák, T.B., 1971, Bull.Astr.Inst.Czechoslovakia 22, 327

Wood, F.B., 1971, I.B.V.S. No. 519

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1725

Konkoly Observatory
Budapest
1980 January 9

NEW FLARE STARS IN ORION

In our first note there were described 22 flare stars discovered in Orion [1]. This program was continued during the period of 22 Dec. 1970 - 19 Jan. 1972. The observations were made on ORWO ZU-2 emulsion without filter. 48 plates with five successive exposures on each one were obtained; the exposures varied from 6^m to 7^m20^s, so that the sum of exposures was equal to 33^m20^s.

Table I gives the coordinates, pg magnitudes at minimum, pg amplitudes, date of the flares for 26 stars and identification with Tonantzintla Catalogue [2] (noted with H), or that of Rosino and Pigatto (noted with R) [3].

Table I also gives new data of star No.19 from [1], which was erroneously identified.

Only one from these stars (No.43 in Table I) is a slow flare, the brightness of which increased more than for 40 minutes.

Table I

No	α_{1900}	δ_{1900}	magn.	Δm_{pg}	date	ident. H	R
19	$5^h29^m41^s$	$-4^\circ23'.5$	$(20^m.5)$	$4^m.7$	06.01.1970		
23	34 20	-7 04.5	17.9	2.8	22.12	184	
24	26 33	-4 29.4	17.5	0.7	22.12		
25	30 49	-4 22.5	16.9	1.5	22.12		
26	35 19	-7 13.1	(18.7)	2.8	22.12		
27	31 55	-6 12.1	18.1	1.8	23.12		
28	32 29	-5 47.0	17.4	0.8	23.12		
29	29 12	-3 13.5	17.0	0.5	23.12		
30	39 07	-5 39.4	16.6	0.7	23.12		
31	37 42	-6 43.3	17.1	0.9	29.12		
32	29 47	-6 11.2	17.4	1.5	29.12		
33	31 57	-5 12.3	16.7	1.9	29.12	101	
34	30 31	-6 05.7	17.7	1.3	30.12	157	17
35	30 38	-6 02.5	17.0	2.5	30.12		
36	26 07	-5 46.7	17.2	1.0	30.12		
37	30 39	-7 14.2	(22.0)	5.1	30.12		
38	30 27	-4 26.0	(17.9)	1.3	30.12		

Table I.(cont.)

No	α_{1900}	δ_{1900}	magn.	Δm_{pg}	date	ident.	
						H	R
39	$5^h30^m30^s$	-6 05.4	16.4	2.4	09.12.1971		
40	23 02	-5 04.5	(19.8)	3.7	09.12		
41	29 47	-5 50.2	18.0	3.2	17.12		
42	29 13	-5 05.8	17.5	2.1	17.12		
43	28 17	-4 55.8	17.2	2.0	17.12		
44	28 33	-5 09.0	(19.6)	3.8	17.12		
45	29 54	-5 50.5	16.6	2.7	10.01.1972	218	
46	28 47	-4 59.9	18.3	2.5	19.01		
47	30 39	-5 55.0	16.2	1.0	19.01		
48	23 59	-4 46.7	17.1	2.2	19.01		56

The details of observations will be published later.

R.I. KILADZE

R.SH. NATSVLISHVILI

Abastumani Astrophysical
Observatory, Georgia,
U.S.S.R.

References:

1. Kiladze, R.I., 1972, I.B.V.S. No. 670
2. Haro, G., Chavira, E., 1969, Bol.Obs.Tonantzintla y Tacubaya
   5, No. 32, 59
3. Rosino, L., Pigatto, L., 1969. Contr.Asiago Obs., No.231

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1726

Konkoly Observatory
Budapest
1980 January 9

FLARE STARS IN ORION

In order to discover flare stars in the Orion nebula region photographic observations were made with the Abastumani Astrophysical Observatory 28" Meniscus-type (pg) and the Byurakan Astrophysical Observatory 40" Schmidt (U) telescopes by means of the multiple exposure method. 14 flare events have been found. Four of them are repeated flares of stars listed in [1].

Out of all flares registered 13 are fast flares and No.49 is a slow one, the brightness of which had increased for more than 30 minutes.

Table I gives the data of these flares. We are continuing the numeration of flares detected at Abastumani [2,3] in the Orion aggregate.

Table I

No	α_{1900}	δ_{1900}	m_{min}		Δm		Date	Telesc.	Ident.
			pg	U	pg	U			
49	$5^h30^m31^s$	$-5^\circ00'.0$	$17^m.0$		$4^m.2$		04.02.1978	28"	
50	30 33	-6 51.9	14.7		1.1		10.10	28"	
51	27 15	-5 00.0	19.3		4.2		11.10	28"	
52	23 05	-5 45.5	18.0		0.8		25.11	28"	
53	27 18	-7 07.6	15.8	18.0	1.7	4.6	25.11	40"28"	187
54	37 08	-5 14.2	21.0	>21.0		>7.0	29.11	40"	
55	27 53	-5 44.0	17.2		1.5		27.12	28"	191
56	22 14	-6 28.7	19.2		3.4		28.01.1979	28"	
57	27 51	-6 41.0	18.7		2.2		28.01	28"	
58	28 28	-5 36.8	15.6		2.3		28.01	28"	194
59	28 28	-5 36.8	15.6	17.8		2.1	29.01	40"	194
60	31 39	-3 47.5	18.3	19.0		3.5	29.01	40"	
61	31 28	-4 32.9	16.2		0.7		19.03	28"	
62	32 50	-5 33.1	18.7		3.2		19.03	28"	

R.SH. NATSVLISHVILI
Abastumani Astrophysical Observatory, Georgia, U.S.S.R.

N.D. MELIKIAN
Byurakan Astrophysical Observatory, Armenia, U.S.S.R.

References:
1. Haro, G., Chavira, E., 1969, Bol.Obs.Tonantzintla y Tacubaya 5, No.32, 59
2. Kiladze, R.I., 1972, I.B.V.S., No.670
3. Kiladze, R.I., Natsvlishvili, R.Sh. 1979, I.B.V.S.No.1725

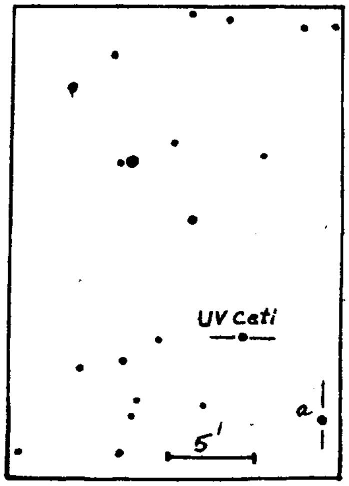
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1727

Konkoly Observatory
Budapest
1980 January 9

SLOW BRIGHTNESS VARIATION OF THE STAR UV Cet

During the period from 20 to 29 September 1979 a series of simultaneous U,B,V,R,I (λ_{eff}=8200Å) observations of UV Ceti was accomplished at the high altitude Maidanak station of the Tashkent Astronomical Institute. The main aim of these observations was to detect flares on UV Ceti.

Some U,B,V,R,I, brightness comparison of this star were accomplished as well. In order to exclude these comparisons during flares, simultaneous control observations were carried out with three other telescopes. As comparison star the star "a" (Fig. 1.) was chosen. The U,B,V,R,I magnitudes of this star have obtained by the known magnitudes of the star HII 801 [I].



These magnitudes and corresponding errors for the star "a" are as follow:

U	B	V	R	I
$11^{m}.07 \pm 0^{m}.01$	$10^{m}.68 \pm 0^{m}.01$	$9^{m}.95 \pm 0^{m}.01$	$9^{m}.32 \pm 0^{m}.01$	$8^{m}.90 \pm 0^{m}.03$

The results of the observations of UV Ceti are presented in Table I.

Table I

Date of observation	UT	U	B	V	R	I
20.9.1979	$20^{h}30^{m}$	-	$13^{m}.53$	$11^{m}.68$	-	-
23.9.1979	18 50	-	13.56	-	-	-
	22 30	14.79	13.79	11.84	9.75	8.15
24.9.1979	22 00	13.92	13.46	11.90	9.70	8.17
25.9.1979	23 25	15.31	13.68	12.00	9.73	8.16
26.9.1979	17 57	15.17	-	-	-	-
	23 00	14.80	13.75	12.00	9.73	8.17
27.9.1979	17 58	14.56	13.78	12.08	9.77	8.29
	19 50	14.34	13.71	12.02	9.75	8.20
	20 00	-	-	-	-	8.30
	22 10	-	-	-	-	8.33
	22 50	15.52	13.73	12.00	9.75	8.12
28.9.1979	17 47	14.58	13.78	12.03	9.75	8.23
	22 10	14.35	-	-	-	-
	23 21	14.74	13.55	12.02	9.75	8.17
	23 30	-	13.51	-	-	-
29.9.1979	19 25	-	13.58	12.01	-	-
	21 03	-	13.54	-	-	-

The data presented in Table I show that in minimum light the brightness of UV Ceti is significantly changing practically in all colours except maybe in R.

N.D. MELIKIAN
Byurakan Astrophysical
Observatory

N.N.KILJACHKOV, A.A.AVERIANOV
O.I.STALBOVSKY, V.S.SHEVCHENKO
N.A.SHUTIOMOVA
Tashkent Astronomical Institute

Reference:

I. Euqenio E., Mendoza V., Bol.Obs.Tonantzintla, Vol.4, No.29.,1967

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1728

Konkoly Observatory
Budapest
1980 January 14

HR 7308, A SHORT-PERIOD CEPHEID WITH VARIABLE AMPLITUDE

HR 7308, (=BD+27°3314) is a F6Ib-II star of 6th magnitude. Semi-regular photometric variations were detected by Breger (1969) and Percy et al. (1979) find that this star is a new small-amplitude cepheid. The radial velocity RV of HR 7308 was measured 132 times with the spectrophotometer CORAVEL (Baranne et al., 1979) between May 1977 and November 1979, and 10 photometric measurements in the Geneva system were obtained between October 1978 and May 1979. Figure 1 presents the RV data in function of the Julian Date. The measurement uncertainty, resulting from the photon noise, the scintillation and instrumental causes, is typically 0.43 km/sec in the case of HR 7308.

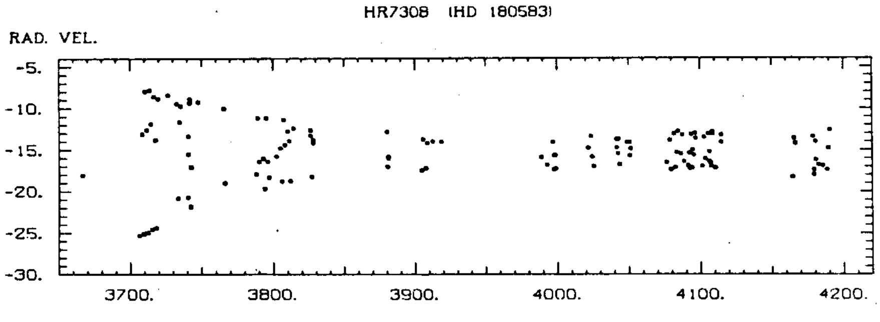


Figure 1

Figure 1 shows that the RV measurements are characterized by :

1) A short-period variability (RV=-9km/sec at JD 2443741.6 and -22 km/sec at JD 2443742.4)
2) An amplitude of variation which is variable with time. During the period of survey, the peak-to-peak amplitude has decreased from 18 km/sec at JD 2443710 to 4 km/sec at JD 2444000.

The search for the period of the short-term variability by a method of Fourier analysis (Burki and Rufener, 1978) reveals that a single period

$$P_o = 1.49107 \text{ d.}$$

characterizes all RV data. Figures 2 and 3 show the RV curves calculated with P_o and the phase origin JD 2440000, for 2 different epochs of survey.

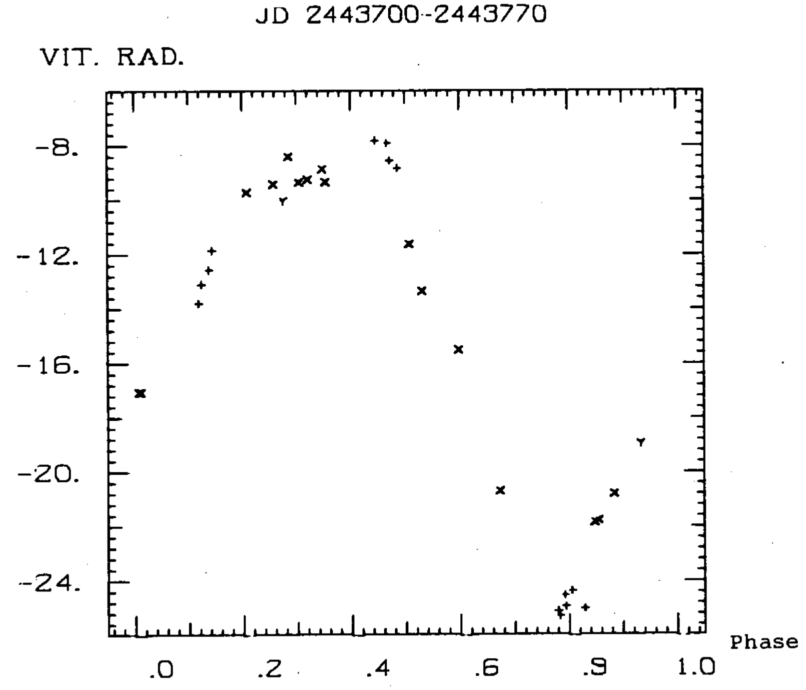


Figure 2

In Figure 2, the symbols plus refer to the data in the interval 2443706<JD<2443719 and the crosses to the data in the interval 2443726<JD<2443766. Figure 4 shows the light curve in magnitude V for the same period P_o and the same phase origin. The squares refer to the data in the interval 2443788<JD<2443802 and the open circles to the data in the interval 2443971<JD<2444001. We see that the light curve is the mirror image of the RV curve.

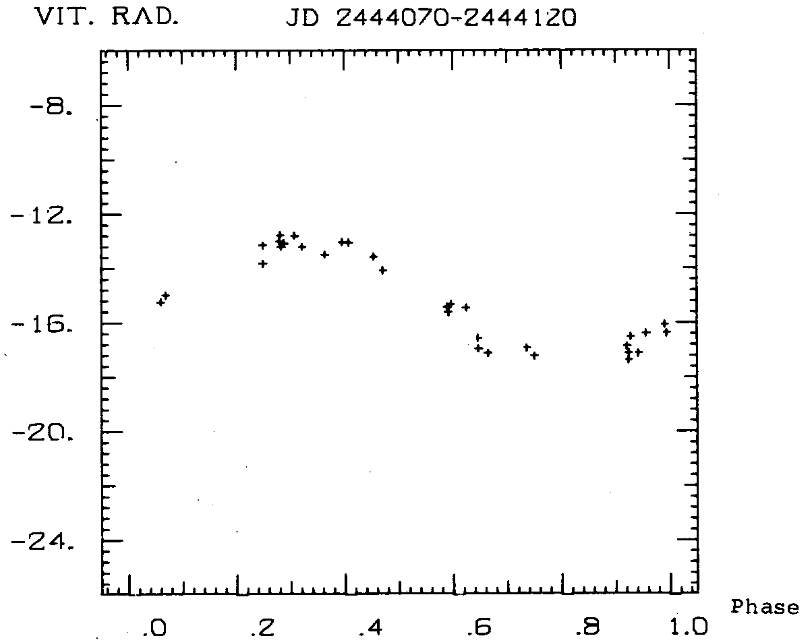


Figure 3

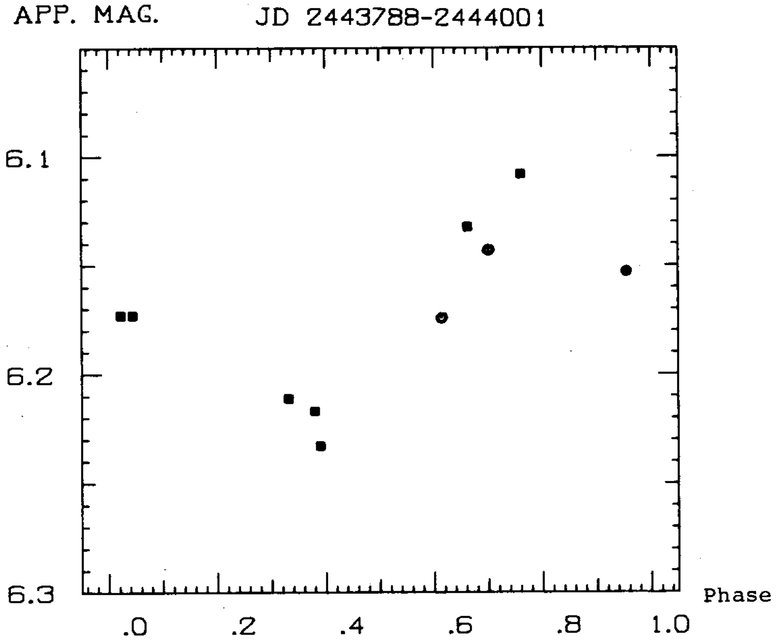


Figure 4

Thus, HR 7308 is a new short-period cepheid exhibiting a strongly variable amplitude. An analysis of the properties of this bright star reveals that it probably belongs to the population I. If this is really the case, HR 7308 would be the shortest classical cepheid known in our Galaxy. We shall continue to follow this star, both in radial velocity and photometry, in order to describe the future variations of the amplitude and, thus to determine its evolutionary status.

G. BURKI, M. MAYOR

Geneva Observatory
CH-1290 Sauverny
Switzerland

References:

Baranne, A., Mayor, M., Poncet, J.L.: 1979, Vistas in Astronomy, in press

Breger, M. : 1969, Astrophys. J. Suppl. 19, 79

Burki, G., Rufener, F. : 1978, Astron. Astrophys. 70, 105

Percy, J.R., Baskerville, I., Trevorrow, D.W.: 1979, Publ.Astron. Soc. Pacific 91, 368

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1729

Konkoly Observatory
Budapest
1980 January 16

PHOTOELECTRIC LIGHT CURVES OF VW CEPHEI

VW Cephei is a W UMa type eclipsing system which has both a variable period and a variable light curve (Kwee, 1966a). Many authors have looked for a long term and a short term periodic variation of the period. The long term variation was generally interpreted as due either to the presence of a third component or to dynamical interactions between the two components. The short term variations of the period of VW Cep have been studied by Kwee (1966a,b). He found periodic displacements of the minimum times which are connected with a clearly visible variation of the height of the two maxima. Kwee interpreted this variation as due to an inhomogeneous cloud of circumstellar absorbing material revolving at a very small distance around the system with a period about 3.5% longer than the period of the component stars.

During a program of photoelectric observations of eclipsing binary stars a new light curve (Figure 1) of VW Cep in two colours (B and V) was obtained on July 20-23, 1979.

The Observations.

The observations were made with a 48-inch Cassegrain reflector (Contopoulos and Banos, 1976) and a two beam multi-mode photometer (Goudis and Meaburn, 1973). The two intermediate passband filters used were selected to be in close accordance with the standard U,B,V colour system. As comparison star we used BD +74°889, as check star BD +75°726. The observations of July 20-21 and those of July 22-23 cover the whole light curve, while those of July 21-22 cover the phase interval from 0.0 to 0.65 and from 0.87 to 1. The following ephemeris (Cristescu, 1978) was used for the reductions of the observations

$$\text{Min I} = \text{JD Hel } 2443448.2663+0.2783176\cdot E. \quad (1)$$

A total of 116 B and 116 V observations were obtained (each observation consists of two individual measurements).

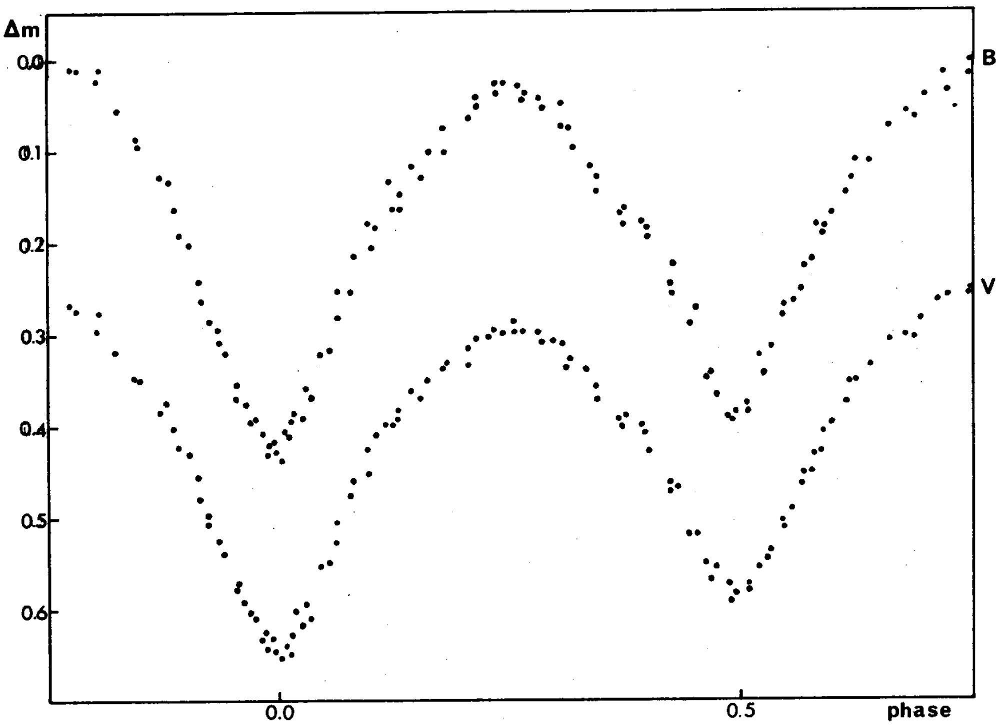


Figure 1. The B and V light curves of VW Cep.

Times of Minima.

One of the conspicuous features of the light curve of VW Cep is the variable but very pronounced asymmetries which appear regularly at both minima. Because of the asymmetric minima, the parabolic parts of the light curve around each minimum (van't Veer, 1973) have been used to determine the times of minima. Six epochs of minimum light, given in Table I, were determined by the method of bisecting chords connecting points of equal magnitude on the opposing branches to find the temporal mean.

Table I Observed Minima of VW Cep

HJD 2440000+	$(O-C)_1$	$(O-C)_2$	Rem.
4075.3151	-0.0007	-0.0982	I
4075.4541	-0.0009	-0.0984	II
4076.4284	-0.0007	-0.0982	I
4076.5673	-0.0010	-0.0985	II
4077.4028	-0.0009	-0.0979	II
4077.5415	-0.0004	-0.0984	I

The $(O-C)_1$ values were computed using the ephemeris given by equation (1), while the $(O-C)_2$ values were calculated according to van't Veer's (1973) ephemeris

$$\text{Min I} = \text{JD Hel } 2433898.4410 + 0.27831793 \cdot E \qquad (2)$$

The so calculated $(O-C)_2$ values are in accordance with van't Veer's (1973) O-C diagram completed by Hopp et al. (1979) with later determinations. That diagram clearly shows that the period shortening still goes on.

The Light Curve.

According to Schmidt and Schrick (1955) the following three values were determined from our observations to descibe the variability of the light curve around the extrema

	B	V
$\Delta m_1 = m_{minI} - m_{minII}$	+0.042	+0.060
$\Delta m_2 = m_{maxI} - m_{minII}$	-0.385	-0.332
$\Delta m_3 = m_{maxII} - m_{minII}$	-0.358	-0.297

The heights of the two maxima are not equal. Their difference is about $0\overset{m}{.}035$ and $0\overset{m}{.}030$ for the V and B bands, respectively. A shoulder appears at about $0\overset{p}{.}65$ (Hopp et al.,1979) in the V-band,

while another one is present at $0^{p}.11$ in both bands.
An unusual scatter in B and V is observed around the primary minimum.

P.G. NIARCHOS
Department of Astronomy
University of Athens
Athens (621), Greece

References:
Contopoulos, G. and Banos, C.: 1976, Sky and Telescope, 51, 154
Cristescu, C.: 1978, I.B.V.S. No. 1383
Goudis, C. and Meaburn, J.: 1973, Astrophys. Space Sci.,20, 149
Hopp, U., Witzigmann, S., and Kiehl, M.: 1979, I.B.V.S. No.1599
Kwee, K.K.: 1966a, Bull.Astron.Inst.Neth.Suppl. 1 245
Kwee, K.K.: 1966b, Bull.Astron.Inst.Neth. 18, 448
Schmidt, H. and Schrick, K.W.: 1955,Zeitschrift f.Astrophys.37,73
van't Veer, F.: 1973, Astron. and Astrophys. 26, 357

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1730

Konkoly Observatory
Budapest
1980 January 18

INVERSE P Cyg PROFILE OF Hα IN THE SPECTRUM OF THE RED GIANT HD 139216 = τ^4 Ser

The star HD 139216 = τ^4 Ser is an irregular variable of spectral class M 5 III with a light change of $m_{pg}=7\overset{m}{.}5-8\overset{m}{.}5$ according to Kukarkin et al. (1970). In 1977 Sato et al. (1978) found an unusually wide absorption Hβ line and an inverse P Cyg profile of the Hα line in the spectrum of τ^4 Ser. It is interesting that earlier Jennings and Dyck (1972) did not notice any emission feature in the Hα line.

With the purpose of expressing possible further profile changes of the Hα line in the τ^4 Ser spectrum, in 1979 we obtained a series of spectrograms in the region around Hα with a dispersion of 20 Å/mm. The spectra were obtained in the Cassegrain focus of the 125-cm reflector of the Crimean Station of the Sternberg Astronomical Institute with the help of a grating spectrograph with an image tube. Ten spectrograms of the standard star HD 134943 of the spectral class M4III were also obtained. The dates of the observations and the number of the spectrograms for the variable and the standard star are:

Date of observation	τ^4 Ser	HD 134943
31.III-1.IV.1979	8	~
5-6.IV.1979	8	4
26-27.VI.1979	5	2
27-28.VI.1979	2	2
28-29.VI.1979	3	2

All of these 26 spectrograms of τ^4 Ser, analogically to the results obtained in 1977 by Sato et al. (1978), show an inverse P Cyg profile of the Hα line with faint emission and absorption components. Noticeable significant changes in the intensity of the emission-absorption components during our observations were not established.

For qualitative measurements the spectrograms of the standard star HD 134943 and the best quality spectrograms of the variable star τ^4 Ser were registered in density with the help of the microdensitometer "Youce-Loeble" of the National Astronomical Observatory of Bulgaria (Rojen). From the microdensitometer registrations we obtained the wavelengths for the maximum and minimum of the reverse P Cyg profile. In all measurings, corrections have been made for the terrestrial orbital motion. With the help of the absorption Hα line in the spectrum of the standard HD 134943 a radial velocity of V_r=-46±1 km/sec was obtained. In the catalogue by Wilson (1953) the radial velocity of the standard is V_r= -34.7±1.2 km/sec, from where we derived the correction ΔV_r=+11km/sec in order to reduce our measurements to Wilson's system. For the Hα line in the τ^4 Ser variable spectrum in Wilson's system we obtained V_r=-205±9 km/sec for the emission component and V_r=+6±4 km/sec for the absorption component of the inverse P Cyg profile.

The radial velocity of the absorption component coincides practically with the one defined by Sato et al. (1978). As to the emission component our measurements present a significantly greater negative radial velocity in comparison with the one defined by these authors ($\Delta V \approx 80$ km/sec).

Probably, a certain part of this difference may be explained by the different methods of elaboration of the spectrograms, but in its larger part, it seems, that there is a real change of the emission component radial velocity during the time. This conclusion conforms to the fact that the previous observations made by Jennings and Dyck (1972) did not show the presence of Hα emission in the τ^4 Ser spectrum.

The τ^4 Ser star is an interesting peculiar object. The investigation of its physical nature requires a more thorough photometric and spectroscopic study.

E.A. KOLOTILOV
Sternberg Astronomical Institute,
Moscow, U.S.S.R.

R.M. RUSSEV
Department of Astronomy
University of Sofia, Bulgaria

References:
Jennings, M.C., and Dyck, H.M., 1972 Astrophys. J, 177, 427
Kukarkin, B.V., et al., 1970, Gen.Cat.Var.Stars, Moscow
Sato, K., et al., 1978, Publ.Astron.Soc.Japan, 30, 557
Wilson, R.E., 1953, Gen.Cat.Stellar Radial Velocities, Washington D.C.

COMMISSION 27 OF THE I. A. U.

INFORMATION BULLETIN ON VARIABLE STARS

Number 1731

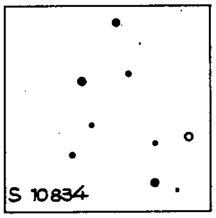
Konkoly Observatory
Budapest
1980 January 21

A NEW FLARE STAR IN THE PRAESEPE CLUSTER (= S 10834)

On a blue plate (ORWO-ZU2+filter GG13) with 5 exposures from 1978 March 1 taken with the 200 cm telescope at Karl-Schwarzschild Observatory (Ziener, Lochno) a new flare star was discovered. Its behaviour on this plate and further flares observed on blue plates of the 50/70/172 cm Schmidt-type telescope at Sonneberg Observatory in the period from 1977 March 8 to 1979 March 23 can be seen from the table which summarizes the Julian Dates of the middles of the exposures, their duration and the brightness in B. The mean brightness in minimum amounts to $B=18\overset{m}{.}04$.

The position of the new flare star is given to

$8^{h}32\overset{m}{.}82$ $+18^{\circ}48\overset{\prime}{.}7$ (1900.0).



The identification chart, comprised in the Figure, represents an area of approximately 7'x 7'. North is on the top.

Table

J.D. 244...	B	Exp.time (min.)	J.D. 244...	B	Exp.time (min.)
3569.311	$18\overset{m}{.}09$	2	3485.488	$17\overset{m}{.}21$	60
313	17.98	2	3524.483	17.10	60
315	18.02	2	3596.329	17.21	60
317	17.21	2	3933.356	17.10	30
319	17.54	2			

W. GÖTZ
Akademie der Wissenschaften der DDR
Zentralinstitut für Astrophysik
Sternwarte Sonneberg

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1732

Konkoly Observatory
Budapest
1980 January 24

NEW LIGHT CURVES OF RS CVn

The eclipsing binary RS CVn has been observed at the Ege University Observatory from March 25 to August 3, 1979. The observations in B and V were made with the 48 cm Cassegrain telescope equipped with unrefrigerated EMI 9781 A photomultiplier. The filters B and V are approximately in the standard UBV system. BD $+36^{\circ}2347$ as proposed by Hall (1976) was used as comparison star. The phases of individual observations have been computed with the following light elements

Min I = JD Hel. 2439834.471 + $4\overset{d}{.}79781 \cdot E$.

The light curves obtained in B and V colours are shown in Figures 1 and 2.

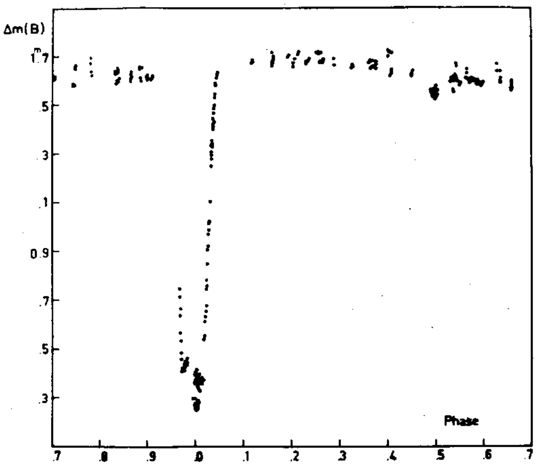


Fig. 1. B light curve of RS CVn.

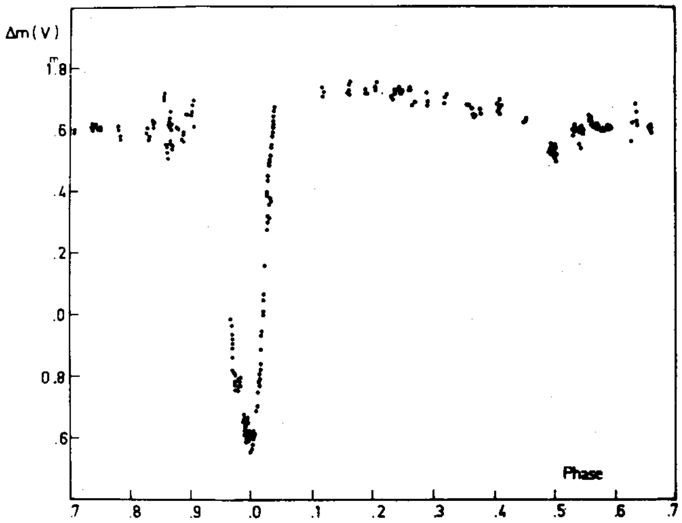


Fig. 2. V light curve of RS CVn.

The wave-like distortion outside the minima is clearly seen. The amplitude of the wave is about $0\overset{m}{.}09$ in blue and $0\overset{m}{.}14$ in yellow light. The maximum and minimum of the wave fall approximately at the phases 0.22 and 0.72, respectively. The amplitude of the wave and the phase of the minimum of the wave agree well with the values computed from the equations given by Hall (1972).

The observations will be carried on in the next observing seasons.

S. EVREN, Z. TUNCA, O. TÜMER, A.Y. ERTAN
C. IBANOĞLU and M. KURUTAÇ
Ege University Observatory
Bornova-Izmir, Turkey

References:
Hall, D.S., 1972, Pub.A.S.P. 84, 323
Hall, D.S., 1976, I.A.U. Comm.42, Circ.2

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1733

Konkoly Observatory
Budapest
1980 January 24

PHOTOELECTRIC PHOTOMETRY OF THE SPECTROSCOPIC BINARY HD 91948

The star HD 91948 (BD+60°1274) has been found to be a spectroscopic binary by Gorga (1971) with an orbital period of $2\overset{d}{.}7700266$. No photoelectric work on this star is available in the literature. The purpose of our photoelectric measurements was to study the variable nature of this binary star.

The star was observed by us photoelectrically on the 38-cm reflector of the Uttar Pradesh State Observatory on a total of 17 nights during the period May 1973 - May 1978. The conventional UBV filters of Johnson and Morgan and standard d.c. techniques were employed. The observations collected during 1973 to 1975 were obtained with an unrefrigerated 1P21 photomultiplier tube, while the remaining ones were obtained using a similar tube refrigerated to -20°C. Two comparison stars BD+60°1270 and BD+60°1289 were used to begin with. However, the latter was found to be a better comparison star than the former, hence all the final reductions were done using that star. The standard deviations of the comparison star on typical nights when an unrefrigerated photomultiplier tube was used were $0\overset{m}{.}013$(B) and $0\overset{m}{.}012$(V), while when a cooled photomultiplier was used were $0\overset{m}{.}011$(B) and $0\overset{m}{.}010$(V). Our observations were planned on the basis of the following ephemeris

Primary minimum = JD 2440243.334 + $2\overset{d}{.}7700266 \cdot E$ (Gorga, 1971).

Due to the large scatter in U filter, on most of the nights, the light curves only on B and V filters are given in Figure 1. On the first observational night of 22 May 1973 (JD 2441825) which was planned near primary minimum (at phase $0\overset{d}{.}09$), we noticed light variations in U, B and V. The differential magnitudes (instrumental)

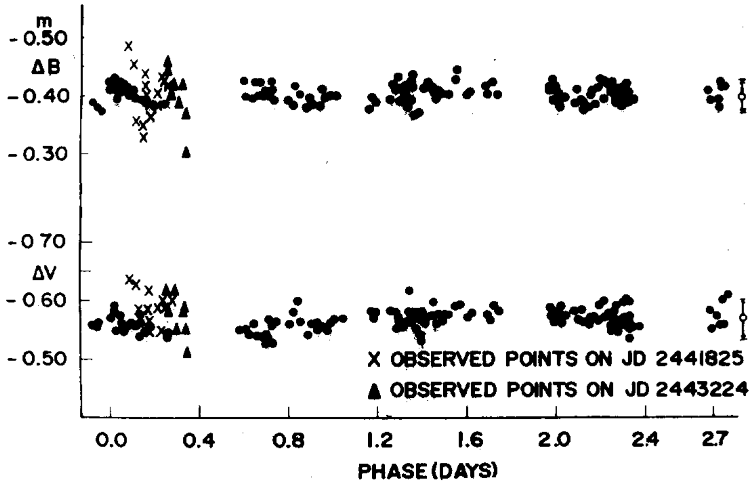


Figure 1. Light curves of HD 91948 on an assumed period of $2^{d}.7700266$. The differential magnitudes are in the sense variable minus comparison. The ±2σ error bars for the comparison star are indicated along the side.

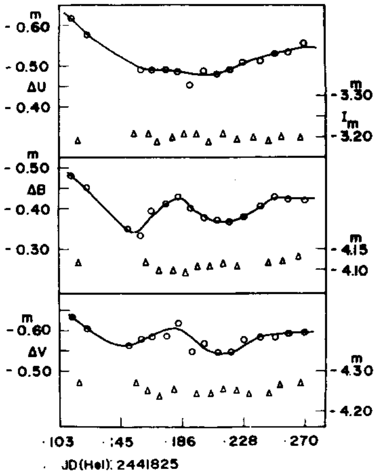


Figure 2. Individual observations on the night of JD 2441825. The differential magnitudes are in the sense variable minus comparison. The solid line indicates free hand curve. Points with Δ are instrumental magnitudes for comparison star used.

against JD are given in Figure 2. Below each light curve, the instrumental magnitude of the comparison star used, is also given, with its magnitude scale on the right hand side. This variation demanded further observations of the system in the entire phase region. However, on an other night of 21 March 1977 (JD 2443224) at phase $0^{\mathrm{d}}.25$, a variation of $0^{\mathrm{m}}.26$ in U, $0^{\mathrm{m}}.15$ in B and $0^{\mathrm{m}}.10$ in V filter, in two hours of duration was noticed and is given in Figure 3. The individual observations on the night of JD 2441825 and JD 2443224 are shown by cross and solid triangles respectively in Figure 1.

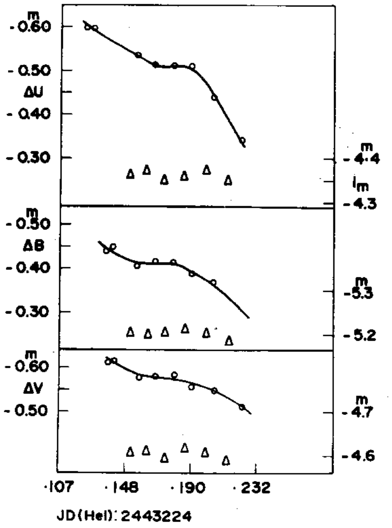


Figure 3. Individual observations on the night of JD 2443224. The differential magnitudes are in the sense variable minus comparison. The solid line indicates free hand curve. Points with Δ are instrumental magnitudes for comparison star used.

Gradual variation of light (increasing or decreasing) has been noticed in case of Be stars which are also spectroscopic binaries. For example, Landis et al. (1977) V measurements of 4 Her on the night of JD 2442542 indicate gradual brightening of the star for at least $0^{\mathrm{m}}.05$ during 3 hours (0.13 days). But it is unusual in case of HD 91948 which has been reported tentatively as spectral class F6V. HD 91948 has a companion star of 11^m at 4.4" apart (Batten et al. 1978). This companion star, could not be separated out in the diaphragm of 38-cm reflector and hence was observed together with the main star. Considering that the latter is of magnitude $M_V = 7.3$, the companion does not contribute effectively to the total light coming through.

Due to lack of U observations, no definite colour class could be assigned to this star. However, B-V values, based on the mean values of B and V filters in Figure 1, were determined and came out to be $+0^m.016$, which corresponds to AOV spectral class. Our light curves in Figure 1 show the absence of eclipses at scheduled primary and secondary minima phases. Unfortunately we could not get any night in the gap which occurs just after the aforesaid night of JD 2443224. The variability of this star in the aforesaid two nights is quite significant as compared to the error of our observations. Since there is no consistency in the shape of the light curves obtained on those two individual nights, it is difficult to assign the type of variability to this star. However, we conclude that HD 91948 is a suspected variable. Also the light curve does not point towards the star being an eclipsing binary.

The author is thankful to Dr. S.D. Sinvhal for helpful discussions and suggestions.

T.D. PADALIA
Uttar Pradesh State Observatory
Manora Peak, Naini Tal-263129
India

References:

Batten,A.H., Fletcher,J.M., Mann,P.J., 1978, Seventh catalogue of the Orbital Elements of Spectroscopic Binary Systems, DAO Publ. Vol. XV, No.5, p. 156

Gorza, W., 1971, J.R.A.S. Can., 65, 277

Landis, H.J., Lovell, H.P., Hall, D.S., Uckotter, D.G., 1977 Acta Astronomica, 27, 265

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1734

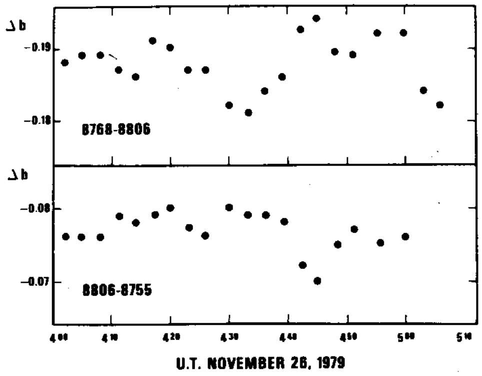
Konkoly Observatory
Budapest
1980 January 29

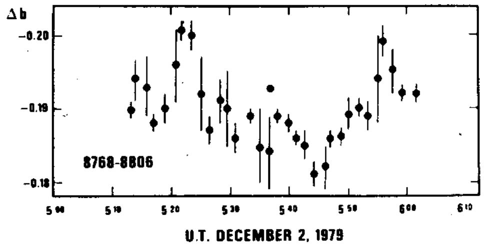
THE VARIABILITY OF HR 8768

HR 8768 (HD 217811, B2V, m_V = 6.38) is one of four members of a new class of early-type ultra-short-period variables proposed by Jakate (1979). The other three members are the southern stars HR 3467, HR 3582 and HR 5285. These stars are all B2V and B3IV stars, with periods of 30-50 minutes, and ranges of about $0^m.02$ in blue light.

Because of the small ranges of these stars, it is particularly important that their variability be confirmed by other observers. Accordingly, HR 8768 was observed on two good photometric nights with the #4 0.4 m telescope at the Kitt Peak National Observatory in Arizona, U.S.A. The telescope was equipped with a dry-ice-cooled 1P21 photomultiplier, and pulse-counting electronics. On the first night, HR 8755 and HR 8806 were used as comparison stars. On the second night, in order to improve the time resolution and accuracy, only HR 8806 was used. The magnitude differences, corrected for differential extinction, are shown in Figure 1. Approximate error bars are given for the data obtained on the second night. The average accuracy of the magnitude differences is $\pm 0^m.002$, as determined from the internal scatter and from the scatter in Δb (HR 8806 - HR 8755).

The variability of HR 8768 is only marginally apparent on the first night, but is quite apparent on the second. The period is about 35 minutes (slightly longer than Jakate's value of 28 minutes) and the range varies from $0^m.01$ on the first night to $0^m.02$ on the second. Jakate found a range of $0^m.025$; the range appears to be variable. Although Figure 1 appears to





confirm the ultra-short-period variability of HR 8768, independent confirmation of this and other members of the class would be desirable.

This research was supported by the Natural Sciences and Engineering Research Council of Canada. I thank the Kitt Peak National Observatory for the use of the facilities there.

JOHN R. PERCY
Department of Astronomy,
University of Toronto,
Toronto, Canada
M5S 1A7

Reference:

Jakate, S.M. 1979, Astron. J. 84, 1042.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1735

Konkoly Observatory
Budapest
1980 January 30

PHOTOMETRIC VARIABILITY OF THE SILICON Ap-STAR HD 43819 +)

In a larger photometric program of Ap stars I have included the object HD 43819 (=HR 2258) classified B9 IIIp Si, (Cr) by Cowley (1972) in order to look for possible photometric variability. The measurements were carried out at the ESO 1 m photometric telescope on La Silla (Chile) using a dry ice cooled EMI 6256 photomultiplier and a pulse counting device for the Strömgren and g_1g_2 (Maitzen, 1976) filter measurements. The latter were introduced for measuring the λ5200 flux depression of Ap stars.

HD 43819 was measured against the comparison star HD 42784. The mean colours of both stars as derived from my absolute photometry are:

	b-y	m_1	c_1	Δa
HD 43819	-.053	.137	.744	.042
HD 42784	-.036	.099	.574	.000

The Δa-parameter (which is a measure of the presence of the λ5200-depression as defined by Maitzen, 1976) of HD 43819 indicates a rather pronounced Ap characteristic, while the comparison star shows up as a normal late B type star using this criterion.

The absolute colours b-y and Δa are slightly variable for HD 43819 with amplitudes of about 0.01 mag. They vary in phase: the bluer b-y, the stronger the Δa-excess.

Based on the foregoing there seems to be sufficient evidence that the variations displayed in Fig. 1 are caused by a photometric variability of the Ap star HD 43819. Moreover, the wavelength dependence of the amplitude is typical for a Silicon star - it decreases from u (0.04) to y (0.01). No final determination of

---

+) Based on measurements collected at the European Southern Observatory (ESO), La Silla - Chile.

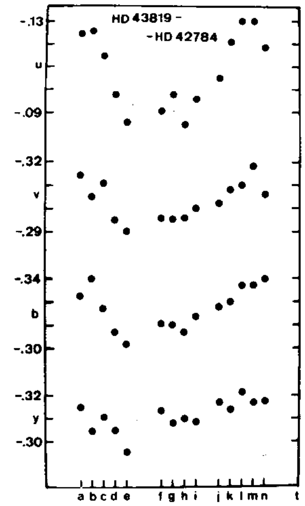


Figure 1. Differential Strömgren photometry HD 43819 minus HD 42784. The precise time abscissae values are:

a= JD 2441721.586
b= 22.588
c= 23.612
d= 24.551
e= 25.558
f= 28.534
g= 29.541

h= JD 2441730.530
i= 31.525
j= 33.557
k= 34.547
l= 35.545
m= 36.554
n= 37.542

the period of the variations can be obtained from this data, because the observational test for variability of the order of 1 day, i.e. observations well displaced over the night, could not be performed due to the northern position of the stars.

The quicklook 14 days period as indicated by the run of the differential photometry in Fig. 1 would be unusually large for an early type Ap star. It can be safely ruled out, however, by its published rotational velocity v_e sin i = 55 km/s according to the catalog of Uesugi and Fukuda (1970). Such a fast rotation would imply an impossible minimum radius of about 15 solar radii for this star. Thus, the correct period will have to be found among the related periods: $\pm 1/P = \pm n + 1/14$.

This points rather to 0.93 or 1.077 days than to 0.48 or 0.52 days because the latter would require a nearly pole-on aspect ($i=10^{\circ}$ for a 3 solar radii star) restricting strongly the observable variability.

In conclusion, future observers should concentrate their efforts to monitor the photometric variability of HD 43819 from a more northern observatory throughout the night in order to find the final period of this Silicon star.

