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RECENT PHOTOELECTRIC MINIMA OF THE ECLIPSING BINARY RZ Cas

Sometimes the bright eclipsing system RZ Cas (=BD+69°179 =HD 17138) has been reported to have a flat bottom near the centre of primary light minimum (Szafraniec 1960, Burke and Rolland 1966, Arganbright et al. 1988) and in some cases this behaviour was not observed (Chambliss 1976, Surkova 1988). Recently, Arganbright et al. (1988) published their experiences about the contradictions of different studies. They have measured a 22 minute long apparent totality, although theory yields a partial eclipse on the basis of very good geometrical elements of Chambliss (1976).

Our photometric measurements were made using the 40 cm Cassegrain telescope of Baja Observatory, with a Starlight-1 photoelectric photometer. The comparison star was BD+69°171. Eclipses were observed on 18/19 November and 12/13 December 1987, 2/3 January, 22/23 and 28/29 March 1989. We used only the "V" filter on the last two nights, and "V" and "B" on the previous ones. The minimum times of the first two nights have already been published (Hegedüs, 1987). The new values are:

Min.Hel.J.D. =	2447529.5011	(V)	n=24	O-C=+0.0102 days
(obs)	2447529.5010	(B)	n=24	O-C=+0.0101 days
	2447608.3867	(V)	n=28	O-C=+0.0095 days
	2447614.3628	(V)	n=42	O-C=+0.0093 days

where "n" is the number of individual points taken into account in the least squares parabolic fitting. The O-C values were computed with respect to the ephemeris taken from G.C.V.S. (Kholopov, 1985).

The shape of the eclipses of the first two nights is given in Figures 1 and 2. The stellar magnitudes are given in our instrumental system. The dots represent our measurements during the first nights, while the crosses are the data of Arganbright et al. (1988), shifted by a certain value of magnitudes (to compensate the difference between their and our photometric system). The descending and ascending branches of the two light curves are in good agreement with one another. The shift of the earlier measurements can be a legitimate procedure, since our photometric system is very close to the standard UBV system, and because

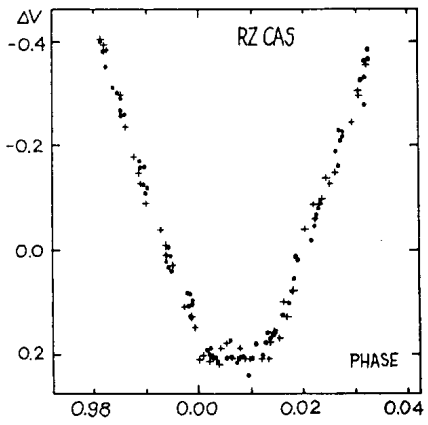

Figure 1

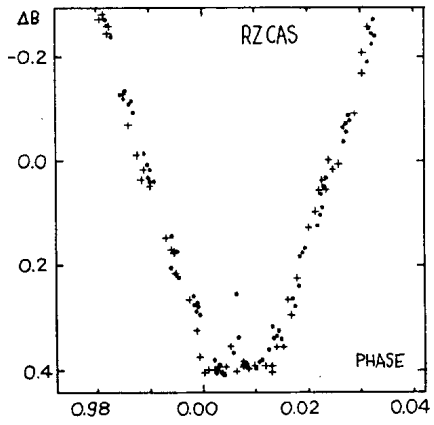

Figure 2

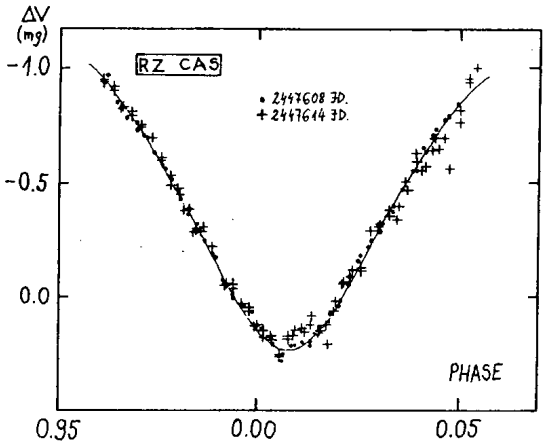

Figure 3

the depths of primary minima (1.570±0.015 in "V" and 1.665±0.026 in "B" from measurements made in 1987, and 1.550±0.021 in "V" from measurements made in 1989) are close to the corresponding values of Chambliss (1976) (1.55 in "V" and 1.64 in "B") and those of Arganbright et al. (1988).

The constant brightness of RZ Cas near the middle of the eclipse is well appreciable in "V" band but less evident in the "B" light. The length of this flat light minimum is found to be 18 (from our data plotted in Fig. 1), 15.5 (from our data plotted in Fig. 2) and 16 minutes (from our V-filter data of 22/23 March 1989). The light of the system seems to be constant within ±0.009, ±0.023, and ±0.019 magnitudes, for these three data set, respectively. So our data show the apparent totality with nearly the same accuracy, as the data of Arganbright et al. (1988).

Averaging our 213 individual "V" measurements (observed before 28/29 March 1989) into 40 points we constructed a normal light curve. This curve shows no sign of any asymmetry of primary minimum (in agreement with the conclusion of Nowak and Piotrovski, 1982). An estimation of the lower and upper limits of the possible length of the flat bottom also was made from this curve. We obtained 4 and 20 minutes for them, respectively. Arganbright's 22-minute long totality is slightly beyond our upper limit.

It should be also mentioned, that although Reed (1968) and Karle et al. (1975) did not treat this behaviour in their papers, a 19-minute long total eclipse (at JD 2439877, Reed, 1968) as well as a 17-minute long one (at JD 2442303, Karle et al. 1975) are well appreciable. Photometric studies of Stokes (1972) and Surkova (1988) contain very scanty data near the mid eclipse but the distribution of their individual measurements does not exclude an about 16, and 13 minute long totality, respectively.

We observed a short-term light change of 0.16 mag. in the "B" band, near the phase of 0.006 at JD 2447118 (see Fig. 2). Among Arganbright's data one can see also a light increase near this phase. In the earlier studies we couldn't see any evidence for such light jump. Thus, its reality is questionable, or it can be a rare event.

Finally, we call the attention to the eclipse of 28/29 March 1989. On that night we have measured a slow light increase near the bottom of the minimum. In Figure 3 our single measurements are given as crosses, the dots represent our observational data of 22/23 March 1989 and the continuous curve is the approximate theoretical light curve. This hump maybe seen also in the measurements of Burke and Rolland (1966). The presence of an additional light in the total phases of certain eclipsing variables is a known fact. Kudzej (1987) has studied this phenomenon from theoretical aspects and in the case of twelve close binaries. The eclipse of RZ Cas is not surely total and the hump is not always observable. Even if it were a real effect, the time dependence of the appearance and of the probable shape of the hump in the apparent total phase would make it probable that the reason of these phenomena is entirely different from the effect studied by Kudzej (1987). At this time we cannot exclude that the above mentioned effect can be a consequence of observational errors or of the variability of the comparison star.

Thus, it is clear that despite of RZ Cas is a frequently studied eclipsing variable, it would be advisable to observe this binary systematically, with a better time-resolution and higher precision, than it has been usually done. We can verify only in this manner what in the binary system RZ Cas happens.

TIBOR HEGEDÜS
Baja Observatory of the Hung. Acad. of Sci.
H-6500 BAJA, P.O.Box 766. (HUNGARY)

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