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PHOTOELECTRIC OBSERVATIONS OF SZ Psc DURING 1993-1994

SZ Psc (HD 219113, $\alpha_{2000} = 23^{\rm h}13^{\rm m}24^{\rm s}$, $\delta_{2000} = +02°41'30'', m_v = 7.2 - 7.7$) is a totally eclipsing double line spectroscopic binary of the RS CVn type. It consists of an F8 V primary with a K1 IV subgiant companion. This system exhibits continuous period changes of very large magnitude (Kalimeris et al., 1995). Very few photometric observations exist for the system, as its period is very close to four days. The most recent light curve is given by Tunca (1984), who gives the last accurate eclipse timing from 1981. Doyle et al. (1994), based on spectroscopic data noted that the minimum in 1991 occurred approximately 0.025 phase earlier than the time calculated from the ephemeris by Tunca (1984). Such a phase shift is in good agreement with the findings of Kalimeris et al. (1995), who undertook a detailed study of the orbital period variation for this system. It was obvious hence, that a new light curve was necessary and so we included SZ Psc in our observing list for the last two years. In this paper we present new BV photoelectric observations, carried out with the 1.2 telescope at the Kryonerion astronomical station from July 1993 to September 1994. The equipment used is a single channel photon counting photometer described by Dapergolas and Korakitis (1987). The photometer employs a high gain 9789QB phototube and conventional UBV filters. The star HD 219018 ($\alpha_{2000} = 23^{\rm h}12^{\rm m}39^{\rm s}$, $\delta_{2000} = +02°41'18'', m_v = 7.7$) was used as comparison. The filters used are in close accordance with the international UBV system. Each observation is the average of four successive measurements, and the corresponding phase was calculated using the linear ephemeris by Tunca (1984) mentioned earlier:

$$\text{MinI} = \text{HJD}\,2444827.0047 + 3^{\rm d}.9657889 \times \text{E}$$

where the primary minimum corresponds to the position where the hotter F8 V component is occulted.

In Figure 1 we have plotted the differential magnitudes (variable minus comparison) against phase for the two colours. It is clear, from the light curves that, relative to the primary minimum calculated from the above linear ephemeris, a shift of the primary minimum towards decreasing phase is observed. This is in good agreement with the analysis of Kalimeris et al. (1995), who find that the orbital period of the system is currently decreasing. Also, the secondary minimum is broad, while the primary is sharp and deep, in agreement with the light curves given by Jakate et al. (1976) and Tunca (1984).

Because of the very peculiar shape of the light curve, neither Budding–Zeilik analysis curve programme nor Wilson–Devinney code can be fitted. The very broad secondary minimum can be explained assuming that at this phase we are looking at the subgiant's hemisphere facing the companion. Since we expect this hemisphere to be heavily spotted, this could be the reason for the asymmetries in the light curves which make it unfittable.

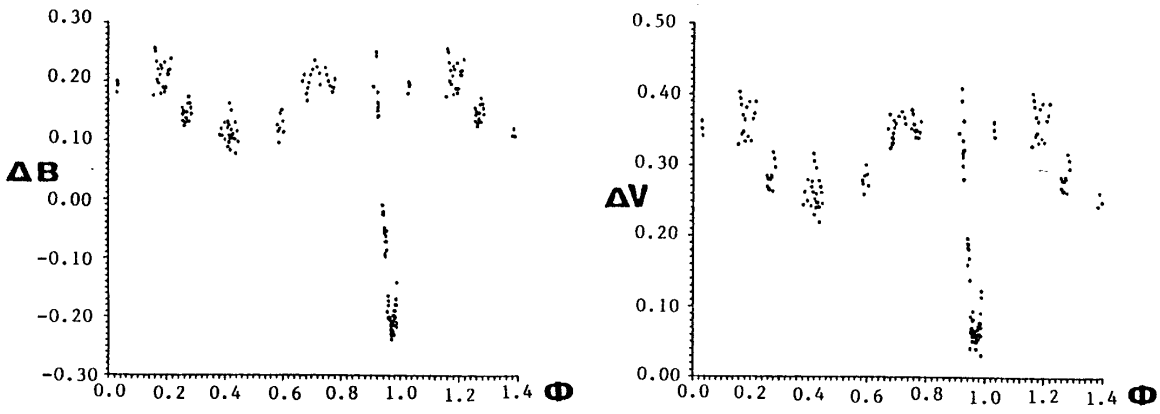

Figure 1. Light curve of SZ Psc. Δ is the differential magnitude in the sense HD 219018−SZ Psc.

We cannot estimate the extent of spot coverage, but if the filling factor is high and the spots are asymmetrically distributed over the surface, the peculiar observed light curves from the system can be expected.

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