HANS M. MAITZEN
Institut für Astronomie der
Universität Wien
Türkenschanzstr. 17.
A-1180 Wien

References:

Cowley, A. 1972: Astron.J. 77, 750
Maitzen, H.M. 1976: Astron. and Astrophys. 51, 223
Uesugi, A., Fukuda, I. 1970: Contr.Kwasan Obs.Univ.Kyoto No.189

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1736

Konkoly Observatory
Budapest
1980 January 30

PHOTOELECTRIC MINIMA OF VW CEPHEI

Photoelectric observations on the peculiar eclipsing binary VW Cep (HD 197433=BD +75°752, G5) were carried out, in B and V, during September 1979. The observations were made using the two-beam, multi-mode, nebular-stellar photometer of the National Observatory of Athens attached to the 48-inch Cassegrain reflector at the Kryonerion Astronomical Station.

The stars HD 192889 (G5, Pt_m=8.12) and HD 192635 (F5,Pt_m=8.1) were used for comparison and checking, respectively. The filters used are in close accordance with the standard ones. Reduction of the observations has been made using Hardie's method (1962).Every observational night (13/14, 14/15, 18/19 and 21/22) the observations were carried out for several hours thus, we succeeded in obtaining 3 complete light curves and 8 minima.

The following Table gives the Hel.J.D. of the 8 minima, the differences (O-C), the mean error σ, and the type of minimum. The times of minima and the mean errors have been calculated using the method of Kwee and Van Woerden (1956); while the ephemeris used is that of Kwee (1966).

Table

Hel.J.D. 2444000+	(O-C) days	σ days	Minimum
130.4162	-0.1052	±0.0007	I
130.5558	-0.1047	±0.0008	II
131.5278	-0.1068	±0.0002	I
135.2859	-0.1060	±0.0005	II
135.4254	-0.1057	±0.0006	I
135.5648	-0.1055	±0.0004	II
138.3480	-0.1054	±0.0003	II
138.4866	-0.1060	±0.0002	I

Our O-C values indicate that the period of the system continues to decrease. (See for instance the residual diagrams of van't Veer (1973) of Hopp et al. (1979)).

P. ROVITHIS
National Observatory
of Athens, Athens (306)
Greece

H. ROVITHIS-LIVANIOU
Astronomy Department
Athens University
Panepistimiopolis
Athens (621), Greece

References:

Hardie, R.H.: 1962, Stars and Stellar Systems, Vol.II, Astronomical Techniques, ed. Hiltner, W.A., The University of Chicago Press, Chicago

Hopp, U., Witzigmann, S., Kiehl, M.: 1979. I.B.V.S. No. 1599

Kwee, K.K.: 1966, Bull.Astron.Inst.Neth. 18, 448

Kwee, K.K., Van Woerden, H.: 1956, Bull.Astron.Inst.Neth. 12, 327

Van't Veer, F.: 1973, Astron. and Astrophys. 26, 357

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1737

Konkoly Observatory
Budapest
1980 January 30

THE LIGHT CURVES OF RT CrB

The RS CVn-type eclipsing binary RT CrB has been observed in B and V colours at the Ege University Observatory from April 26 to July 30, 1979. The observations were made with the 48 cm Cassegrain telescope equipped with EMI 9781 A photomultiplier. For comparison and check stars BD $+29^{\circ}2691$ and BD $+29^{\circ}2692$ were used, respectively. A total of 288 observations were obtained on 32 nights.

The phases of the observations have been computed from the following light elements given in the second supplement to the GCVS (1969),

$$\text{Min I} = \text{JD Hel. } 2428273.28 + 5\overset{d}{.}11712 \cdot E.$$

The differential observations in the sense comparison minus variable have been plotted against phase and are shown in Figures 1 and 2. Corrections for atmospheric extinction on differential observations were too small to be taken into account. Although, there is a large scattering in the light curves, a wave-like distortion can still be distinguished. The amplitudes of the wave are about $0\overset{m}{.}04$ and $0\overset{m}{.}03$ in yellow and blue lights, respectively. The maximum of the wave is around phase 0.05, while the minimum is around phase 0.55.

The observations of the system will be carried on in the next observing seasons.

A.Y. ERTAN, Z. TUNCA, S. EVREN
O. TÜMER, M. KURUTAÇ and
C. IBANOĞLU
Ege University Observatory
Bornova-Izmir, Turkey

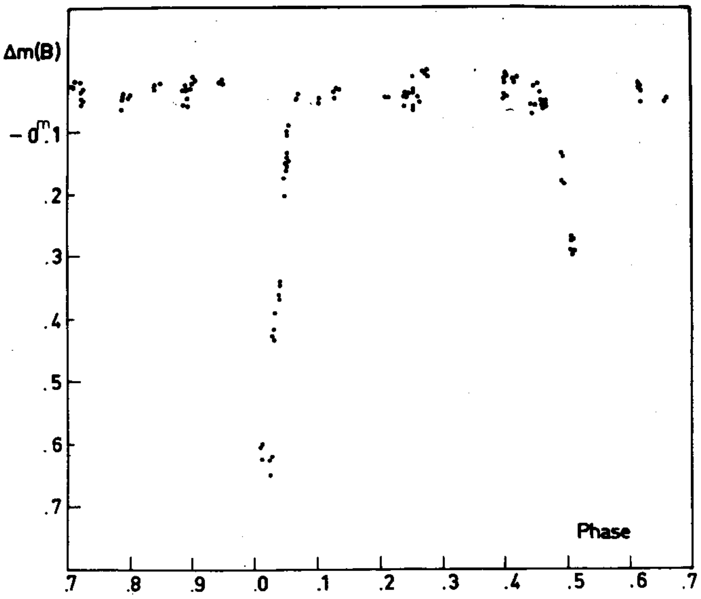


Figure 1. B light curve of RT CrB.

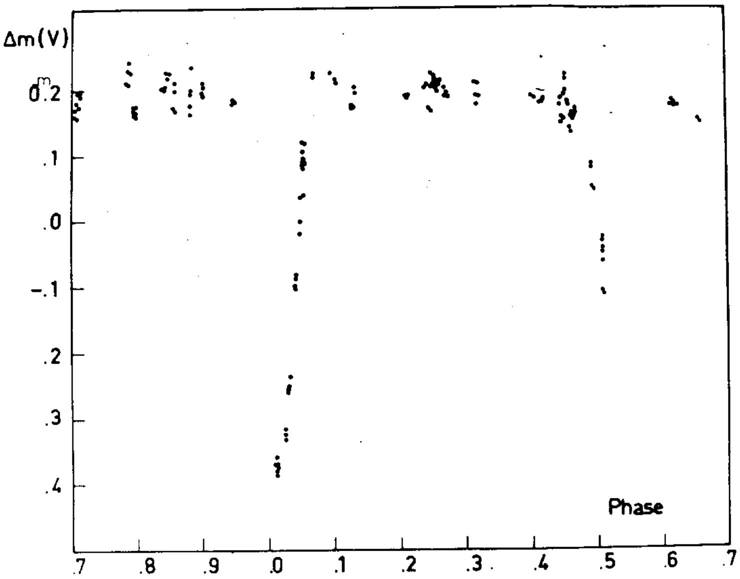


Figure 2. V light curve of RT CrB.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1738

Konkoly Observatory
Budapest
1980 February 5

NOTES ON THE SPECTRUM OF U SCORPII AND ON ITS POSITION AMONG THE RECURRENT NOVAE

A spectrogram (dispersion 132 Å mm^{-1}, emulsion IIa-O) of the recurrent nova U Sco during its recent outburst was taken on 1979 June 28.95 (UT) with the Cassegrain spectrograph of the 1.06 m telescope of the Hoher List Observatory. While the blue part of the spectrum is underexposed due to the faintness of the object and the strong atmospheric extinction, some features in the region between Hδ and 5050 Å can be studied.

The nova had at that time a magnitude of about 11.5, and was nearly 3^m below maximum. Simultaneous high speed photometry has been reported by Warner (1979). Spectroscopic observations on 1979 July 2 and 3 are briefly described by Hill et al. (1979).

At the time of our observations, the most prominent feature is a broad blend of emission lines of Fe II , N III , C III , and He II at 4580 - 4690 Å, which is much stronger than the Balmer lines Hβ and Hγ . The tracing of the spectrum with some (often tentative) identifications is shown in Fig. 1. As already suggested by Hill et al. (1979) the spectrum bears some resemblance to that of T CrB 3^m below maximum (see, e.g., Herbig and Neubauer 1946). However, it is also similar to that of RS Oph 3^m below maximum (see, e.g., Dufay et al. 1964). While the lines of RS Oph are much more diffuse than those of T CrB, the lines of U Sco are by far the most diffuse at this stage, making line identifications very uncertain.

Fast recurrent novae show a tendency of decreasing line width with time:
T CrB : 570 → 270 km s^{-1} in 7 days (Herbig and Neubauer 1946)
RS Oph: 1600 → 950 km s^{-1} in 10 days (Folkart et al. 1964)
U Sco, however, seems to show very broad emission lines also in later stages of the outburst. We derive half-widths of ± 2800 ± 200 km s^{-1} (m.e.) 5.5 days after outburst. Hill et al. report 10 000 km s^{-1} zero-intensity line widths 9 days after outburst.

An attempt is made to estimate the interstellar extinction in the direction of U Sco. Unlike ordinary novae, recurrent novae do not show dramatic changes in the B - V index during decline from maximum. T CrB had B - V = 0.1 around

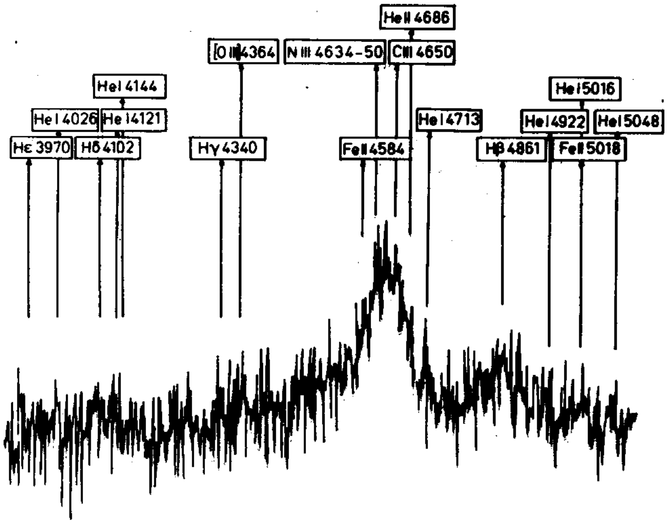


Fig. 1. The spectrum of U Sco, 1979 June 28.95 (UT)

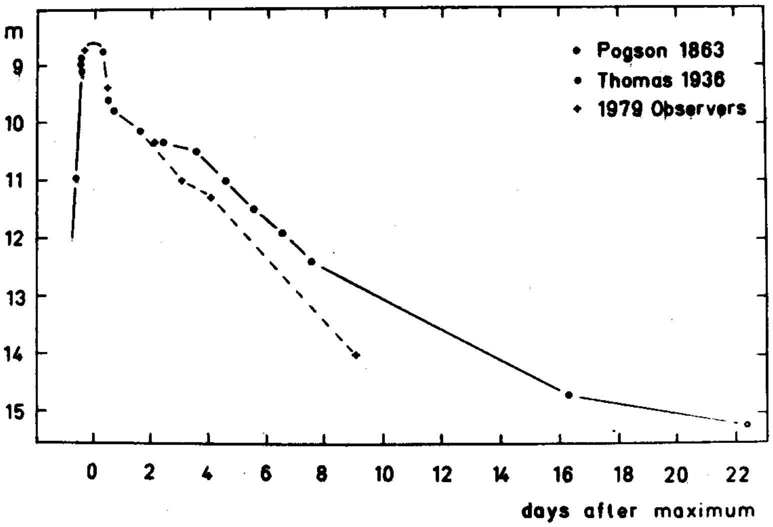


Fig. 2. A composite light curve of the outbursts of U Sco. The 1979 outburst appears to have a more rapid decline

maximum (Gordon and Kron 1979) and suffers no noticeable reddening. RS Oph had $B-V = 0.74$ (Connelley and Sandage 1958); Svolopoulos (1966) derived $(B-V)_o = -0.02$. For U Sco, the visual and photographic observations of Narumi and Kuwano (Kosai 1979) indicate $m_{pg} - m_{vis} = 0.1$ at maximum, and Whitney (1979) observed $B-V = -0.13$ 2.5 days after maximum. It appears that U Sco is very little reddened. Unfortunately, there is no clear distance - reddening relationship in this region (see, e.g., Neckel's (1967) field No. 194). $E_{B-V} = 0.3$ should be present if U Sco is not closer than 250 pc, but the extinction does not increase up to a distance of 3 kpc and likely more, since the line of vision at that distance has left the Galactic plane.

Let us assume that U Sco has reached an absolute magnitude at maximum equal to that of T CrB and RS Oph. T CrB has shown some nebular whisps that may have been ejected during the 1946 outburst (Williams 1977). They yield an expansion rate of $0\overset{''}{.}33$ year^{-1}. Due to the ambiguity of our knowledge of the principal expansion velocity (radial velocities of 4 000 ... 1 000 km s^{-1} have been observed), the absolute magnitude is only coarsely determined: $M_V = -8.5 \pm 1.5$. Svolopoulos' study of the reddening and distance of RS Oph yields $M_V = -8.7$. With an apparent maximum brightness of U Sco of $m_v = 8.7$, an estimated A_V of 1^m, and an absolute magnitude $M_V = -8.5$, a distance of the order of 17 kpc is derived. This brings U Sco 6 kpc above the Galactic plane !

If we assume that the minimum V magnitude is only due to the late type companion, then $M_V = -0.5 \pm 1.5$ for T CrB, and -2.5 (variable; Tempesti 1975) for RS Oph indicate that the secondaries are in the range of M giants and semiregular variables. The estimated brightness and colour of U Sco at minimum, as derived from the POSS charts (Webbink 1978) make it more likely that the secondary is an F or G giant with $M_V = +1.5$, if the distance of 17 kpc is correct.

Spectroscopic observations of U Sco at minimum would be highly desirable, since they could settle the question whether all *fast* recurrent novae have indeed giant secondaries. For the *slow* recurrent nova T Pyx, the colour at minimum light (Webbink 1978) and the nebular expansion parallax (Duerbeck and Seitter 1979) put severe restrictions on the size of the secondary. It is very likely a dwarf star.

The knowledge of the colour of U Sco also allows a construction of the combined light curve for all well-observed outbursts. While the visual light curve of Pogson et al. (1908) and the photographic light curve of Thomas (1940) appear to be very similar, the new observations (Bortle 1979, Kosai and Mattei 1979, Whitney 1979) indicate a more rapid decline.

H. W. DUERBECK
Observatorium Hoher List
der Universitäts-Sternwarte Bonn
5568 Daun, F. R. Germany

W. C. SEITTER
Astronomisches Institut
der Universität Münster
4400 Münster, F. R. Germany

References :

Bortle, J., 1979, IAU Circ. 3378

Connelley, M., Sandage, A., 1958, Publ. astr. Soc. Pacific 70, 600

Duerbeck, H.W., Seitter, W.C., 1979, ESO Messenger 17, 1

Dufay, J., Bloch, M., Bertaut, C., Dufay, M., 1964, Ann. Astrophys. 27, 555

Folkart, B., Pecker, J.C., Pottasch, S.R., 1964, Ann. Astrophys. 27, 249

Gordon, K.C., Kron, G.E., 1979, Inf. Bull. var. Stars 1610

Herbig, G.H., Neubauer, F.J., 1946, Publ. astr. Soc. Pacific 58, 196

Hill, P.W., Pringle, J.E., Whelan, J.A.J., 1979, IAU Circ. 3378

Kosai, Y., Mattei, J., 1979, IAU Circ. 3373

Pogson, N.R., Brook, C.L., Turner, H.H., 1908, Mem. R. astr. Soc. 58, 90

Svolopoulos, S.N., 1966, Publ. astr. Soc. Pacific 78, 159

Tempesti, P., 1975, Inf. Bull. var. Stars 974

Thomas, H.L., 1940, Harvard Bull. 912

Warner, B., 1979, Inf. Bull. var. Stars 1707

Webbink, R.F., Publ. astr. Soc. Pacific 90, 57

Whitney, C.A., 1979, IAU Cric. 3373

Williams, R.E., 1977, IAU Coll. 42 "The Interaction of Variable Stars with Their Environment", Veröff. Remeis-Sternw. Bamberg 9, No. 121

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1739

Konkoly Observatory
Budapest
1980 February 5

FLARE LIKE ACTIVITIES IN ECLIPSING BINARY DI Peg

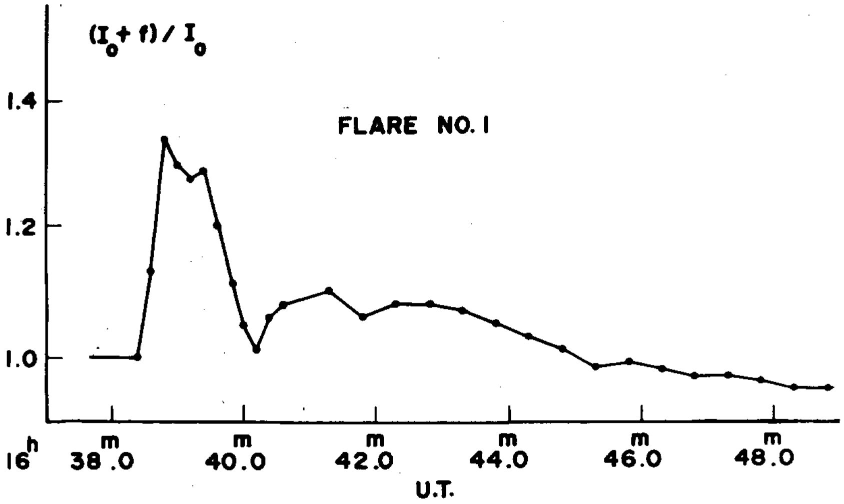
The eclipsing binary DI Peg (BD +14°5006, HD 220619) was selected for UBV photometry because earlier photometric investigations drew attention to its interesting nature (Jensch, 1934, Rucinski, 1967 and Binnendijk, 1973). Rucinski (1967) derived an orbital solution by assuming 24 % extra light in V light. The magnitude and spectral type, according to him, are:

Magnitudes: U=$9^{m}_{.}96$, B=$9^{m}_{.}92$, V=$9^{m}_{.}45$
Spectral type: F4 + G9 to K1.

The system was observed with the 104-cm telescope of Uttar Pradesh State Observatory using the conventional d.c. techniques of photoelectric photometry to obtain the full UBV light curves. The telescope is equipped with a refrigerated EMI6094S photomultiplier and standard UBV filters. A diaphragm covering 15 arc sec of the sky was used to exclude a nearby companion of magnitude ≃14 (visual estimate).

During four nights (17,18 October and 11, 12 December 1979), we had about 15 hours of total observation. On December 12, 1979 during the secondary minimum two flares were observed.

Figure 1 and 2 show the light curves of the observed flares in B filter. The characteristics of the flares are given in Table I. Δm_B is the difference in instrumental B magnitude between the steady flux and peak of the flares and F(z) is air mass at the time of the peak of the flares.


$(I_o+f)/I_o$
FLARE NO. 1
1.4
1.2
1.0
16^h
$38^m.0$
$40^m.0$
$42^m.0$
$44^m.0$
$46^m.0$
$48^m.0$
U.T.

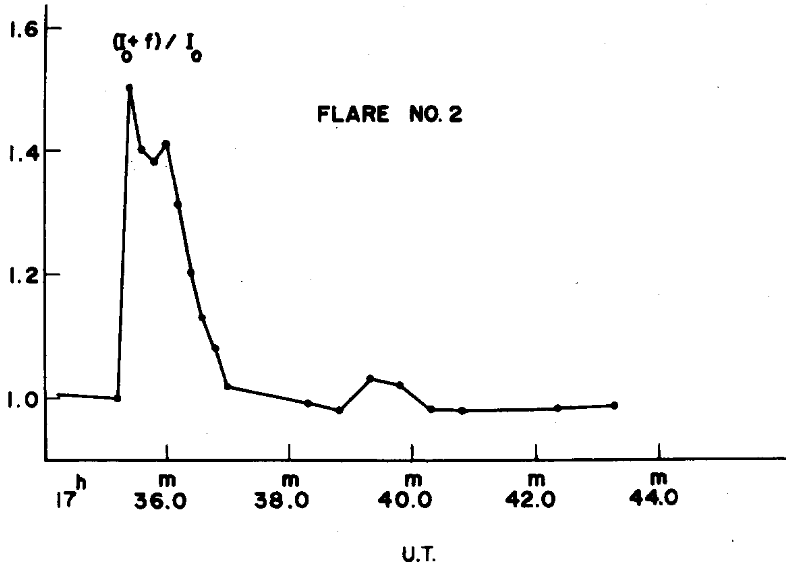

$(I_o+f)/I_o$
FLARE NO. 2
1.6
1.4
1.2
1.0
17^h
$36^m.0$
$38^m.0$
$40^m.0$
$42^m.0$
$44^m.0$
U.T.

Table I

Flare No.	Time of occurrence of peak in U.T.	Duration rise time in minute	 decay time in minute	F(z)	Δm_B
1	$16^h38^m.8$	0.4	9.5	1.713	$0^m.31$
2	17 36.0	0.2	4.9	2.529	0.44

It can be seen from Table I and Figures 1 and 2 that the ratio between the rise time and decay time of both the flares are similar to the other flares observed in AD Leo, YZ CMi and UV Ceti (Sinvhal and Sanwal, 1977).

Acknowledgements: We would like to express our thanks to Drs. M.C. Pande, S.C. Joshi, C.D. Kandpal and to Mr. B.B. Sanwal for their helpful discussions and valuable remarks.

U.S. CHAUBEY
Uttar Pradesh State Observatory
Naini Tal, 263129, India

References:
Binnendijk, L.: 1973, Astron. J. 78, 97
Jensch, A.: 1934, Astron. Nachr. 252, 396
Rucinski, S.M.: 1967, Acta Astr. 17, 271
Sinvhal, S.D. and Sanwal, B.B.: 1977, I.B.V.S. No. 1263

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1740

Konkoly Observatory
Budapest
1980 February 11

THE ELEMENTS OF THE ECLIPSING BINARY HU TAURI

During the period from November, 1974 to January, 1976 the eclipsing binary HU Tau was observed photoelectrically with the 50 cm Cassegrain telescope of Bucharest Observatory. The observations were performed in two colours, V and B. BD +19°744 was used as comparison star.

The light curves were made up of 122 normal points in V and 114 in B. The heliocentric timing minima for computation of the phase angle were chosen 2442807.2718 J.D. and 2442807.2693 J.D. for the light curves in V and B, respectively.

The rectification was carried out by the Russell-Merrill method. The coefficients of rectification are presented below.

Filter V	Filter B
$A_o = 0.9732 \pm 0.0021$	$A_o = 0.9800 \pm 0.0018$
$A_1 = -0.0198 \pm 0.0032$	$A_1 = -0.0032 \pm 0.0028$
$A_2 = -0.0280 \pm 0.0031$	$A_2 = -0.0079 \pm 0.0028$
$B_1 = 0.0011 \pm 0.0022$	$B_1 = 0.0024 \pm 0.0019$
$B_2 = 0.0009 \pm 0.0023$	$B_2 = 0.0023 \pm 0.0020$
$C_o = 0.0172$	$C_o = 0.0026$
$C_1 = 0.0198$	$C_1 = 0.0032$
$C_2 = 0.0056$	$C_2 = 0.0010$

There were no special problems in the computation of the geometric and photometric elements. The elements are given as follows:

Filter V

$k = 0.8104$, $r_g = 0.2150$, $i = 78\overset{\circ}{.}5$, $L_s = 0.8020$, $L_g = 0.1880$,
$x_g = 0.8$, $x_s = 0.0$, $\alpha_o^{oc} = 0.5976$, $\theta_e = 26\overset{\circ}{.}4$, $J_s/J_g = 6.50$

Filter B

$k = 0.7910$, $r_g = 0.2127$, $i = 78\overset{\circ}{.}3$, $L_s = 0.8310$, $L_g = 0.1690$, $x_g = 0.8$, $x_s = 0.0$, $\alpha_o^{oc} = 0.6150$, $\theta_e = 26\overset{\circ}{.}6$, $J_s/J_g = 7.88$.

So far no elements have been published. A detailed analysis of this system will be published elsewhere.

AL. DUMITRESCU
Center of Astronomy and Space Sciences
Bucharest,Rumania

R. DINESCU
Institute of Geodesy, Photogrammetry,
Chartography and Land Management
Bucharest,Rumania

References:
1. Strohmeier, W., Knigge, R., 1960, Veröff. Bamberg,Bd.V, 5
2. Strohmeier, W., 1963, Sky and Tel., <u>26</u>, 264
3. Mammano, A., Mannino, G., and Margoni, R.,1967, Mem.Soc.Astr. It. <u>38</u>, fasc. 3
4. Tümer, O. and Kurutac, M., 1979, I.B.V.S. No. 1547

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1741

Konkoly Observatory
Budapest
1980 February 12

B V LIGHT CURVES OF SZ Psc

The RS CVn type eclipsing binary SZ Psc was observed photoelectrically at the Ege University Observatory from July 18 to December 1, 1979. The observations were made in two colours, B and V, with the 48 cm Cassegrain telescope equipped with an unrefrigerated EMI 9781 A photomultiplier.

As comparison star, HD 219150 was used as suggested by Jakate (1979) since the former comparison HD 219018 was reported to be an intrinsic variable by some authors. A total of 108 observations have been obtained in each colour in 14 nights. The phases of each observation were computed by the following light elements

$$\text{Min I} = \text{JD Hel. } 2443894.885+3\overset{d}{.}96525\cdot E.$$

The differential observations, taken as comparison minus variable, have been corrected for atmospheric extinction. They were plotted against phase and are shown in Figure 1 and 2.

It is clearly seen that the mid-primary is displaced and falls at around the phase 0.05. No observations falling within secondary minimum have been obtained, thus making it difficult to estimate the mid-secondary. However, from the shoulders of secondary minimum it seems that mid-secondary is around the phase 0.52 and is not separated by the half period. This may be the consequence of either an eccentric orbit or a migrating wave as proposed by Hall (1976) for RS CVn-type binaries.

The most distinguished features of the light curves of the eclipsing binary SZ Psc are the asymmetric and unequal maxima.

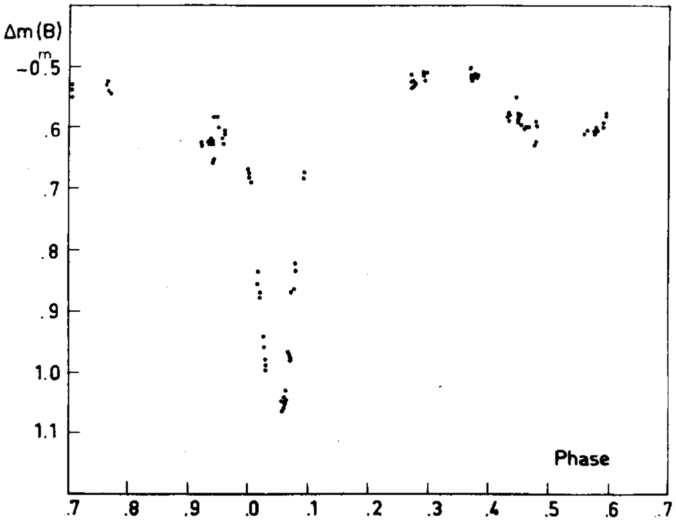


Fig.1. B light curve of Psc

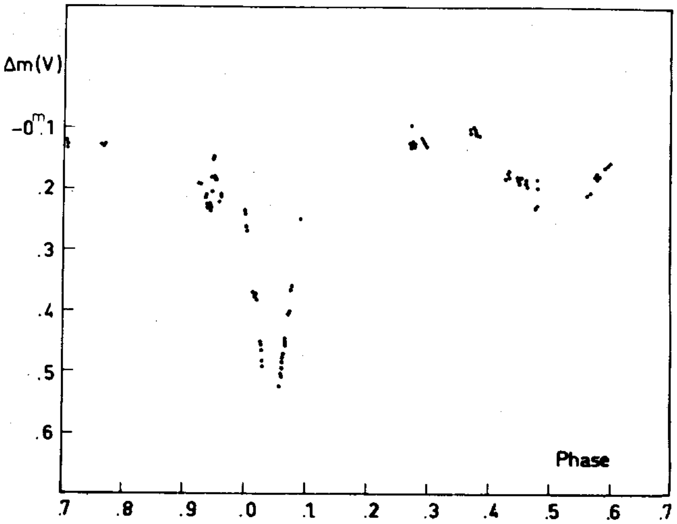


Fig.2. V light curve of SZ Psc

Two possible alternatives may be considered for the light variation of SZ Psc.

i) The comparable light variation outside eclipses and displaced secondary minimum suggest that the system is a semi-detached one with eccentric orbit.

ii) The light variation seen outside eclipses is caused by stellar-spots, and the distortion wave possesses two minima separated by almost half a period.

However, the preliminary solution given by Weiler (1977) shows that neither component fills its Roche lobe. Thus, it may seem that the possibility of a semi-detached system is ruled out. The second alternative to explain the light variations outside eclipses by stellar-spots leads to a conclusion that two minima in the distortion wave are either caused by two groups of spots on one component separated by nearly 180 degrees in longitude or two spots suitably located on both components.

In order to clarify the problem, more observations in future are greatly desired.

This study is a part of research project No. 375 supported by the Scientific and Technical Research Council of Turkey.

O. TÜMER, M. KURUTAÇ, Z. TUNCA,
S. EVREN, A.Y. ERTAN, C. İBANOĞLU
Ege University Observatory
Bornova-İzmir, Turkey

References :
Hall, D.S. 1976, I.A.U. Comm. 42, Circ. 2
Jakate, S.M., 1977, I.B.V.S. No. 1578
Weiler, E.J.,1977 , Mon.Not.R. astr. Soc. 182, 88

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1742

Konkoly Observatory
Budapest
1980 February 15

FURTHER NOTE ON HD 219018, COMPARISON STAR TO SZ Psc

Last year a small controversy arose over whether or not HD 219018 is variable. Jakate (1979) claimed that it is variable on a scale of about 0.1 mag, while I could find no such variability in observations made by me in Chile 1974 (Fernie, 1979). The result is important for much previous work done on SZ Psc itself, an interesting RS CVn binary, since HD 219018 has long been used as a comparison star for SZ Psc.

Jakate arrived at his result by using HD 219150 as a check star, and in my note I suggested that possibly it was this star that was variable. During the past season, therefore, I obtained sporadic differential observations over several months between each of these stars and a nearby bright star HR 8852. The results in B and V are shown in Table I, each entry being the mean of four pairs of observations.

Table I

Differential Photometry

J.D.	HD 219018-HR 8852		HD 219150-HR 8852	
	ΔV	ΔB	ΔV	ΔB
244 4121.697	4.062±.008	3.725±.010	3.539±.007	2.970±.008
4134.682	4.064±.005	3.739±.003	3.534±.003	2.990±.003
4163.610	4.064±.006	3.744±.006	3.534±.006	2.988±.010
4225.496	4.067±.005	3.741±.003	3.559±.004	2.986±.002
4237.464	4.060±.016	-	3.536±.010	-
4242.475	4.057±.018	3.742±.021	3.558±.011	2.988±.002
Weighted means:	4.064±.001	3.740±.002	3.541±.005	2.987±.002

It is clear that there is no variability of HD 219018 exceeding a few thousandths of a magnitude. The same is probably true of HD 219150, although the scatter is slightly larger in ΔV, but quite comparable in ΔB.

However, in the course of this work it was discovered that HD 219150 is a particularly interesting star with a massive uv excess, and more detailed photometry and spectroscopy of it will be reported elsewhere (Fernie and Bolton, in preparation). There is a suggestion that the star may be variable at times or variable on a much longer time-scale.

Meanwhile, it seems safe to continue to use HD 219018 as the primary comparison star for SZ Psc.

J.D. FERNIE

David Dunlap Observatory
Richmond Hill, Ontario
Canada L4C 4Y6

References:
Fernie, J.D. 1979, I.B.V.S. No. 1609
Jakate, S.M. 1979, I.B.V.S. No. 1578

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1743

Konkoly Observatory
Budapest
1980 February 20

HISTORICAL LIGHT CURVE FOR STEPANIAN'S VARIABLE STAR IN SERPENS

Stepanian (1979) reports observations of an unusual variable star in Serpens. A search of the plate collection at the Harvard College Observatory has produced B magnitudes, presented in Table 1, from 1897 to 1979. Comparisons were made with a rough sequence set up from the Palomar Sky Survey blue print (see Liller and Liller, 1975). Figure 1a shows a light curve for this star, and Figure 1b gives the points from 1936 to 1951 on an expanded scale. The light curve is

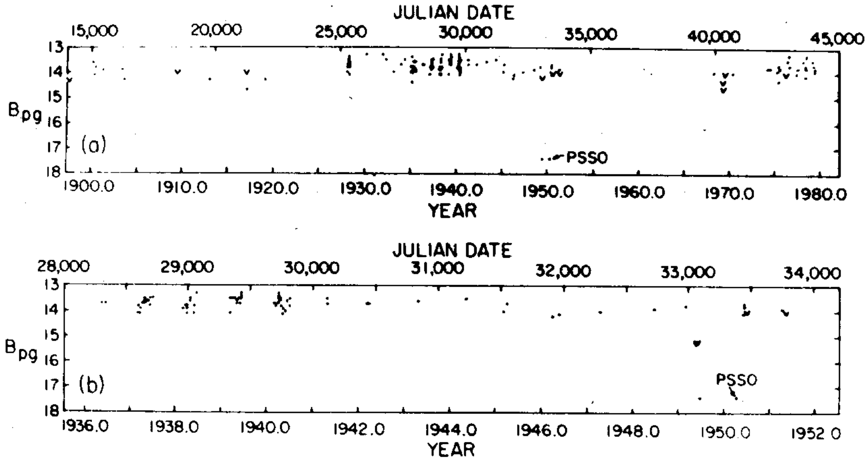


Fig. 1 a. Light curve for Stepanian's Variable in Serpens from 1897 to 1979.

b. Repeat of Fig. 1a from 1936 to 1951 on an expanded scale.

Table 1. B magnitudes for Stepanian's Variable in Serpens

J.D.	Mag.	J.D.	Mag.	J.D.	Mag.	J.D.	Mag.
14098	>14.4	27949	13.6	29396	13.7	33098	17.4:
15095	13.6::	27952	13.8	29396	13.6	33389*	17.4
15134	14.1	27985	13.8	29408	13.5	33446	14.1:
15189	13.8	27986	13.6	29419	13.7	33448	13.7
15502	13.9	28011	14.0	29429	13.5::	33450	13.8
16257	13.9	28308	13.7:	29429	13.3	33477	>14.1
16341	14.3	28342	13.7:	29429	13.4	33752	13.9
18494	>14.1	28602	14.1	29696	13.7::	33781	>14.1
19813	14.3	28604	13.8	29702	13.8	39943	14.0
21284	>14.1	28614	14.1:	29721	13.7	40323	>14.4
21308	14.7	28626	13.9	29726	13.5	40324	>14.7
22025	14.3	28636	13.7	29726	13.3	40332	>14.7
25301	14.0	28644	13.7:	29730	13.4	40383	>14.1
25325	13.8	28654	13.5	29730	13.5	40735	14.0
25361	13.5	28654	13.6:	29734	13.6:	42134	13.8
25361	13.6	28656	13.7	29734	13.5	42154	13.8
25361	13.8:	28656	13.7	29734	13.5	42217	13.8::
25362	13.7	28666	13.6	29748	13.8	42514	13.9
25363	13.6::	28663	13.6:	29760	13.8	42549	14.3:
25363	13.7	28683	13.6:	29760	14.1:	42573	13.7:
25379	13.7	28684	13.6::	29762	13.9	42595	13.8
25379	13.4	28696	13.8	29783	14.0::	42845	>14.1
25379	13.5	28700	13.5:	29787	14.0::	42932	13.5
25382	14.1::	28724	13.5::	29787	13.7::	42934	13.5
25383	13.8::	28964	13.9	29816	13.5::	42977	13.3
25383	13.7	28982	13.8	29819	13.8::	43009	13.7
26059	13.3::	28985	13.8	30113	13.5	43285	14.0::
26725	13.3	28993	13.8	30118	13.7::	43334	13.8
26826	13.5:	28993	13.9	30438	13.7::	43573	13.5
27158	14.0	28996	14.1::	30444	13.7:	43611	13.5::
27457	13.7:	28996	13.8:	30843	13.6	43630	13.7
27576	13.5:	29022	13.6	31223	13.5:	43659	13.8::
27839	13.8	29022	13.5	31523	14.0	43685	14.1::
27840	14.0	29050	13.8	31549	13.7:	43716	13.3:
27875	13.4	29050	14.1	31911	14.2:	43955	13.5
27903	14.4	29052	13.8	31963	14.1:	43987	13.7
27918	14.0	29070	13.3:	32297	14.0	44016	13.9
27924	13.9	29339	13.5:	32728	13.9	44040	13.8
27944	13.6	29339	14.1	32984	13.8		
27948	13.9	29344	13.5	33062	>15.3		
27948	13.9	29377	13.5	33066	>15.3		

* magnitude from PSS-O print.

reminiscent of that for R Coronae Borealis (Mayall, 1960), with a clear minimum in 1949-50 (during which the PSS-O exposure was made) and suggestions of less pronounced minima in 1917 and 1969, and possibly in 1897. A computer search for periodicity of the many observations in 1937-1940 revealed no significant period between 20 and 160 days. Also, there seems to be no simple period that fits the observed minima.

MARTHA H. LILLER
Harvard Smithsonian Center for Astrophysics
60 Garden Street
Cambridge, MA 02138, U.S.A.

References:
Liller, M. H. and Liller, W. 1975, Astrophys. J. Lett. 199, 133.
Mayall, M. W. 1960, Journal Roy. Astr. Soc. Canada 54, 193.
Stepanian, J. A. 1979, I.B.V.S. No. 1630.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1744

Konkoly Observatory
Budapest
1980 February 22

CATALOGUE OF PARAMETERS FOR ECLIPSING BINARIES
(short communication)

On the basis of A Catalogue of Photometric Parallaxes of Eclipsing Binaries (Dworak, 1975) geometric and physical parameters for 1048 eclipsing binaries have been calculated. For calculations we used an iterative method for numerical solutions of the following equations: the third Kepler's law, the Stefan-Boltzman law, the mass-luminosity relation and the relation between relative and absolute radii of components for any eclipsing system. Additionally the radii of Roche lobes have been calculated according to the formulae given by Paczynski (1971). The Catalogue will be published in Acta Astronomica in future. If anybody would like to obtain the computer copy of the Catalogue he is asked to contact with the authors of this communication.

The Catalogue contains the following data of every given star: the name of the star according to GCVS(1971); period in days; the parallax in 0.″00001; separation between the components in solar radii; the absolute radii of components in solar radii; per cent of filling up of the Roche lobe RL1 and RL2; the integral bolometric luminosities L1 and L2 in solar units; the temperatures T1 and T2 in kelvins; the sum of mass SM in solar units; the ratio of mass ALFA; the mass of the first component in solar units; the classical type of eclipsing binaries according to GCVS (A-algol type, B-β Lyrae type, W-W UMa type, E-eclipsing binary of unknown type); the type of Kopal's classification of the eclipsing systems according to calculated radius of the Roche lobe (D-detached system, S-semidetached system, C-contact system, where we understand that the star fills up its Roche lobe if we obtained 95 per cent or more); and the observed spectrum of the system.

HENRYK K. BRANCEWICZ
Institute of Physics,
School for Higher Education
Krakow, ul.Podchrazych 2.,
Institute of Geodesy, University
of Mining and Metallurgy,
Krakow, Al. Mickiewicza 30
pav. c-4, Poland

T. ZBIGNIEW DWORAK
Institute of Meteorology and
Water Management, Krakow,
ul. Borowego 1, Poland

References:
Dworak, T.Z., 1975, Acta Astron. 25, 383
Kukarkin et al., General Catalogue of Variable Stars 1971,Moscow, third edition
Paczynski, B., 1971, Ann.Rev.Astron. Ap. 9, 183

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1745

Konkoly Observatory
Budapest
1980 February 25

PHOTOMETRY OF HR 5110

The RS CVn binary HR 5110 (HD 118616, V = +4.97) was observed on a total of nine nights in June and July 1979 at Biruni Observatory and at Villanova University Observatory, prompted by the observations of large radio outbursts from the system in late May and June 1979 (Feldman, 1979; Viner, 1979). The Biruni observations were obtained using the 51-cm, f/13.5 Cassegrain reflector equipped with an unrefrigerated RCA 4509 multiplier photocell. A Leeds and Northrup Speedomax chart recorder was used to record the amplified photomultiplier output. The Villanova observations were made using a thermoelectrically cooled (-10°C) RCA C31034 Gallium Arsenide photocell attached to the 38-cm reflector. A microprocessor-controlled integrating system recorded the observations (McCook and Maloney, 1979). The comparison star was 25 CVn (HR 5127, V = +4.84, A7 III). Matched pairs of intermediate and narrow-band interference filters centered near the Balmer Hα line were used at the two stations. The bandpass of the intermediate-band Hα filter (Hαw) is sufficiently broad (HWFH~280Å) to be little affected by the presence of the line feature. The filter characteristics are given in Guinan et al. (1979) and Guinan and McCook (1974) for Biruni and Villanova, respectively. Additional observations were obtained at Biruni using Strömgren y and u filters.

The observing sequence was the usual pattern of sky-comparison-variable-comparison-sky, with each observation typically consisting of a 50 sec deflection. The effects of differential atmospheric extinction were removed. The differential Hαw, y and u magnitudes in the sense (V-C) are given in Fig.1 as a function of orbital phase, computed from the ephemeris of Burke et al. (1979):

$$\text{JD Hel. } 2443639.52+2\overset{d}{.}6131738\cdot E$$

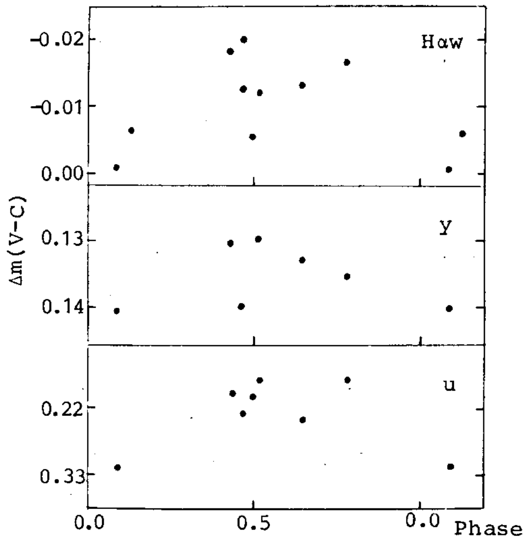


Fig.1. Hαw, y and u light curves of HR 5110

where zero phase corresponds to the conjunction in which the F-star is farthest from the observer (superior conjunction). Hα indices were calculated in the usual manner:

$$\alpha\text{-index}=\text{constant } -2.5 \times \log \left\{ \frac{\text{flux through narrow-band filter}}{\text{flux through broader-band filter}} \right\}$$

The mean, standardized α-index of the variable is typical for its assumed spectral type of F2 IV (Conti, 1967) so that there is no evidence for Hα emission. Bopp and Talcott (1980) have also reported an absence of Hα emission. The α index of the comparison is also nominal for its assumed spectral type. Furthermore, a transformation of the y observations indicates no significant change in the V-magnitude of the system since 1977. As can be seen from Fig. 1 the amplitude of the light variation is small, ~0.13 mag in Hα, with slightly smaller variations in the other two bandpasses, and is about the same as reported by Hall et al. (1978) during 1977-1978. The occurrence of minimum light and maximum light at the superior and inferior conjunctions, respectively, of the F-star are in accord with the light variation expected from the reflection effect in a system seen at low inclination. A full discussion will be published later.

J.D. DORREN
and
N. RIAZI
Biruni Observatory
Shiraz, Iran

E.F. GUINAN
and
M.K. HART
Department of Astronomy
Villanova University
Villanova,
Pennsylvania 19085

References:

Bopp, B.W., and Talcott, J.C. (1980) Astron. J. 85, 55

Burke, E.W., Eaton, J.A., Fisher, G.F., Hall, D.S., Louth, H., Sabria, J.D., Skillman, D.R. (1980) preprint (to be submitted to the Astron. J.)

Conti, P.S. (1967) Astrophys. J. 149, 629

Feldman, P.A. (1979) I.A.U. Circ. No. 3366

Guinan, E.F. and McCook, G.P. (1974) Pub. Astron. Soc. Pac. 86, 947

Guinan, E.F., Dorren, J.D., Siah, M.J. and Koch, R.H. (1979) Astrophys. J. 229, 296

Hall, D.S., Henry, G.W., Vaucher, C.A., Louth, H., Lovell, L.P., Landis, H.J., Brooks, P., Schlegel, R. and Wasatonic, R. (1978) Inf. Bull. Var. Stars No. 1459

McCook, G.P. and Maloney, F.P. (1979) Bull. Am. Astron. Soc. 11, 649

Viner, M.R. (1979) I.A.U. Circ. No. 3368

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1746

Konkoly Observatory
Budapest
1980 February 25

FLARE STAR OBSERVATIONS IN THE NGC 7000 AND IC 5070 REGION IN 1977 - 1979

Four new flare stars and an outburst repetition of the object previously known in this Cygnus region were discovered during 46^h40^m effective observational time on the ultraviolet plates obtained with the 60/90/180 cm Schmidt telescope at the Konkoly Observatory in the period 1977-1979. The centre of observed field is: RA = 20^h52^m; Decl.= $+43^o00'$(1950.0), the observations were made on Kodak 103aO emulsion through a Schott UG-2 filter. The multiple exposure plates contain a series of 6-exposures of 10 minutes each.

Table I.

Konkoly No.	RA. 1950.0	D.	m_u min.	Δm_u	Date
1	$20^h43^m.1$	$43^o33'$	$20^m.5$:	> $6^m.2$	28.09.1979
2	48.8	44 25	17.5	2.2	27.09.1979
2*	48.8	44 25	17.5	0.8	27.09.1979
3	49.0	44 08	19.5	3.2	28.08.1979
4	51.6	44 53	20.5	4.2	24.11.1978
T1	21 00.7	42 08	17.8	3.6	28.08.1979

*In the star No.2 two subsequent flare ups were discovered. Forty minutes after the first outburst the star reached its minimum level. The second outburst occurred about 100 minutes after the first one. These two flare ups are considered as separate flares.

Table I gives the serial number for the new flare stars found in this region at the Konkoly Observatory; approximate coordinates for 1950.0; the approximate minimum brightness in U-band; and the date of the flare events.

In this table the data for the observed flare-up of the already known flare star Tonantzintla No. 1 (Haro G, Chavira E. I.B.V.S.,No. 624, 1972) are also presented.

