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LIGHT ELEMENTS OF W Gru

The variability of W Gru =HV3370= 54.1913= HD 214791= SAO 231251= CoD-44°15009= CPD-44°10254 was discovered by Thome (1900), in the past century when he was observing for the Cordoba Durchmusterung. The first ephemeris for this system was prepared by Miss Leavitt from 6 plates taken in 1902 in the zone defined by Harvard Map 45, she derived a period of $1^d.47603$, an Algol-like variability, a maximum magnitude of 9.5 and an amplitude of $0^m.5$ (Pickering, 1913). Later W Gru was listed as a dwarf (short period) late type object with no photometric orbit in a work on statistics of eclipsing binaries (McLaughlin, 1927). Further, from 318 Harvard photographic estimates C.Payne Gaposchkin determined a period of $1^d.4842609$, the amplitude for Min I of $0^m.53$ and a weak secondary minimum of amplitude $0^m.06$. In 1953 S. Gaposchkin published a mean photographic light curve and absolute dimensions for this system. Recently Imbert (1974) obtained new absolute elements based on 20 double-lined spectrograms (20 Å/mm) and on the photographic light curve given by Gaposchkin, he was forced to double the period in order to conciliate it with the epochs of maximum radial velocity differences, a fact supported by his visual spectral classification of FG IV for both components.

The present observations involve five times of minimum light in the U,B and V bands made in 1978, 1979 and 1980 at the Bosque Alegre Station of Cordoba Observatory in Argentina and at Cerro Tololo Interamerican Observatory in Chile. The "history" of this system comprises now 11500 cycles.

Individual minima are listed in Table I. The standard errors are given in brackets, 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:

$$\text{Min I=JD (hel)} \quad 2443781^{d}.5029 + 2^{d}.968521\ E$$
$$\pm.0021 \quad \pm.000013 \qquad (1)$$

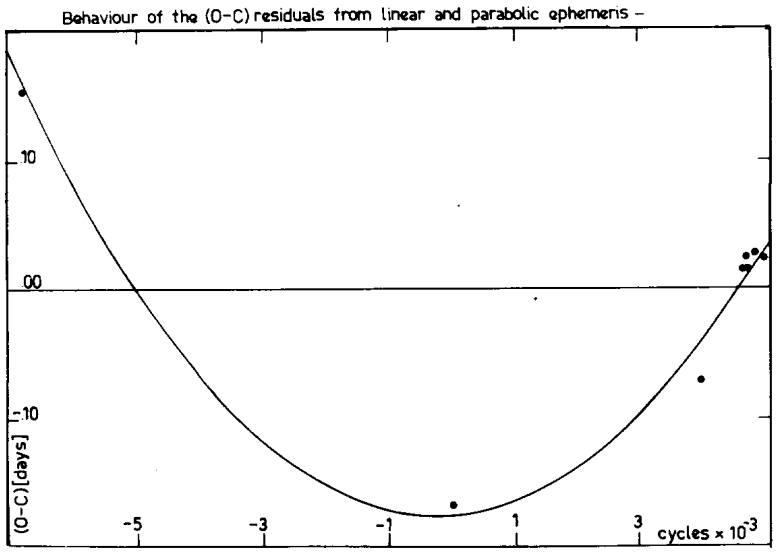

Figure 1

The minimum epochs obtained by Pickering, Gaposchkin and that found from Imbert's spectroscopic data together with the present minima give the following least squares linear ephemeris:

$$\text{Min I= JD (hel)} \quad 2430132^{d}.327 + 2^{d}.9684994\ E$$
$$\pm.024 \quad \pm.0000054 \qquad (2)$$

The epochs with their standard errors, the cycles E with their weights and the residuals (o-c) for the ephemeris (2) are listed in Table II. The primed quantities stand for the elements of ephemeris (1).

The trend of the (o-c) residuals from (2) allows to improve (2) with a quadratic term in E. The resulting least squares parabolic ephemeris is:

$$\text{Min I= JD (hel)} \quad 2430132^{d}.149 + 2^{d}.9685036\ E + 7^{d}.84 \times 10^{-9}\ E^{2}$$
$$\pm.012 \quad \pm.0000016 \quad \pm 0.46 \times 10^{-9}$$
$$(3)$$

Table I

Times of Minima

JD (hel) 2440000+

Min	V	B	U
I	3778.53261(17)	3778.53091(26)	3778.52625(105)
I	3781.49871(26)	3781.49921(19)	3781.49701(48)
II	3818.61250(48)	3818.61436(17)	3818.61529(99)
II	4177.80418(19)	4177.80459(43)	4177.80302(28)
I	4517.69474(38)	4517.69469(72)	4517.69353(147)

Table II

Mean Times of Minima

JD (hel) 2400000+	E (w)	E' (w')	(O-C)	(O-C)'
10001.60	-6781.5(1)		0.1514	
30132.156	0.0(2)		-0.1709	
41569.88(55)	3853.0(2)		-0.0749	
43778.5299(33)	4597.0(3)	-1.0(1)	0.0144	-0.0045
43781.4983(12)	4598.0(3)	0.0(1)	0.0113	-0.0046
43818.6141(14)	4610.5(3)	12.5(1)	0.0209	0.0047
44177.80393(81)	4731.5(5)	133.5(3)	0.0223	0.0034
44517.69432(68)	4846.0(5)	248.0(3)	0.0195	-0.0019

Table III

Times of Minima for parabolic ephemeris

JD (hel) 2400000+	E (w)	(O-C)
10001.60	-6781.5(1)	-0.0022
30132.156	0.0(2)	0.0074
41569.88(55)	3853.0(2)	-0.0293
43781.503(02)	4598.0(5)	0.0092

The elements of (3) are presented in Table III, labeled as Table II. As can be seen in Figure 1, where the (o-c) residuals and the parabolic ephemeris are plotted versus cycles, relative to the linear ephemeris, the (o-c) residuals are smaller than in Table II. The period for this system is therefore increasing at a constant rate of 0.083 sec/y.

The light curve of W Gru is not complete for the moment mainly because of the commensurability of the period with the day. The present fractionary observations show the branches of Min I and Min II equal in shape and depth while in the regions out of

eclipse the light appears to be constant. Observations are planned in the next season to cover the whole light curve.

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