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THE TOTALITY IN A PRIMARY MINIMUM OF RZ CASSIOPEIAE

RZ Cas (HD17138) is an eclipsing binary system ($P = 1^d.195$) and has shown irregular period changes (e.g., Herczeg & Frieboes-Conde 1974; Nowak & Piotrowski 1982). The system is bright enough ($m_V = 6^m.18$ at light maxima), so many photometric observations, mostly by rather small telescopes, have been made, which mainly concern with the timing of primary minima of the system.

There are also some reports on the type of the primary minimum, i.e., whether it is a total eclipse or partial one. Some observations show totality, but the others do not. For example, those by Huffer and Kopal (1951), Huffer (1955), Chambliss (1976), Surkova (1988), etc. show partial eclipses. On the contrary, those by Szafraniec (1960), Burke and Rolland (1966), Margrave et al. (1975), Arganbright et al. (1988), and Hegedüs (1989), etc. seemed to show total ones. Even among the observations which show totality, the duration of totality reported differs from one another, i.e., from 7 to 22 minutes, and moreover there is a report that the duration of totality depends on the colour (Hegedüs 1989).

The spectral types of the components have been assigned to A2V and G5IV (Chambliss 1976). The colour changes during the primary eclipse are not so large: the colour index at the primary minimum is about $B - V = 0^m.23$, which corresponds to late A to early F, never to G. This is one reason why the primary minimum is considered to be partial, not total (e.g., Chambliss 1976). Accordingly, some observers whose observations show total primary minima are doubtful of the totality (Arganbright et al. 1988).

On December 21 in 1989 we observed the system photoelectrically with the 91-cm telescope equipped with the multi-channel polarimetric photometer at the Dodaira Station of the National Astronomical Observatory of Japan. This photometer of eight channels makes the simultaneous photometry possible. The effective wavelength of each channel is 360 nm (ch.1), 420 nm (ch.2), 460 nm (ch.3), 535 nm (ch.4), 650 nm (ch.5), 695 nm (ch.6), 760 nm (ch.7) and 880 nm (ch.8), respectively (Kikuchi 1989). The other details