I. JANKOVICS
J. KELEMEN
Konkoly Observatory
Budapest, Hungary

M.K. TSVETKOV
KATYA P. TSVETKOVA
Department of Astronomy
Bulgarian Academy of Sciences

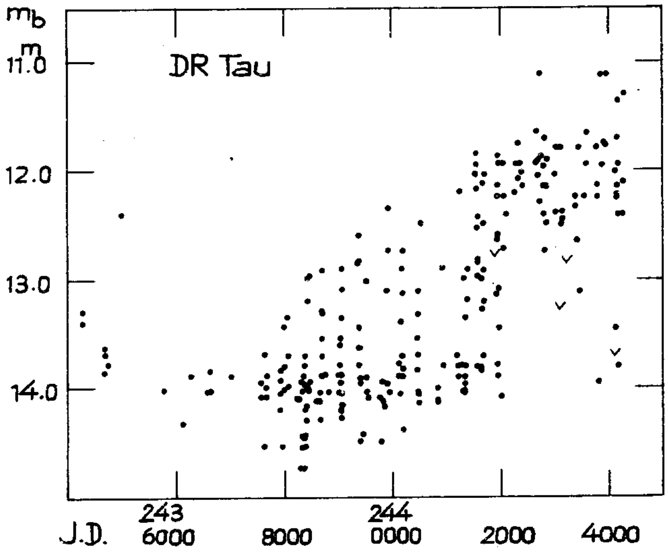
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1747

Konkoly Observatory
Budapest
1980 February 26

THE BRIGHTNESS INCREASE OF DR TAURI

The star was inspected on 691 blue-sensitive sky patrol plates of Sonneberg Observatory covering the years from 1931 to January 1980, in order to complete the light curve of the object given by Chavarria-K.(1). Most of these plates (n=587, observer H. Huth) were exposed between the years 1952 and 1980. Their limiting magnitude amounts to about $14^m.0$ on the average.

For calibration purposes the chosen comparison stars which include those given by Kholopov (2) were linked to the UBV-sequence of NGC 1647 (3) situated in the neighbourhood of DR Tau.



The result of the investigation is shown in Figure 1. There is no doubt that the star increased in mean brightness during the last 20 years. The continuous increase which is superimposed by highly short time variations amounts to more than $3^{m}_{\cdot}5$ in the blue region. Occasionally the short time variability is characterized by changes of more than $1^{m}_{\cdot}5$ per day. The scattered observations given by other authors (see also (1)) are in agreement with our results and follow the light curve without contradiction.

The beginning of the increase at 1960 (J.D. 243 7000) can be stated also by the number of plates on which the star is invisible. The percentage of such plates in relation to the respective whole number amounts to 80% or 90% in the years before 1960 and is decreasing continuously to 1980 when the object is visible on all plates. Therefore and because of the worse limiting magnitude the plates exposed before 1960 show the star only in phases of maximum brightness.

The obtained results and a discussion of the light curve in detail will be published in MVS.

W. GÖTZ
Akademie der Wissenschaften
der DDR Zentralinstitut für
Astrophysik, Sternwarte Sonneberg

References:
(1) Chavarria-K. C., 1979, Astron. Astrophys. 79, L18-L21
(2) Kholopov, P.N., 1951, VS 8, 83
(3) Hoag, A.A., Johnson, H.L., Iriarte, B., Mitchell, R.I.,
Hallam, K.L., Sharpless, S., 1961, Publ. US Naval Obs.,
2nd Ser, Vol.17., No. VII

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1748

Konkoly Observatory
Budapest
1980 February 27

ACCURATE POSITIONS OF SOME R CORONAE BOREALIS VARIABLE STARS

The absolute equatorial coordinates α and δ (1950.0) of a group of 14 R Coronae Borealis variable stars were determined.

The identification of these stars appeared to be difficult due to their quite irregular variations as well as by the fact that the positions given in the General Catalogue of Variable Stars (Kukarkin et al. 1969) are only approximate.

The average positions determined in this work (Table I) were obtained from, at least, two plates of four square degrees each, taken with the Gauthier Astrograph telescope. The x,y rectangular coordinates were measured using a Wild A7 measuring machine with an accuracy of 5 microns whilst the reductions to right ascension and declination were performed with an Olivetti P 6060 Computer applying the least square method. The accuracy

Table I

Star	α	(1950.0)	δ	
UW Cen	$12^{h}40^{m}26^{s}.400$	(26^{s})*	$-54^{\circ}15'14''.55$	(16")*
Y Mus	13 02 34.257	(34)	-65 14 43.74	(43)
DY Cen	13 22 27.136	(25)	-53 59 11.13	(11)
Z Cir	13 47 03.135	(02)	-70 13 32.03	(23)
AE Cir	14 40 22.576	(23)	-69 10 57.69	(53)
S Aps	15 04 21.448	(20)	-71 52 17.76	(01)
RT Nor	16 20 02.844	(04)	-59 13 46.60	(54)
RZ Nor	16 28 45.063	(40)	-53 10 47.63	(09'37")
WX CrA	18 05 25.704	(26)	-37 20 16.58	(08")
RS Tel	18 15 07.050	(07)	-46 34 07.64	(02)
V 1860 Sgr	18 18 24.069	(24)	-24 46 38.80	(34)
GU Sgr	18 21 11.761	(12)	-24 17 08.29	(16'46")
MV Sgr	18 41 33.090	(33)	-21 00 22.91	(24")
RY Sgr	19 13 16.927	(17)	-33 36 42.34	(40)

*Coordinates from the General Catalogue of Variable Stars (Kukarkin et al. 1969) for 1950.0 are given in brackets.

of both coordinates is ±0".1 (mean square deviation).

On each plate, 8 reference stars were taken using in all cases the Cape Photographic Catalogue for 1950.0 with the exception of stars V 1860 Sgr, GU Sgr, and MV Sgr, for which the Transactions of the Astronomical Observatory of Yale University (1950.0) were used. The positions based on the Cape stars are on the FK3 system for eq. 1950.0.

Identification charts for these stars are available on request from the author.

I am indebted to Dr.L.A. Milone under whose direction this project was conducted.

M.M. VILLADA
Observatorio Astronomico
Laprida 854
5000 Cordoba
Argentina

Reference:
Kukarkin, B.V., Kholopov, P.N., Efremov, Yu.N., Kukarkina, N.P., Kurochkin, N.E.,Medvegeva, G.I., Perova, N.B., Fedorovich, V.P., and Frolov, M.S., 1969, General Catalogue of Variable Stars, Moscow State University

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1749

Konkoly Observatory
Budapest
1980 February 27

FLARE STARS IN THE PLEIADES REGION

In the summer 1979 we started a patrol observation programme of flare stars in stellar aggregates at the National Astronomical Observatory of Bulgaria (on Mt.Rodopy, at Rojen, 1760 m above sea level). The observations were made with the 50/70/172 cm Schmidt telescope which had been previously mounted in Potsdam, now being one of the telescopes at the observatory in Rojen.

From October to December 1979, 27 patrol plates were taken by the method of equal multiple exposures. The observations were made on ORWO ZU-21 emulsion using Schott UG-2 filter. The limiting magnitude in U-band was about $17^m.3$ and the field covered 14.4 square degrees centered on Alcyone. The scale on the telescope is 122" per millimetre. The total effective time of observations is 26^h50^m, they include 161 single 10 minute exposures.

The data of observed flare stars are summarized in Table I.

Table I

Rojen Nos	HII	RA	D	m_u min.	Δm_u	Date	Ident. Byurakan Nos.
1	133	$3^h30^m.5$	$24^\circ 23'$	$16^m.9$	$1^m.4$	09.12.1979	397
2	335	38.4	23 45	16.0	0.9	17.10.1979	73
3		45.0	22 22	18.4	3.8	17.10.1979	475
4		45.0	23 38	:20.5	>6.1	17.10.1979	
5	3101	45.7	22 53	15.8	2.6	18.10.1979	111

The successive columns give the following data:

1 Rojen designation,
2 the Hertzsprung numbers,
3-4 coordinates for 1900.0,
5 photographic magnitude of the stars at minimum,
6 amplitude of the observed flare,
7 date of the flare events (U.T.),
8 identification of the flare stars by the Byurakan lists.

M.K. TSVETKOV
S.A. TSVETKOV
ASSYA G. TSVETKOVA

Department of Astronomy with
National Astronomical Observatory
Bulgarian Academy of Sciences
Sofia-1000, 7th November Str.1
Bulgaria

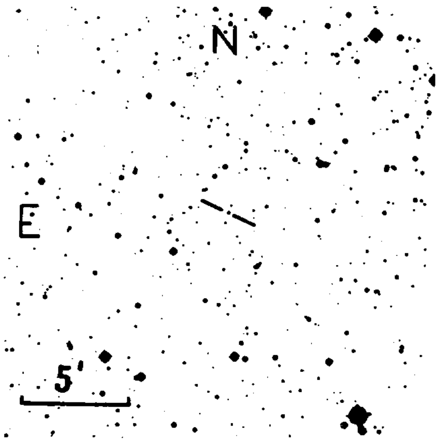
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1750

Konkoly Observatory
Budapest
1980 February 27

THE FIRST FLARE STAR IN THE REGION NEAR γ CYGNI

According to the programme of regular search for flare stars in different stellar aggregates we took 10 ultraviolet multiple exposure plates near γ Cygni (on the stellar association Cygnus T2) between July 1977 and August 1978. Our observations were carried out with the 40" Schmidt telescope at the Byurakan Observatory on Kodak 103AO emulsion with 2 mm Schott UG-2 filter. The centre of the observed field is RA = 20^h20^m, Decl.= 41^o10^m(1950.0). The multiple exposure plates contain a series of 6-exposures of 5 or 10 minutes each. A new flare star was discovered during 6^h10^m effective observational time.

Figure 1 gives the identification chart of the new flare



star (on No. E-754 POSS print) and in Figure 2 the observed flare up is presented.

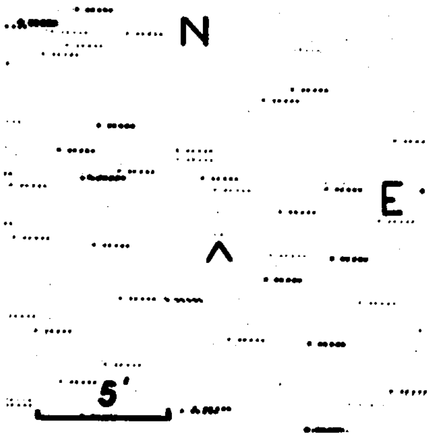


Table I gives the approximate coordinates for this flare star and the data of the flare event.

Table I

Byurakan No.	RA	D	m_u min	Δm_u	Date of flare up
	1950.0				
1	$20^h32^m.5$	$+43^\circ30'$	$18^m.3$	$1^m.8$	12.09.1977

N.D. MELIKJAN
Byurakan Observatory
I. JANKOVICS
Konkoly Observatory

KATYA P. TSVETKOVA
M.K. TSVETKOV
Department of astronomy
Bulgarian Academy of Sciences

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1751

Konkoly Observatory
Budapest
1980 February 27

PHOTOELECTRIC MINIMA OF ECLIPSING VARIABLES

The photoelectric minima of eclipsing binaries listed below, with one exception, were all observed with the 60 cm reflector of the Konkoly Observatory. The observations were done with an unrefrigerated EMI 9502B type photomultiplier combined with 2mm UG1; 1mm BG12+ 2mm GG13, and 2mm GG11 filters.

Linear elements given in the First (I), Second (II) and Third (III) Supplements to the 1969 General Catalogue of Variable Stars were used for computing the O-C values. N denotes the number of individual observations each consisting of six measurements.

Star	J.D. hel	$O-C_I$	$O-C_{II}$	$O-C_{III}$	Colour	N	Remark
U Peg	2442291.543			-.003	BV	24	
	2444185.3093			-.0070	BV	18	
VV UMa	2442811.4871			-.0011	UBV	51	1m RCC
	2443198.4800			+.0019	BV	34	
	2444014.3973			+.0100	BV	32	
SZ Her	2442956.4657	-.0037			BV	52	
RT And	2443044.3992			-.0143	BV	48	
SW Lyn	2443966.372			-.009	BV	32	
	2443975.3907			-.0070	BV	56	
AI Dra	2443966.5571		-.0054		BV	74	
RW CrB	2444010.410		-.002		BV	42	
V836 Cyg	2444129.5100	+.0071			BV	48	

L. PATKÓS

Konkoly Observatory
Budapest

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1752

Konkoly Observatory
Budapest
1980 February 28

PHOTOMETRIC OBSERVATIONS OF THE VARIABLE (?) UV-BRIGHT STAR K1082 IN M15

We present further observations of K1082 in M15, made to try to confirm the 2-hour variation observed by Chu (1977) and not found by Smith et al. (1979). Photoelectric magnitudes were obtained by RAS with the 1.3-m reflector at Kitt Peak, and by MHL with the 1.5-m Catalina reflector (University of Arizona) at Mt. Lemmon. Photographic magnitudes are from blue plates taken with the 1.5-m Wyeth reflector of Harvard College Observatory's Agassiz Station. The data are presented in Table I.

On the nights during which several observations were made, we find no evidence for a 2-hour variation. There seems, however, to be a possibly significant difference between mean magnitudes and colors on different nights. The photographic observations from Agassiz still are about 0.1 mag fainter than other observations (see Smith et al.); this effect may be due to the much lower altitude of Agassiz Station as compared to the other sites, combined with the rather blue color of K1082 compared to the photographic standards.

Thus we suggest that there is currently no short-period variation of K1082, but variations over periods longer than several hours remain a distinct possibility.

MARTHA H. LILLER
Harvard-Smithsonian Center for Astrophysics
Cambridge, MA 02138, U.S.A.

ROBERT A. SCHOMMER
Yerkes Observatory
Williams Bay, WI 53191, U.S.A.

References:

Chu, Y.-H. 1977, Chinese Astronomy 1, 302.

Smith, H. A., Millis, A. J., and Liller, M. H. 1979, Publ. Astron. Soc. Pacific 91, 671.

Table I. Magnitudes for K1082 in M15

JD$_{\text{Hel.}}$	Photoelectric			Photographic	Observatory
2,440,000+	V	B-V	U-B	B	
3987.812				15.37	Agassiz
4022.910	14.98	+.25	+.16		KPNO
.921	14.96	+.25			"
.931	14.97	+.23			"
.942	14.99	+.20			"
.952	14.96	+.24	+.21		"
4023.927	15.00	+.23	+.28		"
.933	15.00	+.23			"
.949	15.02	+.18	+.23		"
.953	15.00	+.23			"
.958	15.02	+.21			"
4048.896	14.92	+.26			Mt. Lemmon
.903	14.93	+.26			"
.910	14.93	+.25			"
.917	14.94	+.25			"
4049.844	14.94	+.25			"
.851	14.93	+.26			"
.858	14.94	+.26			"
.865	14.93	+.26			"
.872	14.93	+.26			"
.881	14.92	+.27			"
.888	14.94	+.26			"
.895	14.93	+.26			"
.902	14.93	+.26			"
.916	14.92	+.27			"
.924	14.93	+.27			"
4050.757				15.36	Agassiz
.838	14.91	+.25			Mt. Lemmon
.845	14.91	+.26			"
.852	14.92	+.26			"
.859	14.92	+.26			"
.866	14.92	+.26			"
.872	14.89	+.27			"
4052.717				15.36	Agassiz
.736				15.34	"
4058.715				15.40	"
.736				15.34	"
.757				15.30	"
.777				15.36	"
4116.673				15.32	"
.704				15.28	"
.737				15.30	"
4134.651				15.34	"
4143.603				15.34	"
.631				15.38	"
.647				15.30	"
.659				15.34	"
.686				15.34	"

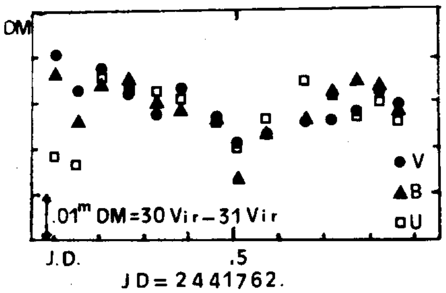
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1753

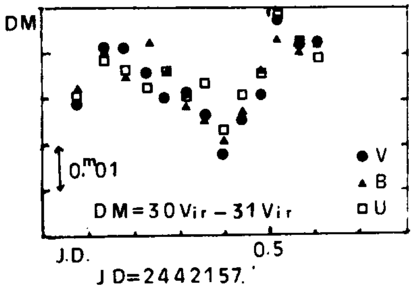
Konkoly Observatory
Budapest
1980 March 3

RHO Vir : A HOT DELTA SCUTI STAR ?

The star Rho Vir was observed photoelectrically during 12 nights since February 27, 1971 to March 1, 1976 with the UBV photometer described by Piccioni (1972) mounted on the 60 cm telescope of the Bologna observatory.

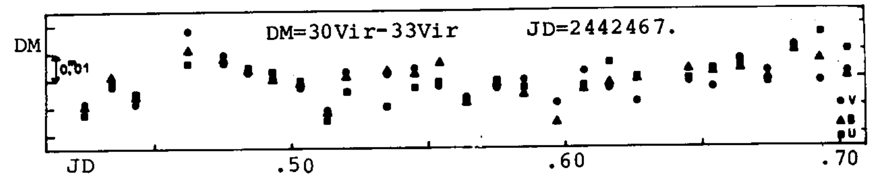
31 Vir and 33 Vir were used as comparison stars; the reductions were performed taking into account also the colour effects of the atmosphere. Light curves obtained during the nights March 20, 1973, April 19,1974 and February 23, 1975 are reproduced in the Figures.





In order to confirm the variability of Rho Vir we have made search for periods in the observations secured in 7 nights with the Barning (1963) method using a program written by F.Grilli. From the results reported in Table I and II, for the comparison stars 31 Vir and 33 Vir respectively, we note that periods close to $0\overset{d}{.}022$, $0\overset{d}{.}029$ and $0\overset{d}{.}08$ occur very often.

The actual variability of this star is supported also by the fact that Frost et al. (1929) detected radial velocity varia-



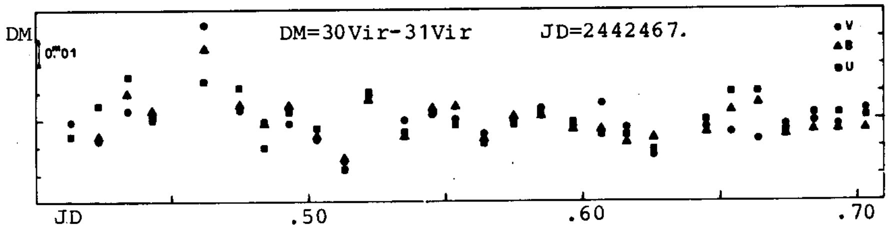


Table I

J.D.		Period	Amplitude	R.F.
2442467.	P1	0.074±0.007	0.010±0.002	26.6 %
	P2	0.023±0.001	0.007±0.002	16.0 %
	P3	0.100±0.008	0.006±0.002	12.0 %
2442468.	P1	0.023±0.001	0.010±0.002	19.2 %
	P2	0.08 ±0.01	0.008±0.002	16.0 %
	P3	0.029±0.001	0.006±0.002	10.0 %
2442833.	P1	0.042±0.003	0.006±0.001	18.0 %
	P2	0.028±0.001	0.006±0.001	28.6 %
2442836.	P1	0.08 ±0.01	0.008±0.001	22.8 %
	P2	0.022±0.001	0.006±0.001	11.0 %
2442837.	P1	0.09 ±0.01	0.006±0.002	14.7 %
2442838.	P1	0.07 ±0.01	0.016±0.004	24.3 %
	P2	0.024±0.001	0.010±0.004	13.0 %
	P3	0.032±0.002	0.009±0.004	8.0 %

Table II

J.D.		Period	Amplitude	R.F.
2442451.	P1	0.048±0.002	0.010±0.001	21.5 %
	P2	0.036±0.004	0.005±0.001	7.5 %
	P3	0.076±0.006	0.005±0.001	8.0 %
2442467.	P1	0.029±0.001	0.010±0.002	23.0 %
	P2	0.10 ±0.01	0.008±0.002	16.4 %
	P3	0.022±0.001	0.006±0.002	20.0 %
2442468.	P1	0.029±0.001	0.014±0.002	27.0 %
	P2	0.040±0.002	0.010±0.002	21.0 %
	P3	0.08 ±0.01	0.010±0.002	19.0 %

tions up to 20 km/sec in about one hour. However the spectral type AOV (Eggen, 1963) or A1V (Osawa, 1959) puts this star outside the normal Delta Scuti instability strip, not far from the left corner of the H-R diagram (Breger, 1979, page 7), being M_V=2.05 (Eggen, 1963). We suggest therefore that Rho Vir could be a "Maia variable" linking the Delta Scuti stars with the Beta CMa stars (Breger, 1979, page 23).

C. BARTOLINI
A. DAPERGOLAS
G. PARMEGGIANI
A. PICCIONI
M. VOLI
Osservatorio Astronomico dell' Università
di Bologna, via Zamboni 33,40126 Bologna
Italy

References:
Barning, F.J.M., 1963, Bull.Astr.Netherland 17, 22
Breger, M., 1979, P.A.S.P., 91, 5
Eggen, O.J., 1963, A.J. 68, 697
Frost, E.B., Barrett, S.B., Struve, O., 1929, Publ.Yerkes Obs.7,1
Osawa, K. 1959, Ap.J. 130, 159
Piccioni, A., 1972, Mem.Soc.Astr.It. 43, 159

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1754

Konkoly Observatory
Budapest
1980 March 5

SPECTROPHOTOMETRIC OBSERVATIONS OF MIRA CETI

Following an announcement in the IAU Circular No. 3407 by S. McLean, we have observed the long period variable Mira (o Ceti) on two nights (6 and 18 October 1979) with the help of a scanner attached to the 104-cm reflector of the Uttar Pradesh State Observatory as a spectral resolution of 50 Å. The monochromatic magnitudes of the star have been corrected for atmospheric extinction and have been put on an absolute scale corresponding to Hayes and Latham (1975) calibration of Vega. Table 1 gives these data.

From a plot of these data against wavelength (λ), classification indices α,β and γ (Rautela and Joshi, 1979) were formed. These indices reveal spectral types of M5.5 III and M4.5 III of the star on the 6th and on the 18th October 1979, respectively. From a correlation of β index with effective temperature, the effective temperatures on the above two nights were found to be 2470° K and 2760°K.

S.C. JOSHI,
B.S. RAUTELA
B.B. SANWAL
Uttar Pradesh State
Observatory, Naini Tal
263129, India

References:
Hayes, D.S. and Latham, D.W.: 1975, Astrophys.J. 197, 593
Rautela, B.S. and Joshi, S.C.: 1979, Bull.Astron.Soc.India,7,43

Table 1

Monochromatic fluxes of the star Mira Ceti normalized to λ 555.0 nm

λ (nm)	6/7 Oct. 1979	18/19 Oct. 1979	λ (nm)	6/7 Oct. 1979	18/19 Oct. 1979
400	+0.63	-	600	-0.14	-0.47
405	+0.50	-	605	-0.37	-0.28
410	+0.49	-	610	-0.51	-0.20
415	+0.50	-	615	-0.60	-0.34
420	+0.57	-	620	-0.54	-0.62
425	+0.63	-	625	-0.33	-0.63
430	+0.66	-	630	-0.46	-0.94
435	+0.67	-	635	-0.75	-1.04
440	+0.71	-	640	-0.96	-1.12
445	+0.79	-	645	-1.13	-1.13
450	+0.83	-	650	-1.37	-0.99
455	+0.84	-	655	-1.32	-0.89
460	+0.81	-	660	-1.32	-0.88
465	+0.83	+1.02	665	-1.27	-0.96
470	+0.79	+1.07	670	-1.13	-1.14
475	+0.68	+0.88	675	-1.02	-1.30
480	+0.64	+0.81	680	-1.10	-1.54
485	+0.63	+0.77	685	-1.32	-1.73
490	+0.44	+0.47	690	-1.51	-1.79
495	+0.24	+0.17	695	-1.82	-1.65
500	+0.31	-0.03	700	-1.92	-1.29
505	+0.45	-0.20	705	-2.10	-1.26
510	+0.17	-0.06	710	-1.96	-1.41
515	+0.00	+0.13	715	-1.70	-1.66
520	-0.06	-0.03	720	-1.49	-1.93
525	+0.02	-0.13	725	-1.66	-2.11
530	-0.07	-0.14	730	-2.01	-2.39
535	-0.08	-0.09	735	-2.47	-2.46
540	-0.18	+0.00	740	-2.73	-2.48
545	-0.17	-0.01	745	-2.81	-2.48
550	-0.09	+0.00	750	-2.83	-2.09
555	+0.00	-0.08			
560	+0.01	-0.18			
565	+0.05	-0.30			
570	-0.05	-0.30			
575	-0.16	-0.10			
580	-0.26	-0.12			
585	-0.28	-0.17			
590	-0.07	-0.30			
595	-0.02	-0.42			

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1755

Konkoly Observatory
Budapest
1980 March 5

NOUVELLE RECHERCHE DE PÉRIODES D'ÉTOILES Ap OBSERVÉES À L'ESO-IV

Huit étoiles Ap, dont les variations photométriques n'avaient pas encore été recherchées, ont été mesurées en juin 1979, dans le système uvby, avec le photomètre attaché au télescope danois de 50cm situé à l'ESO (qui malheureusement présente toujours des défectuosités de fonctionnement : cf. IBVS 1391). Les réductions ont été faites comme pour les séries précédentes. Pour la recherche des périodes, on a aussi utilisé la méthode habituelle (un peu perfectionnée grâce à l'utilisation de tracés "Benson" de θ_1 et θ_2 en fonction des valeurs "essayées" de 1/P, dont le nombre est en général de l'ordre de dix mille). En bref, les résultats sont les suivants.

Etoile	type spectral	période (j)	gradeur approx. (±0.005:) de la variation (mag.)			
			y	b	v	u
HD 143658=GC21561	AOpSi	5.2±0.2	0.014	0.013	0.014	0.026
HD 144231=GC21650	B9pSi	4.41±0.08	0.028	0.030	0.030	0.061
HD 148898=ω Oph	A7pSr	2.99±0.05 (ou 1.5)	0.006	0.006	0.007	0.012
HD 150549=41G.TrA	AOpSi	3.76±0.05	0.033	0.044	0.046	0.060
HD 151771=HR6244	B9pSi	longue?	0			
HD 159376=52 Oph	B8pSi	9.75±0.4	0.041	0.051	0.052	0.079
HD 164258=HR6709	A3pSr	(2.41±0.03)?	0.008	0.016	0.015	0.020
HD 166596=3G.CrA	B3pSi	1.67±0.01 (ou 0.83)	0.05	0.04	0.04	0.05?

La période de ω Oph et celle de HR 6709 sont incertaines à cause de l'extrême petitesse des variations. Celles de HD 143658 sont d'ailleurs petites aussi et les amplitudes sont particulièrement peu précises pour cette étoile. Ceci est aussi le cas pour 3 G.CrA, pour laquelle la recherche de la période elle-même est rendue très difficile, malgré l'amplitude relativement grande, à cause d'une double vague - si la période est 1.67j, comme c'est le plus probable - et à cause d'erreurs observationnelles plus grandes provenant de ce qu'une des deux étoiles de comparaison, HD 167756, a dû être éliminée parce qu'elle varie (et peut-être l'autre aussi, sous forme de très petites éclipses !).

Un net maximum secondaire existe aussi, dans la branche descendante des courbes, pour 41 G.TrA. Pour 52 Oph, le maximum est beaucoup plus plat que le minimum.

Comme c'est le cas pour la plupart des étoiles Ap, on voit que la variation est plus grande dans l'ultraviolet que dans le visible.

Plus de détails et notamment les graphiques des variations seront publiés ailleurs.

P. RENSON et J. MANFROID

Institut d'Astrophysique
de l'Université de Liège
Avenue de Cointe 5
B-4200 Cointe-Ougree
Belgique

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1756

Konkoly Observatory
Budapest
1980 March 11

FURTHER OBSERVATIONS OF SX PHOENICIS

Seventeen times of maximum light of SX Phe were observed during 1979, and were subsequently analysed to find whether the fundamental and first overtone periods of the star had changed from the values determined by Coates et al. (1979).

Based on these previously determined values of the periods, we have tabulated the residuals (observed-calculated) for the 17 maxima. The rms value of the residuals is 0.0010 day, which can be accounted for by experimental error. We thus conclude that there has been no significant change in the accepted periods of

$$P_o = 0.054964438 \text{ day}$$
$$P_1 = 0.042772692 \text{ day}$$

Table I

Observed times of maximum light of SX Phe
for 1979
(fundamental cycles are for Epoch HJD 2438636.6170)

	Cycle No.	t_{max}(obs.) HJD+2440000.0	Residual (obs-calc)
1	98128	4030.1687	-0.0009
2	99583	4110.1453	+0.0026
3	99966	4131.1959	+0.0007
4	99981	4132.0155	+0.0001
5	100126	4139.9847	+0.0006
6	100127	4140.0467	+0.0026
7	100129	4140.1482	+0.0002
8	100290	4148.9979	-0.0002
9	100799	4176.9751	+0.0009

Table I (cont.)

	Cycle No.	t_{max}(obs.) HJD+2440000.0	Residual (obs-calc)
10	100800	4177.0326	+0.0003
11	100801	4177.0906	+0.0001
12	100802	4177.1409	-0.0001
13	100928	4184.0682	0.0000
14	100929	4184.1206	+0.0011
15	100930	4184.1790	+0.0002
16	100965	4186.1038	+0.0018
17	100966	4186.1585	-0.0009

D.W. COATES, L. HALPRIN, G.N. HEINTZE, K. THOMPSON
Department of Physics
Monash University,
Clayton Victoria, 3168,
Australia

Reference:

Coates, D.W. et al., 1979, Mon.Not.R.Ast.Soc. 187, 83 - 89

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1757

Konkoly Observatory
Budapest
1980 March 12

THE DELTA SCUTI VARIABLE GG Vir

The star 27 Vir=GG Vir was announced to be a Delta Scuti variable with a period of $0\overset{d}{.}05$ by Bartolini et al.(1975). Sterken (1977) confirmed this variability and pointed out by means of six colour photometry that the period was variable from $0\overset{d}{.}042$ to $0\overset{d}{.}056$ during two nights.

Furthermore this star presents radial velocity variations (Palmer et al. 1968; Plaskett et al. 1922).

27 Vir was observed during 13 nights since February 7,1975 to February 1, 1980 with the three colour photoelectric photometer described by Piccioni (1972) mounted on the 60cm reflector telescope of Bologna Observatory. 31 Vir and 33 Vir were used as comparison stars; the reductions were accomplished taking into account the colour effects of the atmosphere.

The collected data were analysed by means of a program written by F. Grilli in order to search for multiperiodicities using the Barning (1963) method; the range of periods investigated was from $0\overset{d}{.}022$ to $0\overset{d}{.}133$. The results for the comparison stars 31 Vir and 33 Vir are summarized in Table 1 and 2, respectively.

Table I

J.D.	Period	Amplitude	R.F.
2442451.	P1 0.037±0.001	0.008±0.002	13.3%
	P2 0.030±0.001	0.006±0.002	11.6%
	P3 0.064±0.004	0.004±0.002	6.7%
2442467.	P1 0.027±0.001	0.012±0.002	13.7%
	P2 0.031±0.001	0.008±0.002	10.1%
	P3 0.056±0.003	0.006±0.002	7.1%
2442468.	P1 0.064±0.004	0.012±0.002	18.5%
	P2 0.047±0.002	0.012±0.002	19.7%
	P3 0.027±0.001	0.008±0.002	12.6%

Table II

J.D.	Period	Amplitude	R.F.
2442467.	P1 0.027±0.001	0.014±0.002	24.4%
	P2 0.050±0.002	0.006±0.002	6.3%
	P3 0.033±0.001	0.006±0.002	4.3%
2442468.	P1 0.059±0.003	0.016±0.003	24.8%
	P2 0.031±0.001	0.012±0.003	18.1%
	P3 0.024±0.001	0.012±0.003	18.7%
2442833.	P1 0.030±0.001	0.010±0.002	18.4%
	P2 0.083±0.006	0.006±0.002	12.1%
2442836.	P1 0.030±0.002	0.008±0.002	25.0%
	P2 0.083±0.006	0.008±0.002	20.0%
	P3 0.042±0.003	0.004±0.002	13.0%
2442837.	P1 0.037±0.002	0.007±0.003	12.4%
	P2 0.061±0.005	0.008±0.003	17.4%
2442838.	P1 0.033±0.002	0.008±0.003	7.0%
	P3 0.023±0.001	0.006±0.003	6.0%

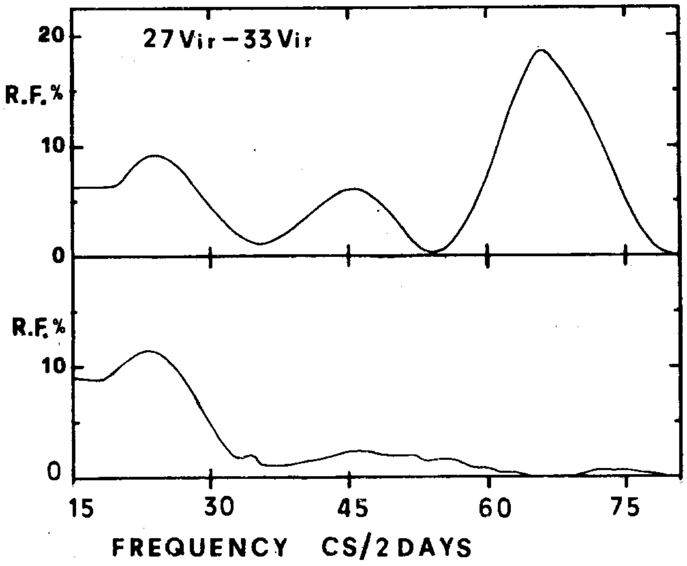


Figure 1

In the Figure the Reduction Factor (R.F.) defined by Barning(1963) is plotted against frequency (number of cycles in 2 days) for the night of February 24, 1976.

Analysing all the observations collected in the nights of February 23 and 24, 1975 together the values of the R.F. and the amplitude become smaller, as shown by Table 3. This result

Table III

J.D.	Period(Days)	Amplitude	R.F.
2442467/8	P1 0.02745±0.00008	0.010±0.002	12%
	P2 0.0559 ±0.0003	0.008±0.002	7%
	P3 0.0320 ±0.0001	0.006±0.002	6%
2442833/6	P1 0.0302 ±0.0003	0.008±0.002	20%
	P2 0.0813 ±0.0002	0.007±0.002	12%

confirms that 27 Vir has also variable period in a time scale of one day as Sterken (1977) found. However in both nights (February 24 and 27, 1976) the same periods $0^{\mathrm{d}}.030$ and $0^{\mathrm{d}}.083$ are found.

Beside these the periods $0^{\mathrm{d}}.027$, $0^{\mathrm{d}}.037$ and others close to $0^{\mathrm{d}}.060$ often occur. According to the formulae given by Breger and Bregman (1975) and the values $M_V=1.92$ and b-y=0.12 published by Breger (1979), for the fundamental period and the overtones the values $P_o=0^{\mathrm{d}}.057$, $P_1=0^{\mathrm{d}}.043$, $P_2=0^{\mathrm{d}}.035$ and $P_3=0^{\mathrm{d}}.030$ are deduced that fit fairly well with the observed values.

C. BARTOLINI

A. DAPERGOLAS

A. PICCIONI

M. VOLI

Osservatorio Astronomico
dell'Università di Bologna
via Zamboni 33 40126
Bologna, Italy

References:
Barning, F.J.M. 1963, Bull. Astr. Netherland 17, 22
Bartolini, C., Piccioni, A., Silveri, P., 1975,I.B.V.S.No.981
Breger, M. 1979, P.A.S.P. 91, 5
Breger, M. and Bregman, J.N. 1975, Ap.J. 200, 343
Palmer,D.R., Walker, E.N., Jones, D.H.R. and Wallis, R.E. 1968, Roy.Obs.Bull., No. 135
Plaskett, J.S., Harper, W.E., Young,R.K., Plaskett, H.H., 1922, Dom.Astr.Obs. 1, 287
Piccioni, A. 1972, Mem.Soc.Astr.It. 43, 159
Sterken, C. 1977, I.B.V.S. No. 1294

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1758

Konkoly Observatory
Budapest
1980 March 18

A LOW-AMPLITUDE RED VARIABLE STAR NEAR THE GLOBULAR CLUSTER NGC 6352

Photoelectric observations spanning 10 years of UBV secondary standard stars (Hartwick and Hesser 1972) near the southern globular cluster NGC 6352 ($\alpha_{1950}=17^h21^m.6$, $\delta_{1950}=-48^{\circ}26'$; $l=342^{\circ}$, $b=-7^{\circ}$) have recently been summarized preparatory to undertaking calibration of a new color-magnitude diagram for the cluster. The observations were made on the telescopes of the Cerro Tololo Inter-American Observatory with both single- and dual-channel photometers, RCA 1P21 or ITT FW-130 (S20) photomultipliers, appropriate filters, and charge integration or pulse counting techniques. E-region standards (Cousins and Stoy 1962, Cousins, Lake and Stoy 1966, selected as described by Hartwick, Hesser and McClure 1972) were observed each night; in 1979 use was also made of Landolt's (1973) standards having numerous observations.

With the exception of star E (and noting that the V value for star A in Hartwick and Hesser (1972) should read 7.01 mag), the mean difference between the latest values (where the quantity of data has been approximately quadrupled) and the original ones given by them is 0.004 ± 0.003 (s.d.), 0.000 ± 0.002, and -0.002 ± 0.002 mag for V, B-V, and U-B, respectively.

Star E, however, is found to be a low amplitude ($\Delta V \sim 0.3$ mag) variable. Its mean V, B-V, and U-B values are 9.43, 1.83, and 1.96 mag, respectively. The standard deviations of the individual values entering into the respective means are 0.10, 0.02, and 0.06 mag; thus B-V is constant within the precision of these data. Individual photoelectric magnitudes and colors for N6352-E are given in the Table, where multiple measures on the same night have been averaged. Clearly, the highly irregular spacing

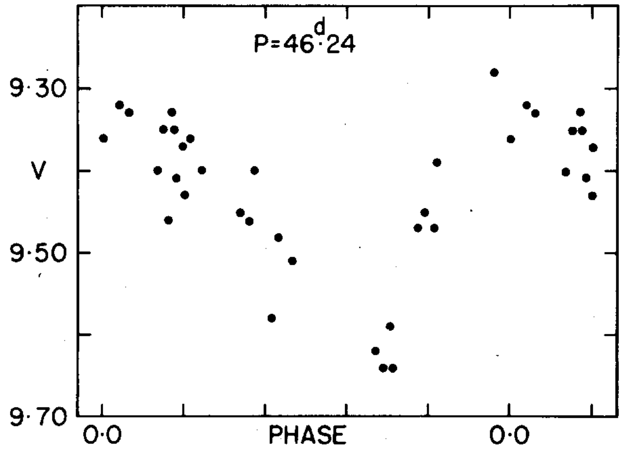


Figure 1

Table I

NGC 6352 - Star E Photoelectric UBV Measurements

Date (dd-dd/mm/yy)	V (mag)	B-V (mag)	U-B (mag)	Notes	Date	V	B-V	Notes
22-23/05/69	9.36	1.81	2.05	1	28-29/03/73	9.58	1.84	3
24-25/05/69	9.32	1.81	2.04	1	27-28/05/73	9.49	1.81	3
25-26/05/69	9.33	1.81	1.88	1	01-02/06/73	9.47	1.83	3
30-31/05/69	9.33	1.78	1.99	1	26-27/08/73	9.62	1.82	3
17-18/04/70	9.40	1.83	1.94	1	27-28/08/73	9.64	1.80	3
18-19/04/70	9.46	1.79	1.94	1	28-29/08/73	9.64	1.78	3
19-20/04/70	9.41	1.83	1.92	1	20-21/08/74	9.48	1.86	3
20-21/04/70	9.43	1.83	2.00	1	11-12/06/75	9.39	1.86	3
21-22/04/70	9.40	1.83	1.96	1	05-06/07/75	9.45	1.84	3
03-04/06/70	9.35	1.84	2.02	1,2	06-07/07/75	9.46	1.86	3
04-05/06/70	9.35	1.85	1.98	1,2	27-28/03/79	9.47	1.80	3
05-06/06/70	9.37	1.82	2.01	1	28-29/03/79	9.45	1.83	3
14-15/06/70	9.40	1.83	1.98	1	18-19/07/79	9.36	1.82	3
11-12/05/72	9.51	1.82	1.90	1				
19-20/07/72	9.28	1.87	1.83	1				

Notes:

1. 1P21 photomultiplier.
2. Average of observations made at 0.4 and 1.5m telescopes.
3. ITT FW 130 photomultiplier.

of the data complicates the derivation of a unique period, if, indeed, one exists. Nevertheless, the data were searched with the DAO period finding program (Morbey 1976) over the range 5 to 60 days. A reasonable, but by no means unique or entirely satisfactory fit to the V-band data, is provided by P=$46^{\mathrm{d}}.24$ (see Fig. 1). The possibility that star E is an irregular variable obviously cannot be discounted. Adopting E(B-V)=0.23 mag (Hesser 1976), the DDO and UBV colors of the star are consistent with it being a K5 Ib star.

JAMES E. HESSER*

Dominion Astrophysical Observatory
Herzberg Institute of Astrophysics
Victoria, B.C., V8X 3X3, Canada

References:
Cousins, A.W.J., and Stoy, R.H. 1962, Roy.Obs.Bull., No. 49
Cousins, A.W.J.,Lake, R., and Stoy, R.H. 1966, Roy.Obs.Bull., No. 121
Hartwick, F.D.A., and Hesser, J.E. 1972, Ap.J., 175, 77
Hartwick, F.D.A., Hesser, J.E., and McClure, R.D. 1972 Ap.J., 174, 557
Hesser, J.E. 1976, Pub.A.S.P., 88, 849
Landolt, A.U. 1973, A.J., 78, 959
Morbey, C.L. 1976, Pub.Dom.Ast.Obs., 15, 105

---

*Visiting Astronomer, Cerro Tololo Inter-American Observatory, which is supported by the U.S. National Science Foundation under contract No. AST 78-27879.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1759

Konkoly Observatory
Budapest
1980 March 20

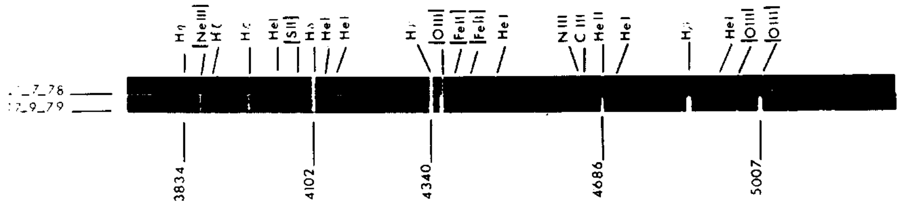
SPECTROSCOPIC OBSERVATIONS OF CI CYGNI IN 1978 AND 1979

Two low-dispersion spectra (80 Å mm^{-1}) were taken at the Haute-Provence Observatory on July 21, 1978 and September 17, 1979. The spectrograph was equipped with a RCA tube and the spectrum was recorded on IIaO plates.The exposure times were 40 and 60 minutes, respectively.

In the optical range investigated (from λ 3750 to 5000) the following emission lines appear on both spectra (Fig. 1):

- HI, (up to H_{10})
- HeI, triplet transitions
- HeII, (λ 4686)
- NIII, (λ 4097, 4640)
- MgII, (λ 4481)
- FeII, (λ 4178, 4233, 4386, 4415, 4582, 4630)
- {FeII} (λ 4244, 4287)
- {FeIII} (λ 4655, 4672, 4755)
- {SII} (λ 4068)
- CIII, (λ 4267, 4650)
- {OIII} (λ 4363, 4959, 5007)

and {NeIII} (λ 3868) which characterize the nebular surrounding shell. Let us note that the lines of {OIII} are particularly prominent, thus proving a high electron temperature (1).



On the other hand {FeVII} (λ 3760), already observed on 1977 spectra, seems absent, owing to possible stratification effects (2). HeI singlets transitions are not present in 1979. Emission lines are observed at λ 4036 and 4059 which remained unidentified.

It is difficult to assign a pure M-type to the cool giant star from the presence of the TiO absorption bands alone since the absorption line of CaI (λ 4227) and emission line of CaII (λ 3933) are absent.

Our present observations indicate that this star is characterized by the mean excitation lines (I.P.=35-55 eV). The spectra taken on 1978 and 1979 closely resemble one another and correspond to the previous near-minimum light (3).

R. GRAVINA
Observatoire de Lyon
69230 Saint-Genis-Laval

References:
(1) Gurzadyan, G.A. 1970, Planetary Nebulae, Reidel Publ. Co., Holland
(2) Colloque vol. 54, p. 101, Liège 1968
(3) Contributi Asiago No. 330
A. Mammano, L. Rosino and S. Yildizdogdu

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1760

Konkoly Observatory
Budapest
1980 March 24

PERIODS AND MEAN LIGHT CURVES OF 22 LONG PERIOD VARIABLES IN A FIELD CENTERED AT $\alpha = 13^h$, $\delta = -70°$

This report gives the results of a study of 22 new long period variable stars in a galactic field centered at $\alpha = 13^h$, $\delta = -70°$. The results of a search for short and intermediate period variables in the same field have been reported by Deurinck and Vissenberg (1973). The variable stars were discovered with a blink microscope, and their light variability measured on 551 photographic plates that were taken with the 10-inch telescope of the Boyden Observatory. The observations span 11 years. The apparent magnitudes of the variables were estimated on each plate with Pogson's method using six comparison stars for each variable star. When a variable star becomes fainter than the limiting magnitude of the photographic plates, which is about $16\overset{m}{.}1$, it is assigned an apparent magnitude of $16\overset{m}{.}1$. For each comparison star the number of stars brighter than this comparison star were counted in one square degree around each variable star. The apparent magnitudes of the comparion stars were then derived by interpolation in the Tables of the Groningen Publication Nr. 43. The periods and the mean light curves were determined by means of computer analysis using the Phase Dispersion Minimization method (PDM) (Stellingwerf, 1978), the program of which was kindly put at our disposal by R. Stellingwerf. The PDM method can be applied succesfully to variables for which there are only a few observations of maximum or minimum light, which makes the usual least squares treatment of the observed moments of maximum or minimum light impossible. In the case of long period varibles there are very few observations of maximum light even if the observations span several years. The PDM method has been used with a bin structure $N_b = 20$, $N_c = 2$ (the notation is Stellingwerf's 1978).

The variables are indicated on identification charts 1 - 22, which cover a field of about 30 minutes of arc squares with North on top. On Table I we have listed for each variable star the program number, the provisional coordinates, the period with an accuracy of about $0^{d}.5$, the apparent magnitude of maximum light of the mean light curve, the total variation of the mean light curve, the number of estimates, the number of observed moments of maximum light, and the Julian date of the observed moment of maximum light that is closest to the midpoint of the observations. No amplitude is given for stars that become fainter than the limiting magnitude of the photographic plates. Because of the finite width of the bins, the maximum and total variation of the mean light curve underestimate the true maximum and total variation. The difference between the true maximum and the maximum of the mean light curve is of the order of $A/N_b \approx 0^{m}.2$ which is about the accuracy of the magnitude determination of the comparison stars. On Table II we have summarized the basic quantities of the PDM analysis of the light curves. The notation σ^2, σ_0^2, σ_N^2, θ_{min}, and ε is Stellingwerf's. θ_{min} is typically 0.1 and in all cases smaller than 0.2 so that generally 90% and always more than 80% of the initial variance of the data has been removed by the mean light curve at the indicated period. The signal-to-noise ratio is typically 3 to 4. Table II is followed by a list of remarks on individual variables. Here we have also indicated the stars that are invisible (fainter than the limiting magnitude of the photographic plates) during a considerable portion of the total phase interval.

Light curves are presented by Figures 1 - 22. Individual observations (estimated magnitudes) are indicated by an asterisk *, bin means by +, the spline fit to the bin means, which is used to remove the oscillation from the data and to calculate the residuals, by ×. The symbol Q is used whenever at least two out of the three symbols, *, + and ×, coincide.

