COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 3593

Konkoly Observatory
Budapest
22 April 1991
HU ISSN 0374 - 0676

Epochs of Minimum Light For Eight Eclipsing Binary Star Systems

An Optec SSP-3 photometer was used on the 41cm David Irons telescope at the observatory of the Charlotte Amateur Astronomers Club to make differential measurements of eight eclipsing binaries. Because of the sensitivity of the detector and the faintness and color of the stars, generally only V observations were attempted. The exception is R Canis Majoris, for which both B and V observations were made. The Hertzsprung method was used to find epochs of minimum light, which are presented in Table I. The epoch of R Canis Majoris is an average of the determinations from the observations in each filter.

The residual for AA Andromedae was computed based on the light elements of Pierce (1951). Because the residual was about 1.86 hours, a new set of light elements was obtained by combining this epoch of minimum light with those from recent literature:

$$\text{H.J.D. MIN.I} = 2447804.6739 + 0^{d}.93509705E$$
$$\pm 13 \text{ p.e.} \qquad \pm 36 \text{ p.e.}$$

Note that this period is about 0.289 seconds shorter than that of Pierce. Table II contains the epochs of minimum light used to get the above light elements, as well as the residuals. Photoelectric epochs of minimum light were weighted by a factor of five in the computations.

The residual for AO Camelopardalis was computed based on the light elements of Evans *et al.* (1985). The insignificance of the residual indicates that the period of AO Camelopardalis has remained constant.

The residual for WY Cancri was calculated based on the light elements of Mullis and Faulkner (1988). Mullis and Faulkner presented two times of minimum light that indicated the period had decreased. A time of minimum light presented by Mullis and Faulkner (1989) along with the time of minimum light presented here supports the new period of Mullis and Faulkner (1988).

The residual for R Canis Majoris was computed from the light elements of *S.A.C.* No. 61 (1990). Since the residual was about 48.5 minutes, a new set of light elements was calculated by combining this epoch of minimum with those from recent literature.:

$$\text{H.J.D. MIN.I} = 2447918.7189 + 1^{d}.13595100E$$
$$\pm 25 \text{ p.e.} \qquad \pm 258 \text{ p.e.}$$

Note that this period is about 1.037 seconds longer than that of *S.A.C.* No. 61. The epochs of minimum light used to get the above light elements, as well as the residuals, are shown in Table III. Photoelectric epochs of minimum light were weighted by a factor of five in the computations.

The residuals for SW Lacertae were determined from the light elements of Faulkner *et al.*(1984). The period of SW Lacertae has apparently remained constant because the residuals presented here are very small.

The residuals for XY Leonis were determined from the light elements of Kałuzny and Pojmánski (1982). Because the residuals were about 35 minutes, a new set of light elements was obtained by combining these epochs of minimum light with those from recent literature:

$$\text{H.J.D. MIN.I} = 2447864.9125 + 0^{d}.28409949E$$
$$\pm 18 \text{ p.e.} \qquad \pm 27 \text{ p.e.}$$

Note that this period is 0.219 seconds longer than that of Kałuzny and Pojmánski. The epochs of minimum light used to get the above light elements, as well as the residuals, are given in Table IV. A period change apparently occurred between -4900 and 0 cycles. This explains the large probable errors exhibited by the new light elements presented here. Note the systematic differences between the O-C's for primary and secondary eclipses which indicate a displaced secondary. Faulkner and Grossoehme (1983) noted this, but it was first noted by Gehlich *et al.*(1972).

The residual for AM Leonis was computed based on the light elements of Rafert and Twigg (1980). Since the residuals for AM Leonis presented by Mullis and Faulkner in 1989 and here are relatively small, it can be deduced that the period of AM Leonis had remained constant since the observations of Rafert and Twigg.

The residual for GR Tauri was determined from the light elements of Yamasaki *et al.* (1984). Because their observations only spanned 81 cycles, we attempted to improve the period, using our epoch of minimum light and those of Yamasaki *et al.*:

$$\text{H.J.D. MIN.I} = 2444573.1070 + 0^{d}.42985160E$$
$$\pm 2 \text{ p.e.} \qquad \pm 7 \text{ p.e.}$$

This refined period is only approximately 0.0778 seconds shorter than the period of Yamasaki *et al.* Table V contains the epochs of minimum light used to get the above light elements.

Table I
Epochs of Minimum Light

Star	Hel. J.D.	E	(O-C)
AA Andromedae	2447804.6670	19168.0	-0.0775
AO Camelopardalis	2447864.7879	6423.5	+0.0025
WY Cancri	2447971.6029	2346.0	-0.0004
R Canis Majoris	2447918.7210	22790.0	+0.0337
SW Lacertae	2447821.5405	6968.0	+0.0007
"	2447822.6617	6971.5	-0.0006
"	2447825.7092	6981.0	+0.0001
"	2447850.5649	7058.5	+0.0000
"	2447854.5747	7071.0	+0.0008
"	2447860.5080	7089.5	+0.0008
XY Leonis	2447864.9146	9822.0	+0.0237
"	2447881.8187	9881.5	+0.0240
AM Leonis	2447971.7479	4978.5	-0.0003
GR Tauri	2447881.6752	7697.0	-0.0066

Table II
AA Andromedae

Hel. J.D.	E	(O-C)	Source
2439033.448	-9380.0	-0.0155	*H.B.Z.* No. 76 (1987)
2441598.443	-6637.0	+0.0082	"
2441599.376	-6636.0	+0.0061	"
2441600.308	-6635.0	+0.0030	"
2441959.374	-6251.0	-0.0082	"
2441960.324	-6250.0	+0.0067	"
2447060.3455	-796.0	+0.0089	*B.A.V. Mitt.* No. 50 (1988)
2447804.6670	0.0	-0.0073	This paper
2448209.5689	433.0	-0.0020	Faulkner (1991)

Table III
R Canis Majoris

Hel. J.D.	E	(O-C)	Source
2445743.384	-1915.0	+0.0113	*B.A.V. Mitt.* No. 43 (1986)
2445743.378	-1915.0	+0.0053	" No. 48 (1988)
2446521.493	-1230.0	-0.0061	" No. 52 (1989)
2446536.247	-1217.0	-0.0195	*B.B.S.A.G.* No. 82 (1987)
2447205.330	-628.0	-0.0116	*B.A.V. Mitt.* No. 50 (1989)
2447230.345	-606.0	+0.0124	*B.B.S.A.G.* No. 88 (1988)
2447581.339	-297.0	-0.0024	" No. 91 (1989)
2447918.7210	0.0	+0.0021	This paper

Table IV
XY Leonis

Hel. J.D.	E	(O-C)	Source
2445396.6566	-8688.0	+0.0005	Faulkner/Grossoehme (1983)
2445416.6904	-8617.5	+0.0053	"
2445444.6685	-8519.0	-0.0004	"
2445449.6462	-8501.5	+0.0025	"
2445732.8868	-7504.5	-0.0011	Faulkner (1986)
2446079.9122	-6283.0	-0.0032	"
2446469.4080	-4912.0	-0.0078	Pohl *et al.* (1987)
2447864.9146	0.0	+0.0021	This paper
2447881.8187	59.5	+0.0023	"

Table V
GR Tauri

Hel. J.D.	E	(O-C)	Source
2444544.3075	-67.0	+0.0006	Yamasaki *et al.* (1984)
2444573.1074	0.0	+0.0004	"
2444578.2643	12.0	-0.0009	"
2444579.1252	14.0	+0.0003	"
2446438.6622	4340.0	-0.0007	Faulkner (1986)
2447881.6752	7697.0	+0.0004	This paper

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