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PHOTOMETRIC STUDIES OF THE ECLIPSING VARIABLE V 368 Cas

The eclipsing binary star V 368 Cas (BD+59°0607=HD 19644)was photoelectrically observed during 1980 to 1982 in BV and during 1983 in UBVR with the 0.5-m telescope of Ural University Observatory. The spectral type is B_3 III according to GCVS III. There were obtained 520 photometric measurements in BV and 80 ones in UR with root mean square errors $\pm 0^m.016$; $\pm 0^m.008$; $\pm 0^m.008$; $\pm 0^m.009$ for UBVR accordingly. BD$\pm$58°0567 was used as comparison star. The observations were published by Polushina (1984), and yielded four times of minima, which are given in Table I. Using the above new photoelectric minima together with the photographic minimum given by Strohmeier (1959), the new ephemeris has been derived as follows :

$$JD_o\,I\ min = 244\ 5435.3089 + 4^d.4516321 \cdot E.$$

The observations are illustrated in Figure 1.

Table I

V 368 Cas times of minima

JD(hel) 244 5000+	filter	min	$(O-C)_{GCVS}$
326.2437	B,V	II	-0^d.0442
386.3409	B,V	I	-0.0442
386.3407	U,R	I	-0.0444
435.3089	U,B,V,R	I	-0.0443

Each light curve has been considered as an independent source of information. The Russell-Merill method was used for calculation. Least-squares solutions were made for the light at the maxima according to the formula

$$l = A_o + A_1 \mathrm{Cos}\theta + A_2 \mathrm{Cos}2\theta.$$

Fourier coefficients as well as the number of points outside the eclipse are given in Table II. The solution was obtained in a completely automatized manner with Lavroy's computer program (1982) for "Nairi-K" computer. Because of the small number of U,R observations in minima, B,V light curves were

used for calculate the photometric elements. The main variable parameters for the solution are the orbital inclination angle i, the unperturbed

Table II

Fourier coefficients for the light curves at the maxima

	U	B	V	R
A_o	0.9505 ±48	0.9629 ±5	0.9566 ±5	0.9358 ±32
A_1	−0.0476 ±53	−0.0515 ±7	−0.0550 ±6	−0.0613 ±35
A_2	−0.0077 ±62	−0.0120 ±9	−0.0134 ±7	−0.0188 ±41
n	36	364	364	36

relative radius of the less component r_2, the ratio of the unperturbed radii $k=r_2/r_1$. A circular orbit has been adopted. Photometric elements together with corresponding errors are listed in Table III. According to value p eclipse in the system is partial. The theoretical light curve in V is illustrated in Figure 1 with the aid of a solid line. The agreement between the theoretical light curve and observations seems to be very good. There is, however, a discrepancy with orbital elements published by Cristescu et al. (1984).

Table III

Photometric elements of V 368 Cas

	V	B		V	B
i	77°.9 ±1.0	78°.8 ±1.0	a_2	0.262 ±30	0.247 ±44
k	0.924 ±75	0.873 ±55	b_2	0.254	0.241
a_1	0.283	0.283	L_1	0.816 ±25	0.864 ±15
b_1	0.275	0.276	x_1	0.35 ±.27	0.17 ±.26
c_1	0.269	0.271	x_2	0.53 ±.30	0.27 ±.44
p	−0.317	−0.302			

The spectral type A1 for the cooler component follows from the ratio of surface brightnesses. Effective temperatures by Popper (1980) were used. The star is greater in size for its spectral type, i.e. it is obvious that it has already evolved. In fact V 368 Cas evolved through mass exchange.

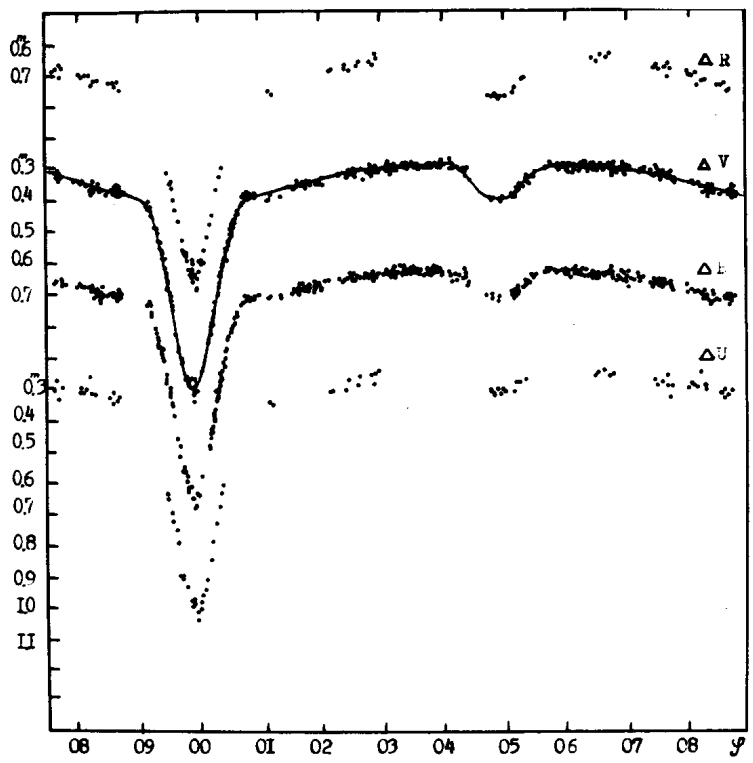

Figure 1. Light curves of V 368 Cas

Assuming an A-star filling its Roche-lobe, it was possible to estimate the absolute parameters of the orbit. We have obtained these for mass ratio q=0.24, using the empirical spectral type-mass and mass-radius relations for main sequence stars by Svechnikov et al. (1984 a,b):

$$R_B = 6.4R_\odot; \quad M_B = 6.7M_\odot$$

$$R_A = 5.7R_\odot; \quad M_A = 1.7M_\odot$$

$$A = 23.04R_\odot$$

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