Acknowledgement. The authors are grateful to R.J. Stellingwerf.

Table I

Nr	α	δ	P	V_{max}	A	NE	Nm	JD 2 437 000 +
1	$12^h21^m25^s$	- 67°58'.6	$248^d.6$	13.1		477	2	1915
2	12 33 02	- 69 30.7	155.3	12.5	3.4	502	6	1472
3	12 40 40	- 69 28.5	220.4	12.75		410	4	1504
4	12 42 28	- 69 50.1	408.7	14.1	1.7	389	6	1812
5	12 42 39	- 70 05	279.4	14.6		446	4	1911
6	12 44 09	- 69 20.1	349.0	12.75		408	1	368
7	12 46 00	- 71 31.9	131.5	14.0		456	6	1474
8	12 49 08	- 67 25.3	347.8	14.5		416	2	757
9	12 49 59	- 73 35.6	202.9	12.1		508	7	1178
10	12 51 13	- 70 40.8	297.6	13.8		495	4	1530
11	12 51 35	- 67 32.4	253.3	14.1		412	4	1910
12	12 51 57	- 72 23.9	329.3	12.9		457	5	1490
13	12 52 11	- 70 39.4	341.7	13.55		331	2	3044
14	12 55 13	- 67 16.7	199.5	12.0		483	4	1202
15	13 02 15	- 72 58.0	209.9	13.35		458	2	1468
16	13 03 02	- 67 53.7	317.7	11.45	4.55	496	5	3008
17	13 08 38	- 67 18.6	203.3	12.15	3.65	479	6	1511
18	13 10 12	- 67 13.1	352.7	13.45		469	1	1213
19	13 10 20	- 65 34.3	189.2	12.8		415	6	1502
20	13 21 04	- 72 12.4	275.15	13.75		391	2	403
21	13 22 38	- 67 09.2	241.75	13.4		383	2	1461
22	13 22 45	- 72 39.4	316.05	12.55		454	5	1407

Nr : program number which refers to the identification chart

α,δ : provisional coordinates for 1900

P : period in days

V_{max} : apparent magnitude of maximum light of the mean light curve

A : total variation of the mean light curve

NE : number of estimates

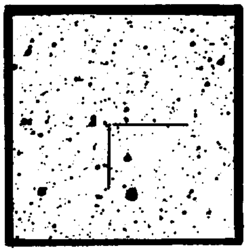
Nm : number of observed moments of maximum light

JD : mean epoch

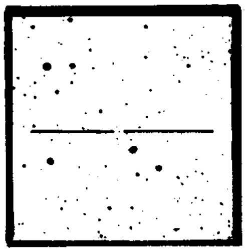
Table II

Characteristic quantities of the PDM analysis of the light curves

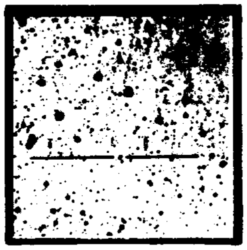
Nr	σ^2	σ_N^2	σ_0^2	θ_{min}	ε
1	1.156	0.101	1.055	0.102	3.2
2	1.626	0.096	1.530	0.069	4.0
3	2.016	0.116	1.900	0.064	4.0
4	0.350	0.034	0.316	0.108	3.0
5	0.404	0.021	0.382	0.090	4.2
6	1.079	0.079	1.000	0.087	3.4
7	0.761	0.040	0.721	0.061	4.3
8	0.391	0.051	0.340	0.159	2.6
9	2.245	0.125	2.120	0.065	4.1
10	0.685	0.087	0.598	0.139	2.6
11	0.499	0.038	0.461	0.089	3.5
12	1.026	0.059	0.967	0.070	4.0
13	0.572	0.040	0.532	0.079	3.6
14	1.723	0.029	1.594	0.092	3.5
15	1.124	0.068	1.056	0.076	3.9
16	1.836	0.082	1.754	0.058	4.6
17	1.855	0.147	1.708	0.090	3.4
18	1.416	0.198	1.218	0.153	2.5
19	1.042	0.156	0.886	0.170	2.4
20	0.958	0.025	0.933	0.036	6.2
21	1.355	0.078	1.277	0.076	4.0
22	1.740	0.124	1.616	0.097	3.6



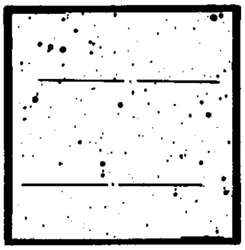
Var. 1



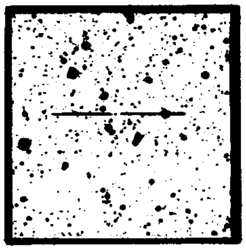
Var. 2



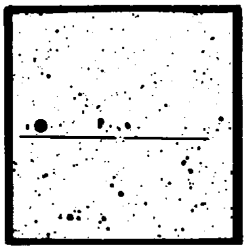
Var. 3



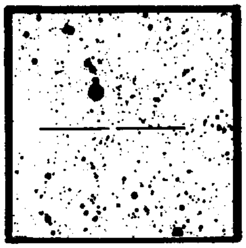
Var. 4 and 5



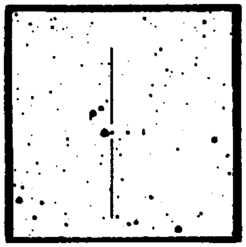
Var. 6



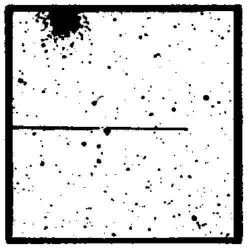
Var. 7



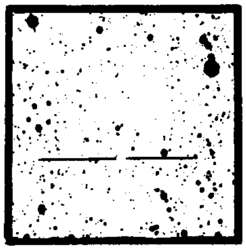
Var. 8



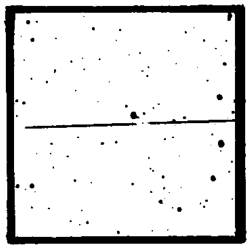
Var. 9



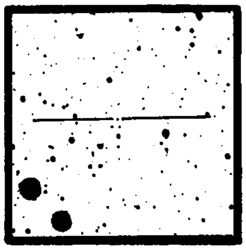
Var. 10



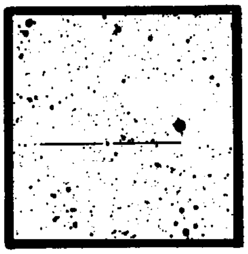
Var. 11



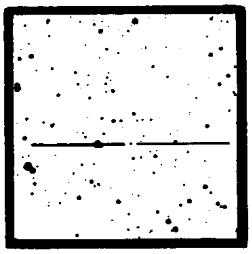
Var. 12



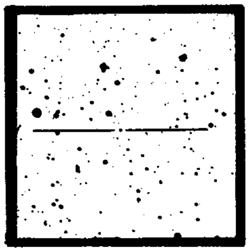
Var. 13



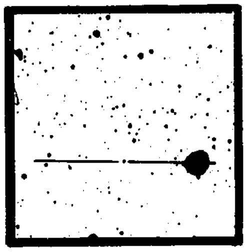
Var. 14



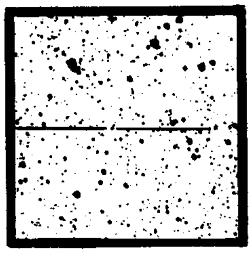
Var. 15



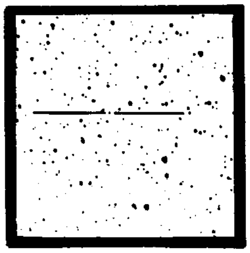
Var. 16



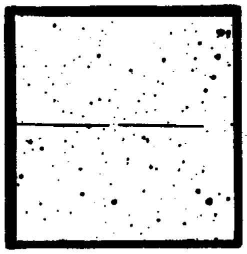
Var. 17



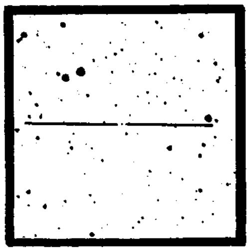
Var. 18



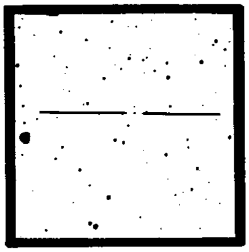
Var. 19



Var. 20



Var. 21



Var. 22

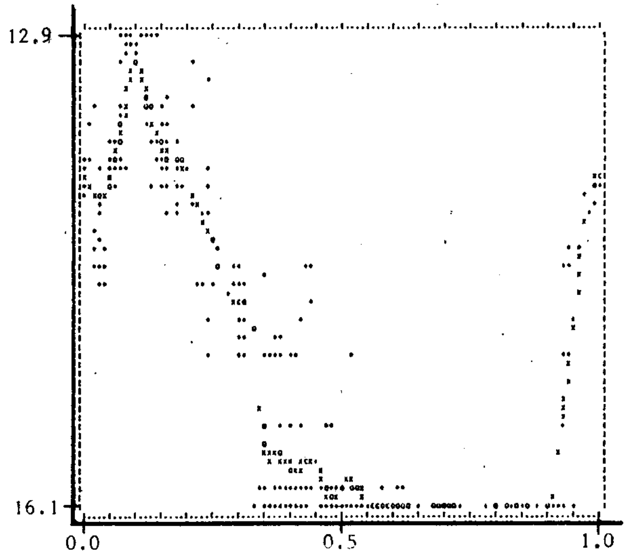


FIG. 1. Variable 1

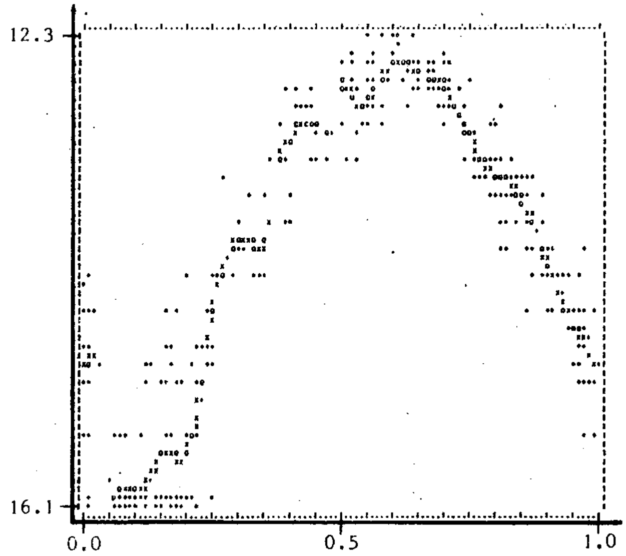


FIG. 2. Variable 2

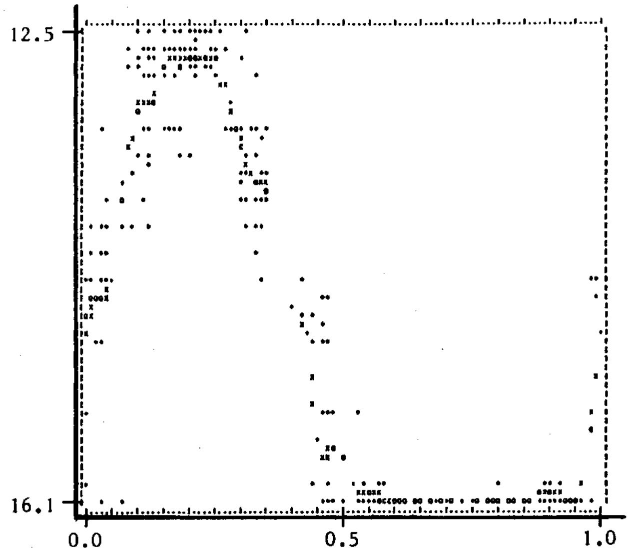


FIG. 3. Variable 3

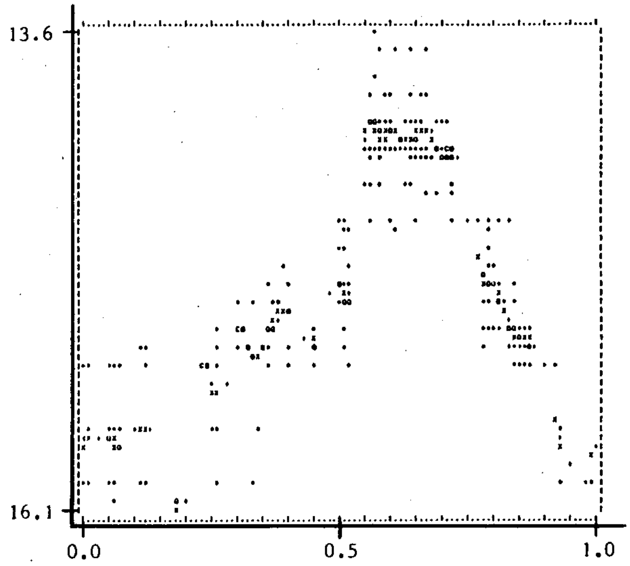


FIG. 4. Variable 4

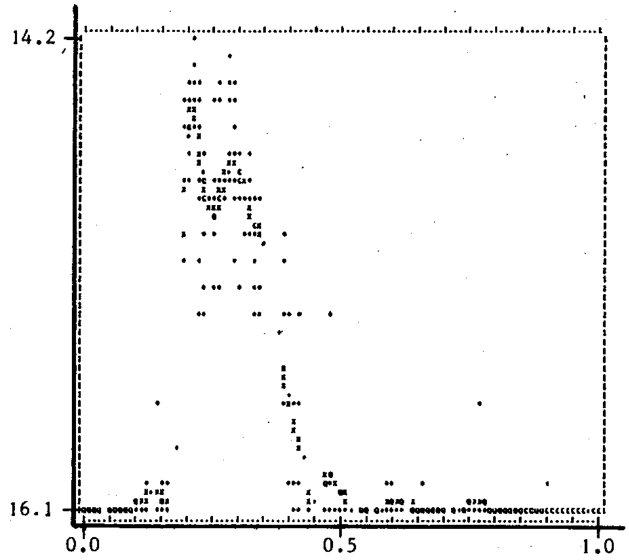


FIG. 5. Variable 5

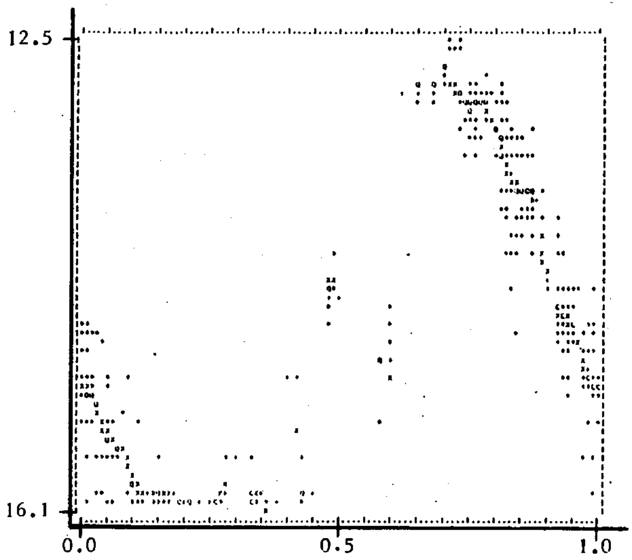


FIG. 6. Variable 6

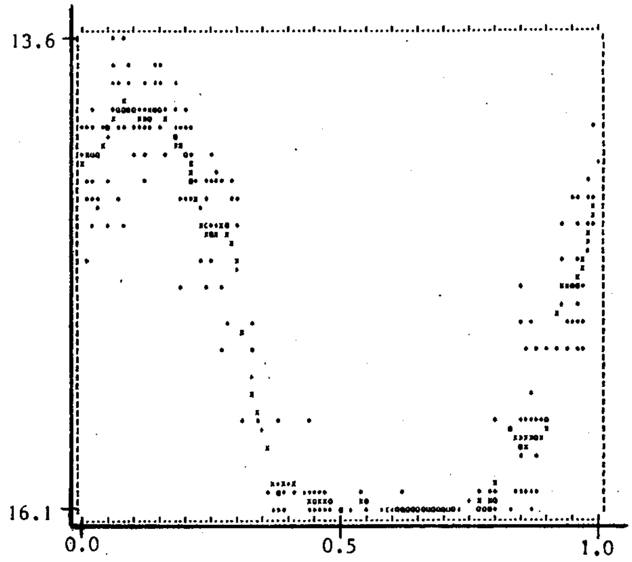


FIG. 7. Variable 7

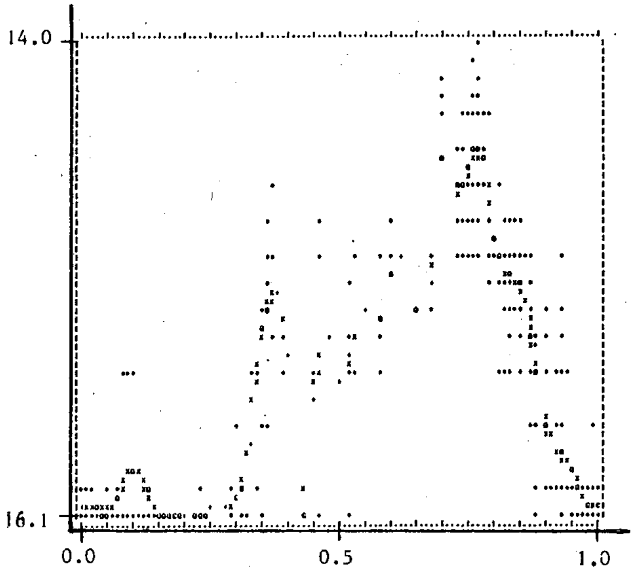


FIG. 8. Variable 8

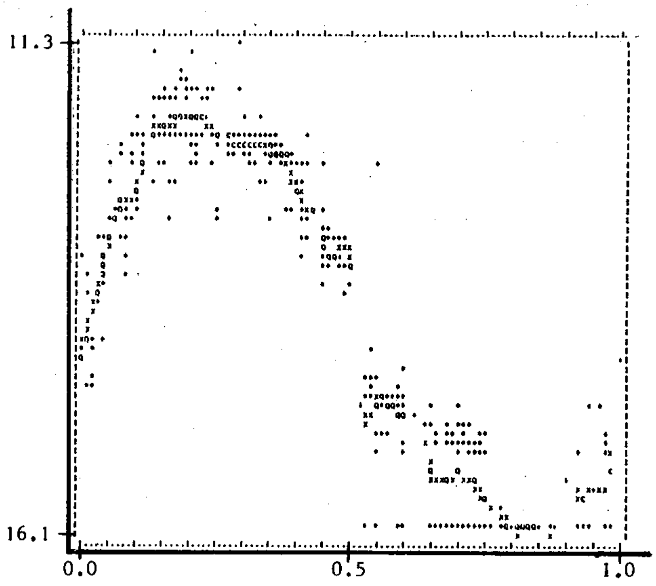


FIG. 9. Variable 9

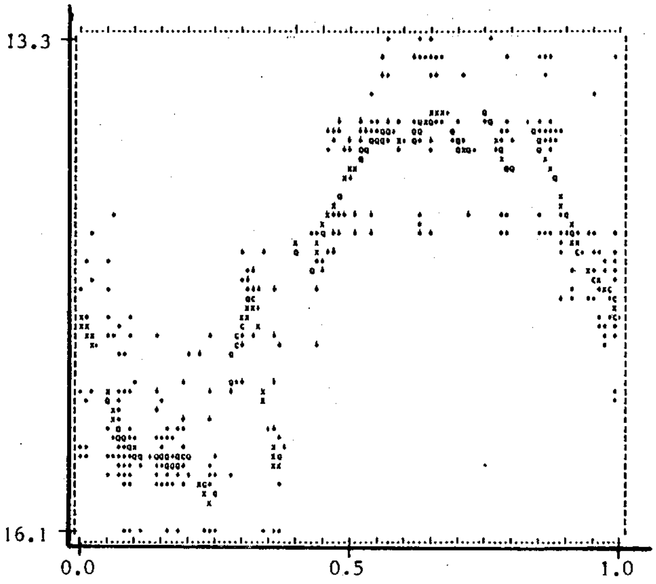


FIG. 10. Variable 10

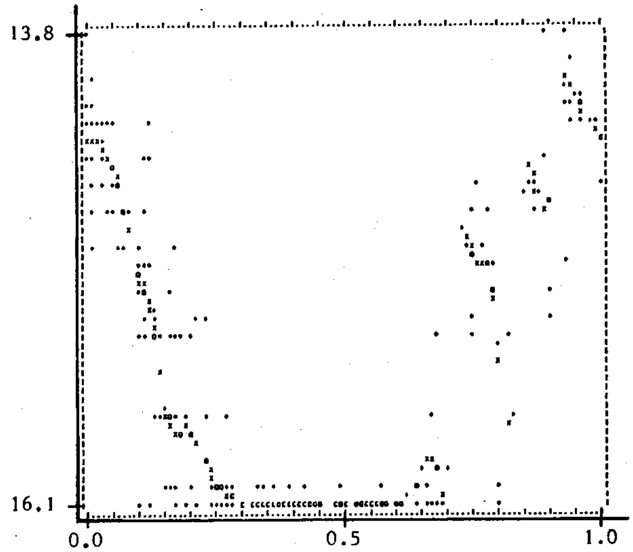


FIG. 11. Variable 11

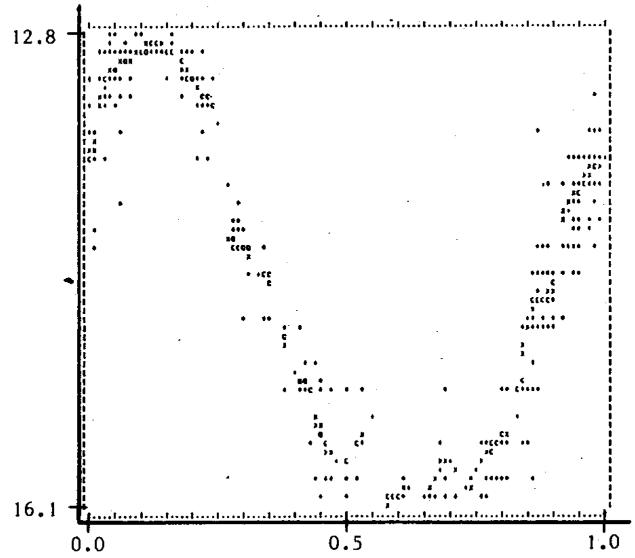


FIG.12. Variable 12

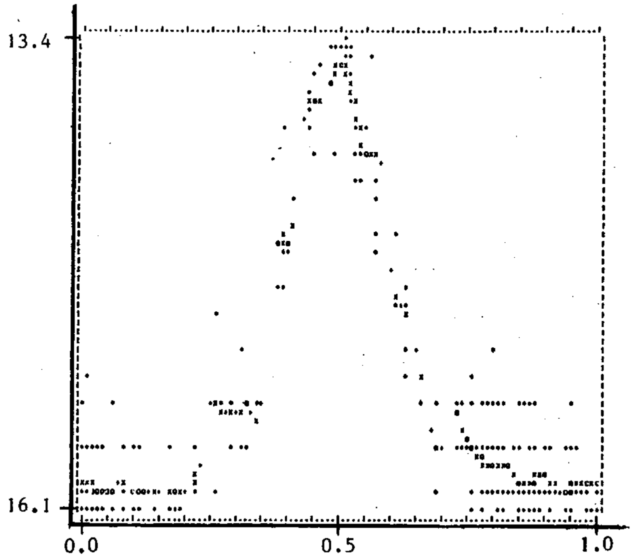


FIG. 13. Variable 13

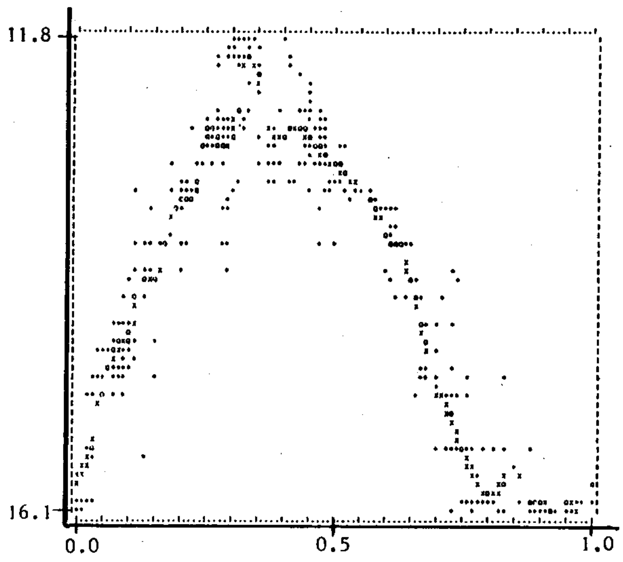


FIG. 14. Variable 14

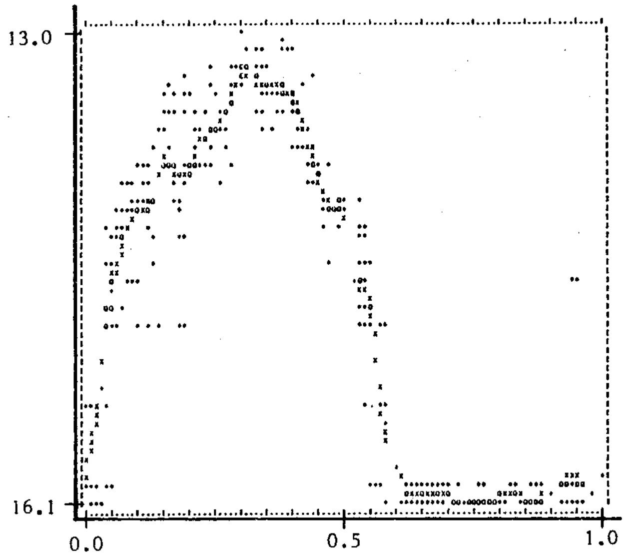


FIG. 15.   Variable 15

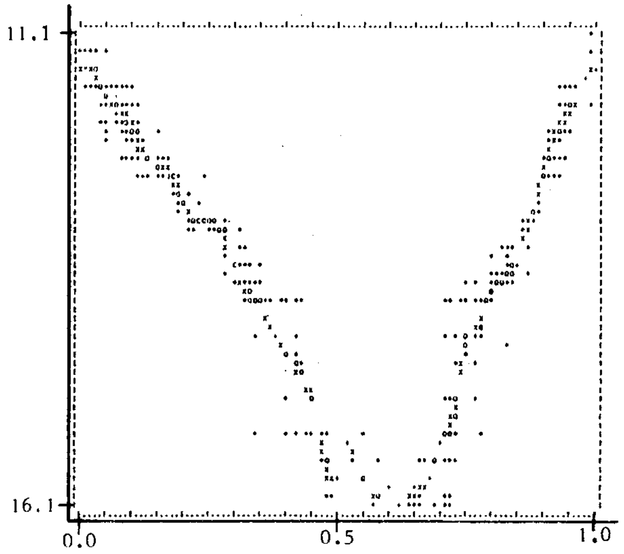


FIG. 16.   Variable 16

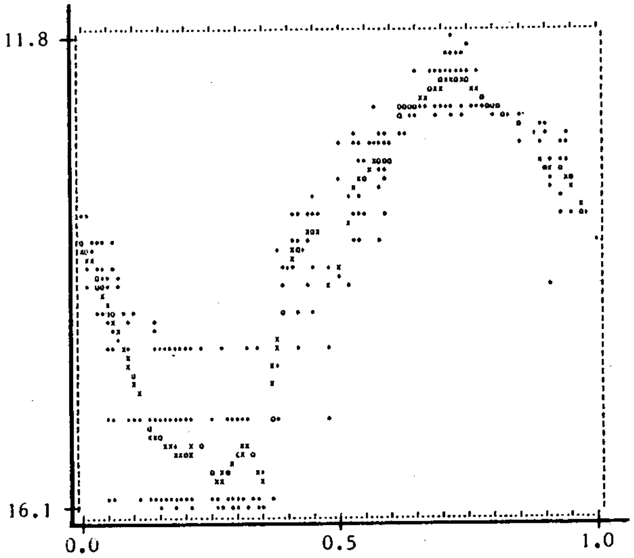


FIG. 17 Variable 17

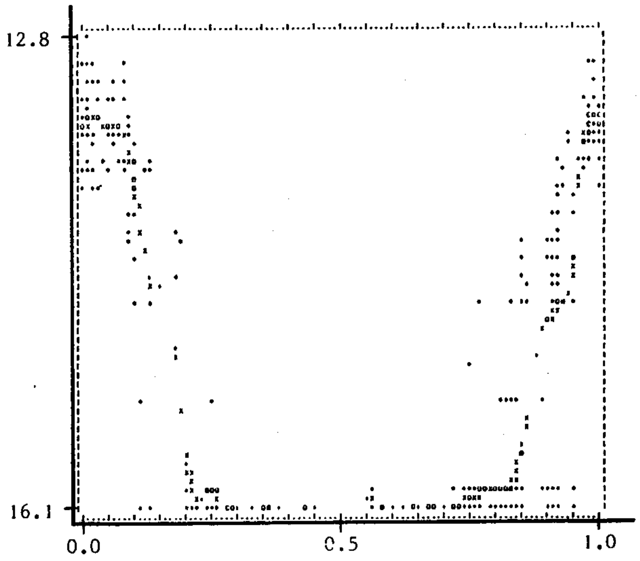


FIG. 18 Variable 18

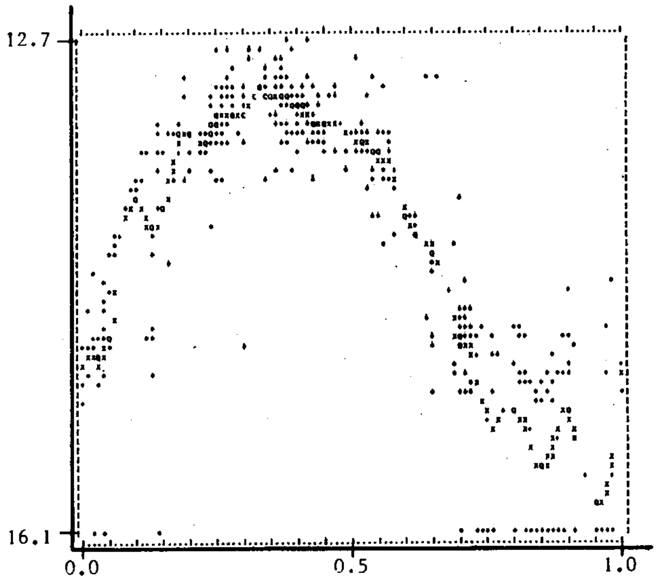


FIG. 19. Variable 19

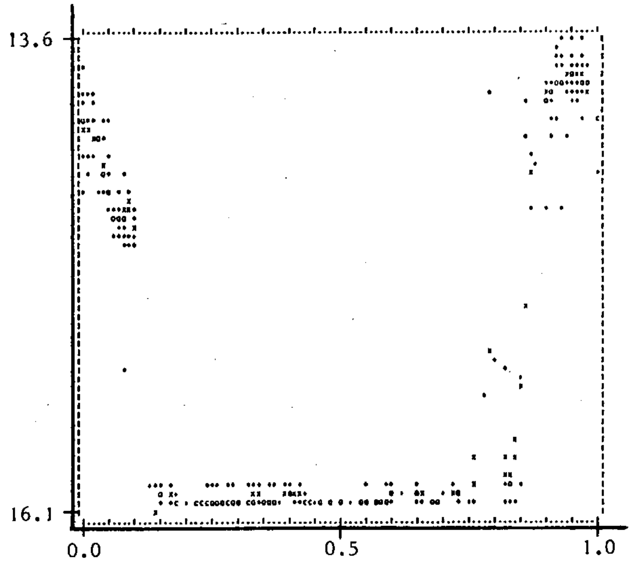


FIG. 20. Variable 20

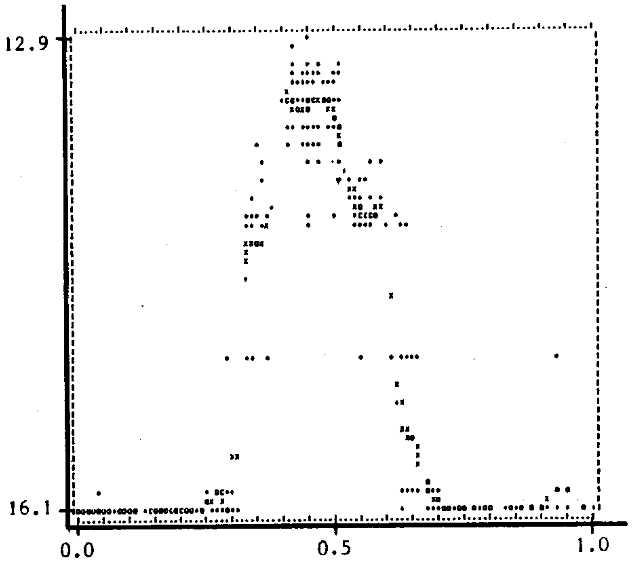


FIG. 21.   Variable 21

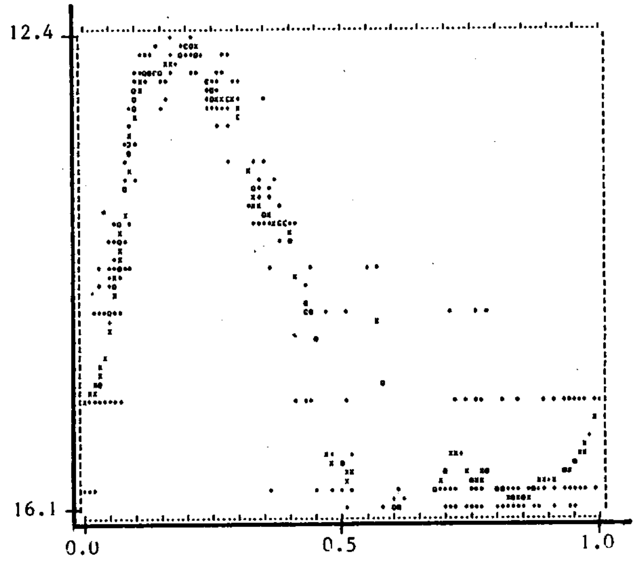


FIG. 22   Variable 22

Individual remarks

Var. 1. Invisible during about 2/5 of the total phase interval.

Var. 3. Invisible during about 1/4 of the total phase interval.

Var. 4. Bump on the ascending branch.

Var. 5. Invisible during about 7/10 of the total phase interval, the light curve has probably a double maximum.

Var. 7. Invisible during about 1/3 of the total phase interval.

Var. 11. Invisible during about 1/2 of the total phase interval.

Var. 14. Intensity of maximum light decreases in time.

Var. 15. Invisible during about 1/4 of the total phase interval.

Var. 18. Invisible during about 1/3 of the total phase interval.

Var. 20. Invisible during about 7/10 of the total phase interval.

Var. 21. Invisible during about 3/5 of the total phase interval.

M. GOOSSENS, C. STOOP and C. WAELKENS

Astronomisch Instituut
Katholieke Universiteit Leuven
Naamsestraat 61
B-3000 LEUVEN
Belgium

References :

Deurinck, R. and Vissenberg, B. : 1973, I.B.V.S. No. 793.
Stellingwerf, R.J. : 1978, Ap. J. 224, 953.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1761

Konkoly Observatory
Budapest
1980 March 24

SPECTROSCOPIC AND PHOTOELECTRIC MEASUREMENTS OF νEri

Photometric observations (partly simultaneously with two telescopes) of the β Cep-star ν Eri ($P \approx 4^h10^m$) in 1974 at the ESO site in La Silla/Chile revealed a secondary hump in two out of three light curves. The hump is located in the ascending branch around maximum radial velocity. The data did not allow to decide whether this secondary hump repeats every cycle or not. Additional spectroscopic and photoelectric observations have been performed in 1977 at the same site though the position of the star was not favourable (maximum height above horizon approx. 40°).
All observational data are compiled in Table I and II. The reduction techniques concerning the photometry and scanner observations were the same as described by Haefner et al. (1975) and Schoembs et al. (1976), respectively.

Table I

Photometric observations

a) Photometry

Telesc.	Date	Start (UT)	Duration	Time-Res./ Filt. (s)	Integr.-Time/ Filter (s)	Filter*)
61 cm	1974,Nov.24/25	$02^h33^m00^s$	$4^h17^m00^s$	4	1	H_β(w/n)
61 cm	1974,Nov. 4/ 5	02 30 00	4 17 00	4	1	"
61 cm	1974,Nov.12/13	02 04 30	4 25 30	4	1	"
50 cm	1974,Nov.12/13	02 11 10	4 18 20	1	0.99	Int./Hα
50 cm	1977,March 9/10	00 15 00	2 05 00	6	1	H_β(w/n)
50 cm	" 11/12	00 21 00	1 50 00	6	1	"
50 cm	" 12/13	00 27 15	1 57 45	6	1	"
50 cm	" 15/16	00 23 05	1 26 55	6	1	"
50 cm	" 16/17	00 25 00	1 40 00	6	1	"

*) H_β(w/n): wide (Δλ=175A), narrow(Δλ=29A), quasisimultaneously used by means of a rotating filter wheel, cycle time 2s (1974) or 3s (1977), Int./H_α: white light, H_α(Δλ=3A), two channel photometer.

b) Scanner

Telesc.	Date	Start	Duration	Line	Band width (A)	Spectr. Res. (A)	Time Res. (s)
50 cm	1974,Nov.24/25	$02^h33^m00^s$	4^h15^m	Hα	230	7	8.192

Table II

Spectroscopic observations

Plate *) No.	Midexposure HJD 2440000+	Exposure Time(min)	Phase
G 8315	3229.5189	4	0.875
G 8332	3230.5057	8	0.562
G 8333	3230.5157	9	0.620
G 8334	3230.5265	10	0.682
G 8335	3230.5383	12	0.750
G 8361	3231.5209	12	0.413
G 8362	3231.5348	10	0.494
G 8363	3231.5500	12	0.581
G 8386	3232.4944	8	0.024
G 8387	3232.5020	7	0.068
G 8389	3232.5250	10	0.200
G 8390	3232.5364	11	0.266
G 8438	3234.4852	8	0.498
G 8439	3234.4929	6	0.542
G 8440	3234.5036	15	0.604
G 8441	3234.5192	18	0.694
G 8442	3234.5317	10	0.766
G 8443	3234.5415	12	0.822

*) 1.5m telescope, Coudé, dispersion 12.4A/mm, emulsion 098-2.

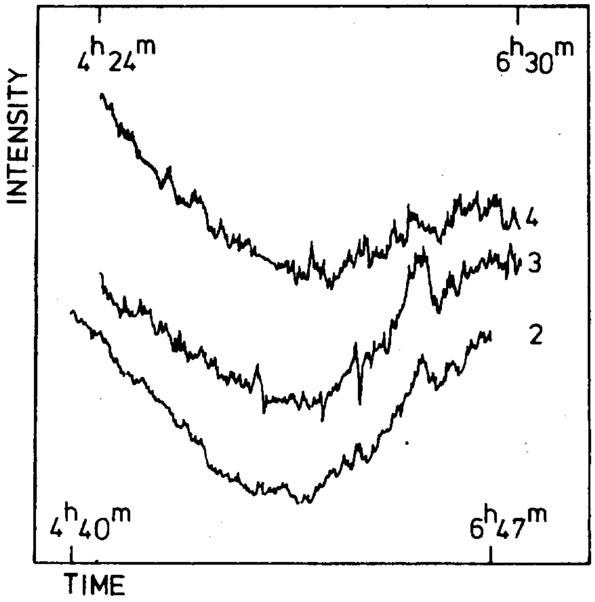


Fig.1. Part of the light curves (not corrected for extinction) of 1974 Dec. 4/5 in H_β-w (2) and the simultaneous runs of Dec. 12/13 in H_β-w (3) and white light (4) showing the secondary peak.

Fig. 1 shows some light curves of Dec. 1974. The duration of the small secondary peak is approx. 1000s≈0.06P and the relative amplitude between approx. 1.0 and 1.5% in H_{β}(w/n) and somewhat smaller in white light, indicating a connection with the H-lines (see also Fig.3). The photometric runs of March 1977 are generally of worse quality because of the appreciable air mass during the observations. Mostly they cover less than half a period. In order to isolate the secondary hump in these data too, all proposed periods including overtones and resonance oscillations according to Van Hoof (1961) and Saito (1976) have been tested, but without success. Unfortunately the beat period, which would approx. be consistent with the data of Dec. 1974, cannot be checked with the present observations.

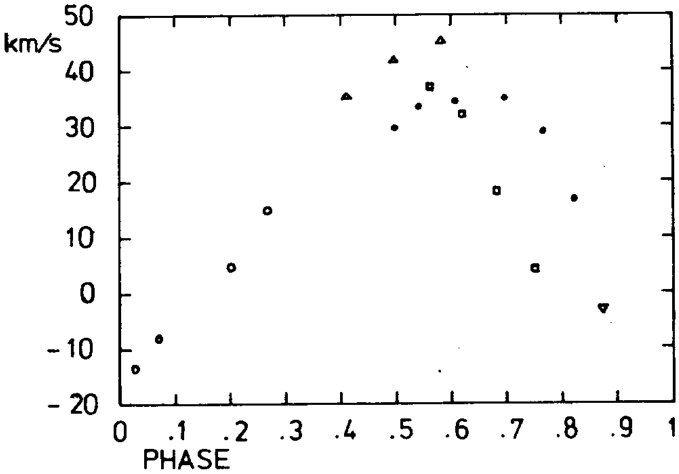


Fig. 2 Radial velocity curve. Average error of the weighted means is ±1.5 km/s. Symbols: ▼G 8315, □G 8332-35, ▲G 8361-63, oG 8386, 87, 89, 90, •G 8438-43.

Fig.2 shows the weighted mean radial velocities as determined from the lines listed in Table III. The phases have been computed using the time of minimum radial velocity given by Laskarides et al. (1971) and a period of $0\overset{d}{.}1735089$. The scatter is due to the Blashko-effect. No Van Hoof-effect could be detected and no unusual behaviour around the time of maximum radial velocity (ap-

Table III

Lines used for radial velocity and equivalent width determinations on all plates.

Wavelength (A)	Identification	Weight for RV-det.
6678.149	HeI	1
6582.85	CII	0.5
6578.03	CII	0.5
6562.817	Hα	1
5875.618 .650	HeI	1
5739.762	SiIII	0.5
5722.65	AlIII	0.5
5696.47	AlIII	0.5
5679.56	NII	0.5
5666.64	NII	0.5
5895.923	NaI D_1 interst.	
5889.953	NaI D_2 interst.	

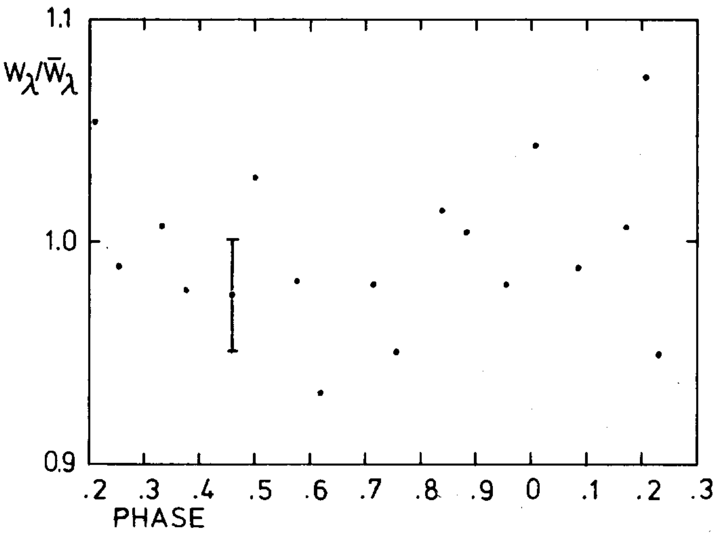


Fig. 3 Variation of the Hα-equivalent widths from scanner observations. Each point is the average of approx. 40 foreward and backward scans of 8.192 s. Vertical bar: mean error. The phases refer to the radial velocity curve (minimum: phase 0).

prox. position of the secondary hump) can be seen.
According to Laskaridest et al. (1971) and Laskarides (1973) a "filling in" of the H-lines by emission in the ascending branch of the radial velocity curve (around minimum light) should be observed. A careful examination of the H_α-profiles and equivalent widths did not reveal this effect though especially this line should strongly be affected by possible emission. The equivalent widths remained constant and the line profile variation was the same for all the lines. The failure of the "filling in"-test may be explained by the scanty data around this special phases. Futhermore it might be that the "filling in" only is present with varying strength in different cycles. This is confirmed by the scanner equivalent widths of Hα, which cover one complete cycle. As shown in Fig. 3 there is a slight variability which exceeds the error of the measurements. But only the second minimum around maximum radial velocity phase 0.6 - 0.7 found by Laskarides et al. (1971) is clearly present whereas around phase 0.2 (expected "filling in") no minimum can be noticed.
The radial velocity and equivalent widths for the interstellar D1 and D2-lines are (22.0 ± 0.5) and (21.3 ± 0.3) km/s and (103 ± 4) and (138 ± 5) mA, respectively. These values are in good agreement with values given for D1 by Hobbs (1978).

R. HAEFNER
R. SCHOEMBS

Universitäts-Sternwarte
Scheinerstr. 1
D-8000 München 80
Germany (W)

References:

Haefner, R., Metz, K., Schoembs, R., 1975, Astron.Astrophys.38,203
Hobbs, L.M., 1978, Astrophys. J. Suppl. 38, 129
Laskarides, P.Q. 1973, Astron. Astrophys. 26, 91
Laskarides,P.Q.,Odgers,G.J.,Climenhaga,J.L.1971,Astron.J.76,363
Schoembs, R., Spannagl, C. 1976, Astron.Astrophys.Suppl. 26, 55
Saito, K., 1976, in Multiple Periodic Variable Stars (ed.W.Fitch) Contributed Papers p. 47
Van Hoof, A., 1961, Zeitschrift f. Astrophys. 53, 106

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1762

Konkoly Observatory
Budapest
1980 March 26

PHASE-DEPENDENT MASS FLOW IN UW CMa

Mass flow in the interacting binary system UW CMa, consisting of an O7f primary and an O7 secondary (Batten, Fletcher and Mann 1978), has been studied using the Copernicus ultraviolet spectra by McCluskey, Kondo and Morton (1975), McCluskey and Kondo (1976) and Drechsel, Rahe, Kondo and McCluskey (1980). Mass loss rate has been estimated to be in the range of 2.3 to 3.0 x 10^{-6} solar mass per year.

However, as the Copernicus telescope spectrometer employed a single-channel detector system (Rogerson, Spitzer et al. 1973), it took a quarter of the orbital period or longer to complete the spectral scan in the spectral range 1000 to 1550 A. This made a study of the phase-dependence of the absorption and emission features, many of which were of P Cygni type, quite difficult. Consequently, the results reported by McCluskey and Kondo (1976) were uncertain in this respect.

We have performed a preliminary examination of the ultraviolet spectra of UW CMa obtained with the IUE on 1978 June 2 and 4. The exposures were 80 and 100 seconds; thus, the time-resolution was excellent. The phase of observation was 0.84 and 0.24 for the respective dates.