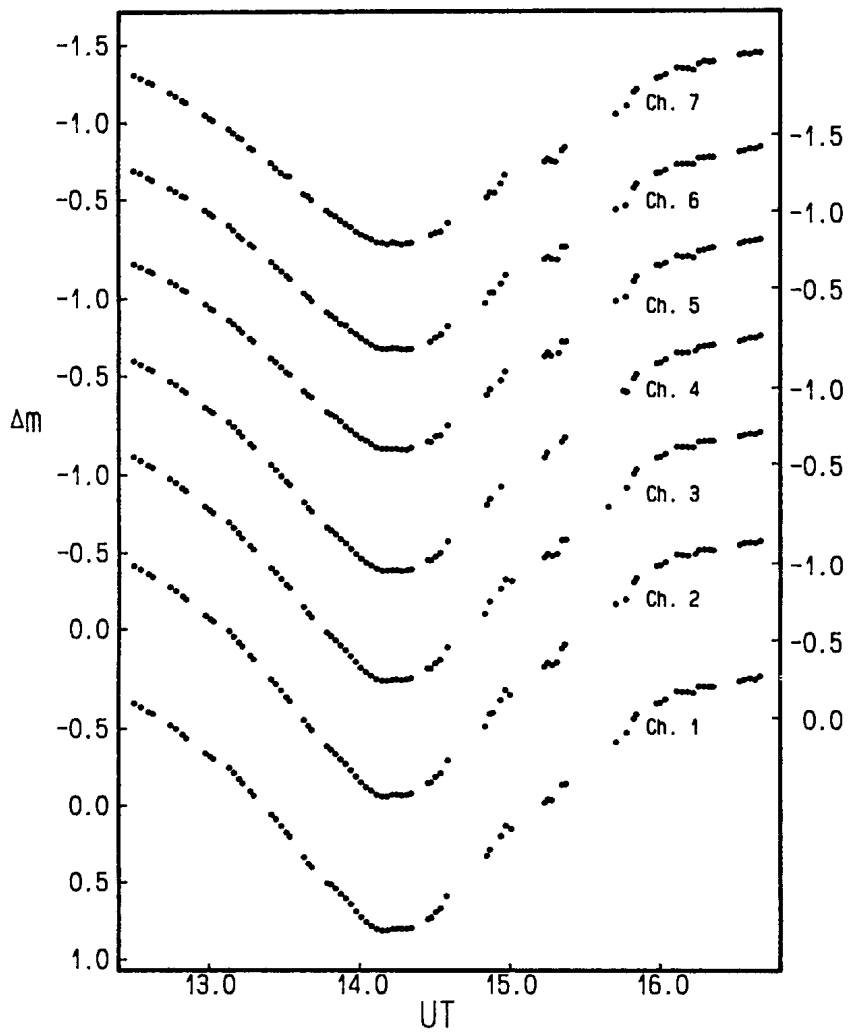


Figure 1. Light curves of a primary eclipse of RZ Cas. The circles represent averaged data usually from three points. The abscissa is Universal Time.

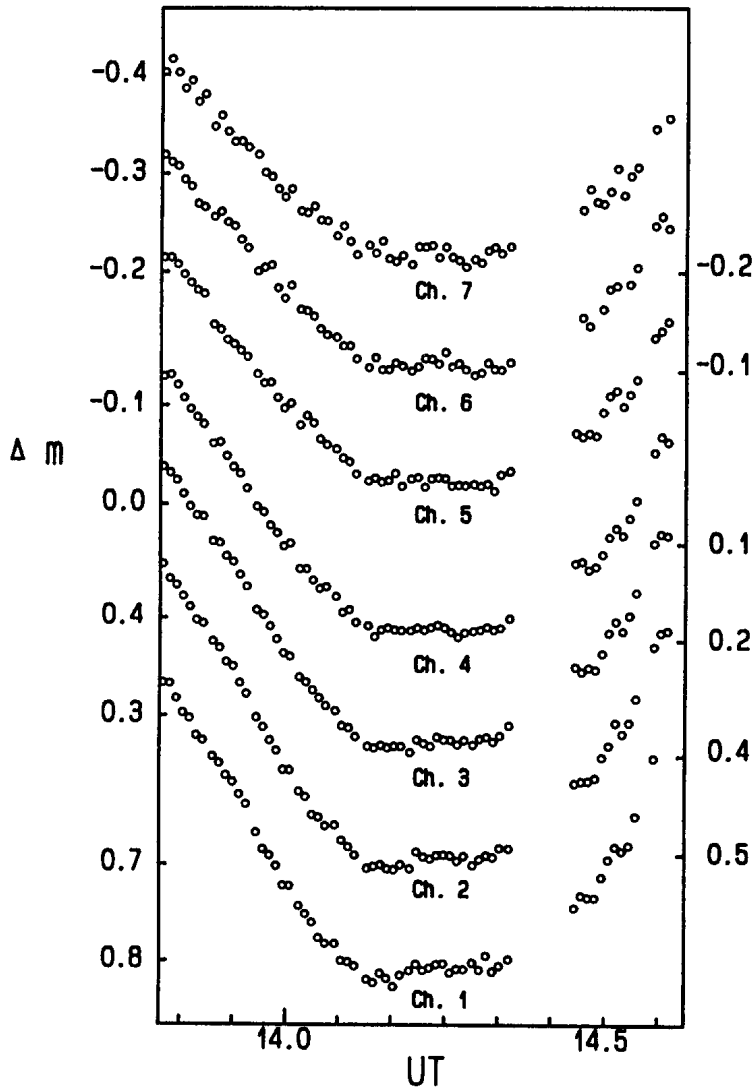


Figure 2. Enlarged light curves near the bottom of the minima of RZ Cas. The circles are individual observations.

of this polarimetric photometer are described in Kikuchi (1988).

On that night we observed a primary minimum with flat bottom showing totality. The comparison star was BD+69°171 (HD16393) and the check star HR791 (HD16769). The differential light curves of the primary minimum at channels 1 through 7 are shown in figure 1 and the enlarged ones around the bottom in figure 2. As can be seen in these figures, the duration of the totality are the same with one another, which is estimated to be 14 minutes irrespective of the colour, corresponding to $0^{\text{P}}.0081$. The central time of the minimum has been estimated, after the heliocentric correction, to be HJD 2447882.0971.

Olson (1982) argued that there have been instabilities in the light curves of primary eclipse of RZ Cas, and that the shapes of the primary eclipse vary between partial-type and total-type. We have observed several primary minima of the system also with the 45-cm telescope of Fukushima University in the period covering the above date and found that they were usually total eclipses, the result of which will be published elsewhere.

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