The radial velocity changes observed in the shifting of the short-wavelength edge of the emission in the C III (1175 A), N V (1238 and 1242 A), Si IV (1393 and 1402 A) and C IV (1548 and 1550 A) P Cygni profiles corresponded to a value in the vicinity of 400 km s^{-1}; the radial velocity was in the positive sense at phase 0.84 and negative at phase 0.28. Several absorption lines, e.g. Si III (1206 A) and N IV (1718 A), show no emission but are displaced by a constant value of 500 to 800 km s^{-1}

with the orbital velocity variation superimposed on top of this mean displacement. The radial velocity difference for the O7f star at these two phases was 406 km s^{-1} using K_1=222.5 km s^{-1} (Batten et al. 1978). The P Cygni absorption components of these lines also show a velocity change due to orbital motion superimposed on the 800 to 1100 km s^{-1} mean expansion velocity.

We have re-examined the previous Copernicus data. The radial velocity changes, although not conclusive, are basically not in disagreement with the current findings.

Incorporating the previous results, we conclude that the mass flow in UW CMa is primarily from the O7f primary and that the matter is being lost from the binary system at the rate of 2.3 to 3.0 x 10^{-6} solar mass per year. The P Cygni lines must arise within several stellar radii above the surface of the primary star in order to show such orbital motion effects.

GEORGE E. McCLUSKEY
Division of Astronomy
Department of Mathematics
Lehigh University
Bethlehem, Pa. 18015, U.S.A.

YOJI KONDO
Code 685, Goddard Space Flight
Center, Greenbelt, Md. 20771
U.S.A.

JURGEN RAHE
Remeis-Sternwarte
Sternwartstrasse 7
D-8600 Bamberg,
Federal Republic of Germany

References:

Batten, A.H., Fletcher, J.M. and Mann, P.J. 1978, Publications of the Dominion Astrophysical Observatory, XV, No. 5
Drechsel, H., Rahe, J., Kondo, Y. and McCluskey, G.E. 1980, Astron. Ap., in press
McCluskey, G.E., Kondo, Y. and Morton, D.C. 1975, Ap.J., 201, 607
McCluskey, G.E. and Kondo, Y. 1976, Ap.J., 208, 760
Rogerson, J.B., Spitzer, L., Drake, J.F., Dressler, K., Jenkins, E.B., Morton, D.C. and York, D.G. 1973, Ap.J., 181, L97

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1763

Konkoly Observatory
Budapest
1980 March 28

RESULTS OF THE FIRST PHOTOMETRIC RUN AT ESO BY THE EUROPEAN WORKGROUP ON Ap STARS

In October 1978, several European astronomers decided to cooperate in the frame of an European Working Group on Ap stars, with the aim of improving the coordination of future observation programmes. One of the first initiatives was the application by the Workgroup as an entity for observation time at ESO. The programme resulted from discussions held in Vienna, before the application, and in Paris six months later (by T. Kreidl,Bochum; Gh. Deridder and H. Hensberge, Brussels; F.A. Catalano, Catania; P. Renson, Liège; M. Floquet and M. Gerbaldi, Paris; R. Faraggiana, Trieste; H.M. Maitzen, K.D. Rakosch, M.J. Stift and W.W. Weiss, Vienna).

We report here the preliminary results for that part of the programme that concerns the variability of Ap stars. The final paper, including detailed light curves, more accurate periods and a discussion of the results, will be submitted for publication in Astronomy and Astrophysics within the next months.

The stars mentioned in Table I were observed with the 50cm ESO telescope from 1979 November 17/18 to December 6/7 and from 1979 December 22/23 to 1980 January 3/4 with the aim of deriving their rotational periods from the variability in Strömgren u and v filters. In Table II, the main results are summarized. Known and suspected very long period variables (showing in previous runs no variations in time intervals of 10 days) are omitted from this table since observations spread over a much longer time interval are needed to cover the whole cycle. We intend to monitor these slow rotators whenever possible. Other potential observers are kindly encouraged to use the same comparison stars.

Table I

Summary of observed stars

programme stars (Ap) by HD number	number of observations	filters used	comparison stars by HD number
5601	16	u,v	6530,6706
19712	23	u,v	19739,20319
25267	36	u,v	24975,25385
30849	24	u,v	30861*,31587*,31640
38823	20	u,v	38856,38866
50169	2	uvby	50040,50109,50405
52847	2	uvby	52190,52350
53116	12	u,v	53237,53238
55540	2	uvby	55521,55815
56022	23	uvby	55892*,56456
81009	10	u,v	80447,82428
94660	1	uvby	93453,94724
101065	1	uvby	101128,101388,101596
101189	1	uvby	99104,101995,103884

The comparison stars marked by an asterisk are definite variable. HD 30861 got about $0\overset{m}{.}1$ fainter (in u and v) during a 2.5 hour interval in the night 1979 November 19/20, and has therefore immediately been canceled as comparison star. HD 31587 and HD 55892 were observed more frequently (11, resp. 20 observations). These data will be discussed in some detail in the announced paper. The observed range of variation is $\Delta u \simeq 0\overset{m}{.}07$, $\Delta v \simeq 0\overset{m}{.}05$ for HD 31587, and $\Delta u \simeq 0\overset{m}{.}02$, $\Delta v \simeq 0\overset{m}{.}04$, $\Delta b \lesssim 0.01$ and $\Delta y \simeq 0\overset{m}{.}02$ in the case of HD 55892. The time intervals in which the change from minimum to maximum observed brightness occur are in both cases of the order of 1 - 2 days.

Table II

Results

star name by HD number	V magnitude,[1] peculiarity type	total range Δu	Δv	approximate period (days)
5601	7.64 Si	$0\overset{m}{.}05$	$0\overset{m}{.}04$	1.1 ?
19712	7.34 Cr Eu	.04	.04	2.2
25267	4.64 Si	.07	.04	?
30849	8.86 Sr Eu	.05	.10	16
38823	7.33 Sr Eu (F)	.07	.14	8.7
53116	8.88 Sr Eu	.10	.06	13 ?
56022	4.89 Si	.05	.01	0.9[2]
81009	6.53 Sr Cr Eu	.01	.05	34[3]

[1] V magnitudes are taken from Vogt and Faundez (1979) or Gronbech and Olsen (1976), spectral peculiarity types from Bidelman and

McConnell (1973)or Bertaud and Floquet (1974).

[2] see also Renson (1976); $\Delta b = .015$, $\Delta y = .015$.

[3] see also Hensberge et al. (1976) and Wolff (1975).

EUROPEAN Ap WORKING GROUP

References:

Bertaud Ch., Floquet M. 1974, Astron.Astrophys.Suppl. 16, 71

Bidelman W.P., Mac Connell D.J. 1973, Astron.J. 78, 687

Gronbech, B., Olsen E.H. 1976, Astron.Astrophys.Suppl. 25, 213

Hensberge H., de Loore C., Zuiderwijk E.J., Hammerschlag-Hensberge G. 1976, Astron. Astrophys. 48, 383

Renson P. 1976, Astron. Astrophys. Suppl. 25, 143

Vogt N., Faundez M. 1979, Astron. Astrophys. Suppl. 36, 477

Wolff S.C. 1975, Astrophys.J. 202, 127

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1764

Konkoly Observatory
Budapest
1980 March 31

6 IOTA TRIANGULI: A NEW VARIABLE STAR

The bright star 6 iota Trianguli is the visual binary ADS 1697. The brighter component ($V = 5^{m}.5$) is an SB2 of spectral type G5 III and orbital period $14^{d}.732$. The fainter component ($V = 6^{m}.7$), about 4 arcseconds away, is also an SB2, of spectral type F5 V and orbital period $2^{d}.2365$. Because the former is a known RS CVn binary (Young and Koniges 1977), we obtained photoelectric photometry to see if it showed the $\sim 0^{m}.1$ distortion wave characteristic of so many binaries of this type. We did find 6 iota Tri varying by about $0^{m}.05$ but probably due to the combined effect of ellipticity and differential reflection.

We observed 6 iota Tri differentially with respect to the comparison star HD 14373 on a total of 34 nights from 2,443,741.8 to 2,444,256.7 at four different observatories. Needless to say, we all included both components of ADS 1697 in our photometry. The individual differential observations, generally three on each night, were corrected for differential atmospheric extinction with mean extinction coefficients and transformed to V of the UBV system with known transformation coefficients and a mean color difference of $\Delta(B-V) = -0^{m}.42$. Here and elsewhere Δ is in the sense variable minus comparison.

The ΔV magnitudes plotted versus phase, computed with the spectroscopically determined orbital period $14^{d}.732$ of Harper (1921), showed two maxima, of roughly equal height, and two minima, of discernably unequal depth. This suggested we might be seeing a superposition of the ellipticity effect and either the differential reflection effect or a distortion wave. Although the value $14\overset{d}{.}732$ was sufficiently precise to use for the 1.4-year span of our observations, it was not sufficiently precise to carry the initial epoch of Harper forward from 1919 to the present. Therefore we used Fourier analysis to determine the phases of the two conjunctions, as indicated by the coefficients of the terms in 2θ. At this point we were not certain whether the terms in θ were produced by the differential reflection effect or by a distortion wave. We are persuaded to believe reflection was responsible, because the terms in θ place their minimum very near one of the two conjunctions, not at a random phase somewhere between. Assuming reflection is the agent, we selected the conjunction at the deeper minimum as the conjunction with the hotter star behind. The time of this conjunction (we chose the one just before our observations began in 1978) is $2,443,729.8 \pm 0\overset{d}{.}3$.

Then we redid the Fourier analysis, expressing the light as

$$1 = A_0 + A_1\cos\theta + A_2\cos2\theta + B_1\sin\theta \ ,$$

where unit light corresponds to $\Delta V = -1\overset{m}{.}550$ and phase angle is computed with our new ephemeris for conjunction

$$JD = 2,443,729.8 + 14\overset{d}{.}732\ n \ .$$

The resulting coefficients are $A_0 = 1.001 \pm 0.001$, $A_1 = -0.016 \pm 0.002$, $A_2 = -0.014 \pm 0.002$, and $B_1 = +0.007 \pm 0.002$. If the A_1 and B_1 coefficients were attributed to a distortion wave, then its full amplitude would be $\Delta V = 0\overset{m}{.}037 \pm 0\overset{m}{.}004$ and its minimum would occur at $0\overset{P}{.}94 \pm 0\overset{P}{.}02$. We are, however, believing that this minimum so close to conjunction (which itself is uncertain by $\pm\ 0\overset{P}{.}02$) probably results from differential reflection.

Work on 6 iota Tri is not finished. The light curve should be redetermined to see if the minimum given by terms in θ remains near conjunction (confirming reflection effect) or migrates to a different phase (indicating distortion wave). A later determination of a time of conjunction, either photometrically as we have done or spectroscopically as Harper did, is needed to refine the orbital period. Because residuals from our Fourier fit, when plotted versus Julian date, gave a hint of systematic secular variations in light on a time scale of $\sim$100 days, future photometry should include secure observations of a check star, something we confess not having done.

D.S.H. is happy to acknowledge that part of this work was supported by N.A.S.A. research grant NSG-7543. G.W.H. was a Guest Investigator at Kitt Peak National Observatory, which is operated by the Association of Universities for Research in Astronomy, under contract with the National Science Foundation. The others wish to thank the A.A.V.S.O. for help with instrumentation provided through the Photoelectric Committee, currently chaired by Howard J. Landis.

DOUGLAS S. HALL
GREGORY W. HENRY

Dyer Observatory
Vanderbilt University
Nashville, Tennessee 37235

HOWARD LOUTH

2199 Hathaway Road
Sedro Woolley, Washington 98284

LARRY P. LOVELL
CHRISTOPHER STEPHAN

Hickox Observatory
18410 Munn Road
Chagrin Falls, Ohio 44022

References:

Harper, W. E. 1921, P.D.A.O. 2, 129.

Young, A. and Koniges, A. 1977, Ap.J. 211, 836.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1765

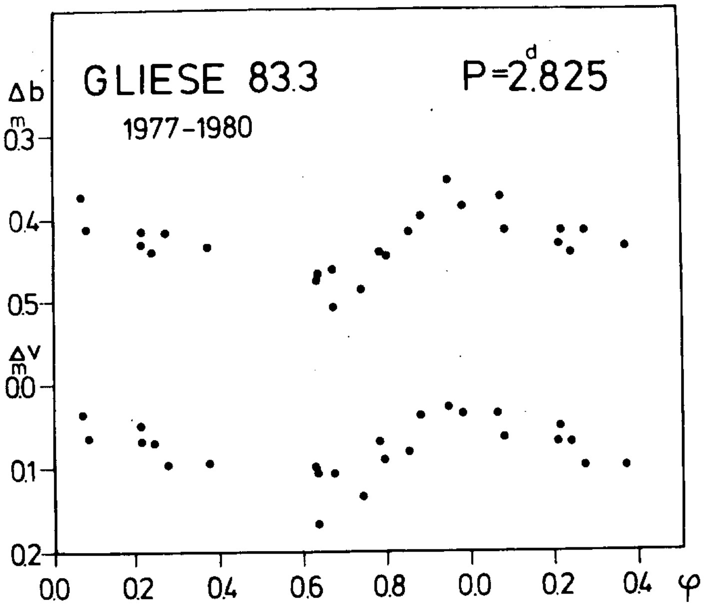
Konkoly Observatory
Budapest
1980 March 31

VARIABILITY OF THE RED DWARF STAR GLIESE 83.3

Bouique (1961) and Bouique et al. (1962) remarked in their publications on photoelectric photometry of stars in the galactic field that Gliese 83.3 was probable variable. They measured the star's brightness and colour and found it to be considerably red: V=7.47, B-V=+1.70.

Petit's (1976) list of probable variable red dwarf stars also included Gliese 83.3.

As one of the stars of our survey program searching for BY Dra type variables, Gliese 83.3=CSV 102367=BD+61°366=HD 12208 was observed at the Konkoly Observatory with the 60 cm telescope close to the UBV system on 18 nights between 1977-1980. The com-



parison and check stars used were BD+60°400=HD 11865 (V=7.44, B-V=+1.28) and BD+59°397=HD 12482 (V=7.36, B-V=+0.53), respectively. The mean scatter of our observations was ±0.005 in V band and ±0.008 in B band.

After reducing the data the star was found to be indeed variable. A systematic search for period was carried out and a period of 2.825 days has been found. In the Figure the yellow (Δv) and blue (Δb) light curves in our instrumental system are seen. The amplitude of light variation is about $0\overset{m}{.}12$ in both colours.

This star was also monitored on two nights during 6 hours 20 minutes, but no flare event was recorded.
The star's red colour, spectral type and low amplitude light variation indicate, that Gliese 83.3 belongs to the BY Dra type stars. The B-V colour index shows no variation (exceeding the observational error) which is also characteristic of this kind of spotted stars.

K. OLÁH
Konkoly Observatory

References:

Bouique, R., 1961, Ann. Obs. Toulouse 28.33
Bouique, R., Boulon, J., Pédossaut, A., 1962, Publ. Obs. Hte-Provence 5. No. 49
Petit, M., 1976, Inf. Bull. Var. Stars No. 1135

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1766

Konkoly Observatory
Budapest
1980 April 1

IAU COLLOQUIUM No. 58 ON STELLAR HYDRODYNAMICS

This colloquium will be held at Los Alamos Scientific Laboratory on 12 - 14 August 1980. The topics will include

1D, 2D and 3D collapse of interstellar clouds
Solar pulsations
β Cephei and 53 Persei variables
δ Scuti and dwarf Cepheids
Cepheids of populations I and II
RR Lyrae and BL Herculis variables
Red variables
Planetary nebulae ejection
R Coronae Borealis pulsations
Supernovae
White dwarf pulsations
Novae

Although the topic list is organized by observed type of variable, the emphasis of the colloquium will be on theoretical aspects and the interpretation of observations rather than a presentation of raw observations alone. Each topic will be introduced by a review paper followed by contributed papers.

If you wish to present a paper at this colloquium send details to reach R S Stobie no later than 1 July 1980 giving information on title paper, abstract, authors and who is going to present it.

IAU Travel Grants are available to a limited number of applicants who have no other means of financial support. If you wish to apply for a Travel Grant contact R S Stobie as soon as possible

Royal Observatory
Blackford Hill
Edinburgh EH9 3HJ
SCOTLAND

R.S. STOBIE
Chairman
Scientific Organizing Committee

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1767

Konkoly Observatory
Budapest
1980 April 3

ELEMENTS FOR CSV 8853 = Wr136

CSV 8853 = Wr 136 (α_{1900}: $23^h22^m19^s$ δ_{1900}:$+45^\circ01'$) was discovered photographically by R. Weber (1963). He classified the star as a probable cepheid variable. One of us (A.G.) set out to determine the elements of variability of CSV 8853 visually in the summer of 1979, using his 20 cm Newton reflector. Very soon it became evident, that the period of variation was rather short, amounting to some 5 hours. Table I lists all the visually determined times of maximum light along with the number of observations. From these observations the following preliminary elements were deduced, employing standard least squares methods:

(1) JD max hel = 2444065.462 + 0.190429·E.

O-C values and E in Table I refer to these elements.

Table I

Visual times of maximum for CSV 8853

JD max hel 2400000 +	O-C	E	n
44065.4544	-0.0086	0	9
069.4672	+0.0048	21	17
070.4173	+0.0027	26	13
070.5902	-0.0148	27	7
072.5007	-0.0087	37	20
073.4550	-0.0067	42	11
076.5128	+0.0039	58	25
077.4643	+0.0032	63	24
078.4157	+0.0024	68	18
081.4653	+0.0049	84	15
082.4103	-0.0023	89	15
087.3677	+0.0035	115	18
118.3937	-0.0130	278	8
133.4463	-0.0055	357	6
143.3472	-0.0078	409	9

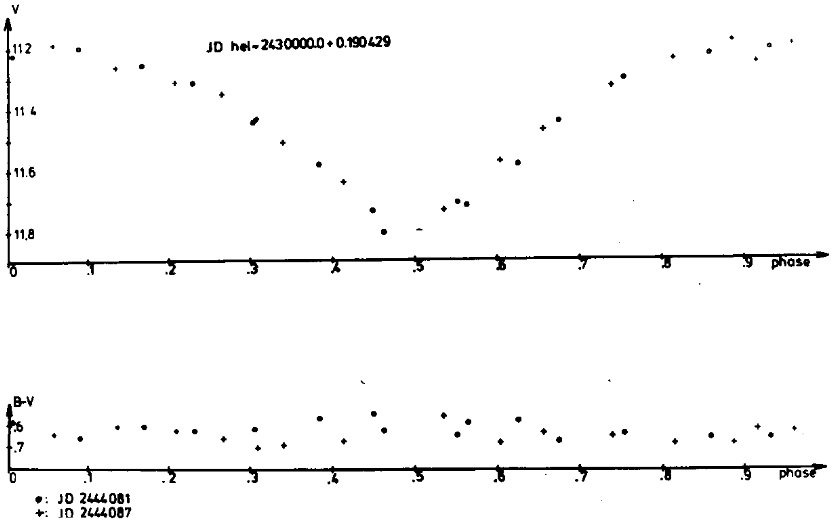


Figure 1. Photoelectric V- and B-V-curve of CSV 8853 obtained with the Basel University photometer attached to the 1m reflector on the Gornergrat, Switzerland.Circlets denote observations obtained on JD 2444081, crosses observations obtained on JD 2444087.

Table II

Photoelectric observations of CSV 8853

t_{obs}	phase	V	B-V
44081.4640	0.0061	11.230	0.590
44087.3770	0.0571	11.190	0.640
44081.4800	0.0901	11.210	0.670
44087,3920	0.1358	11.270	0.600
44081.4950	0.1689	11.270	0.610
44087.4060	0.2094	11.320	0.620
44081.5070	0.2319	11.330	0.630
44087.4170	0.2671	11.360	0.660
44081.5210	0.3055	11.460	0.620
44087.4250	0.3091	11.440	0.700
44087.4310	0.3406	11.520	0.690
44081.5360	0.3842	11.600	0.570
44087.4450	0.4142	11.650	0.670
44081.3580	0.4495	11.750	0.550
44081.5510	0.4630	11.820	0,630
44087.4680	0.5349	11.740	0.550
44081.5680	0.5523	11.720	0.650
44081.3800	0.5650	11.730	0.590
44087.4810	0.6032	11.580	0.680
44081.5820	0.6258	11.600	0.580
44087.4910	0.6557	11.480	0.630

Table II (cont.)

t_{obs}	phase	V	B-V
44081.4010	0.6753	11.460	0.680
44087.5070	0.7397	11.340	0.640
44081.4160	0.7541	11.320	0.640
44087.5210	0.8133	11.250	0.680
44081.4360	0.8591	11.240	0.660
44087.5350	0.8868	11.190	0.680
44087.3500	0.9153	11.260	0.610
44081.4500	0.9326	11.220	0.660
44087.5490	0.9603	11.200	0.620

In order to check the elements and to secure a photoelectric light-curve, one of us (R.D.) observed CVS 8853 during two nights in the summer of 1979, covering the whole cycle in both cases. We used the single channel RGUBV-photometer of Basel University attached to the 1 meter reflector of Gornergrat station, Switzerland (3100 m/M) operated by "Stiftung Hochalpine Forschungsstationen Jungfraujoch und Gornergrat". Transformation into the standard Johnson UBV-system was obtained by repeated observations of standard stars. Table II lists the V magnitudes as well as the B-V colours. They were all reduced differentially by comparing the variable with comparison star c in Weber's chart, lying some 3' south of CSV 8853 (V=11.55±0.02, B-V=+0.61±0.03). Due to the close proximity of the variable and the comparison star, the use of mean extinction coefficient was appropriate. The internal errors of a single observation amounts to 0.02 in V and 0.03 in B-V.

R. DIETHELM

Astronomical Institute of
Basel University
Switzerland

A. GAUTSCHY

Gontenschwil
Switzerland

Reference:

Weber, R. : 1963, I.B.V.S. No. 21

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1768

Konkoly Observatory
Budapest
1980 April 8

REQUEST FOR COOPERATION FROM OPTICAL AND RADIO OBSERVERS

Time has been allocated on the International Ultraviolet Explorer satellite jointly by NASA, the British SRC, and ESA to three groups based at JILA, Colorado, USA, Armagh Observatory, Northern Ireland and Catania Observatory, Sicily to observe a Flare Star/BY Draconis variable. The total time allocated is many times the mean inter-arrival time between flares and comparable to the period of the BY Dra variations. As a result it is hoped to be able to monitor changes taking place in the star's UV spectrum during a flare and during a complete cycle of the BY Dra variations, with particular reference to those lines indicative of conditions in the chromosphere, transition region and lower corona.

AU Mic (=HD 197481; V=8.9, B-V =+1.4 and U-B =+1.1; $\alpha(1980)=20^{h}44^{m}54^{s}$, $\delta(1980)=-31^{\circ}24'.7$) has been chosen as the most suitable target. It is known to be both a Flare Star (Harding, 1970 and Kunkel, 1973) and a BY Dra variable of relatively large amplitude and a period of 4.865 days (Torres et al. 1972). The amplitude of the BY Dra variations as reported by Torres et al. is $\Delta V\sim 0\overset{m}{.}3$ making it one of the largest amplitude BY Dra variables known. Harding (1970), observing with a 1-meter telescope, recorded one flare per 2.4 hours in the Johnson U-band under adverse, bright-sky conditions, while Kunkel (1973) registered 31 U-band flares with a 1.5-meter telescope in 6.7 hours of observation, many of which were of much smaller amplitude than those of Harding.

A total of nine eight-hour shifts on IUE has been assigned to the project totalling 72 hours in all. Thus as many as 30 moderately large flares may be recorded during this period. A single UV flare spectrum has already been recorded with IUE on the star Gliese 867A and the UV out-of-flaring spectrum of this star is similar to that of AU Mic (Andrews, Butler and Byrne 1980). In addition it is hoped to spread the time over about four days to maximize the phase coverage with respect to the BY Dra variations. In order that the best possible use be made of these UV data at least optical photometry of the programme star of a type suitable for detecting flares and the phase of the BY Dra variations will be needed. To this end we are appealing to all optical observers in the southern hemisphere or at the lower northern latitudes, spread over as wide a range of longitude as possible to cooperate in providing the necessary coverage. In addition we would like to appeal to any who may be able to secure spectra of AU Mic during the appropriate times to do so particularly if these can be time-resolved. In order that the information be as complete as possible an invitation is also being extended to radio observers and to a number of groups involved in X-ray astronomy.

Observations should consist of continuous photometric monitoring in the near ultraviolet (e.g. Johnson U or similar wavebands) with integration times of between 1^s- 10^s. It is important for investigating the BY Dra phenomenon that we be able to establish the amplitude and phase at the time of the IUE observations. Measurements should therefore be made of AU Mic and at least two nearby comparison stars of similar colour in U, B and V at least once but preferably two or three times per night. Spectroscopic observations should cover as much of the visible spectrum as possible with preference being given to the blue end longward of, but including, Hβ.

Final observing dates have not yet been set but one of two intervals is being sought. The first is during the second week of July and the second would be in the first week of August. As soon as they are available final details will be published in this bulletin but individual observers interested are invited to contact the undersigned.

P.B. BYRNE
Armagh Observatory
Armagh BT61 9DG
Northern Ireland

References:

Andrews, A.D.,Butler, C.J. and Byrne, P.B.,1980, Private communication from a paper in preparation.
Harding, G.A. 1970, M.N.A.S.S.A., Vol. XXIX, 130
Kunkel, W.E., 1973, Astrophys.J.Suppl.Ser., 25, 1
Torres,C.A.O.,Ferraz Mello,S. and Quast,G.R.,1972, Astrophys.Lett.,11,13

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1769

Konkoly Observatory
Budapest
1980 April 8

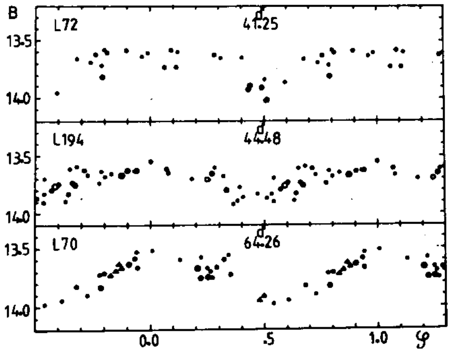
THREE NEW RED VARIABLE STARS, V10 AND V15 IN M13

Up to now four red variable stars V10 (with unknown period), V11, V15 and L973 (Sawyer-Hogg, 1973; Fuenmayor and Osborn,1974) were known in the globular cluster M13 = NGC6205. On the same 43 blue plates, on which L973 was studied (Russev and Russeva, 1979a) we investigated the variability of V10 and V15, as well as nine red giants. The latter are Nos.70, 72, 194, 240, 252, 261, 353, 414 and 877 in Ludendorff's (1905) catalogue and Nos. 309, 310, 382, 398, 403, 409, 434, 444 and 513, respectively, in Kadla's (1966) catalogue. Our plates cover about four years,from 1974 to 1978. The photometric system is near the B one, as it was announced in the paper on L973. In addition to this observational material we have also used the data for V15 from Russev's (1973a) publication and the unpublished measurements of the same 23 blue plates from the State Astr.Inst. collection in Moscow for V10, L194, 240, 252, 261, 353, 414 and 877 (J.D.2437790-41093). Besides we have used Osborn and Fuenmayor's (1977) measurements for V10, V15, L261 and L414 (J.D. 2439658-40439), as well as those by Pike and Meston (1977) for V10 and L70 (J.D. 2441069 - 41160). In general we have not established essential systematic deviation in the B-systems of the different authors.

New variables. As a variability criterion of the investigated nine program stars we have adopted the mean error ($\varepsilon = \frac{(Bi-\bar{B})}{n}$) of their mean magnitudes ($\bar{B}$), obtained from the available individual measurements (Bi). It was assumed that we could suspect in variability those stars, for which ε is greater than the accuracy of the photometry $\pm 0\overset{m}{.}08$. L70, 72, 194, 240 and 261 proved to be such stars. Recently the star L70 was suspected in variability also by Pike and Meston (1977). The analysis of the available observations permitted the construction of light curves for

L70 (from 48 observations in all), L72 (40 observations) and L194 (64 observations), which are shown in Fig.1. The light curve elements are:

for L72 Max = J.D. 2442307.6 + $41\overset{\mathrm{d}}{.}25 \cdot E$ (before J.D.2443000)
Max = J.D. 2442315.9 + $41\overset{\mathrm{d}}{.}25 \cdot E$ (after J.D.2443000)
for L194 Max = J.D. 2437810.8 + $44\overset{\mathrm{d}}{.}48 \cdot E$
for L70 Max = J.D. 2442324.0 + $64\overset{\mathrm{d}}{.}26 \cdot E$



In Fig. 1 the measurements by Russev are denoted with crosses those by Pike and Meston with triangles and our observations with dots. The size of the symbols is proportional to the numbers of observations per night.

We must note that when constructing the light curve of L72 it was necessary to admit the shifting of the light curve maximum with about $8\overset{\mathrm{d}}{.}3$ for the time after J.D. 2443000 in comparison with its position for the earlier observations. That is why we consider the light curve of L72 preliminary and in need of specification.

These three new variables are physical members of M13 according to the radial velocities measured by Popper (1947) and the proper motions (Cudworth and Monet, 1979).

V10 and V15. The light curves of these two variables, constructed with the help of the following elements:

for V10 Max = J.D. 2439670.0 + $35\overset{\mathrm{d}}{.}62 \cdot E$
for V15 Max = J.D. 2441061.5 + $39\overset{\mathrm{d}}{.}23 \cdot E$

are shown in Fig.2. The symbols are the same as in Fig. 1. Osborn and Fuenmayor's (1977) observations are denoted with x-es. The scattering in the light curve of V10 is probably due first and foremost to the fact that the star has close optical companions and is difficult to measure. Here we confirm the period $39^{\mathrm{d}}.23$ for V15, obtained by Osborn and Fuenmayor (1977). This period is approximately 7/2 of Russev's period and is used by Russev and Russeva (1979c) for the explanation of the observations published there.

Discussion. At the first sight it seems odd that the periods of several red variables in M13 (V10,V15,L72,L194 and L973) fall in the region from 35^{d} to 45^{d}, which, as is known, are found comparatively rarely among the variables of this type in globular clusters. It must be noted, however, that if we could doubt to a certain extent in the reliability of the periods obtained for V10 and L72, we believe that the periods of the remaining four stars are beyond any doubt. On the other hand, according to its period ($64^{\mathrm{d}}.26$), amplitude ($0^{\mathrm{m}}.48$) and shape of the light curve the variable L70 may be compared with the long-period variable V11 ($P=91^{\mathrm{d}}.77$, $A_B=0^{\mathrm{m}}.67$) known long since in M13.

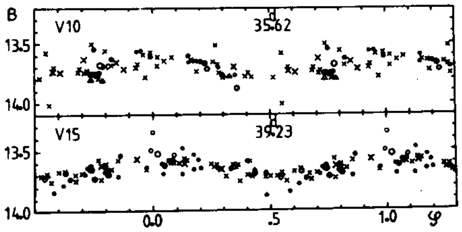


Fig. 2

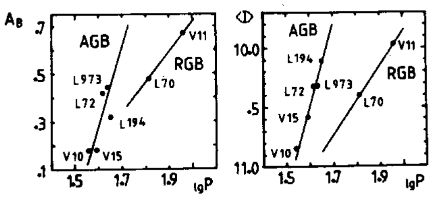


Fig. 3

Fig. 3 presents the period-amplitude (A_B) diagram, as well as the period-magnitude (<I>) ones of the seven red variables in M13 known up to now. The amplitudes are for V10-$0^{\mathrm{m}}.18$, V15-$0^{\mathrm{m}}.18$, L72-$0^{\mathrm{m}}.42$, L194-$0^{\mathrm{m}}.32$ and L70-$0^{\mathrm{m}}.48$ from the present article (Fig.1 and Fig.2), and for L973 ($P=43^{\mathrm{d}}.27$)-$0^{\mathrm{m}}.45$ and V11-$0^{\mathrm{m}}.67$ from our recent publications (Russev and Russeva, 1979a, 1979b).The infrared magnitudes $\langle I \rangle$ for V11, V15, L194 and L973 are from Russev's (1973b) work, while for V10, L70 and L72 they were additionally determined from the same observational material.

On both diagrams two sequences may be distinguished clearly, the one for the lesser amplitude variables with periods 35^d-45^d, and the second one formed by L70 and V11 with $P \gtrsim 50^d$. We must note immediately that on the colour-magnitude diagram, constructed using the infrared magnitudes $\langle I \rangle$ and the colour (B-I) (Russev, 1973b), the first group stars fall on the asymptotical giant branch (AGB), while L70 and V11 are on the prolongation of the giant branch (RGB) at higher luminosities and lower temperatures. Thus the period-luminosity dependence of the investigated variables in M13 is divided in two sequences with a different slope of both these evolutionary star groups. A confirmation of the obtained result for this cluster, as well as for other globular clusters in our Galaxy is necessary.

This investigation will be published in detail elsewhere.

TATIANA RUSSEVA
Department of Astronomy
Academy of Science,Sofia
Bulgaria

RUSCHO RUSSEV
Department of Astronomy
University of Sofia,
Bulgaria

References:

Cudworth, K., and Monet, D., 1979, AJ, 84, 774
Fuenmayor, F., and Osborn, W., 1974, IBVS, No. 952
Kadla, Z., 1966, Iz. Pulkova Obs., 24, 93
Ludendorff, H., 1905, Publ.Potsdam Obs., 15, No. 50
Osborn, W., and Fuenmayor, F., 1977, ApJ. 82, 395
Pike, C., and Meston, C., 1977, MN, 180, 613
Popper, D., 1947, ApJ. 105, 204
Russev, R., 1973a, Perem.Zvezdi, 19, 181
Russev, R., 1973b, Astron.Zh., 51, 122
Russev, R., and Russeva, T., 1979a, IBVS No. 1534
Russev, R., and Russeva, T., 1979b, IBVS No. 1624
Russev, R., and Russeva, T., 1979c, Perem.Zvezdi, 21, 169

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1770

Konkoly Observatory
Budapest
1980 April 9

HD 17576AB: A VARIABLE G DWARF WITH A VERY HOT SUBDWARF COMPANION

HD 17576 ($7^{m}.29$, G0) was identified by Darius and Whitelock (1978) as the optical counterpart to the ultraviolet object UV0246-37 found in an UV sky survey made by the TD-1 satellite. They suspected duplicity and obtained spectra and uvbyβ photometry confirming the unusual nature of the object. The luminosity class of the G0 primary was found to be V or IV-V. Several independent estimates of m_V for the secondary led to approximately $10^{m}.1$. They concluded that the secondary is more luminous than any white dwarf, but markedly subluminous for an early-type star. Darius and Whitelock do <u>not</u> mention that HD 17576 is a known <u>visual</u> double star (DAW 35).

Independently, Olsen (1979) also found HD 17576 to be a very interesting object. This was based on uvby photometry, and some speculations concerning the nature of the visual companion were published. The latest of two astrometric measures is by Finsen in 1934, and he estimated the visual magnitude difference at $3^{m}.2$ (Worley, private communication). The agreement with the estimate by Darius and Whitelock is fair, and it seems reasonable to suppose that the visual companion is the source of the ultraviolet flux from the system.

At the suggestion of the author, Hidayat et al. (Nature, preprint) observed the double star in July 1979 with the Bosscha double-refractor. Their preliminary results are a separation of $1''.6$ and a position angle of about 170°. This is nearly the same as the two astrometric measures from 1919 ($1''.8$, 173°) and 1934 ($1''.8$, 171°) indicating little or no projected orbital motion in the intervening six decades. The projected separation may be estimated at less than 100 A.U., and therefore orbital motion may be detectable in the coming decades, assuming the pair to form a physical system. A mass determination for the secondary would be very valuable.

Table I

HJD 2440000+	u	v	b	y=V	u-v	v-b	b-y	u-b
$3932\overset{\mathrm{d}}{.}5282$	45	50	48	35	-5	2	13	-3
3933.5279	19	19	24	29	0	-5	-5	-5
3934.5283	25	37	28	26	-12	9	2	-3
3935.5229	8	22	28	34	-14	-6	-6	-20
3936.5209	14	9	8	8	5	1	0	6
3937.5147	1	2	-2	4	-1	4	-6	3
3938.5163	-3	-13	-6	2	10	-7	-8	3
3940.5172	-7	-14	-11	-21	7	-3	10	4
3941.5205	-15	-25	-34	-26	10	9	-8	19
4127.8752	-19	-34	-32	-30	15	-2	-2	13
4129.8223	-37	-40	-35	-37	3	-5	2	-2
4134.8072	-22	-9	-15	-24	-13	6	9	-7
Mean values	9305	8718	8216	7840	587	502	376	1089

During two observing periods in 1979 HD 17576 was observed occasionally with a simultaneous four-channel photometer in the Strömgren four-colour system. The reductions show that the double star is variable, and the variations must be ascribed to the primary component. In Table I the mean values in the standard system are given together with the individual deviations from these means (unit $0\overset{\mathrm{m}}{.}001$). Over a period of nine days in March 1979 the double star gradually brightened by about $0\overset{\mathrm{m}}{.}06$ in all colours and in September 1979 it was still at the bright level around $V=7\overset{\mathrm{m}}{.}81$. One observation more than two years before (HJD=$2443013\overset{\mathrm{d}}{.}866$) gave $V=7\overset{\mathrm{m}}{.}79$, i.e. also relatively bright. It is tempting to speculate that this slow light variation of the primary may be due to an earlier interaction between the components at an epoch when the present secondary evolved through a violent phase towards the hot subdwarf stage. It is suggested that photometrists with frequent access to a southern telescope monitor this system to throw additional light on the nature of the variations. The 1980.0 coordinates of HD 17576 are

$$\text{R.A.} = 2^{\mathrm{h}}47^{\mathrm{m}}19\overset{\mathrm{s}}{.}7,\ \text{Dec.}=-37^{\circ}3\overset{\prime}{.}8$$

Finally, it is instructive to compare the properties of this binary with those of HD 149499AB, which was recently discussed in detail by Wray et al. (1979) (cf. Table II). Their conclusion

Table II

	HD 149499	HD 17576
Separation	$2''.4$	$1''.8$
V(AB)	$8^{m}.69$	$7^{m}.79-7^{m}.87$
m_V(B)	$11^{m}.7$	$11^{m}.1$
S_p(A)	K0V	G0V or IV-V
M_V(A)	$5^{m}.9$	$4^{m}.4$
M_V(B)	$8^{m}.9$	$7^{m}.6$
Distance	35 pc	50 pc
m(1550Å)-m(2740Å)	$-2^{m}.0$	$-2^{m}.0$
T_{eff}(B)	85.000:K	42.000:K

is that HD 149499B may be the hottest white dwarf known with a temperature in the range 70000-100000 K. The steep gradient in the ultraviolet spectrum is shown by the magnitude difference, m(1550Å)-m(2740Å)=$-2^{m}.0$, which is equal to the one derived for HD 17576B by Darius and Whitelock form somewhat less detailed data. The identical gradients suggest that HD 17576B may be quite as hot as HD 149499B.

ERIK HEYN OLSEN
Copenhagen University Observatory
Brorfelde, Denmark

References:

Darius, J. and Whitelock, P.A. 1978, Nature, 275, 428

Olsen, E.H. 1979, Astron. Astrophys.Suppl. 37, 367

Wray, J.D., Parsons, S.B. and Henize, K.G. 1979, Astrophys.J. 234, L187

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1771

Konkoly Observatory
Budapest
1980 April 9

ONE LESS CARBON STAR

The irregular variable BX Aurigae is noted as belonging to the carbon class in the General Catalogue of Variable Stars, and, as such, is included in Stephenson's General Catalogue of Cool Stars (1973). Reference to a blue objective-prism plate in the observatory files, however, indicates that this object, while rather red and badly overlapped by another spectrum, is not a carbon star. To the writer's knowledge the first mention of BX Aurigae as a carbon star is in the 7th Supplement to the 1st edition of the GCVS (1955), and no later spectral type seems to have been determined. It seems not unlikely that a clerical error confusing this object with the well-known nearby carbon star RV Aurigae was responsible for the erroneous type.

WILLIAM P. BIDELMAN

Warner and Swasey Observatory
Case Western Reserve University
Cleveland,Ohio

Reference:
Stephenson, C.B.: 1973, Publ. Warner and Swasey Obs. 1, No.4

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1772

Konkoly Observatory
Budapest
1980 April 14

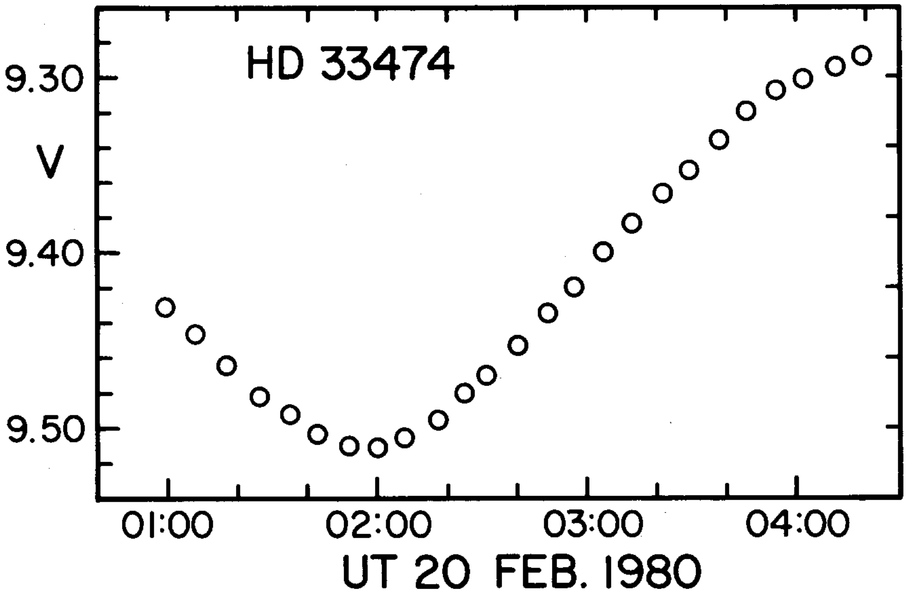
SHORT PERIOD VARIABILITY OF HD 33474

Isolated observations of HD 33474, listed in the table, spread over several years indicate a small range, short period variation. The star was monitored for about three and a half hours on 20 Feb 1980 with the result shown in the Figure. The spectral classification of F8 III (Przybylski and Kennedy 1965) indicates a possible ultrashort period cepheid (USPC) but the mean indices in Table I give $[M_1] = 0.235$, $[C_1] = 0.430$ and $M_V = +3.6$ mag, which are consistent with the classification of F5 V by Houk and Cowley (1975). The star is redder and fainter than any known USPC (Eggen 1979). The value of $[M_1]$ indicates a metal abundance near the solar value. The star is more probably a contact binary, with a period near 0.4 days and very similar to AW UMa (See IBVS 1176), but of even smaller amplitude. These binaries usually contain the light of two equal components

Table I

Observations of HD 33474

V	b-y	$[M_1]$	$[C_1]$	β	Date
$9^m.42$	$0^m.296$	$0^m.153$	$0^m.492$		11 Dec 1975
9.43	0.272	0.164	0.463		12 Dec 1975
9.52	0.304	0.137	0.493		6 Dec 1979
9.29	0.270	0.157	0.494	2.656	4 Jan 1980
9.51	0.296	0.140	0.491	2.650	14 Jan 1980
9.37	0.289	0.143	0.491	2.662	2 Feb 1980
mean	0.288	0.149	0.487	2.656	



(Eggen 1976), giving a modulus for HD 33474 of 6.55 mag and a space motion of (U, V, W) = (+79, -39, +48)km/sec from the proper motion of $(\mu_\alpha, \mu_\delta) = (+0''.076, +0''.072)$ on the FK4 system and a radial velocity of +6.8 km/sec. The space motion and metal abundance indicate a member of the ε Ind group; the motion of ε Ind is (U, V, W) = (+79, -39, +3) km/sec.

OLIN J. EGGEN
Cerro Tololo Inter-American Observatory*
La Serena, Chile

References:

Eggen, O.J. 1967, Mem. R.A.S., 70, 111.
_____. 1979, Ap. J. Suppl. 41, 413.
Houk, N. and Cowley, A.P. 1975, University of Michigan Catalogue of Two-Dimensional Spectral Types for the HD Stars, Vol. 1.
Przybylski, A. and Kennedy, P.M. 1965, Mon.Not.R.A.S. 129, 63.

---

* Cerro Tololo Inter-American Observatory is supported by the National Science Foundation under contract No. AST 78-27879.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1773

Konkoly Observatory
Budapest
1980 April 16

NEW PHOTOMETRIC ACTIVITY IN U CEPHEI

Crawford and Olson (1979) have summarized photometric disturbances in primary eclipses of U Cep from 1974 to 1977. The frequency of photometrically disturbed eclipses gradually declined during this time. Eclipses of UT 1978 September 2 and 27 (observed with the 1 m Prairie Observatory reflector) were nearly free of contaminating light, and the eclipse of 1979 September 6 (observed with the No. 4 0.4 m Kitt Peak National Observatory reflector) just satisfied the Crawford-Olson criterion (d>0.075 day) for an "undisturbed" eclipse. The eclipse of 1980 February 25 (KPNO) was the cleanest yet observed by the authors, from the ultraviolet to the infrared. We have been unable to observe any other primary minima this year.

Olson (1978) has discussed large light losses often present outside primary eclipse during active periods, particularly near orbital phase 0.6. We now report the sudden recurrence of such activity, as shown in Figures 1 (Strömgren-Crawford ultraviolet) and 2 (near-infrared transformed to the Kron I). The ultraviolet light on 1980 February 24 (triangles) was at its undisturbed level, while on 1979 September 7 (diamonds) some depression is evident (both KPNO nights were of marginal quality, accounting for the large scatter). Following the clean eclipse of 25 February, observations under photometric conditions at Prairie Observatory on 1980 March 15 and 22 (octagons and squares) showed a large dip in the light curve. This depression matches the most prominent dip seen earlier (see Figure 3b of Olson 1978). Features similar to the small "peak" at phase 0.55 have been observed many times before under depressed light conditions and were unquestionably real. The size of the light loss increased mono-

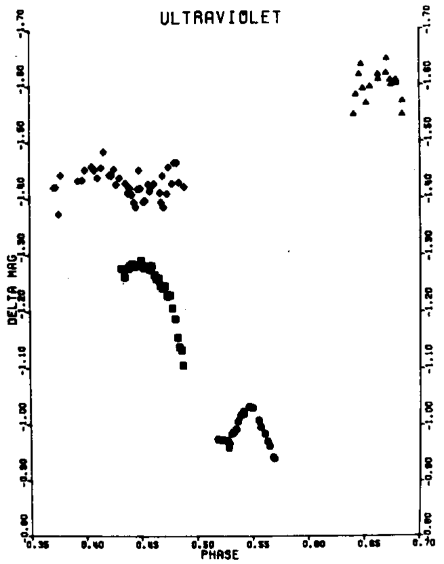


Figure 1 - Strömgren-Crawford U-observation of U Cep near phase 0.5. Diamonds, UT 1979 September 7; triangles, 1980 February 24; octagons, 1980 March 15; squares, 1980 March 22.

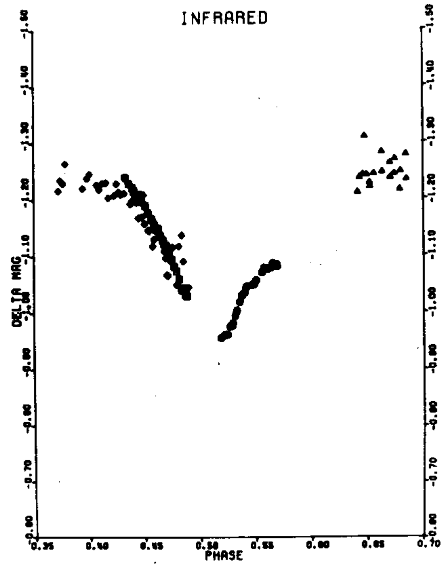


Figure 2 - Near-infrared observations of U Cep, transformed to the Kron system. Symbols are the same as in Figure 1.

tonically from infrared to ultraviolet where up to half of the light was lost, and the phenomenon was very similar to the earlier episodes. Past experience suggests that the dip can disappear on a time scale of about 5 days, and that new episodes of activity can reappear on a scale of months. Eclipse light curves can also be expected to vary significantly.

We urge observers to obtain multicolor photometry of this active Algol-like binary at all possible phases.

R.C. CRAWFORD
E.C. OLSON
University of Illinois
Department of Astronomy
Urbana, Illinois 61801

References:
Crawford, R.C., and Olson, E.C. 1979, Publ.A.S.P., 91, 413
Olson, E.C. 1978, Ap.J., 220, 251

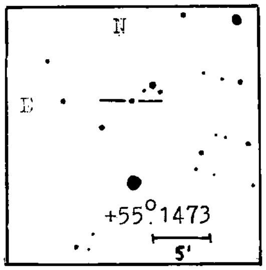
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1774

Konkoly Observatory
Budapest
1980 April 18

COORDONNÉES PRECISES DE SUPERNOVA 1980 DANS NGC 3733

Supernova 1980 dans NGC 3733 a été photographiée 19 et 21 Mars 1980 avec le télescope de Maksutov 35/50/120 cm à l'Observatoire astronomique d'Engelhardt. On a utilisé l'émulsion ORWO ZU 21 9x9 cm.

Nous avons obtenu 2 clichés qu'ont été mesurés à l'aide d'ASCORECORD. Les coordonées ont calculées par la méthode de Turner.



Les coordonnées précises de cette supernova sont :

$$\alpha_{1950.0} = 11^h32^m13^s\!.148 \pm 0^s\!.011$$
$$\delta_{1950.0} = +55^\circ 09' 30''\!.44 \pm 0''\!.18$$

En qualité de répere nous avons pris les étoiles de FK3: 561522, 561530, 551480, 551473, 551471, 551469 et l'étoile de AGK3 No. 819.

M.I. KIBARDINA et L.A. OURASSINE
Observatoire astronomique
d'Engelhardt

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1775

Konkoly Observatory
Budapest
1980 April 21

ON THE 1978 AUGUST PECULIAR NOVA IN M 31

To add to the rather scanty data on the nova discovered in M 31 by Dopita et al. (1979) we looked through the plates obtained between August and October 1978 with the 80 cm Schmidt camera of the Radioastrophysical Observatoty, with the 50 cm Maksutov telescope (in Crimea) and the 70 cm reflector of the Sternberg Astronomical Institute. The star was detected on two of the plates: Sept. 4/5, U.T. $23^{h}50^{m}$, $B=18\overset{m}{.}4$ and Sept. 5/6, U.T. $0^{h}52^{m}$, $B=19\overset{m}{.}6$. The magnitudes of the star have been estimated by comparison with the stars in the nearby association OB 78 (van den Bergh, 1966). No trace of the star could be found on the other plates. The limiting B-magnitudes of the most important of them are $18\overset{m}{.}8$ - Aug. 15/16, $18\overset{m}{.}5$ - Sept. 6/7 and Sept. 7/8, $19\overset{m}{.}0$ - Sept. 25/26, $20\overset{m}{.}0$ - Oct. 10/11.

Dopita et al. estimated the brightness of the star on Oct. 5 1978 to be $B=19^{m}$ according to their table I. There are, however, some discrepancies between this value and some statements in the text, e.g., that the object was absent on the plates taken in October 1978. It may have been that the limiting magnitudes of the plates were given for October 5 in table I by Dopita et al. Despite these uncertainties it seems to be possible to conclude from all available data that between Sept. 1/2 and Sept. 5/6 the nova was in its early phase of decline. The rate of decline in B-magnitudes was about $0\overset{m}{.}8$, and the star can accordingly be classified as very fast nova, a very rare type of novae in M 31. Among all novae studied up to now in M 31 only two - No. 1 and No.2 from Arp's list (1956) are faster. Among the novae known in our Galaxy the Nova Cygni 1975 (V1500 Cyg) possibly was the one most similar to the star discussed here. If we assume that this nova in M 31 was at its maximum ($B=16\overset{m}{.}3$) on

Sept. 1/2, it fairly well satisfies the relationship between maximum magnitude and the rate of decline, m_{max}-log 100d, derived for novae in M 31 by Arp (1956).

The brightness of the star on Aug. 27/28 estimated by Dopita et al. might indicate that either the nova was near its maximum for about five days, or it was on Aug. 27/28 in the rising part of the light curve. The fast novae, however, have a very fast rise and sharp maximum. If we assume that the star has undergone a rise of light similar to that of the other fast novae, its maximum magnitude could have been near $B=13^m$. Consequently, the star would have been too bright at its maximum for novae in M 31 and would sharply fall out of the relationship m_{max}-log 100d.

Thus the 1978 August nova in M 31 seems to be peculiar not only with regard to its spectrum as shown by Dopita et al. but also with regard to its light curve. To get a better idea of the nature of the nova the publishing of more detailed data on the spectrum, including the reliability of the measurements of intensity and wavelengths of emission features of the star would be very desirable. Additional data on the brightness of the star, supposing there are other photographs of M 31 obtained in some observatories during the summer - autumn season of 1978, might be of great importance.

A. ALKSNIS
Radioastrophysical Observatory, Latvian Academy
of Sciences, Riga, Latvia,
U.S.S.R.

A.S. SHAROV
Sternberg Astronomical
Institute,
Moscow, U.S.S.R.

References:

Arp, H., 1956, Astron. J. 61, 15
Dopita, M.A., Rosino, L., D'Odorico, S., 1979, Astron.Astrophys. 76, 240
Rosino, L., 1964, Ann. Astrophys. 27, 498
Van den Bergh, S., 1966, Astron. J. 71, 219

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1776

Konkoly Observatory
Budapest
1980 April 30

A DEEP MINIMUM OF MV LYRAE

The nova-like star MV Lyrae (Mc Rae +43°.1) has been observed on plates taken with the 67/90/215 cm Schmidt telescope of the Asiago Astrophysical Observatory since 1968. The star was considered as a possible old nova by Greenstein (1). Walker observed rapid fluctuations and a slower variation between B$\simeq$12.7 and and 14.0 (2). On the Asiago plates (103a-O + GG 13) the star shows irregular variations from 12.1 to 12.9.

Rather surprisingly, however, during August and September 1979 MV Lyrae suddenly declined from 15.7 to 18.0. The last magnitudes derived by the Asiago material were:

1978	Aug. 2	12.5 B
	" 11	12.9
1979	Aug.13	15.7
	" 29	18.0
	Sep.27	18.0

The sudden decline to 18.0 rules out the possibility that the star may be an old nova.

A programme of photometric and spectroscopic observations of the variable is now in progress. Radio, UV and X-ray observations of this very interesting variable should be highly desirable.

G. ROMANO
L. ROSINO
Padova-Asiago Observatory

References:
(1) Greenstein, J.L., PASP 66, 79, 1954
(2) Walker, M.F., PASP 66, 71, 1954

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1777

Konkoly Observatory
Budapest
1980 April 30

PHOTOELECTRIC MINIMA OF SOME ECLIPSING VARIABLES

The eclipsing binaries U CrB, DO Cas and V470 Cyg have been observed - in B and V - during 1979 with the two-beam, multimode, nebular-stellar photometer of the National Observatory of Athens attached to the 48-inch Cassegrain reflector at the Kryonerion Astronomical Station. Thus, one primary minimum has been observed for U CrB, one primary and one secondary for DO Cas and one secondary for V470 Cyg.

The following Table summarizes our results. It gives the star's name, the Hel. Julian Day, the residuals O-C, the mean error σ and the type of minimum.

Table

Name of the star	Hel. J.D. 2444000+	O-C days	σ days	Type of Min.
V470 Cyg	053.4546	-0.0010	0.0002	II
U CrB	058.3456	-0.0054	0.0003	I
DO Cas	142.3510	-0.0069	0.0006	I
"	193.3577	-0.0076	0.0009	II

The times of minima as well as the mean errors σ have been computed by Kwee and Van Woerden's method (1956). The ephemeris used is that of Kukarkin et al. (1969).

P. ROVITHIS
National Observatory of
Athens, Athens 306
Greece

H. ROVITHIS-LIVANIOU
Astronomy Dept. Athens University
Panepistimiopolis, Athens 621
Greece

References:
1. Kukarkin, B.V., et al.:1969, Gen.Cat. of Var. Stars, Moscow
2. Kwee, K.K. and Van Woerden, H.: 1956, Bull.Astr.Inst. Neth. 12, 327

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1778

Konkoly Óbservatory
Budapest
1980 May 5

ULTRAVIOLET OBSERVATIONS OF THE SILICON STAR HD 179 761

Between July 21 and August 15, 1979 I obtained photoelectric observations on the silicon star HD 179 761 (Searle and Sargent, 1964) at the Shemakha Observatory, Azerbaijan SSR. The one-channel integrating photometer was attached to a 35-cm Cassegrain telescope. The 18 measurements of this star were made in ultraviolet light with a FEU 79 photomultiplier and UG1 2 mm filter, close to the U band of the UBV photometric system.

HD 180 482 (C1) and HD 179 343 (C2) served as comparison stars. The differential magnitudes have been obtained by averaging the results of five measurements of the program and comparison stars, made in the order of C1 - PR -C2. The standard deviation between the averaged and individual values of the differential magnitudes was less than $0^m.008$ at every night.

The differential magnitudes corrected for the extinction in usual way, are given in instrumental system in Table I.

Table I

J.D. 2444000+	PR-C1	PR-C2	$PR-\frac{C1+C2}{2}$
76.295	-1.019	-2.114	-1.566
78.312	-1.028	-2.125	-1.576
79.250	-1.009	-2.110	-1.559
80.303	-1.036	-2.127	-1.581
81.297	-1.019	-2.121	-1.570
83.236	-1.018	-2.119	-1.568
84.268	-1.022	-2.114	-1.568
85.275	-1.023	-2.123	-1.572
88.238	-1.010	-2.113	-1.561
90.281	-1.025	-2.120	-1.572
92.316	-1.039	-2.126	-1.582
94.355	-1.024	-2.117	-1.570
95.243	-1.023	-2.116	-1.569
96.261	-1.021	-2.122	-1.575
97.249	-1.035	-2.125	-1.579
99.231	-1.043	-2.130	-1.586
100.246	-1.030	-2.125	-1.577
101.236	-1.018	-2.118	-1.567

The period of light variation of HD 179 761 is determined by the method of Fourier analysis of unequally spaced data (Deeming, 1975), using a small computer KSR 4100 of the Astrophysical Observatory at Potsdam. The value of the period is found to be $1\overset{d}{.}73\pm0\overset{d}{.}01$ in agreement with the result of Stepien (1968), who observed this star in UBV photometric system and found a period of $1\overset{d}{.}71$.

The observations are plotted against phase calculated with the period $P=1\overset{d}{.}73$ in Figure 1.

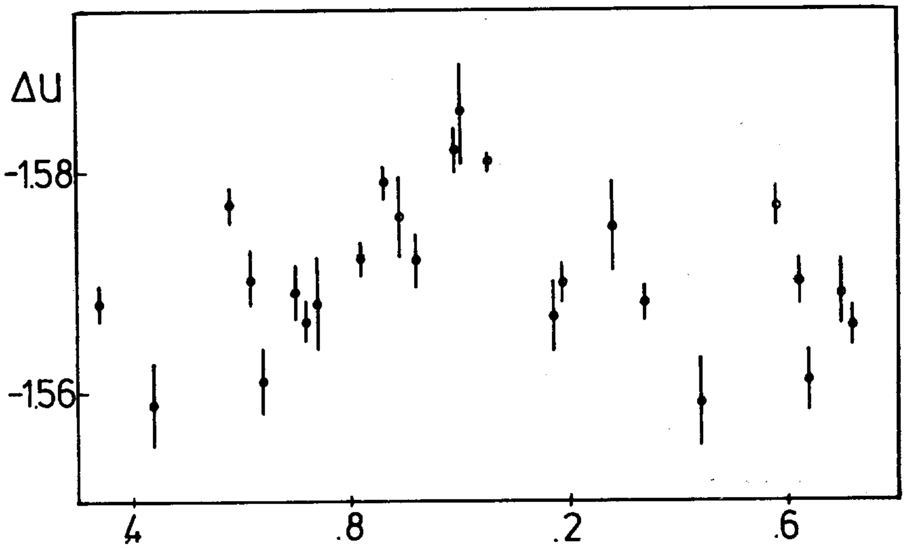


Figure 1. The differential magnitudes of HD 179 761 - $\frac{C1+C2}{2}$ plotted against phase (Hel.Max.=J.D.2444099.23+E·$1\overset{d}{.}73$)

B. VETŐ

Department of Astronomy of Eötvös
University, Budapest, Hungary
Visiting astronomer at Astrophysical
Observatory, Potsdam, GDR

References:

Deeming, T.J. 1975, Astrophys. and Space Sci. 36, 137

Searle, L. and Sargent, W.L. 1964, Astrophys.J. 139, 793

Stepien, K. 1968, Astrophys. J. 154, 945

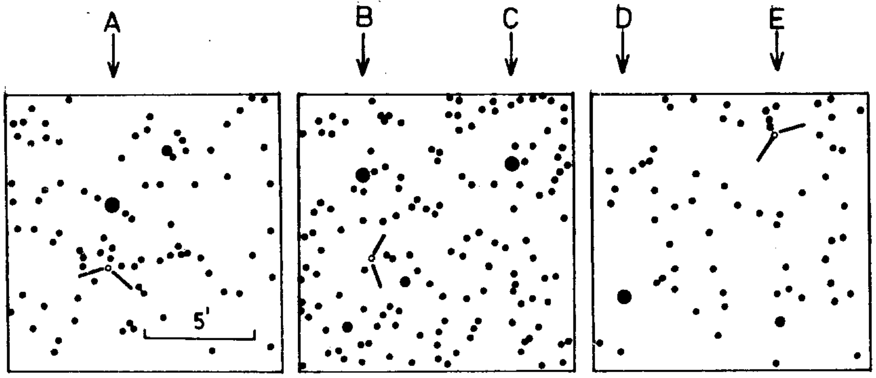
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1779

Konkoly Observatory
Budapest
1980 May 7

THREE NEW FLARE STARS

In the summer 1979 a series of objective prism plates was obtained with the four degree objective prism of the Byurakan 40" Schmidt telescope. Selected dark cloud complexes were observed in order to study H_{α}-emission objects. To obtain unwidened spectra Kodak 103aE and IIIaF emulsions were used in conjunction with an RG-1 filter isolating the spectral interval λλ 6100-6900 A. The dispersion at Hα with the 4° objective-prism is about 1100 A/mm.

The by-product of our study has been the discovery of three new flare stars. Figures 1, 2 and 3 give the identification charts.



The arrows point to the brightest stars in the fields, which have the following designations : A = BD +54°2452, B = BD +48°3309, C = BD +48°3306, D = BD 57°2317, E = BD +57°2316.

In Table I some informations are summarized about these flare stars - the approximate coordinates (1950.0), data of flare ups and the remarks on their spectra in maximum light. In all

Table I

No.	RA. 1950.0	D. 1950.0	m_{pg} min.	Remarks Δm_{pg}	Date
1.	$20^{h}56^{m}.4$	$55^{\circ}14'.7$	$18^{m}.2$	the continuum is enhanced, $\Delta m \sim 1^{m}.5$ strong H_{α} emission	22.08.1979
2.	21 11.1	48 44.2	17.1	the continuum is weakly enhanced $\Delta m \sim 1^{m}.0$ strong H_{α} emission	26.07.1979
3.	21 20.7	57 36.4	18.5	strong H_{α} emission without enhancement of continuum	31.07.1979

three cases the appearance of a strong H_{α}-emission line was registered accompanied with a weak red continuum enhancement. This phenomenon was observed only once for each of the three stars. On the other plates these three stars do not show any sign of activity (e.g. H_{α}-emission). The colour of these stars estimated on the basis of POSS blue and red prints, as well as the rapid appearance and disappearance of strong H_{α}-emission suggest that these stars are flare stars.

I. JANKOVICS
Konkoly Observatory

N.D. MELIKJAN
Byurakan Observatory

M.K. TSVETKOV
Dept. of Astronomy
Bulgarian Academy
of Sciences

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1780

Konkoly Observatory
Budapest
1980 May 7

FLARE STAR OBSERVATIONS IN THE PLEIADES - REGION IN 1979

Three new flare stars and two new outbursts of already known Pleiades - region flare stars were discovered during $29^{h}40^{m}$ effective observational time on the plates obtained with the 60/90/180 cm Schmidt-telescope at Konkoly Observatory.

The observations were made on Kodak 103a0 emulsion using Schott UG 2 filter. The multiple exposure plates - in most cases - contain a series of 6-exposures of 10 minutes each. The whole number of exposures : 178.

Table I

No.	R.A.	D	m_u	Δm_u	Date
1	$3^{h}41^{m}.6$	$24^{\circ}33'$	$20^{m}.5$	$7^{m}.1$	26.10.1979
2	3 42.6	23 46	20.5	6.0	03.09.1979
3*	3 45.0	23 48	18.5	2.0	04.11.1978

*Star No.3 was found on the observing material published in the paper: Jankovics, Kelemen 1979, I.B.V.S. No. 1696.

In Table I the first column gives the serial number for the new flare star found, columns two and three the approximate coordinates for 1900.0, in the fourth column we give the approximative U-band magnitude at minimum light, column five presents the observed amplitude of the flare in U-band, and column six the date of the flare up.

The data for the observed flare-ups of the known flare stars are presented in Table II.

Table II

No.	HII	R.A.	D.	m_u	Δm_u	Date
70	212	$3^{h}38^{m}.0$	$24^{\circ}07'$	$17^{m}.2$	$4^{m}.4$	27.10.1979
418		3 37.0	24 00	20.4	4.7	27.10.1979

We have used the Byurakan designation and the Hertzsprung number is also given.

I. JANKOVICS
J. KELEMEN
Konkoly Observatory
Budapest, Hungary

M.K. TSVETKOV
Department of Astronomy
Bulgarian Academy of
Sciences

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1781

Konkoly Observatory
Budapest
1980 May 9

IMPROVED EPHEMERIS, UX ERIDANI

UX Eridani (BD-7°553) is a W UMa-type eclipsing binary system which undergoes partial eclipses. Photoelectric B,V observations were obtained with the 0.6 meter telescope at Cerro Tololo Inter American Observatory in December 1979. BD-7°551 was observed as the comparison star. The observations define a secondary eclipse curve. The following epoch of minimum light was determined by an iterative technique based on the Hertzsprung (B.A.N. 4, 179, 1928) method,

$$\text{JD Hel. Min. II} = 2444228.6458.$$

Table I lists all the photoelectric times of minimum light that have been published for this system. The O-C's were calculated from the ephemeris published by Binnendijk (A.J. 72, 82, 1966), namely,

$$\text{JD Hel. Min. I} = 2438700.7228 + 0\overset{d}{.}44528226E.$$

An improved ephemeris for the system is

$$\text{JD Hel. Min. I} = 2441922.3195 + 0\overset{d}{.}44527942E.$$

TABLE I

JD Hel.	Min.	O-C	Reference
2434358.101	II	-0.007	Annals Tokyo Obs. 5, 23, 1957.
4369.015	I	-0.002	"
5097.053	I	0.000	"
8700.7228	I	0.0000	A.J. 72, 82, 1966.
8727.6635	II	+0.0011	"
2441922.5394	II	-0.0232	I.B.V.S. No. 937, 1974.
4228.6458	II	-0.0336	- - - - -

A reanalysis of the system is underway.

BEVERLY B. BOOKMYER
P. A. BASILICO
Department of Physics and Astronomy
Clemson University
Clemson, SC 29631 USA

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1782

Konkoly Observatory
Budapest
1980 May 9

B V OBSERVATIONS OF PLEIONE (BU Tau) 1977 - 1980

Pleione is a well known shell star. Its photometric variability was investigated by Sharov and Lyuty (1976) who collected all available photometric observations of the star. They observed a minimum in 1973 connected with a new shell outburst of BU Tau. In 1974 and 1975 Sharov and Lyuty observed the beginning of a slow increase in B and V.

New B and V observations were made with the 75 cm telescope of the Wilhelm Foerster Sternwarte, Berlin, an uncooled 1P21 photomultiplier and Schott filters BG12+GG13 for B and GG11 for V. The measurements are listed in the table. The accuracy is about $\pm 0^{m}.01$ for V and B-V. In the figure, the B lightcurve of Sharov and Lyuty is shown together with four mean values of our observations. These observations show that the shell outburst

Table

The V and B-V observations of BU Tau

Date	V	B-V	n
2443177^{d}	5.22		3
193	5.21	-0.12	2
411	5.23	-0.05	6
482	5.24	-0.03	5
808	5.20	-0.03	2
833	5.19	-0.02	2
862	5.21	-0.05	3
930	5.20	-0.04	2
4132	5.22	-0.05	1
169	5.22	-0.06	4
271	5.17	±0.00	2
289	5.23	-0.05	3

n : Number of individual measurements of BU Tau in each colour. Comparison star magnitudes from the Yale University Bright Star Catalogue.

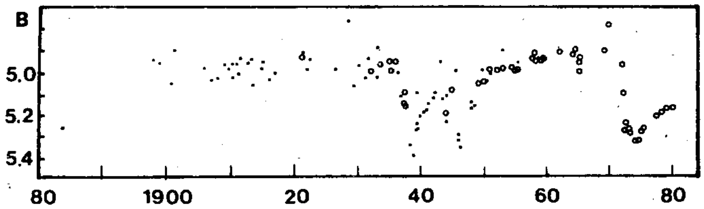


Figure 1: Total B lightcurve of BU Tau 1880 to 1980. Circles represent photoelectric observations.

still goes on as the star has not returned to its normal maximum light.

U. HOPP, S. WITZIGMANN
Wilhelm Foerster Sternwarte
D 1000 Berlin 41, F.R.G.

Reference:

Sharov, A.S., Lyuty, V.M., 1976, in IAU Symposium No. 70, 105 ed. A.Slettebak, D.Reidel Publ.Co. Dordrecht

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1783

Konkoly Observatory
Budapest
1980 May 12

NEW PHOTOELECTRIC TIMES OF MINIMA AND THE PERIOD VARIATIONS OF THE ECLIPSING VARIABLE W UMa

The short period eclipsing variable W Ursae Majoris (BD +56°1400, HD 83950) has been observed photoelectrically with the 48 cm Cassegrain telescope equipped with an unrefrigerated EMI 9781 A photomultiplier between 23 January and 13 March, 1980. The observations were made in two colours B and V which are approximately in the standard system.

BD +56° 1399 was used as comparison star during the observations.

Only the times of primary minima are obtained and are listed in the following table:

JD Hel. 2444000.0	E	$(O-C)_I$	$(O-C)_{II}$	n	filter
262.36930	18809	-0.00355	-0.00322	23	B,V
275.38142	18848	.00331	.00302	30	B
.38156	18848	.00317	.00288	30	V
279.38554	18860	.00285	.00257	27	B,V
280.38656	18863	.00274	.00247	23	B
.38663	18863	.00267	.00240	23	V
298.40353	18917	.00223	.00201	21	B,V
312.41662	18959	.00194	.00176	35	B,V

n: number of observations within minima.

The $(O-C)_I$ and $(O-C)_{II}$ values given in the table were calculated from the following linear (Equ.1) and sinusoidal (Equ.2) light elements given by Tunca et al. (1979), respectively.

$$\text{Min I} = \text{JD Hel. } 2437986.9742 + 0\overset{d}{.}33363808 \cdot E \qquad 1$$

$$\text{Min II} = \text{JD Hel. } 2437986.97426 + 0\overset{d}{.}33363808 \cdot E + 0.00302 \cdot \sin\,(E.2\pi/19200.9) \qquad 2$$

The photographic, photoelectric times of Min I from 1903 to 1980 March and the visual times of Min I before 1930 were collect-

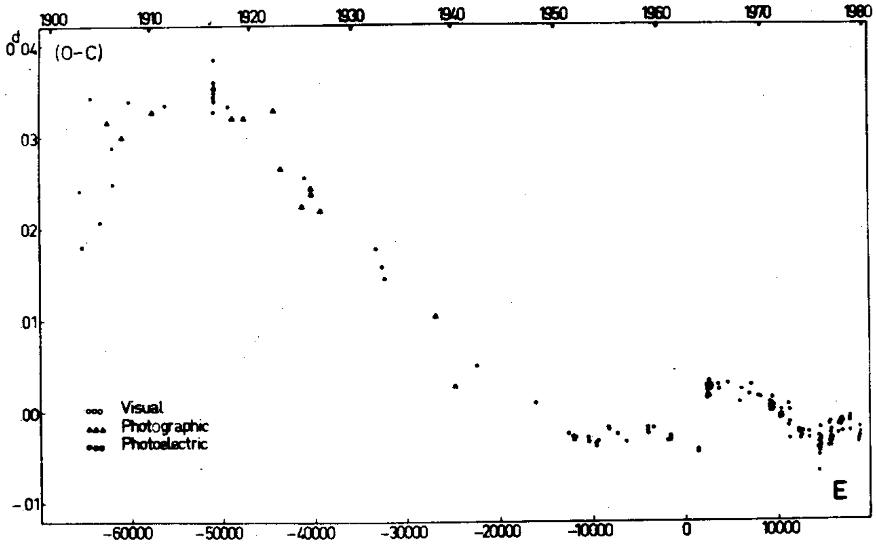

1900
1910
1920
1930
1940
1950
1960
1970
1980
$0^d.04$
(O-C)
.03
.02
.01
.00
-.01
ooo Visual
▲▲▲ Photographic
●●● Photoelectric
E
-60000
-50000
-40000
-30000
-20000
-10000
0
10000

Fig.1

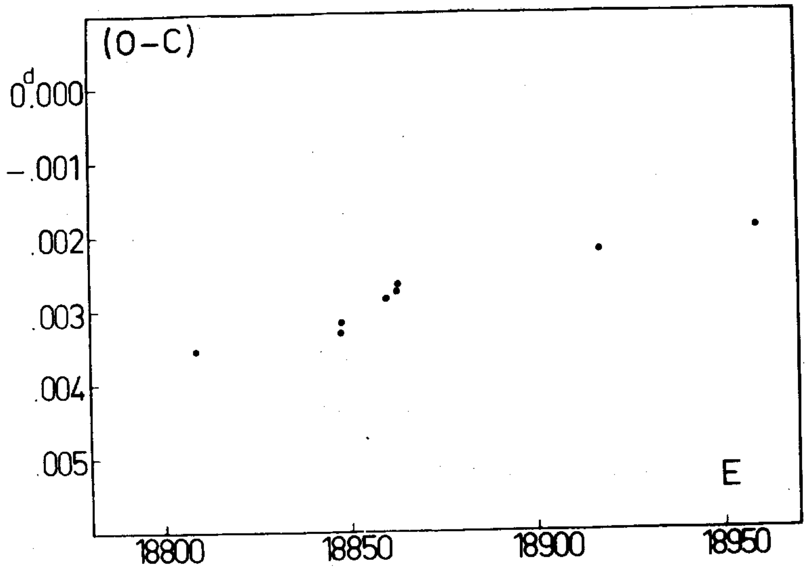

(O-C)
$0^d.000$
-.001
.002
.003
.004
.005
E
18800
18850
18900
18950

Fig.2

ed and the (O-C) values were calculated from the Equ.1, and plotted against cycles. The whole (O-C) variation is shown in Figure 1.

It can be seen from Figure 1 that the complete (O-C) variation cannot be represented with one equation (linear or sinusoidal). Therefore, the different light elements were given by several authors to represent the (O-C) variation for the different short interval of cycles. For instance, the Equation 2 represent the (O-C) variation which is between the cycles 1000 and 18000.

The $(O-C)_I$ values given in the table are plotted in Figure 2. From this Figure, it appears that the (O-C) variation is linear. There are some regular variations in short interval of cycles. However, the complete (O-C) diagram and as a result the period of the system, show irregular variations over the whole cycles in general.

O. TÜMER, S. EVREN, Z. TUNCA
Ege University Observatory
Bornova - Izmir - Turkey

Reference:
Tunca, Z., Tümer, O., and Evren, S., 1979, I.B.V.S. No. 1607

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1784

Konkoly Observatory
Budapest
1980 May 12

PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR EV Lac IN 1975

Continuous photoelectric monitoring of the flare star EV Lac has been carried out at the Stephanion Observatory ($\lambda=-22^{\circ}49'44''$ $\varphi=+37^{\circ}45'15''$) during the year 1975 using the 30 inch Cassegrain reflector of the Department of Geodetic Astronomy, University of Thessaloniki. Observations have been made with a Johnson dual channel photoelectric photometer in the B colour of the international UBV System. The telescope and photometer will be described elsewhere. Here we mention only that the transformation of our instrumental ubv system to the international UBV system is given by the following equations:

for the time interval from 25-6-1975 to 30-7-1975

$$V = v_o + 0.119(b-v)_o + 2.163,$$
$$(B-V)= 0.819 + 1.047(b-v)_o,$$
$$(U-B)=-1.509 + 1.006(u-b)_o,$$

for the time interval from 31-7-1975 to 16-9-1975

$$V = v_o + 0.046(b-v)_o + 2.440,$$
$$(B-V)= 0.782 + 1.062(b-v)_o,$$
$$(U-B)=-1.612 + 1.063(u-b)_o,$$

and for the time interval from 17-9-1975 to 20-2-1976

$$V = v_o + 0.059(b-v)_o + 2.368,$$
$$(B-V)= 0.737 + 1.035(b-v)_o,$$
$$(U-B)=-1.675 + 1.122(u-b)_o.$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in Table I. Any interruption of more than one minute has been noted. In the fourth column of Table I the standard deviation of random noise fluctuation $\sigma(\text{mag})=2.5 \log (I_o+\sigma)/I_o$ for different times (UT) of the corresponding monitoring intervals is given.

Flare Star EV Lac, 1975

Table I

Date 1975	Monitoring Intervals (U.T.)	Total Monitoring Time	σ(U.T.)
July			
19-20	$20^{h}48^{m}$-$21^{h}15^{m}$, $21^{h}18^{m}$-$21^{h}55^{m}$, $21^{h}58^{m}$-$22^{h}27^{m}$, 22 42-23 11, 23 16-23 46, 23 52-23 56, 00 00-00 09, 00 12-00 26, 00 44-01 13, 01 18-01 53.	$4^{h}03^{m}$	0.03($21^{h}05^{m}$),0.02($21^{h}40^{m}$), 0.01(22 21),0.02(22 55), 0.01(23 32),0.02(23 53), 0.01(00 57),0.01(01 37).
August			
10-11	22 00-22 31, 22 39-23 03, 23 10-23 36, 23 56-00 20, 00 34-00 54, 01 01-01 16.	2 20	0.02(22 16),0.02(22 50), 0.02(23 20),0.02(00 11), 0.02(00 46),0.02(01 09).
11-12	21 51-22 17, 22 19-22 50, 22 54-23 27, 23 42-00 09, 00 12-00 45, 00 48-01 34.	3 16	0.02(22 12),0.02(22 35), 0.02(23 15),0.03(23 59), 0.02(00 33),0.02(01 19).
12-13	21 55-22 24, 22 28-22 57, 23 02-23 31, 00 29-01 03, 01 05-01 44.	2 40	0.03(22 15),0.02(22 46), 0.02(23 18),0.03(00 46), 0.03(01 20).
15-16	21 15-21 41, 21 44-22 12, 22 14-22 46, 23 00-23 36, 00 26-00 56, 00 58-01 34.	3 08	0.02(21 30),0.02(21 57), 0.02(22 32),0.02(23 18), 0.02(00 46),0.02(01 16).
18	00 15-01 00, 01 03-01 48.	1 30	0.03(00 45),0.02(01 19).
19-20	19 26-19 59, 20 02-20 31, 20 32-21 06, 21 20-21 55, 21 58-22 27, 22 32-23 22, 00 13-00 58, 01 01-01 44.	4 58	0.06(19 44),0.10(20 16), 0.07(20 55),0.04(21 35), 0.06(22 12),0.07(22 50), 0.05(00 34),0.04(01 16).
27-28	19 03-19 34, 19 38-20 06, 20 09-20 38, 20 51-21 24, 21 30-21 53, 21 57-22 32, 23 21-00 19, 00 21-01 14, 01 16-01 27.	5 01	0.02(19 25),0.02(19 53), 0.02(20 21),0.03(21 06), 0.03(21 42),0.03(22 15), 0.03(23 49),0.04(00 50), 0.03(01 20).

Table I (Continued)

28-29	19^h14^m-19^h43^m, 19^h46^m-20^h22^m, 20^h25^m-21^h03^m, 21 15-21 45, 21 48-22 21, 22 24-23 04, 23 52-00 31, 00 33-01 04, 01 14-01 45.	5^h07^m	0.02(19^h29^m),0.02(20^h01^m), 0.02(20 46),0.03(21 30), 0.03(22 02),0.02(22 41), 0.03(00 14),0.03(00 48), 0.03(01 29).
29-30	19 13-19 45, 19 46-20 17, 20 20-20 54, 21 04-21 36, 21 38-22 07, 22 09-22 51, 23 47-00 28, 00 32-01 21, 01 24-01 50.	5 16	0.02(19 27),0.02(20 01), 0.02(20 35),0.02(21 20), 0.02(21 51),0.03(22 32), 0.03(00 04),0.03(00 59), 0.03(01 39).
30	19 03-19 31, 19 36-20 08, 20 11-20 56, 21 15-21 41, 21 46-22 19.	2 44	0.02(19 16),0.03(19 49), 0.02(20 33),0.02(21 30), 0.02(21 58).
31- 1	19 21-20 02, 20 05-20 41, 20 48-21 18, 21 34-22 05, 22 09-22 35, 22 37-23 11, 01 31-02 00, 02 04-02 34, 02 39-03 02.	4 40	0.02(19 43),0.02(20 29), 0.02(20 59),0.02(21 46), 0.01(22 12),0.02(22 53), 0.02(01 49),0.02(02 19), 0.03(02 47).
September			
2 - 3	21 44-22 14, 22 17-22 48, 22 51-23 21, 23 33-00 16, 00 17-00 59, 01 03-01 51.	3 44	0.02(21 58),0.02(22 29), 0.02(23 08),0.02(23 57), 0.03(00 37),0.03(01 32).
11-12	21 48-21 55, 21 59-22 18, 23 04-23 15, 23 19-23 33, 23 36-23 48, 23 50-00 03.	1 16	0.02(22 08),0.02(23 32), 0.02(00 01).
14-15	23 06-23 24, 23 26-23 31, 23 35-23 55, 23 59-00 03, 00 06-00 14, 00 17-00 26, 00 28-00 31, 00 41-01 09, 01 14-01 20, 01 21-01 46.	2 06	0.02(23 30),0.02(24 00), 0.02(00 29),0.03(00 55), 0.02(01 34).
17	19 54-20 18, 20 21-20 42, 20 43-20 55, 20 58-21 27.	1 26	0.02(20 02),0.02(20 39), 0.03(21 09).
25-26	22 49-23 16, 23 19-23 46, 23 49-00 15, 00 55-01 12, 01 21-01 25, 01 28-01 44.	1 57	0.03(22 59),0.03(23 29), 0.04(23 59),0.06(01 23).

Table I (Continued)

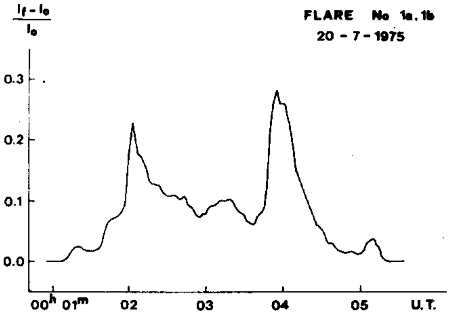
October			
1	20^h55^m-21^h19^m, 21^h22^m-21^h50^m, 21^h53^m-22^h44^m, 22 47-23 04, 23 17-23 28, 23 31-23 44, 23 50-23 55,	2^h29^m	0.02(21^h10^m),0.01(21^h41^m), 0.01(22 58).
2-3	20 32-20 59, 21 02-21 34, 21 36-22 05, 22 19-22 48, 22 50-23 32, 23 35-00 08.	3 12	0.02(20 44),0.02(21 17), 0.02(21 49),0.02(22 31), 0.02(23 09),0.02(23 46).
3	19 34-20 02, 20 04-20 44, 20 46-21 18, 21 29-21 59, 22 10-22 40, 22 43-23 15, 23 17-23 47.	3 42	0.02(19 50),0.02(20 21), 0.02(20 52),0.02(21 45), 0.02(22 25),0.02(22 57), 0.02(23 30).
4	18 56-19 31, 19 33-19 58, 20 00-20 36, 20 48-21 10.	1 58	0.03(19 15),0.03(19 44), 0.02(20 16),0.03(20 59).
7	20 15-20 44, 20 48-21 09, 21 21-21 50, 22 03-22 35, 22 37-23 05, 23 09-23 39.	2 49	0.02(20 30),0.02(20 58), 0.02(21 34),0.02(22 18), 0.02(22 48),0.02(23 19).
8	19 16-19 46, 19 48-20 18, 20 20-20 51, 21 03-21 36, 21 51-22 16, 22 19-22 51, 23 02-23 43.	3 42	0.02(19 31),0.02(19 58), 0.02(20 31),0.02(21 18), 0.02(22 05),0.02(22 35), 0.02(23 21).
10	18 41-18 59, 19 18-19 35.	0 35	0.03(18 51),0.03(19 28).
11	18 33-19 01, 19 03-19 34, 19 38-20 10, 20 24-20 57, 21 01-21 48, 21 52-22 25, 22 49-23 20, 23 22-23 54.	4 27	0.03(18 46),0.02(19 17), 0.03(19 52),0.03(20 41), 0.03(21 20),0.02(22 13), 0.02(23 02),0.03(23 35).
12	18 26-19 00, 19 03-19 34,19 36-20 11, 20 23-20 59, 21 02-21 39, 21 42-21 54,	3 05	0.03(18 43),0.03(19 18), 0.03(19 52),0.03(20 41), 0.03(21 17),0.03(21 47).
21	19 03-19 50, 19 53-20 25, 20 29-20 34, 20 37-20 46.	1 33	0.06(19 28),0.05(20 12), 0.06(20 41).
	TOTAL	82^h44^m	

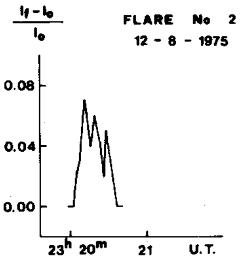
Flare Star EV Lac, 1975

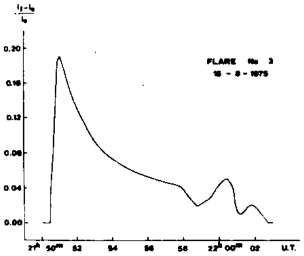
Table II

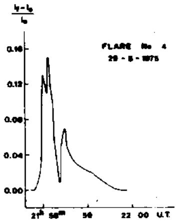
Characteristics of the Flares Observed

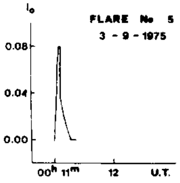
Flare	Date 1975	U.T. max.	t_b min	t_a min	Duration min	I_f-I_o/I_o max.	P min	Δm mag.	σ mag.	Air mass
No.	July	$00^h02^m.06$	$0^m.92$	$3^m.32$	$4^m.24$	0.23	0.36	0.22	0.02	1.05
1a	20	00 03.93				0.28		0.27	0.02	1.05
1b	20									
	August	23 20.2	0.16	0.40	0.56	0.07	0.02	0.07	0.02	1.01
2	12	21 51.0	0.56	11.81	12.37	0.19	0.73	0.19	0.02	1.07
3	15	21 58.12	0.32	1.64	1.96	0.15	0.06	0.15	0.02	1.02
4	29									
	September	00 11.1	0.08	0.19	0.27	0.08	0.01	0.08	0.02	1.07
5	3									
	October	22 15.1	0.58	44.78	45.36	2.24	1.27	6.27	0.01	1.06
6	1	20 38.2	8.36	26.40	34.76	0.22	?	0.21	0.02	1.01
7	3	22 46.2	0.56	6.94	7.50	0.11	?	0.08	0.02	1.15
8	7	23 12.6	0.39	0.80	1.19	0.09	0.03	0.09	0.02	1.21
9	7	19 22.8	1.32	9.26	10.58	0.10	0.28	0.10	0.02	1.02
10	8	19 59.95	0.61	0.76	1.37	0.10	0.06	0.10	0.02	1.01
11	8	21 37.3	0.56	4.34	4.90	0.22	0.45	0.22	0.03	1.07
12	11	22 07.84	0.76	17.23	17.99	0.14	0.63	0.14	0.02	1.11
13	11									

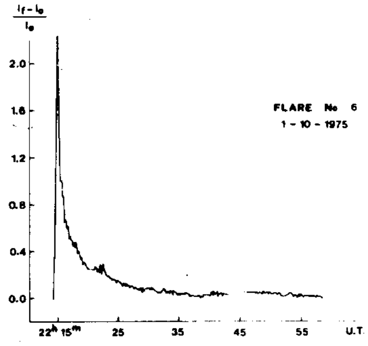

FLARE No 1a.1b
20 - 7 - 1975
If - Io / Io
0.3
0.2
0.1
0.0
00h 01m
02
03
04
05
U.T.

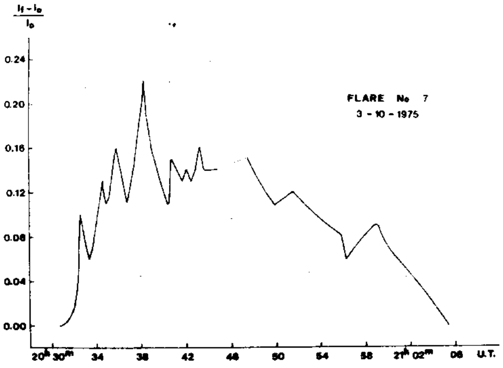

FLARE No 2
12 - 8 - 1975
If - Io / Io
0.08
0.04
0.00
23h 20m
21
U.T.

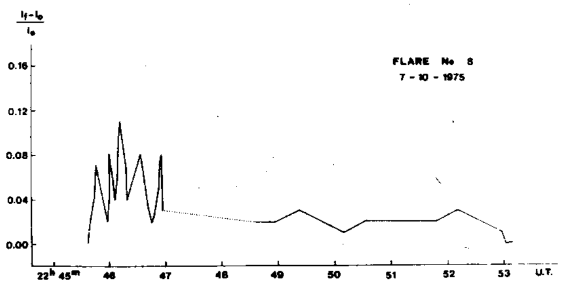

FLARE No 3
16 - 8 - 1975
If - Io / Io
0.20
0.16
0.12
0.08
0.04
0.00
21h 50m
52
54
56
58
22h 00m
02
U.T.

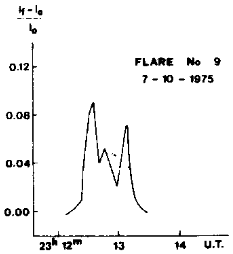

FLARE No 4
29 - 8 - 1975
If - Io / Io
0.16
0.12
0.08
0.04
0.00
21h 58m
56
22 00
U.T.

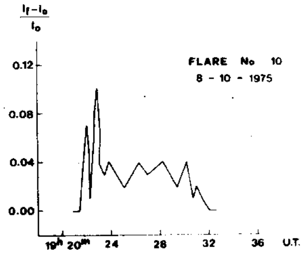

FLARE No 5
3 - 9 - 1975
If - Io / Io
0.08
0.04
0.00
00h 11m
12
U.T.

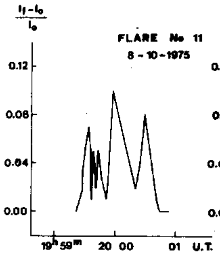

FLARE No 6
1 - 10 - 1975
If - Io / Io
2.0
1.6
1.2
0.8
0.4
0.0
22h 15m
25
35
45
55
U.T.

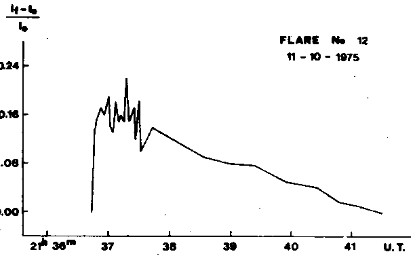

FLARE No 7
3 - 10 - 1975
If - Io / Io
0.24
0.20
0.16
0.12
0.08
0.04
0.00
20h 30m
34
38
42
46
50
54
58
21h 02m
06
U.T.

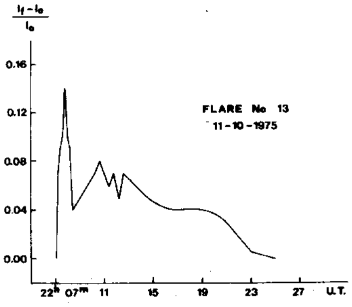

If - Io
Io
FLARE No 8
7 - 10 - 1975
0.16
0.12
0.08
0.04
0.00
22h 45m
46
47
48
49
50
51
52
53
U.T.


If - Io
Io
FLARE No 9
7 - 10 - 1975
0.12
0.08
0.04
0.00
23h 12m
13
14
U.T.


If - Io
Io
FLARE No 10
8 - 10 - 1975
0.12
0.08
0.04
0.00
19h 20m
24
28
32
36
U.T.


If - Io
Io
FLARE No 11
8 - 10 - 1975
0.12
0.08
0.04
0.00
19h 59m
20 00
01
U.T.


If - Io
Io
FLARE No 12
11 - 10 - 1975
0.24
0.16
0.08
0.00
21h 36m
37
38
39
40
41
U.T.


If - Io
Io
FLARE No 13
11 - 10 - 1975
0.16
0.12
0.08
0.04
0.00
22h 07m
11
15
19
23
27
U.T.

During the 82.73 hours of monitoring time 13 flares were observed the characteristics of which are given in Table II. For each flare following characteristics (Andrews et al. 1969) are given: a) the date and universal time of flare maximum, b) the duration before and after the maximum (t_b and t_a, respectively), as well as the total duration of the flare, c) the value of the ratio $(I_f-I_o)/I_o$ corresponding to flare maximum, where I_o is the intensity deflection less sky background of the quiet star and I_f is the total intensity deflection less sky background of the star plus flare, d) the integrated intensity of the flare over its total duration, including pre-flares, if present, $p=\int(I_f-I_o)/I_o dt$, e) the increase of the apparent magnitude of the star at flare maximum $\Delta m(b)= 2.5 \log(I_f/I_o)$, where b is the blue magnitude of the star in the instrumental system, f) the standard deviation of random noise fluctuation $\sigma(mag)=2.5 \log(I_o+\sigma)/I_o$ during the quiet - state phase immediately preceding the beginning of the flare and g) the air mass at flare maximum. The light curves of the observed flares in the b colour are shown in Figures 1-13.

M. E. CONTADAKIS, F. MAHMOUD
L. N. MAVRIDIS, D. STAVRIDIS
Department of Geodetic Astronomy
University of Thessaloniki

Reference:
Andrews, A.D. Chugainov, P.F., Gershberg, R.E. and Oskanian,V.S.: 1969, I.B.V.S., No. 326

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1785

Konkoly Observatory
Budapest
1980 May 14

ON THE PERIODICITY OF SS 433

The inspection of roughly 400 Sonneberg plates, 220 of which are of remarkable quality, showed that no obvious periodicity in the range of several days to several tens of days is present in our estimates of this object (SS=Stephenson,Sanduleak, ApJ Supp. 33, p. 549). The plates had been taken with the astrographs 40/160 cm, 40/190 cm and 17/120 cm, mostly during the years 1961 and 1962, but also scattered over the whole time since 1928. Neither a period around 165 days nor a persistent one around 6.5 (or 13) days (these values are often quoted in literature) seem detectable. The brightness variations could be considered as wave-shaped with changing cycle lengths of 5 to 15 days, superposed by shorter-termed fluctuations. The reality of the latter cannot, however, be proved in all cases because of the faintness of the star near the plate limit. The observed photographic amplitude is 1.7 mag ($15^{m}.0$ to $16^{m}.7$), most estimates ranging between $15^{m}.8$ and $16^{m}.4$ (referred to Mt. Wilson SA 111).

W. WENZEL
Sternwarte Sonneberg
Zentralinstitut für Astrophysik
Akademie der Wissenschaften der DDR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1786

Konkoly Observatory
Budapest
1980 May 16

REVISED PHOTOMETRIC ELEMENTS OF Y Leo

The light variations of the Algol-type eclipsing binary Y Leo has been studied photoelectrically by Johnson in 1960 in four wavelength regions (UBV and infrared). Struve (1945) obtained a single-lined radial velocity curve.

We solved the (most complete) infrared lightcurve of Y Leo obtained by Johnson (1960) by means of WINK Wood's model (1972, 1973-1978). In the table we list our new photometric elements (for the explanation of the symbols see Mardirossian et al. (1980)). The chief variable parameters are the orbital inclination angle i, the unperturbed radius r_h of hotter component, the ratio $k=r_c/r_h$ of the unperturbed radii, and the temperature T_c of the cooler component. The temperature T_h of the hotter star was taken equal

Table

λ	7900
i	85.3±.2
r_h	.218±.006
k	1.281±.030
a_h	.220
b_h	.219
c_h	.217
a_c	.327
b_c	.275
c_c	.254
T_h(eq)	8800
T_h(pol)	8860
T_c(eq)	4400±40
T_c(pol)	4490
u_h	.38
u_c	.55
β_h	.25
β_c	.08
w_h	1
w_c	.5
L_h	.911
L_c	.089
q	.3
ε	1.27

to 8800^0K according to the spectral type type A3 and Flower's (1977) temperature scale. The mass ratio $q=M_c/M_h$ was taken to be equal to 0.3; this value was estimated from Struve's (1945) mass function $f(m)=0.038\ M_o$ together with the assumption that the primary obeys the empirical mass-spectrum relation typical of main sequence stars ($M_h=2.6\ M_o$).

Our photometric elements appear to be in substantial agreement with those computed by Johnson (1960) by means of Russell and Merrill's (1952) method. Y Leo is confirmed to be an ordinary semidetached system, pratically free of complications. The temperature of the lobe filling secondary favours an early K spectral type.

G. GIURICIN, F. MARDIROSSIAN, and F. PREDOLIN
Osservatorio Astronomico di Trieste
via G.B. Tiepolo 11
I-34131 Trieste (Italy)

References:

Flower,P.J., 1977, Astron.Astrophys.54,31

Johnson,H.L., 1960, Astrophys.J.131,127

Mardirossian,F.,Mezzetti,M.,Predolin,F.,and Giuricin,G., 1980, Astron.Astrophys.Suppl.40,57

Russell,H.N.,and Merrill,J.E., 1952, Princeton Contrib.26

Struve,O., 1945,Astrophys.J.102,74

Wood,D.B., 1972, A Computer Program for Modeling Non-Spherical Eclipsing Binary Systems, Greenbelt,U.S.A.

Wood,D.B, 1973-1978, WINK Status Report No.1-9, priv.com.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1787

Konkoly Observatory
Budapest
1980 May 19

INFRARED PHOTOMETRY OF ALGOL

The triple system eclipsing binary Algol have been observed over a wide range of wavelengths -- from X rays to radio. Infrared observations to data have been at 1.6 microns (Chen and Reuning, 1966); 5 microns (Jameson et al.,1973); 2.2, 3.6, 4.8, and 8.6 microns (Longmore and Jameson, 1975); 2.2 microns (Smyth et al., 1975); 4.8 microns (Magro et al., 1977); and 10 microns near secondary minimum (Nadeau et al., 1978). Some of these observations did not have very much time resolution or contained large statistical errors. These limitations on the data make it difficult to develop comprehensive theoretical models of the infrared emission from the system. To provide a better observational foundation, we have begun a program of infrared observations of Algol with the 1.3-meter telescope and InSb detector ("Otto") at Kitt Peak National Observatory. Here we present our preliminary results.

All observations have been made during the day with a 23" or 32" aperature. Beam switching 60" in declination cancelled the infrared background. The standard star of all observations was Alpha Persei, whose magnitudes are J = +0.874, H = +0.647, K = +0.565, L = +0.459, and M = +0.36. Extinction correction were usually small at all wavelengths.

Figures 1-6 summarize the results so far. The phase was calculated from primary minimum by JD = 2440953.4657 + 2.8673075 E (Ashbrook, 1976). Figure 1 show a little more than half of the primary eclipse on 10 February 1979 (U.T.). Complete sets of data were taken every ∿ 5 minutes; the M data was averaged so

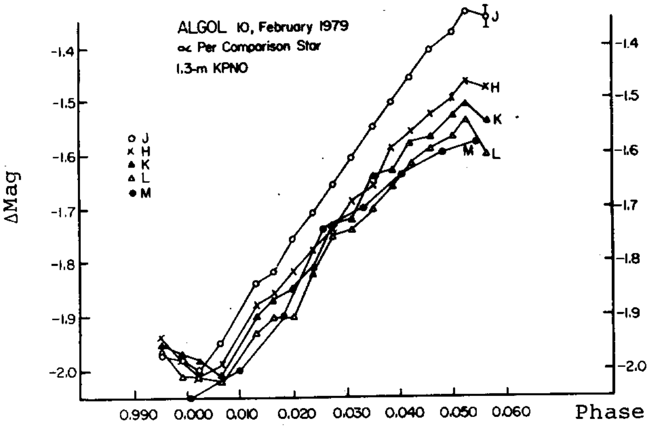


Fig. 1

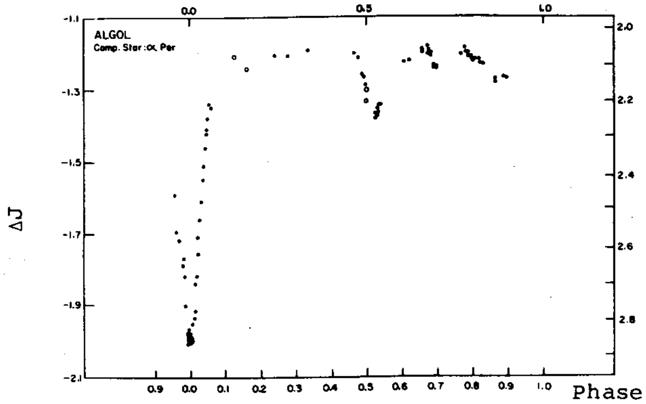


Fig. 2

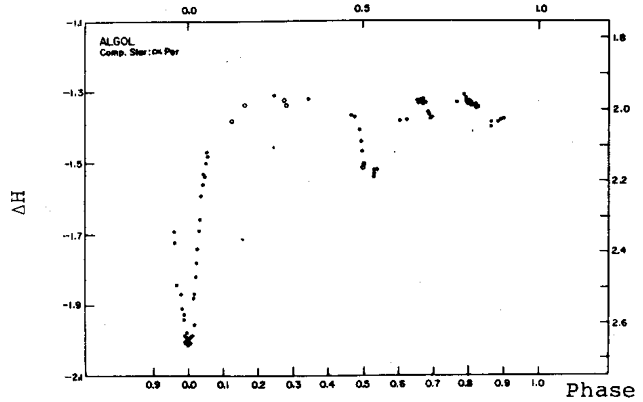


Fig. 3

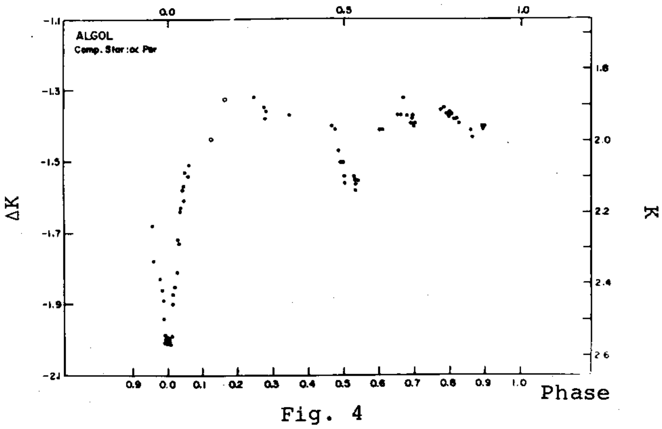


Fig. 4

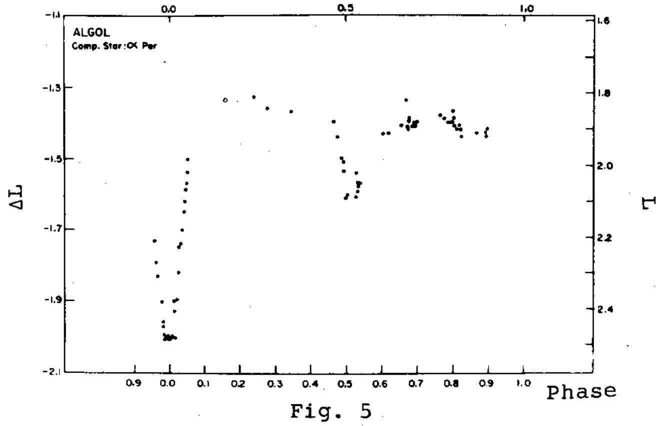


Fig. 5

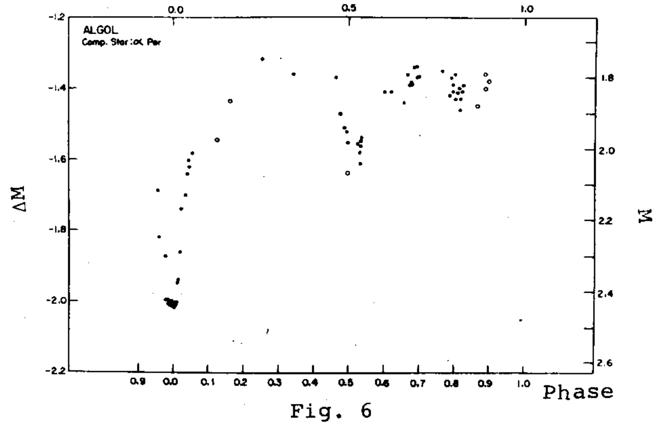


Fig. 6

each point is roughly 10 minutes apart. Note than the eclipse is fainter and shallower at longer wavelengths.

Figures 2-6 show light curves at J, H, K, L, and M bands. (Open circles indicate marginal data.) From these data, we find that the magnitudes during primary eclipse are: J = +2.87 ± 0.01, H = +2.65 ± 0.01, K = + 2.57 ± 0.01, L = +2.50 ± 0.01, M = +2.49 ± 0.02. During secondary eclipse, the magnitudes are: J = +2.20 ± 0.06, H = +2.12 ± 0.03, K = +2.07 ± 0.03, L = +2.01 ± 0.01, and M = +1.98 ± 0.01. Outside of eclipses, we determine that J = +2.08 ± 0.04, H = +1.99 ± 0.04, K = +1.93 ± 0.06, L = 1.89 ± 0.01, and M = +1.84 ± 0.01. We had no significant excess at any wavelengths.

We are continuing observations, especially at M, where the scatter in the data is the greatest.

MICHAEL ZEILIK, LINDA BAYLISS, PAUL HECKERT
Department of Physics and Astronomy
The University of New Mexico
Albuquerque, New Mexico 87131
U.S.A.

References:

1. Chen, K.-Y. and Reuning, E.G., Astronomical Journal, vol. 71, 283, 1966
2. Jameson, R.F., Longmore, A.J., and Crawford, B., Nature, vol. 242, 107, 1973
3. Longmore, A.J. and Jameson, R.F., Mon. Not. R. Astr. Soc., vol. 173, 271, 1975
4. Magro, C.S., Needham, J.D., Phillips, J.P., and Selby, M.J., Mon. Not. R. Astr. Soc., vol. 180, 461, 1977
5. Nadeau, D., Neugebauer, G., Becklin, E.E., Elias, J., Ennis, D., Matthews, K., and Sellgren, K., Mon. Not. R. Astr. Soc., vol. 184, 523, 1978
6. Ashbrook, J., Sky Telesc. 52, 48, 1976

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1788

Konkoly Observatory
Budapest
1980 May 19

ETOILES VARIABLES OU SUSPECTES DE GRANDE PARALLAXE

A diverses reprises (Petit 1976, 1977, 1979) j'ai publié des listes de variables confirmées ou suspectes, situées à moins de 22 pc du Soleil ($\pi \geq 0''.045$) et qui sont contenues dans le "Catalogue of Nearby Stars" de Gliese (1969) et "Nearby Stars Data Published 1969-1978" de Gliese et Jahreiss (1980).

Tableau I

Gl GJ	Designation	AR 1950	Dec	V	B-V	Sp	(0".001)	M(V)
48	Ross 318	$00^h58^m48^s$	+71°25'0	10.06	1.47	dM3.5e	0".112	10.31
60	-30°529AB	01 32 42	-30 10 0	7.87	0.92	K3V	056	6.6
105	+6°398 B	02 33 31	+06 38 0	11.65	1.61	dM4.5e	137	12.23
136	ζ1 Ret	03 16 41	-62 46 0	5.23	0.64	GIV	089	4.98
179	Wolf 1539	04 49 24	+06 23 8	12.04	1.62	dM4e	082	11.61
229	-21°1377	06 08 28	-21 50 6	8.14	1.50	dM2e	173	9.33
299	Ross 619	08 09 11	+08 59 7	12.83	1.77	M5Ve	147	13.67
402	Wolf 358	10 48 19	+07 05 1	11.66	1.46	M5Ve	148	12.47
450	+36°2219	11 48 33	+35 32 8	9.78	1.48	MIV	125	10.26
526	+15°2620	13 43 12	+15 09 7	8.50	1.43	dM3.5e	192	9.92
2108	L 19-2	14 25 23	-81 07	13.75	0.25	DA	056	12.5
596.2	α Ser	15 41 48	+06 34 9	2.64	1.17	K2III	049	1.1
1208	G 170-2	16 55 01	+21 31 7	14.08	0.24	DAss	060	13.0
678.1	+5°3409A	17 27 55	+05 35 4	9.33	1.47	MIV	101	9.35
755	-35°13422	19 18 12	-35 04 6	6.47	0.63	G5V	046	4.8
809	+61°2068	20 52 18	+61 58 5	8.54	1.49	M2V	135	9.19
829	Ross 775	21 27 12	+17 25 1	10.35	1.56	M4V	150	11.23
871.1B	L574-61	22 42 17	-33 31	12.8		dM4e	060	11.7
880	+15°4733	22 54 10	+16 17 4	8.68	1.51	M2.5V	146	9.50
895.2	G 29-38	23 26 16	+04 58 5	13.05	0.20	DA	073	12.37
2158	Gr 336	23 37 42	+12 21 3	13.13	0.03	DAs	066	12.2
908	+1°4774	23 46 36	+02 08 2	8.98	1.48	dM2.5e	180	10.26
-	+27°4642	23 52 31	+27 53 8	7.36	1.02	KIV	075	6.7

Le tableau suivant présente 23 étoiles qui ne figurent pas dans nos listes précédentes. Parmi elles, il y a 10 variables confirmées: Gl 48, 229,809,829,871.1 B, 880 et BD +27°4642, qui appartiennent aux types UV Cet ou BY Dra; Gl 895.2, GJ 2108 et 2158 au type ZZ Cet. Neuf étoiles sont des variables probables ou suspectes et parmi elles 6 (Gl 105, 179, 299, 402, 526 et 908) ont un spectre dMe et sont donc susceptibles d'appartenir aux types UV ou BY.

Enfin pour Gl 136, 450, 678.1 et 755 on relève simplement des discordances dans les valeurs photometriques mesurées par différents observateurs.

Remarques:

48 sursaut observé par Shakhovskaya(1974b)
60 couple orbital très serre (0".2); variabilite suspectée par Finsen (1962)
105, 299, 402, type UV suspecté par Pettersen (1975) d'après le rapport d'intensité des raies Hα et de la bande B de Johnson.
179 notée de mpg 13.0 sur un cliché, de mpg 13.7 sur 4 autres
229 sursauts observés photoelectriquement par Kunkel (1973)
526 variation d'intensité des raies brillantes, mais Shakhovskaya (1974a) n'a pas observé de sursaut.
2108 présente des oscillations rapides du type ZZ Cet, selon Mc Graw (1977) Hesser et al. (1977)
596.2 variation de 0.2 m en V. Semi-régulière ou irrégulière probable
1208 type ZZ Cet possible: oscillations observées par Richer et Ulrych (1974) mais non confirmées par Mc Graw et Robinson (1975)
809 et 829 type BY Dra selon Chugainov (1973)
871 B sursaut observe par Kunkel (1972)
880 type BY Dra selon Chugainov (1973)
895.2= ZZ Psc type ZZ Cet selon Mc Graw et Robinson (1975)
2158= HX Peg type ZZ Cet selon Green (Mc Cook et Sion 1977)
908 type UV suspecté par Gershberg et Shakhovskaya (1971)
+27°4642= 11 Peg type BY Dra selon Chugainov (1976)

MICHEL PETIT

References:

Chugainov, P.F.,1973,Izv. Krymski Astr.Obs. 48.3
Chugainov, P.F.,1974,Izv. Krymski Astr.Obs. 54.89
Finsen, W., 1962,Circ. Inform. I.A.U. No.28
Gershberg, R.E., Shakhovskaya, N.I.,1971, IAU Coll.15,Bamberg Veröff.9.126
Gliese, W., 1969,Cat. of Nearby Stars, Heidelberg Veröff No.22
Gliese, W., Jahreiss, H.,1980,Astron.and Astrophys.Suppl.Serie à paraitre
Hesser,J.E., Lasker, B.M., Neupert, H.E.,1977,Astrophys.J.Letters 215 L75
Kandel,P.,1962, C.R. Ac.Sciences 225, 1975
Kunkel, W.E.,1972, I.B.V.S. 748
Kunkel, W.E.,1973, Astrophys.J. Suppl. Serie 25.I
Mc Cook,G.P., Sion, E.M.,1977,Villanova Univ.Contr. No.2
Mc Graw,J.T.,Robinson, E.L.,1975,Astrophys.J.Letters 200 L 89
Mc Graw,J.T.,1977,Astrophys.J. Letter 214.L 123
Pettersen, B.R., 1975, Astron. and Astrophys. 41. 87
Petit,M.,1976,I.B.V.S.No.1135,1977,I.B.V.S. No.1242,1267,1362, 1979,I.B.V.S. No.1644
Richer, H.B., Ulrych, T.J., 1974, Astrophys. J. 192. 719
Shakhovskaya, N.I., 1974a, I.B.V.S. No. 897
Shakhovskaya, N.I., 1974b, Izv. Krymski Astr. Obs. 51. 92

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1789

Konkoly Observatory
Budapest
1980 May 19

VARIABILITY OF NEBULOUS OBJECT AT 15^h44^m $+46^\circ\!.4$

Comparing two 40 cm astrograph plates of a field centered at β Aur with the blink microscope I discovered a small but distinct variability of the star-like central part of the nebulous object with the approximate coordinates $5^h44^m\!.1$, $+46^\circ26'$ (1855). The variable condensation appears slightly reddish. The brightness variations are slow in the range $14^m\!.4$ to $15^m\!.5$ (pg).

At our request Dr.P. Notni took an image tube spectrogram at the Tautenburg 2 m telescope and found that the object is a Seyfert Galaxy. He also drew our attention to the fact that it is catalogued by Vorontsov-Vel'yaminov and Krasnogorskaya under number 8-11-11 in their Morphological Catalogue of Galaxies (Moskva-Shternberg Trudy 32).

Further details on the lightcurve will be given in Mitteilungen über Veränderliche Sterne, Sonneberg. The object receives the provisional designation S 10838.

HERTA GESSNER

Sternwarte Sonneberg
Zentralinstitut für Astrophysik
Akademie der Wissenschaften der DDR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1790

Konkoly Observatory
Budapest
1980 May 26

REVISED PHOTOMETRIC ELEMENTS OF ST Aqr

The eclipsing binary system ST Aqr is believed to consist of an A7 primary (brighter) star accompanied by a G8IV secondary companion (see Roman 1956). The light variation of this binary has been studied photoelectrically by Knipe (1971) in yellow light and later by Gleim (1973) in yellow, blue and ultraviolet light. As a follow-up to a series of works, which systematically rediscuss the photometric elements of numerous eclipsing binaries (see, e.g., Mardirossian et al. 1980), we have reanalyzed Gleim's (1973) three-colour observations by means of Wood's (1972, 1973-1978) lightcurve synthesis computer model. Our photometric solutions are listed in the table (for the explanation of the symbols the reader is referred to the paper by Mardirossian et al. (1980)).

The chief variable parameters are the orbital inclination angle i, the unperturbed radius r_h of the hotter component, the ratio of the unperturbed radii $k=r_c/r_h$, and the temperatures T_h and T_c of the two components. The mass ratio $q=M_c/M_h$ was also treated as a free parameter. Proximity effects probably give rise to some discordance among the temperatures T_h an T_c we have deduced for different lightcurves. However, no doubt the primary minimum is due to a transit and both components can be considered to be in contact with their Roche lobes, in substantial agreement with the results computed by Gleim (1973) by means of Russell and Merrill's (1952) method. It is remarkable that for our ratio of the radii $k \cong 0.5$ both components of ST Aqr may belong to the main sequence. Further spectrographic observations are needed for checking this possible view.

Table

λ	yellow	blue	ultraviolet
i	76.6±0.9	76.5±0.8	76.1±1.1
r_h	0.494±0.004	0.496±0.005	0.501±0.004
k	0.552±0.014	0.526±0.003	0.548±0.010
a_h	0.549±0.007	0.553±0.010	0.559±0.009
b_h	0.516±0.005	0.519±0.006	0.523±0.005
c_h	0.475±0.003	0.477±0.003	0.481±0.003
a_c	0.302±0.011	0.286±0.005	0.305±0.008
b_c	0.271±0.007	0.260±0.003	0.273±0.005
c_c	0.257±0.005	0.248±0.002	0.258±0.004
T_h(eq)	8100±200	7000±200	7000±300
T_h(pol)	8700	7500	7500
T_c(eq)	5200±100	4000±300	4500±200
T_c(pol)	5200	4100	4600
u_h	0.58	0.73	0.67
u_c	0.70	0.84	0.90
β_h	0.25	0.25	0.25
β_c	0.08	0.08	0.08
w_h	1	1	1
w_c	0.5	0.5	0.5
L_h	0.957	0.975	0.955
L_c	0.043	0.025	0.045
q	0.4±0.1	0.4±0.1	0.4±0.1

F. MARDIROSSIAN, F. PREDOLIN, and G. GIURICIN
Osservatorio Astronomico di Trieste
via G.B. Tiepolo 11
I-34131 Trieste (Italy)

References:

Gleim,J.K., 1973, Astron.J.78,662.

Knipe,G.F.G., 1971, Mon.Not.Astron.Soc.South Africa 30,157.

Mardirossian,F., Mezzetti,M., Predolin,F., and Giuricin,G., 1980, Astron.Astrophys.Suppl.40,57.

Roman,N.G., 1956, Astrophys.J.123,247.

Russell,H.N., and Merrill,J.E., 1952, Princeton Contrib.No.26.

Wood,D.B., 1972, A Computer Program for Modeling Non-Spherical Eclipsing Binary Systems, Greenbelt, Maryland, U.S.A..

Wood,D.B., 1973-1978, WINK Status Report No.1-9, private communications.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1791

Konkoly Observatory
Budapest
1980 May 26

PHOTOMETRY OF HD 166181

HD 166181 is a single line spectroscopic binary with strong and narrow H and K emission. Heard (1956) reported its variable radial velocity and classified as G5 V. Nadal et al. (1974) gave the spectroscopic elements and showed that the velocities derived from CaII H and K emission are similar to those derived from absorption lines. They also assign G5 V type to the primary based on the absolute magnitude determined using the Wilson-Bappu's method. Based on eight nights' observation during January to August 1962, Eggen (1978) reported a variation of $\sim 0^{m}.1$ in V.

The observation of HD 166181 was undertaken to see whether the "wavelike distortion" seen in most of the binaries with G-K spectra displaying CaII emission, is present. Hall (1976) has shown that these binaries are related to the well known eclipsing systems RS CVn and AR Lac.

HD 166181 was observed on seven nights in V and two nights in B filters from 25th March to 2nd April 1980 with the 34 cm reflector of the Kavalur Observatory. An unrefrigerated 1P21 together with the conventional d.c. set up was used for the observations. All measurements were made with respect to the comparison star HD 166435. Observations were corrected for atmospheric extinction using mean extinction values of $k_v=0.25$ and $k_{bv}=0.15$. The magnitude difference in the sense HD 166181 - HD 166435, was determined and then transformed to the standard UBV system of Johnson and Morgan (Johnson, 1963). The transformation coefficients derived from the standard stars observations are $\varepsilon = 0.015 \pm 0.004$ and $\mu = 1.098 \pm 0.003$. Mean $\Delta(B-V)$ of HD 166181 and

HD 166435 was used for the transformation of the visual observations to the standard system.

The constancy of HD 166435 was checked by observing differentially with HD 166093. The mean magnitude difference, HD 166093 - HD 166435, obtained by us is $\Delta V = 0^{m}.397 \pm 0^{m}.004$.

The results are summarized in Tables I and II.

Table I

B-V values of HD 166181 and comparison stars

Star	Present Study	Eggen (1964)
HD 166435	+0.629±0.005	+0.62
HD 166181	+0.697±0.008	+0.72
HD 166093	+1.360±0.005	-

Table I gives the B-V values of the variable and comparisons obtained by us. The B-V values of HD 166181 and HD 166435 agree well with those given by Eggen (1964). Table II gives the Julian Day of observation and ΔV values for the variable. Each ΔV value is a mean of 3-4 independent observations. The total uncertainty in a ΔV given in Table I is $\pm 0^{m}.009$.

Table II

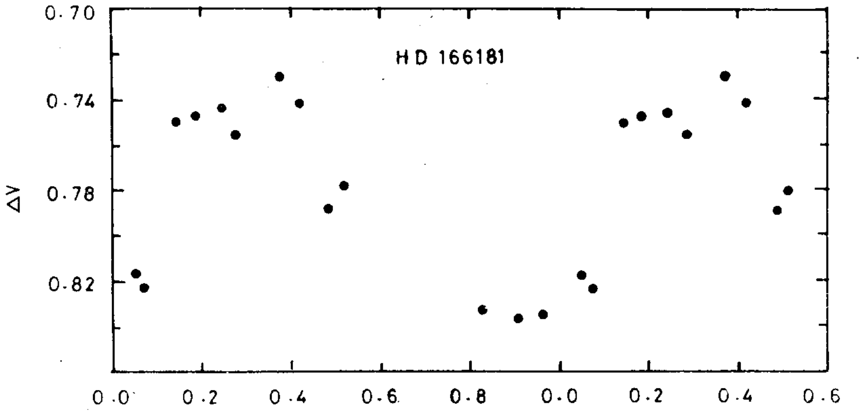
Differential magnitudes of HD 166181

J.D. 2444000.+	ΔV
323.4201	0.832
324.4162	0.729
324.4902	0.742
325.3831	0.836
325.4833	0.835
326.4152	0.788
326.4898	0.778
327.4444	0.816
327.4891	0.823
329.4307	0.750
329.4954	0.747
331.4122	0.746
331.4746	0.756

The Julian Day of observation is converted to orbital phase using the ephemeris:

$$\text{Phase} = 2441931.127 + 1^{d}.8098368 \cdot E.$$

The initial epoch which corresponds to the Time of Periastron passage and the period are from Nadal et al. (1974). In the Figure the ΔV values are plotted against the orbital phase. Though the phases of light variation are not well covered, the general trend of the variation is clear. The rise to maximum is



Light curve of HD 166181

steep compared to the fall to the minimum. The minimum occurs at ~$0^{P}.9$ and maximum at ~$0^{P}.3$. The amplitude of the light variation is ~$0^{m}.1$, comparable to the value reported by Eggen (1978).

HD 166181 is probably a member of the RS CVn group of binaries where the light variation is attributed to the presence of star spots rotationally modulating the observed flux (Eaton and Hall, 1979). It conforms to the main criteria laid down by Hall (1976). According to Nadal et al. (1974), the companion is an M dwarf. Usually the mass ratio in RS CVn systems is close to unity (Hall, 1976; Popper and Ulrich, 1977). The mass ratio of HD 166181 is far from unity and resembles RT Lac, a well known member of RS CVn group (Popper and Ulrich, 1977).

We are planning to obtain more photometric observations for the next few months.

We are grateful to Professor M.K.V. Bappu for the encouragement.

M.V. MEKKADAN

A.V. RAVEENDRAN

S. MOHIN

Indian Institute of
Astrophysics
Bangalore 560 034
India

References:
Eaton, J.A., and Hall, D.S., 1979, Ap.J. 227, 907
Eggen, O.J., 1964, A.J. 69, 570

Eggen, O.J., 1978, I.B.V.S. No. 1426
Hall, D.S., 1976, IAU Colloquium No. 29
Heard, J.F., 1956, Publ. David Dunlap Obs. 2, 107
Johnson, H.L., 1963, Stars and Stellar Systems, vol. III
Nadal, R., Pedoussant, A., Ginestet, N., and Carquillat, J.M., 1974, Astron. and Astrophys., 37, 191
Popper, D.M., and Ulrich, R.K., 1977, Ap.J. (Letters) 212, L131

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1792

Konkoly Observatory
Budapest
1980 May 26

PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR UV Cet IN 1978

Continuous photoelectric monitoring of the flare star UV Cet has been carried out at the Stephanion Observatory ($\lambda = -22^{\circ}49'44''$, $\varphi = +37^{\circ}45'15''$) during the year 1978, using the 30-inch Cassegrain reflector of the Department of Geodetic Astronomy, University of Thessaloniki. Observations have been made with a Johnson dual channel photoelectric photometer in the B colour of the international UBV system. The telescope and photometer will be described elsewhere. Here we mention only that the transformation of our instrumental ubv system to the international UBV system is given by the following equations:

$$V = v_o + 0.036(b-v)_o + 2.954,$$
$$(B-V) = 0.683 + 1.059(b-v)_o,$$
$$(U-B) = -1.484 + 1.022(u-b)_o.$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in Table I. Any interruption of more than one minute has been noted. In the fourth column of Table I the standard deviation of random noise fluctuation $\sigma(\mathrm{mag}) = 2.5 \log(I_o+\sigma)/I_o$ for different times (UT) of the corresponding monitoring intervals is given.

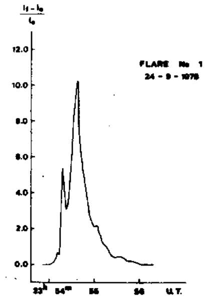
During the 36.7 hours of the monitoring time 14 flares were observed the characteristics of which are given in Table II.For each flare following characteristics (Andrews et al. 1969) are given; a) the date and universal time of flare maximum, b) the duration before and after the maximum (t_b and t_a, respectively), as well as the total duration of the flare, c) the value of the ratio $(I_f-I_o)/I_o$ corresponding to flare maximum, where I_o is the intensity deflection less sky background of the quiet star and I_f is the total intensity deflection less sky background of the star plus flare, d) the integrated intensity of the flare over

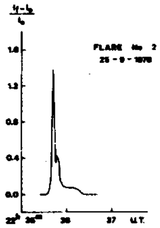
TABLE I

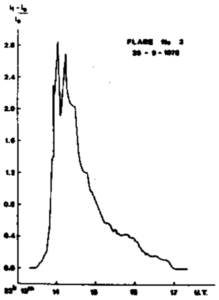
Monitoring intervals in 1978

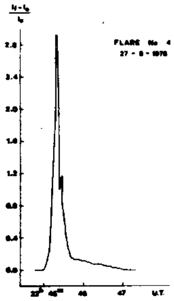
Date 1978	Monitoring intervals (U.T.)	Total Monitoring Time	σ(U.T.)
September			
24-25	$23^h03^m-23^h31^m,23^h34^m-00^h01^m,00^h04^m-00^h33^m$,	02^h35^m	$0.25(23^h22^m),0.30(23^h48^m)$,
	00 45 -01 29, 01 33 -02 00.		0.35(00 27),0.38(01 41).
25-26	22 08 -22 43, 22 46 -23 26, 23 29 -23 59,	03 05	0.27(22 32),0.25(23 06),
	00 10 -00 47, 00 54 -01 27, 01 33 -01 43.		0.23(23 49),0.24(00 36).
26-27	22 08 -22 37, 22 40 -23 17, 23 20 -00 09,	03 43	0.20(22 23),0.22(22 55),
	00 21 -00 48, 00 51 -01 21, 01 25 -02 16.		0.26(23 48),0.26(00 33),
			0.33(01 10),0.34(01 50).
27-28	22 02 -22 36, 22 39 -22 54, 22 56 -23 30,	03 27	0.22(22 28),0.21(22 40),
	23 41 -00 20, 00 22 -01 02, 01 05 -01 50.		0.21(23 12),0.22(23 55),
			0.26(00 25),0.28(01 01).
29-30	22 11 -22 39, 22 42 -23 09, 23 11 -23 39,		0.14(22 29),0.14(22 56),
	23 50 -00 32, 00 35 -00 58, 01 00 -01 37,	03 38	0.13(23 25),0.13(00 16),
	01 40 -02 13.		0.15(00 48),0.16(01 28),
		01 48	0.16(02 01).
30	22 06 -22 45, 22 48 -23 16, 23 19 -24 00.		0.19(22 27),0.15(22 49),
			0.13(23 37).
October			
1	00 00 -00 05, 00 18 -01 08, 01 11 -01 42,	02 03	0.15(00 45),0.13(01 37),
	01 45 -02 22.		0.15(02 07).
1-2	21 26 -22 00, 22 05 -22 31, 22 34 -23 02,		0.18(21 53),0.23(22 23),
	23 14 -23 38, 23 50 -00 02, 00 08 -00 31,	03 49	0.22(22 55),0.23(23 29),
	00 34 -01 08, 01 12 -01 42, 01 45 -02 03.		0.21(00 15),0.22(00 42),
			0.26(01 16),0.32(01 48).
3-4	21 30 -21 59, 22 01 -22 34, 22 36 -23 36,		0.16(21 41),0.16(22 21),
	23 39 -00 15, 00 26 -01 00, 01 02 -01 43,	04 58	0.17(22 51),0.22(00 09),
	01 45 -02 44, 02 48 -02 54.		0.19(00 46),0.19(01 34),
			0.26(02 25).
4-5	22 52 -23 17, 23 19 -23 48, 23 50 -00 30,	03 26	0.21(23 09),0.19(23 39),
	00 41 -01 18, 01 20 -01 58, 02 01 -02 38.		0.19(00 21),0.15(01 03),
			0.22(01 44),0.24(02 25),
5-6	21 28 -21 53, 21 56 -22 30, 22 32 -23 06,	04 10	0.19(21 46),0.14(22 16),
	23 17 -23 45, 23 47 -00 23, 00 26 -00 56,		0.18(22 48),0.18(23 20),
	00 58 -01 45, 01 48 -02 04.		0.20(00 06),0.18(00 44),
			0.21(01 26),0.24(01 51).

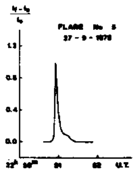
TOTAL $36^h42^m = 36^h.70$

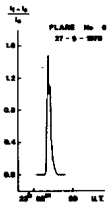

FLARE No 1
24 - 9 - 1976
$\frac{I_f - I_o}{I_o}$
12.0
10.0
8.0
6.0
4.0
2.0
0.0
23h 54m 55 56 U.T.

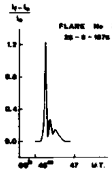

FLARE No 2
25 - 9 - 1976
$\frac{I_f - I_o}{I_o}$
1.6
1.2
0.8
0.4
0.0
22h 35m 36 37 U.T.

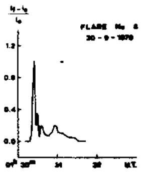

FLARE No 3
26 - 9 - 1976
$\frac{I_f - I_o}{I_o}$
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
23h 13m 14 15 16 17 U.T.

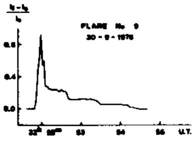

FLARE No 4
27 - 9 - 1976
$\frac{I_f - I_o}{I_o}$
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
22h 45m 46 47 U.T.


FLARE No 5
27 - 9 - 1976
$\frac{I_f - I_o}{I_o}$
1.2
0.8
0.4
0.0
22h 50m 51 52 U.T.

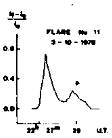

FLARE No 6
27 - 9 - 1976
$\frac{I_f - I_o}{I_o}$
1.6
1.2
0.8
0.4
0.0
22h 58m 59 U.T.

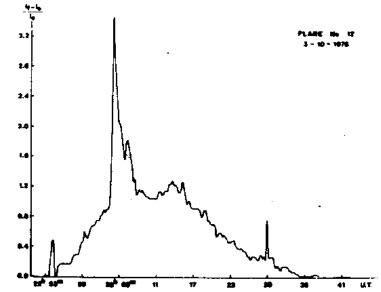

FLARE No 7
28 - 9 - 1976
$\frac{I_f - I_o}{I_o}$
1.2
0.8
0.4
0.0
00h 46m 47 U.T.

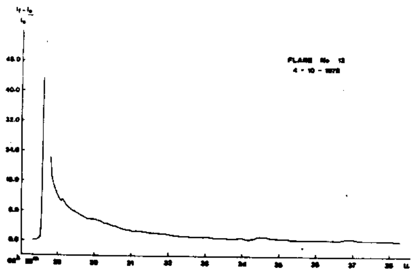

FLARE No 8
30 - 9 - 1976
$\frac{I_f - I_o}{I_o}$
1.2
0.8
0.4
0.0
01h 30m 31 32 U.T.


FLARE No 9
30 - 9 - 1976
$\frac{I_f - I_o}{I_o}$
0.8
0.4
0.0
22h 52m 53 54 55 U.T.


FLARE No 10
1 - 10 - 1976
$\frac{I_f - I_o}{I_o}$
8.0
4.0
0.0
00h 50m 52 54 56 58 01h 00m 02 04 U.T.


FLARE No 11
3 - 10 - 1976
$\frac{I_f - I_o}{I_o}$
0.8
0.4
0.0
22h 27m 29 U.T.


FLARE No 12
3 - 10 - 1976
$\frac{I_f - I_o}{I_o}$
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
22h 53m 59 23h 05m 11 17 23 29 35 41 U.T.


FLARE No 13
4 - 10 - 1976
$\frac{I_f - I_o}{I_o}$
48.0
40.0
32.0
24.0
16.0
8.0
0.0
00h 28m 29 30 31 32 33 34 35 36 37 38 U.

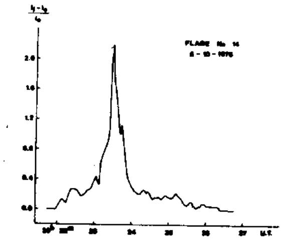

FLARE No 14
5 - 10 - 1976
$\frac{I_f - I_o}{I_o}$
2.0
1.6
1.2
0.8
0.4
0.0
20h 22m 23 24 25 26 27 U.T.

TABLE II

Characteristics of the Flares Observed

Flare No	Date 1978	U.T. max	t_b min	t_a min	Duration min	I_f-I_o/I_o max	P min	Δm mag	σ mag	Air mass
	Sept.									
1	24	$23^h54^m.60$	0.58	1.45	2.03	10.18	4.64	2.62	0.30	1.77
2	25	22 35.74	0.16	0.68	0.84	1.38	0.17	0.94	0.27	1.90
3	25	23 14.02	0.56	3.00	3.56	2.84	2.74	1.46	0.25	1.80
4	27	22 45.31	0.32	1.74	2.06	2.95	0.67	1.49	0.21	1.84
5	27	22 50.92	0.12	0.48	0.60	0.98	0.12	0.74	0.21	1.83
6	27	23 58.38	0.10	0.22	0.32	1.48	0.14	0.99	0.22	1.78
7	28	00 46,27	0.13	0.47	0.60	1.23	0.12	0.87	0.26	1.87
8	30	01 30.42	0.12	1.12	1.24	1.00	0.19	0.75	0.16	2.14
9	30	22 51.98	0.16	2.48	2.64	0.92	0.40	0.71	0.15	1.80
	Oct.									
10	1	00 51.71	1.03	12.09	13.12	8.27	3.57	2.42	0.15	1.94
11	3	22 27.20	0.33	1.27	1.60	0.73	0.31	0.59	0.16	1.83
12	3	23 03.96	10.41	37.92	48.33	3.45	28.76	1.62	0.17	1.78
13	4	?	?	?	9.76?	>43	?	>4.11	0.26	3.15
14	5	23 23.43	1.48	2.93	4.41	2.19	1.48	1.26	0.18	1.78

its total duration, including pre-flare, if present, $p=\int(I_f-I_o)/I_o dt$, e) the increase of the apparent magnitude of the star at flare maximum $\Delta m(b)=2.5 \log(I_f/I_o)$, where b is the blue magnitude of the star in the instrumental system, f) the standard deviation of random noise fluctuation $\sigma(mag)=2.5 \log(I_o+\sigma)/I_o$ during the quiet-state phase immediately preceding the beginning of the flare and g) the air mass at flare maximum. The light curves of the observed flares in the b colour are shown in Figs. 1-14.

S. AVGOLOUPIS
Department of Astronomy
University of Thessaloniki

L.N. MAVRIDIS
Department of Geodetic Astronomy
University of Thessaloniki

P. VARVOGLIS
Department of Mathematics
University of Thrace

Reference:

Andrews, A.D., Chugainov, P.F., Gershberg, R.I. and Oskanian, V.S., 1969, I.B.V.S., No. 326

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1793

Konkoly Observatory
Budapest
1980 May 26

PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR EV Lac IN 1978

Continuous photoelectric monitoring of the flare star EV Lac has been carried out at the Stephanion Observatory ($\lambda=-22^{\circ}49'44''$, $\varphi=+37^{\circ}45'15''$) during the year 1978, using the 30-inch Cassegrain reflector of the Department of Geodetic Astronomy, University of Thessaloniki. Observations have been made with a Johnson dual channel photoelectric photometer in the B colour of the international UBV system. The telescope and photometer will be described elsewhere. Here we mention only that the transformation of our instrumental ubv system to the international UBV system is given by the following equations:

$$V=v_o+0.036(b-v)_o+2.954,$$
$$(B-V)= 0.683 + 1.059(b-v)_o,$$
$$(U-B)=-1.484 + 1.022(u-b)_o.$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in Table I. Any interruption of more than one minute has been noted. In the fourth column of Table I the standard deviation of random noise fluctuation $\sigma(\mathrm{mag})= 2.5 \log(I_o+\sigma)/I_o$ for different times (UT) of the corresponding monitoring intervals is given.

During the 70.9 hours of the monitoring time 5 flares were observed the characteristics of which are given in Table II. For each flare following characteristics (Andrews et al. 1969) are given: a) the date and universal time of flare maximum, b) the duration before and after the maximum (t_b and t_a, respectively), as well as the total duration of the flare, c) the value of the ratio $(I_f-I_o)/I_o$ corresponding to flare maximum, where I_o is the intensity deflection less sky background of the quiet star and I_f is the total intensity deflection less sky background of the

TABLE I

Monitoring intervals in 1978

Date 1978	Monitoring intervals (U.T.)	Total Monitoring Time	σ(U.T.)
August			
22-23	$20^{h}51^{m}$-$21^{h}19^{m}$,$21^{h}21^{m}$-$21^{h}52^{m}$,$21^{h}55^{m}$-$22^{h}23^{m}$,		0.04($21^{h}09^{m}$),0.04($21^{h}37^{m}$),
	22 25 -22 42 ,22 53 -23 28 ,00 04 -00 40 ,		0.04(22 00) 0.04(22 27),
	00 43 -01 20 ,01 22 -01 27 ,01 33 -01 45 .	$03^{h}49^{m}$	0.04(23 16),0.05(00 22),
			0.06(01 04),0.06(01 34).
23-24	21 24 -21 47 ,21 48 -22 04 ,22 07 -22 44 ,		0.04(21 51),0.05(22 25),
	22 45 -23 09 ,23 13 -23 28 ,00 01 -00 16 ,		0.04(23 16),0.04(00 21),
	00 18 -00 38 ,00 42 -01 13 ,01 16 -01 30 ,		0.04(00 59),0.04(01 35).
	01 33 -01 53 .	03 35	
24-25	21 27 -22 12 ,22 14 -22 43 ,22 46 -23 12 ,		0.03(21 52),0.04(22 28),
	23 14 -23 41 ,00 27 -00 37 ,00 40 -00 51 ,		0.04(23 17),0.05(00 42),
	00 54 -01 12 ,01 14 -01 28 ,01 30 -01 59 .	03 29	0.05(01 16),0.04(01 49).
25-26	21 27 -21 59 ,22 02 -22 23 ,22 25 -22 48 ,		0.03(21 44),0.03(22 28),
	22 51 -23 18 ,23 20 -23 45 ,23 53 -24 00 ,		0.03(23 22),0.03(00 12),
	00 00 -00 09 ,00 11 -00 29 ,00 33 -00 49 ,		0.03(00 55),0.04(01 46).
	00 52 -01 06 ,01 13 -01 29 ,01 45 -01 55 .	03 38	
26-27	22 01 -22 39 ,22 42 -23 22 ,23 25 -24 00 ,		0.03(22 22),0.03(23 06),
	00 00 -00 04 ,00 13 -00 48 ,00 50 -01 21 ,		0.03(23 47),0.03(00 36),
	01 23 -01 54 .	03 34	0.04(01 25).
28-29	22 22 -23 04 ,23 08 -23 41 ,23 43 -23 50 ,		0.02(22 43),0.02(23 23),
	23 53 -24 00 ,00 00 -00 10 ,00 12 -00 27 ,		0.02(00 14),0.03(00 58),
	00 38 -01 23 ,01 25 -01 40 ,01 42 -01 58 .	03 10	0.03(01 44).
29-30	22 01 -22 45 ,22 47 -22 50 ,22 54 -23 37 ,		0.03(22 22),0.03(23 13),
	23 39 -24 00 ,00 00 -00 04 ,00 16 -00 49 ,		0.04(00 00),0.04(00 34),
	00 52 -01 32 ,01 35 -01 47 ,01 50 -01 58 .	03 28	0.04(01 19),0.04(01 51).
30-31	22 57 -23 15 ,23 18 -23 29 ,23 32 -23 49 ,		0.02(23 19),0.02(23 52),
	23 51 -24 00 ,00 00 -00 08 ,00 11 -00 27 ,		0.03(00 30),0.03(01 29).
	00 29 -00 52 ,01 02 -01 18 ,01 20 -01 40 ,		
	01 43 -01 58 .	02 33	
September			
1-2	23 19 -24 00 ,00 00 -00 20 ,00 23 -01 00 ,		0.02(23 45),0.02(00 48),
	01 03 -01 29 ,01 31 -01 47 .	02 20	0.02(01 20).
2	22 45 -23 24 ,23 26 -23 38 ,23 42 -23 57 .	01 06	0.02(22 46),0.02(23 16),
			0.02(23 44).

T A B L E I (continued)

Date	Monitoring intervals (U.T.)	Total Monitoring Time	σ(U.T.)
September			
3-4	$22^{h}48^{m}-23^{h}26^{m}$,$23^{h}29^{m}-23^{h}47^{m}$,$23^{h}50^{m}-24^{h}00^{m}$,		0.02($23^{h}10^{m}$),0.02($23^{h}59^{m}$),
	00 00 -00 11 ,00 16 -00 50 ,01 03 -01 48 .	$02^{h}36^{m}$	0.02(00 33),0.02(01 28).
5-6	00 28 -00 59 ,01 02 -01 15 ,01 17 -01 57 ,		0.02(00 47),0.02(01 40).
	02 00 -02 15 .	01 39	
6-7	19 46 -20 27 ,20 29 -21 13 ,21 15 -22 14 ,		0.02(20 14),0.02(20 59),
	22 23 -23 03 ,23 06 -23 23 ,23 25 -23 42 ,		0.02(21 50),0.02(22 49),
	23 45 -23 54 ,00 19 -00 47 ,00 50 -01 05 ,		0.02(23 28),0.02(00 41),
	01 15 -01 30 ,01 32 -01 44 ,01 46 -01 57 ,		0.02(01 37).
	01 59 -02 08 .	05 17	
9	21 36 -22 18 ,22 20 -23 00 .	01 22	0.02(22 05),0.02(22 46).
10-11	23 05 -23 56 ,23 58 -24 00 ,00 00 -00 11 ,		0.02(23 31),0.02(00 16),
	00 12 -00 25 ,00 38 -00 58 ,01 04 -01 16 ,		0.02(01 46).
	01 29 -02 00 .	02 20	
12	20 11 -20 49 ,20 51 -21 18 ,21 19 -21 47 ,		0.03(20 31),0.03(21 21),
	22 28 -22 55 ,22 57 -23 05 ,23 07 -23 35 .	02 36	0.03(22 43),0.03(23 09).
19-20	20 09 -20 40 ,20 43 -21 16 ,21 19 -21 52 ,		0.04(20 27),0.04(20 55),
	22 05 -22 25 ,22 39 -22 58 ,23 01 -23 25 ,		0.04(21 29),0.05(22 19),
	23 46 -00 14 ,00 17 -00 46 ,00 48 -01 17 .	04 06	0.05(22 43),0.05(23 11),
			0.05(23 55),0.07(00 25),
			0.06(00 57).
20-21	19 33 -19 47 ,19 48 -20 17 ,20 20 -20 49 ,		0.05(19 41),0.05(19 55),
	20 52 -21 30 ,21 40 -22 05 ,22 07 -22 37 ,		0.04(20 25),0.04(21 05),
	22 40 -23 08 ,23 37 -23 52 ,23 55 -00 24 ,		0.05(21 48),0.05(22 14),
	00 27 -00 57 ,01 08 -01 39 ,01 42 -02 16 .	05 32	0.07(22 52),0.04(23 41),
			0.06(00 03),0.05(00 35),
			0.05(01 15),0.06(01 50).
23-24	20 44 -21 10 ,22 16 -22 36 ,22 46 -23 17 ,		0.03(20 50),0.03(22 53),
	23 20 -23 47 ,23 49 -00 22 ,00 36 -00 58 ,		0.03(23 27),0.04(23 58),
	01 00 -01 26 ,01 31 -02 05 ,02 09 -02 17 .	03 47	0.04(00 50),0.04(01 10),
			0.04(01 38).
24	21 33 -22 05 ,22 07 -22 33 .	00 58	0.03(21 40),0.03(22 13).
25	19 28 -20 04 ,20 06 -20 36 ,20 38 -21 40 .	02 08	0.03(19 48),0.03(20 21),
			0.04(20 52).

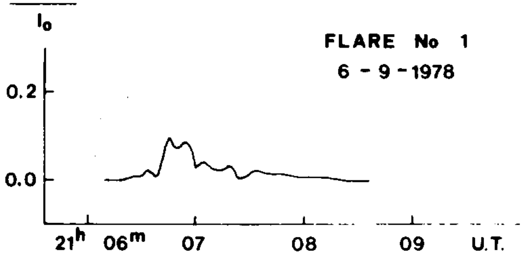
TABLE I (continued)

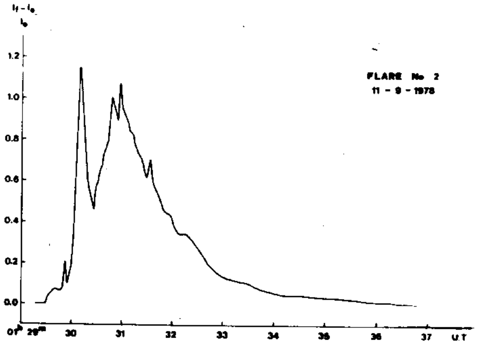
Date 1978	Monitoring intervals(U.T.)	Total Monitoring Time	σ(U.T.)
September			
26	19^h08^m-19^h38^m,19^h41^m-20^h22^m,20^h25^m-21^h03^m, 21 14 -21 45 .	02^h20^m	0.03(19^h18^m),0.02(19^h55^m), 0.03(20 34),0.03(21 28).
27	20 24 -20 57 ,21 00 -21 33 .	01 06	0.03(20 42),0.03(21 19).
29	19 51 -20 31 ,20 34 -21 09 ,21 11 -21 36 ,	01 40	0.02(20 00),0.02(20 46), 0.02(21 20).
30	20 41 -21 11 ,21 14 -21 40 .	00 56	0.02(20 50),0.02(21 27).
October			
3	18 59 -19 30 ,19 33 -20 05 ,20 07 -20 53 .	01 49	0.04(19 15),0.03(19 55), 0.03(20 36).
	TOTAL	70^h54^m	

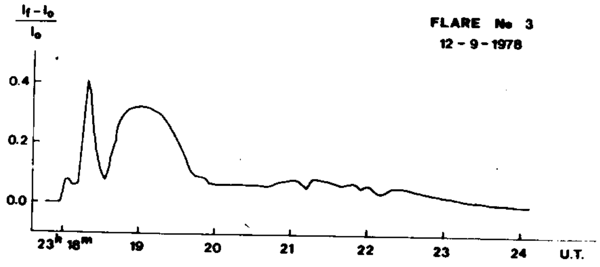
TABLE II

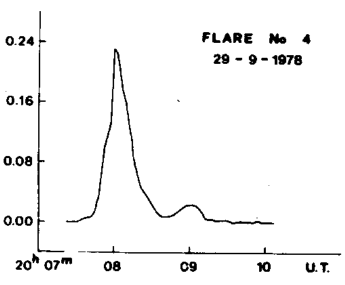
Characteristics of the Flares Observed

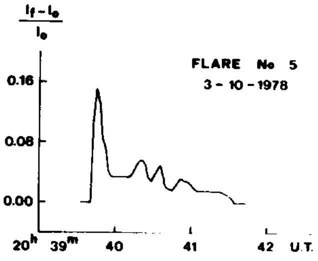
Flare No	Date 1978	U.T. max	t_b min	t_a min	Duration min	I_f-I_o/I_o max	P min	Δm mag	σ mag	Air mass
	Sept									
1	6	$21^h06^m.78$	0.45	1.72	2.17	0.10	0.05	0.10	0.02	1.03
2	11	01 30.18	0.70	6.65	7.35	1.15	1.88	0.83	0.02	1.31
3	12	23 18.32	0.40	5.60	6.00	0.40	0.60	0.37	0.03	1.05
4	29	20 08.02	0.54	1.86	2.40	0.23	0.09	0.22	0.02	1.01
	Oct									
5	3	20 39.76	0.20	1.80	2.00	0.15	0.07	0.15	0.03	1.01




$\frac{I_f - I_o}{I_o}$
1.2
1.0
0.8
0.6
0.4
0.2
0.0
FLARE No 2
11 - 9 - 1978
01h 29m
30
31
32
33
34
35
36
37
U.T


$\frac{I_f - I_o}{I_o}$
0.4
0.2
0.0
FLARE No 3
12 - 9 - 1978
23h 18m
19
20
21
22
23
24
U.T.


$\frac{I_f - I_o}{I_o}$
0.24
0.16
0.08
0.00
FLARE No 4
29 - 9 - 1978
20h 07m
08
09
10
U.T.


$\frac{I_f - I_o}{I_o}$
0.16
0.08
0.00
FLARE No 5
3 - 10 - 1978
20h 39m
40
41
42
U.T.

star plus flare, d) the integrated intensity of the flare over its total duration, including pre-flare, if present $p=\int(I_f-I_o)/I_o dt$, e) the increase of the apparent magnitude of the star at flare maximum $\Delta m(b)=2.5 \log(I_f/I_o)$, where b is the blue magnitude of the star in the instrumental system, f) the standard deviation of random noise fluctuation $\sigma(mag)=2.5 \log(I_o+\sigma)/I_o$ during the quiet-state phase immediately preceding the beginning of the flare and g) the air mass at flare maximum. The light curves of the observed flares in the b colour are shown in Figs. 1-5.

S. AVGOLOUPIS, P. PHYLACTOPOULOS

Department of Astronomy
University of Thessaloniki

G. KAREKLIDIS, L.N. MAVRIDIS

Department of Geodetic Astronomy,
University of Thessaloniki

P. VARVOGLIS

Department of Mathematics,
University of Thrace

Reference:

Andrews, A.D., Chugainov, P.F., Gershberg, R.I. and Oskanian, V.S.: 1969, I.B.V.S. No.326

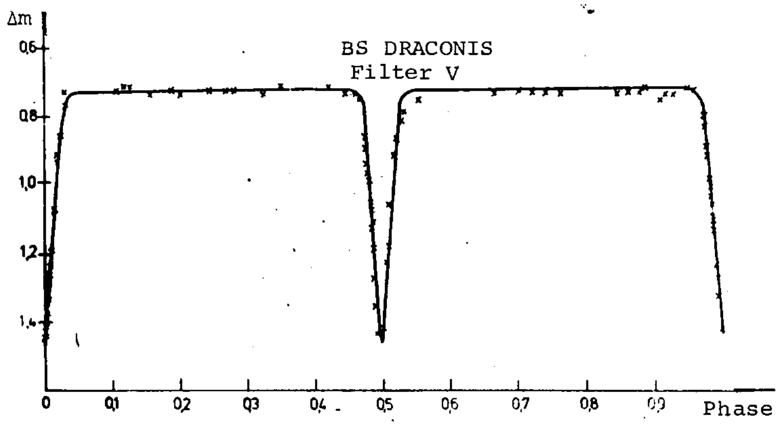
COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1794

Konkoly Observatory
Budapest
1980 May 27

THE BINARY SYSTEM BS DRACONIS

The binary system BS Draconis was observed at the Cluj Observatory from March 3, 1972 to August 18, 1974. The observations in B and V have been made with a 50-cm Newton telescope equipped with unrefrigerated 1P21 photomultiplier.

The mean light curve in V obtained from 498 points is given in Fig. 1, where the observations have been represented by crosses. This curve has been used to determine the elements.



A preliminary solution (Model 1) has been obtained using a Horak-type model; for rectification the Fourier development has been derived: $\ell=0.9805+0.0065 \cos\theta - 0.0046 \cos 2\theta+0.0010 \sin\theta-0.0026 \sin 2\theta$. The results are given in Table I. The preliminary solution has been improved using a Wood model. First taking into account the equal amplitude of the two minima and the spectroscopic results it was assumed that the mass ratio q=1. The results (Model 2) are given also in Table I and are plotted in Fig. 1 (full line). Then q has been computed (Model 3), and the value

Table I

Variable parameters	Model 1	Model 2	Model 3
i°	90.0197	89.783±0.006	90.000±0.008
r_1	0.1035	0.1099±0.002	0.1096±0.002
k	1.1111	1.0581	1.0625
$T_2(eq)^{\circ}$	6379	6443±32	6442±34
q	-	-	0.9920
Constant parameters			
$T_1(eq)^{\circ}$	6500	6500	6500
$u_1=u_2$	0.6	0.6	0.6
$\beta_1=\beta_2$	-	0.25	0.25
$w_1=w_2$	-	0.5	0.5
$n_1=n_2$	-	5	5
q	-	1	-
Auxiliary parameters			
a_1	0.1036	0.1101	0.1098
b_1	0.1035	0.1099	0.1096
c_1	0.1034	0.1098	0.1094
a_2	0.1156	0.1166	0.1167
b_2	0.1148	0.1163	0.1164
c_2	0.1146	0.1161	0.1162
$T_1(pol)^{\circ}$	-	6509	6509
$T_2(pol)^{\circ}$	-	6453	6453
$L_1(ap)$	-	0.0305	0.0303
$L_2(ap)$	-	0.0329	0.0329
$L_1(norm)$	0.4667	0.4809	0.4790
$L_2(norm)$	0.5332	0.5191	0.5210
$(O-C)^2$	0.0346	0.0219	0.0220

obtained is very close to 1, i.e. $q=0.99$. From the three models, model 2 seems to be the best solution, giving the smallest $(O-C)^2$. During the principal minimum there is a total eclipse, while during the secondary - an annular eclipse.

The complete solution, including the light curve in B, will be published elsewhere.

D. CHIS, C. CRISTESCU, G. OPRESCU, M.D. SURAN,
I. TODORAN

Center of Astronomy and Space Sciences,
Bucharest and Cluj

and

V. POP

University Babeş - Bolyai
Cluj

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1795

Konkoly Observatory
Budapest
1980 May 29

SPECTRA OF FOUR BLUE IRREGULAR VARIABLES IN ANDROMEDA

During a variable star survey in a field around ν Andromedae I detected four irregular variable blue stars (Meinunger, Mitt. veränderl. Sterne 7, 1-21. 1975). At my request P. Notni, G.A. Richter, and S. Kopylov kindly took six image tube spectrograms (140 Å/mm) at the 2-m-telescope of Tautenburg Observatory (HQ And and IO And on 1979 Oct. 12; HV And and IW And on 1979 Oct. 13) and the 6-m-telescope of the SAO Selenchukskaja (HV And and IO And on 1979 Nov. 25).

On a plate taken with the 40-cm-astrograph of Sonneberg Observatory by B. Fuhrmann on 1979 Oct. 23 (JD 2444170.290) the photographic brightness of the stars was: HQ And=15.0; HV And=15.8; IO And=16.2; IW And=16.0.

HQ And, HV And, and IO And are photometrically and spectroscopically very similar objects. Probably they are cataclysmic binary systems. Their light-curves resemble those of objects like AM Her and AN UMa but do not belong to the U-Gem or Z-Cam-stars.

IW And seems to be a unique object.

HQ And (S 10774): Weak emission lines of Hα and Hβ are superposed on a blue continuum.

HV And (S 10777): On both plates the spectrum is continuous superposed by weak Hα and Hβ emission lines.

IO And (S 10785): The two spectra are continuous without emission lines. On the spectrum from Selenchukskaja Hα seems to be filled in or weak in absorption.

IW And (S 10792): A photometric tracing of this remarkable spectrum is shown in Fig.1. The absorption spectrum belongs to an O or early B dwarf or subdwarf: Hβ, Hγ, Hδ are broad and strong in absorption.

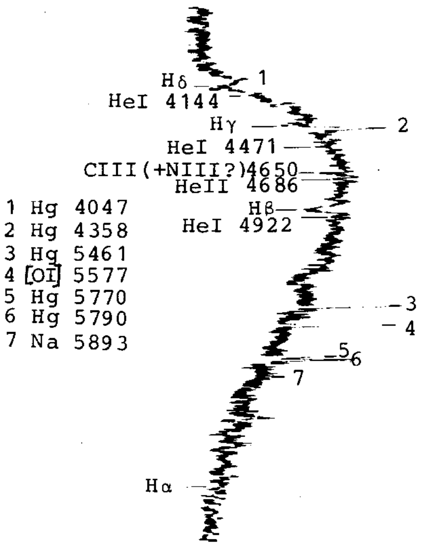


Fig. 1. Photometric tracing of the spectrum of IW And. (Nos.1-7; night-sky and city lines).

Some He I (and He II?) lines are visible but weaker than the C III - N III - band around 4650. Possibly the spectrum is composed: the hump at 5330 towards longer wavelengths is probably not caused by photographic sensitivity. At the place of Hα the spectrum is continuous without signs of emission or absorption. A couple of doubtful emission lines at the limit of detectibility seem to be present in this region of the spectrum, but could not be identified.

L. MEINUNGER
Sonneberg Observatory of
Central Institute for Astro-
physics of Academy of Sciences
of the GDR

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1796

Konkoly Observatory
Budapest
1980 May 30

BVRI PHOTOMETRY OF THE SUPERLUMINOUS SUPERGIANTS HR5171 AND HR6392

The G8Ia supergiant HR5171 has been monitored since 1975 at the Sutherland site of the S.A.A.O. in the Johnson B and V bands and the Cousins R and I bands using ES20 phototubes on the 0.5 and 1.0 metre telescopes. Since 1978 HR6392, a G5Ia supergiant, has also been observed. E region stars from the Cousins (1976) list were used as standards, and the observations have been corrected for atmospheric extinction.

Both stars have nearby early type companions. These have been excluded whenever possible, and corrected for when included in the aperture. The colours adopted for the companions, obtained from two or three observations on nights with good seeing conditions, are given below:

Companion	V	B-V	V-I
HR 5171 B	10.01	0.78	1.21
HR 6392 B	10.42	0.52	
HR 6392 C	11.40	1.55	

The photometry of the supergiants is given in Tables 1 and 2. The heliocentric Julian Date after 2440000 (HJD) is given with the corrected magnitude and colours.

Both stars show long period variations in magnitude and colour (Harvey 1972, Andrews 1977). During the period of observations HR5171 has varied by over a magnitude in V, and by about $0^m.3$ in the colours; HR6392 has shown no large variation, apart from a general decrease in brightness.

J.F. DEAN
S.A.A.O. Observatory
Cape, South Africa

References:

Andrews, P., 1977. Mon. Not. R. astr. Soc. 178, 131

Cousins, A.W.J., 1976. Mem. R. astr. Soc. 81, 25

Cousins, A.W.J., 1978. Mon. Not. R. astr. Soc. S.A. 37, 62

Harvey, G.M., 1972. Mon. Not. R. astr. Soc. S.A. 31, 81

TABLE I

Photometry of HR5171

Julian date	V	B-V	V-R	V-I
-2440000				
2584	7.50	2.31	1.66	2.71
2592	7.40	2.31	1.60	2.68
2609	7.41	2.29	1.66	2.71
2826	6.96	2.43	1.44	2.68
2848	6.98	2.54	1.45	2.64
2849	6.96	2.44	1.45	2.70
2852*	7.01	2.41		2.71
2861	6.95	2.43	1.46	2.69
2970	6.96	2.39	1.47	2.70
2995	6.97	2.45		2.70
3240	6.41	2.34		2.48
3242	6.39	2.33		2.47
3331	6.17	2.26	1.29	2.41
3349	6.20	2.25	1.30	2.44
3680*	6.38	2.32		
3682*	6.40	2.33		2.52
3716	6.33	2.40	1.24	2.44
3719	6.30	2.39	1.24	2.45
3912	6.69	2.53:	1.40	2.50
3914	6.69		1.42	2.52
3978*	6.81	2.64	1.49	2.69
3979*	6.84	2.61	1.49	2.70
4038*	6.85	2.67	1.50	2.71
4039*	6.84	2.67	1.50	2.71
4060	6.79	2.49	1.47	2.66
4079	6.82		1.47	2.70
4096	6.81	2.50	1.40	2.64
4099	6.78	2.46	1.40	2.65
4298	6.50	2.42	1.32	2.52
4299	6.52	2.41	1.31	2.52

* 1.0 metre; rest are 0.5 metre

TABLE 2

Photometry of HR6392

Julian date -2440000	V	B-V	V-R	V-I
3680*	6.38	2.23		
3681*	6.37	2.24		
3716	6.38	2.35	1.15	2.24
3719	6.32	2.32	1.14	2.24
3755	6.35	2.34	1.14	2.24
3756	6.34	2.33	1.14	2.24
3977*	6.42	2.39	1.17	2.26
3979*	6.37	2.40	1.17	2.28
4036*	6.41	2.39	1.17	2.26
4038*	6.39	2.41	1.16	2.26
4059	6.42	2.25	1.17	2.26
4060	6.41	2.24	1.16	2.25
4079	6.42			2.27
4099	6.43	2.23	1.17	2.25
4114	6.47	2.24	1.19	2.27
4115	6.50	2.24	1.19	2.27

* 1.0 metre; rest are 0.5 metre

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1797

Konkoly Observatory
Budapest
1980 May 30

GLIESE 83.3: NOT A RED DWARF, BUT AN UNUSUAL VARIABLE NEVERTHELESS

Quite recently Oláh (1980) reported photoelectric photometry of the red star Gliese 83.3 (= BD + 61° 366 = HD 12208) which showed a roughly sinusoidal light curve with an amplitude of $0\overset{m}{.}12$ in *B* and *V*, with period $P = 2\overset{d}{.}825$. On the basis of its photometric characteristics and its inclusion in Gliese's catalogue of nearby stars, Oláh claimed the star was a BY Draconis variable. The spectral type (from an objective prism plate) given in Gliese's catalog is dK5, though no trigonometric parallax has been measured for this star.

It is the purpose of this note to point out that Gliese 83.3 is not a dwarf at all, but rather a giant of type M3-4. The variability of this star then becomes more of a puzzle.

Petit (1976) had suggested that Gliese 83.3 might be a likely BY Dra star, and in 1976 we obtained several spectra (dispersion 40 Å/mm) of the red region specifically to search for Hα emission, a common characteristic of BY Dra stars. Our spectrograms of Gliese 83.3 show nothing resembling a K-M dwarf - the TiO bandheads are very strong and no Hα emission is present. Our spectra are a close match to that of HR 3319, of spectral type M3 III, or perhaps a shade later. The spectral type for Gliese 83.3 is then M3 - 4 III. No other peculiarities are visible in the red. Apparently the previous spectral type is in error. We note also that the proper motion of this star given in the SAO catalogue is quite small $[\mu(\alpha) = -0\overset{s}{.}0002,\ \mu(\delta) = +0\overset{''}{.}002]$, in accord with a giant classification.

However, anomalies still remain. The photometric variability is rather difficult to understand; irregular or semi-regular variability should take place on a much longer time-scale that the $2\overset{d}{.}8$ period Oláh reports. The (B-V) color of +1.70 is about a tenth of a magnitude redder than we might expect for a giant of this spectral type. Further photometry of this star is clearly in order.

BERNARD W. BOPP
Physics and Astronomy
The University of Toledo
2801 W. Bancroft
Toledo, OH 43606

References:

Oláh, K. 1980, Inf. Bull. Var. Stars No. 1765.

Petit, M. 1976, Inf. Bull. Var. Stars No. 1135.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1798

Konkoly Observatory
Budapest
1980 June 3

93 LEONIS: A NEW VARIABLE STAR

The bright ($V = 4\overset{m}{.}5$) star 93 Leonis is a long-period RS CVn binary with a spectral type of A + G5 IV-III according to Batten et al. (1978) and an orbital period of $71\overset{d}{.}70$ according to Cannon (1910). Young and Koniges (1977) quote a spectral type of F8 IV but note that a secondary component in the spectrum, probably the cooler star, is responsible for the moderately strong Ca II H & K emission.

To look for the photometric distortion wave characteristic of so many other RS CVn binaries, we observed 93 Leo photoelectrically in 1976 and in 1979. The 1976 observations, by Landis, revealed no variation larger than $\pm\ 0\overset{m}{.}01$, as reported by Heiser (1978), but the 1979 observations did show 93 Leo to be variable, with an amplitude around $0\overset{m}{.}03$.

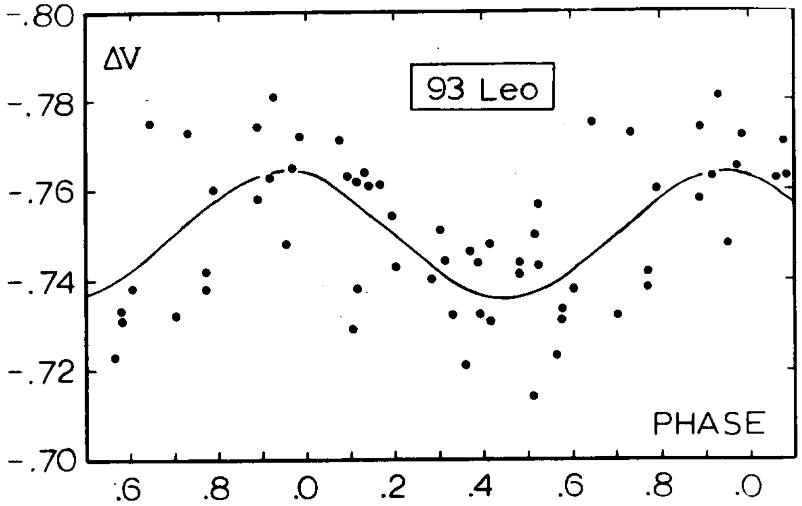
We observed 93 Leo differentially with respect to the comparison star 92 Leo mostly in one color. Landis had observed on 14 nights in 1976 between JD 2,442,871.6 and 2,442,937.6. Louth, Montle, Skillman, and Vaucher observed on 44 nights in 1979 between JD 2,443,906.9 and 2,444,043.6, almost two cycles of the $71\overset{d}{.}7$ orbital period. Details of the observations at Dyer are given by Vaucher (1979). The individual differential observations, generally three on each night, were corrected for differential atmospheric extinction with nightly extinction coefficients at Dyer but mean coefficients at the other observatories. Then they were transformed to V of the UBV system with known transformation coefficients and a mean color difference of $\Delta(B-V) = -\ 0\overset{m}{.}41$, where Δ is in the sense 93 minus 92 Leo. At Dyer observations were obtained also in B of the UBV system, but they are not presented here.

On 8 nights in 1979 at Dyer the comparison star 92 Leo was observed 17 times differentially with respect to the check star HR 4505. There was no indication of significant variability of one respect to the other, the standard deviation of a single observation from the mean being ± $0^m\!.005$ in V and ± $0^m\!.009$ in B.

Nightly means of the 1979 ΔV magnitudes are plotted in the Figure versus phase computed with the ephemeris

$$\mathrm{JD(hel.)} = 2{,}418{,}017.865 + 71^d\!.70 \cdot n \ ,$$

where the epoch is a time of conjunction (the A-type star behind) derived from the time of periastron given by Cannon (1910) and the period is that used by



Cannon in his determination of the spectroscopic orbit. We used Fourier analysis to express the light as

$$\ell = A_0 + A_1\cos\theta + A_2\cos2\theta + B_1\sin\theta \ ,$$

where unit light corresponds to $\Delta V = -\ 0^m\!.750$. The Fourier fit appears as the curve in the Figure. The resulting coefficients are given in the Table below.

	1976	1979
A_0	0.9739 ± 0.0022	1.0000 ± 0.0019
A_1	+0.0055 ± 0.0033	+0.0122 ± 0.0025
A_2	+0.0012 ± 0.0032	+0.0015 ± 0.0028
B_1	+0.0011 ± 0.0031	-0.0038 ± 0.0028

The variation we see in 1979 is probably a distortion wave, with a full amplitude of $\Delta V = 0^{m}.028 \pm 0^{m}.005$ and a minimum at $0^{P}.452 \pm 0^{P}.034$. Seeing this variability prompted us to look again at the 1976 photometry. Fourier analysis of those observations resulted in the coefficients shown also in the Table. The distortion wave was probably there in 1976 also because, although its amplitude of $\Delta V = 0^{m}.013 \pm 0^{m}.007$ was smaller and significant at only the 2σ level, its minimum at $0^{P}.532 \pm 0^{P}.087$ was at the same phase, within the uncertainties. A final curiosity is the smaller value of A_0 in 1976, indicating a mean light level almost $0^{m}.03$ fainter than in 1979. Any uncertainty in the transformation of Landis' data should have produced a systematic error of only $\pm\, 0^{m}.005$.

We can probably say with confidence that the differential reflection effect cannot be producing this variation. For one reason, measurable reflection would be unlikely in such a long-period binary. For a second reason, its amplitude may be variable. And for a third reason, maximum light occurs around phase $0^{P}.0$, when the A-type (presumably the hotter) star is behind. In making this last statement we are assuming the uncertainty in Cannon's $71^{d}.70$ period is around $\pm\, 0^{d}.01$, in which case phases in our Figure would be uncertain by only $\pm\, 0^{P}.05$. If the uncertainty is much larger, then we have lost our fix on the phasing, because the vanishingly small A_2 coefficients can provide no help.

D.S.H. is happy to acknowledge that part of this work was supported by N.A.S.A. research grant NSG-7543.

DOUGLAS S. HALL
GREGORY W. HENRY
CHRISTOPHER A. VAUCHER

Dyer Observatory
Vanderbilt University
Nashville, Tennessee 37235

HOWARD J. LANDIS*

Price Road West
RFD No. 2, Box 44ED
Locust Grove, Georgia 30248

HOWARD LOUTH*

2199 Hathaway Road
Sedro Woolley, Washington 98284

ROBERT E. MONTLE

Veen Observatory
3308 Kissing Rock Road Southeast
Lowell, Michigan 49331

DAVID R. SKILLMAN*

9514 48th Avenue
College Park, Maryland 20740

References:

Batten, A. H., Fletcher, J. M., Mann, P. J. 1978, P.D.A.O. 15, 158.

Cannon, J. B. 1910, J. R. A. S. Canada 4, 455.

Heiser, A. M. 1978, B.A.A.S. 10, 98.

Vaucher, C. A. 1979, M. A. Thesis, Vanderbilt University.

Young, A. and Koniges, A. 1977, Ap. J. 211, 836.

---

* of the A.A.V.S.O.

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1799

Konkoly Observatory
Budapest
1980 June 5

PHOTOELECTRIC OBSERVATIONS OF THE FLARE STAR BD+55°1823 IN 1975

Continuous photoelectric monitoring of the flare star BD+55°1823 has been carried out at the Stephanion Observatory ($\lambda=-22^{\circ}49'44''$ $\varphi=+37^{\circ}45'15''$) during the year 1975 using the 30-inch Cassegrain reflector of the Department of Geodetic Astronomy, University of Thessaloniki. Observations have been made with a Johnson dual channel photoelectric photometer in the B colour of the international UBV system. The telescope and photometer will be described elsewhere. Here we mention only that the transformation of our instrumental ubv system to the international UBV System is given by the following equations:

for the time interval from 5-2-1975 to 24-6-1975

$$V = v_o + 0.001(b-v)_o + 2.278,$$
$$(B-V) = 0.908 + 1.037(b-v)_o,$$
$$(U-B) = -1.895 + 1.031(u-b)_o,$$

for the time interval from 25-6-1975 to 30-7-1975

$$V = v_o + 0.119(b-v)_o + 2.163,$$
$$(B-V) = 0.819 + 1.047(b-v)_o,$$
$$(U-B) = -1.509 + 1.006(u-b)_o,$$

and for the time interval from 31-7-1975 to 16-9-1975

$$V = v_o + 0.046(b-v)_o + 2.440,$$
$$(B-V) = 0.782 + 1.062(b-v)_o,$$
$$(U-B) = -1.612 + 1.063(u-b)_o.$$

The monitoring intervals in UT as well as the total monitoring time for each night are given in Table I. Any interruption of more than one minute has been noted. In the fourth column of Table I the standard deviation of random noise fluctuation $\sigma(\mathrm{mag})=2,5 \log(I_o+\sigma)/I_o$ for different times (UT) of the corresponding monitoring intervals is given.

During the 46.88 hours of monitoring time no flare was observed.

Flare Star BD+55°1823, 1975

Table I

Date 1975	Monitoring Intervals (U.T.)	Total Monitoring Time	σ(U.T.)
June			
13-14	21^h25^m-21^h54^m, 21^h58^m-22^h27^m, 22^h31^m-22^h49^m, 22 52-22 58, 00 41-01 00.	1^h41^m	0.02(21^h45^m),0.02(22^h07^m), 0.02(22 42),0.02(00 44).
17	20 01-20 26, 20 39-21 11, 21 16-21 46.	1 27	0.03(20 12),0.02(20 55), 0.02(21 28).
18	20 32-21 00.	28	0.02(20 47).
27-28	20 00-20 29, 20 33-20 44, 20 48-21 01, 21 06-21 17, 21 20-21 41, 22 58-23 28, 23 33-00 01, 00 04-00 31.	2 50	0.02(20 15),0.04(20 37), 0.02(20 51),0.02(21 13), 0.03(21 26),0.03(23 11), 0.03(23 40),0.03(00 12).
28-29	22 20-22 46, 22 49-23 15, 23 18-23 44, 23 58-00 31, 00 36-00 57, 01 01-01 25.	2 37	0.03(22 26),0.02(22 56), 0.03(23 20),0.03(00 11), 0.03(00 43),0.03(01 09).
July			
4- 5	20 26-20 55, 21 00-21 28, 21 33-22 00, 22 27-22 54, 23 00-23 35, 23 40-00 10, 00 13-00 20, 00 35-01 00, 01 04-01 37.	4 01	0.01(20 35),0.01(21 20), 0.01(21 49),0.01(22 38), 0.01(23 19),0.02(23 59), 0.02(00 42),0.02(01 07).
5- 6	19 38-20 06, 21 24-22 00, 22 05-22 19, 22 30-22 58, 23 04-23 27, 23 30-23 42, 23 58-00 33, 00 36-01 01, 01 06-01 31.	3 46	0.02(19 46),0.01(21 38), 0.01(22 13),0.01(22 37), 0.02(23 17),0.02(00 19), 0.01(00 42),0.02(01 15).
8- 9	21 09-21 35, 21 39-22 12, 22 35-22 52, 23 06-23 27, 23 41-00 07, 00 11-00 26, 00 28-00 43, 01 02-01 37.	3 08	0.02(21 12),0.02(21 53), 0.02(22 42),0.03(23 19), 0.02(23 58),0.02(00 30), 0.02(01 20).
9-10	20 42-21 10, 21 13-21 42, 21 45-22 13, 22 28-22 59, 23 02-23 32, 23 36-00 02, 00 21-00 49, 00 52-01 16, 01 22-01 37.	0.01	0.01(20 56),0.02(21 29), 0.01(22 01),0.02(22 46), 0.02(23 16),0.02(23 53), 0.02(00 37),0.02(01 05), 0.02(01 28).

Table I (Continued)

10-11	20^h55^m-21^h23^m, 21^h26^m-21^h42^m, 21^h45^m-21^h57^m,		$0.02(21^h09^m)$,$0.02(21^h47^m)$,
	22 00-22 32, 22 46-23 14, 23 17-23 46,		0.02(22 20),0.02(22 57),
	23 49-00 04, 00 07-00 19, 00 35-00 57,		0.02(23 35),0.02(24 00),
	01 00-01 11.	3^h25^m	0.02(00 48).
13-14	20 16-20 35, 20 40-21 07, 21 12-21 44,		0.02(20 30),0.02(20 48),
	22 01-22 29, 22 35-23 03, 23 08-23 32,		0.02(21 30),0.02(22 23),
	23 35-23 40, 23 56-00 31.	3 18	0.02(22 57),0.02(23 23),
			0.02(00 09).
15-16	20 57-21 23, 21 27-21 37, 21 41-21 49,		0.02(21 16),0.02(21 34),
	21 55-22 24, 22 46-22 54, 22 57-23 14,		0.02(22 10),0.02(23 05),
	23 18-23 27, 23 31-23 41, 23 44-23 57,		0.02(23 47),0.02(00 10),
	00 02-00 14, 00 16-00 27, 00 42-00 53,		0.03(00 49),0.03(01 32).
	00 56-01 07, 01 15-01 24, 01 26-01 37.	3 15	
17-18	20 37-21 10, 21 14-21 38, 21 41-22 06,		0.02(21 01),0.02(21 25),
	22 22-22 49, 22 54-23 04, 23 10-23 21,		0.02(22 00),0.02(22 39),
	23 27-23 55, 00 14-00 25, 00 29-00 42,		0.02(23 15),0.02(23 44),
	00 46-01 17, 01 23-01 32, 01 35-01 39.	3 49	0.02(00 31),0.02(01 02),
			0.03(21 27).
18-19	22 44-23 12, 23 17-23 29, 23 31-23 44,		0.03(22 54),0.03(23 33),
	23 49-24 00, 00 04-00 15.	1 15	0.04(23 56).
24-25	21 20-21 48, 21 52-22 21, 22 24-22 54,		0.05(21 35),0.05(22 09),
	23 11-23 39, 23 44-00 14, 00 18-00 51,		0.06(22 35),0.08(23 30),
	01 15-01 40.	3 23	0.06(23 54),0.09(00 36),
			0.10(01 24).
August			
5	21 50-22 21, 22 23-22 51, 22 54-23 22.	1 27	0.02(22 09),0.03(22 41),
			0.03(23 08).
10	19 25-19 54, 19 55-20 29, 20 31-21 00.	1 32	0.02(19 40),0.03(20 11),
			0.02(20 46).
11	19 46-20 14, 20 15-20 44, 20 47-21 20.	1 30	0.02(19 59),0.02(20 30),
			0.03(21 01).
	TOTAL	46^h53^m	

F. MAHMOUD, L.N. MAVRIDIS

D. STAVRIDIS, P. VARVOGLIS

Department of Geodetic Astronomy
University of Thessaloniki

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1800

Konkoly Observatory
Budapest
1980 June 9

UBV - OBSERVATIONS OF THE ECLIPSING BINARIES Z Her, AR Lac, AW Peg AND RS Vul

During 36 nights in the summer of 1973 photoelectric observations were made of the eclipsing binary stars Z Her, AR Lac, AW Peg and RS Vul. These systems were selected for observation since, according to the catalogue of Koch et al. (1970), their light curves are rather incomplete.

The observations were made with a 40 cm telescope located near Stefanion, Greece ($\lambda=-1^h31^m$, $\varphi=+37^\circ45'08''$) at an altitude of 800 m. A shielded uncooled EMI 6256A photomultiplier was used in combination with the following filters: Schott UG 1, 2 mm (U); Corning 5030 + Schott GG 13, 2 mm (B); and Baltzers DT Grün (V). The red leak of the U filter is of no consequence since the photomultiplier has zero response in the red. Diaphragms of 44 and 96 seconds of arc were employed. The use of these rather large diaphragms did not cause difficulties as our program stars are rather bright ($V \leq 9$) and are not located in crowded fields.

Although there were a fair number of clear nights, we often encountered variations of the atmospheric extinction on timescales of the order of ten minutes. We have, therefore, observed the variable stars and the comparison stars in one of the following sequences: 1-v-v-1-v-v-1 and 1-v-2-v-1-v-2, where v denotes the variable star and 1 and 2 the comparison stars (see Table II for information about the comparison stars). The mean duration of these sequences is about ten minutes.

On the nights that absolute photometry was done on standard stars and comparison stars possible changes in the sensitivity of the photometer were monitored by means of a standard Čerenkov source.

The data were recorded on a strip-chart recorder with integration times for one star measurement ranging from 5 to 15 seconds.

Table I

Transformation and Extinction Coefficients

	V	B-V	U-B
Transf. coeff.'s (ε,μ,ψ)	-0.190(±0.007)	1.077(±0.007)	1.110(±0.021)
Principal ext.coefficient	0.538(±0.006)	0.107(±0.003)	0.262(±0.005)
Second order ext.coefficient	0.00 (±0.03)	-0.06 (±0.03)	0.03 (±0.05)

Table II

Data on Comparison Stars

Star		BD	N	V	B-V	U-B
Z Her	1	+14°3378	3	7.16(7.20)[a,b]	0.53(0.53)[a,b]	-0.08
	2	+15°3290	3	7.47	0.35	0.11
AR Lac	1	+44°4043	3	5.04	1.54(1.57)[c]	1.94(1.98)[c]
	2	+44°4073	3	5.45	0.04	0.00
AW Peg	1	+23°4392	10	7.42	1.00	0.47
	3	+23°4416	22	8.50	0.96	0.41
RS Vul	1	+22°3644	4	7.86	0.12	-0.26
	2	+21°3719	2	6.83(6.89)[b]	0.19(0.17)[b]	0.14

[a] Popper 1956

[b] Popper 1957

[c] Eggen 1966

Table III

Data on Variables

Variable	BD	Period	Epoch	Eclips*	Remarks	N**
Z Her	+15°3311	3.993	2441870.447 (±0.001)	o	Emission lines RS CVn system	8
AR Lac	+45°3813	1.9832	2439376.4955	O	Emission lines RS CVn system	4
AW Peg	+23°4415	10.662	2441903.690 (±0.015)	t		12
RS Vul	+22°3647	4.478	2441884.482 (±0.001)	o	Probably mass-exchange	12

* O = total occultation
o = partial occultation
t = partial transit

**N = number of observed nights

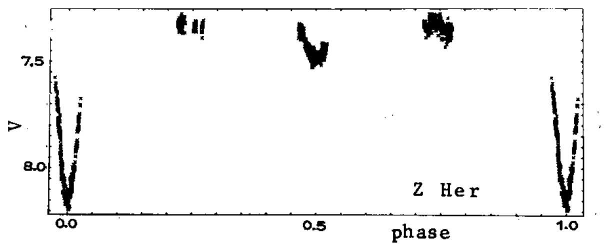
For the reduction of the observations we employed a method outlined in detail by Hardie (1962). The principal extinction coefficients and the coefficients for the transformation from the instrumental to the UBV system were determined from standard star observations during four nights of good photometric quality well distributed over the whole observing run. The standard stars were chosen from the list of Johnson and Harris (1954) and the cluster IC 4665 (Johnson 1954). Because the coefficients showed little variation during these nights, the mean values (see Table I) have been used in the reduction of all observations. For our differential observations the effect of the extinction variations on the magnitude and colour differences is less than 0.01 magnitude.

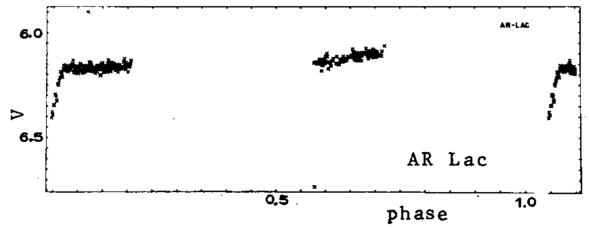
The magnitude and colour indices of the comparison stars were determined during two of the nights that standard stars were measured, from a direct fitting of these stars into the UBV system. The results are given in Table II. Data of these stars from the literature are given between parentheses.

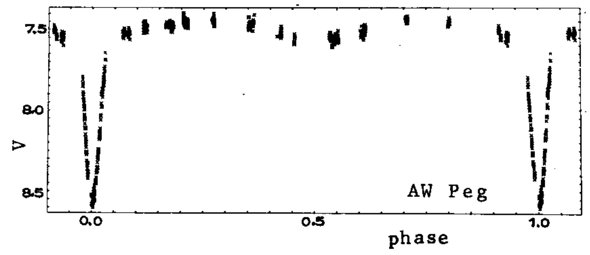
The standard deviation of the distribution of individual magnitudes and colour indices has been determined from the dispersion in the magnitude and colour index differences between the two comparison stars of AW Peg (which have been most frequently observed). We find $\sigma(V) = 0.03$ mag., $\sigma(B-V) = 0.03$ magn. and $\sigma(U-B) = 0.05$ magn. Apart from these standard deviations the magnitudes have a systematic uncertainty due to errors in the zero-points. These errors in V, B-V and U-B are 0.02 mag., 0.01 mag. and 0.01 mag., respectively.

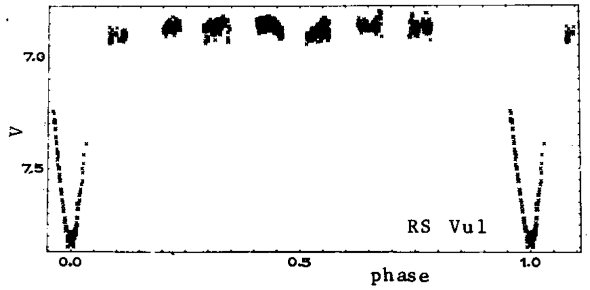
The data have been sent in tabular form to the depositary of photoelectric observations of variable stars at the Royal Astronomical Society, Library, Burlington House, London W1V ONL, Great Britain (file number 64).

The V magnitudes of the four variable stars are represented as a function of phase in Figures 1 through 4. Some basic data of the variable stars are listed in Table III. The epochs of primary minimum of Z Her and RS Vul have been determined from our observations using the method of Kwee and Van Woerden (1956). In this method the observations of one single primary minimum must be used. The epoch of AR Lac, for which no primary minimum was observed, has been taken from Chambliss (1976). The epoch of AW Peg, for which no complete primary minimum was observed on one night, has been determined by folding all available data with Fresa's (1966) period. The other data in Table III have been taken from the catalogue of Koch et al. (1970), except for the period of AR Lac which has been taken from Chambliss (1976).


7.5
V
8.0
Z Her
0.0
0.5
1.0
phase


6.0
V
6.5
AR-LAC
AR Lac
0.5
1.0
phase


7.5
8.0
V
8.5
AW Peg
0.0
0.5
1.0
phase


7.0
V
7.5
RS Vul
0.0
0.5
1.0
phase

The epochs of Z Her and RS Vul, determined from the present data, agree, within the quoted uncertainties, with the times calculated from the ephemeris given by Plavec et al. (1961) and Marmykov (1954). The epoch of AW Peg differs from the time calculated from Fresa's (1966) ephemeris by 0.08 days. This epoch-difference is however not significant because the uncertainty in the period determination of Fresa is 0.01 days.

T. WESSELINK, J. van PARADIJS and R.F.A. STALLER
Astronomical Institute, University of Amsterdam,
the Netherlands
E.J.A. MEURS
Sterrewacht, Huygens Laboratory , Leiden, the Netherlands
D. KESTER
Kapteyn Astronomical Institute, University of Groningen,
the Netherlands

References:

Chambliss, C.R. 1976, PASP 88, 762
Eggen, O.J. 1966, Royal Observatory Bulletin No. 125
Fresa, A. 1966, Capodimonte Cornt., ser. 11, No. 16
Hardie , R.H. 1962, in:Astronomical Techniques,Ed. W.A.Hiltner, Univ. of Chicago Press, p. 178
Johnson, H.L. 1954, Astrophys. J. 119, 181
Koch, R.H., Plavec, M., Wood, F.W. 1970, A catalogue of graded photometric studies of close binaries, Publ.of the Univ. of Pennsylvania, Astronomical Series, Vol. XI
Kwee, K.K., van Woerden, H. 1956, Bull.Astron.Inst.Neth. 12, 464
Marmykov, D.Y. 1954, Perem. Zvezdy 9, 342
Plavec, M., Smetanova, M., Pekny, Z. 1961, Bull.Astr.Czech. 12, 117
Popper, D.M. 1956, Astrophys. J. 124, 196
Popper, D.M. 1957, Astrophys. J. Suppl. 3, 107