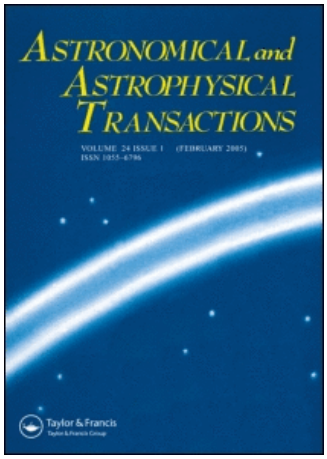

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ON THE ROLE OF EVAPORATIVE WIND IN PRECATACLYSMIC BINARIES (PCBs)

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The first results of a reevaluation of existing methods of analysis for precataclysmic binaries are given.

KEY WORDS Cataclysmic binaries

Recently we have started a systematic reevaluation of the existing observational methods of analysis hitherto applied to PCBs. Here we report the first results of our investigations. In the present work the improved Napier's algorithm (Napier, 1968) to model the light curves of PCBs (with the aid of the set of our computer programs composed in Turbo Pascal) is used.

The source function is taken either from Sobieski (1965) or Strittmatter (1974). The entire luminosity received from the cool companion is calculated by integration of the emerging radiation over its disk; contributions from the illuminated and unilluminated portions of the disk are accounted for. The following main assumptions are made: (a) the validity of the LTE in the photosphere of the cool component; (b) the constancy of the monochromatic to mean absorption coefficient ratio within the photosphere; (c) the hot star irradiates as an absolutely black body;(d) there are no other effects influencing the light curve except for the reflection effect. We have modelled the light curves (Figure 1) of the detached binary EC11575–1845 (Chen *et al.*, 1995). The analysis of the temperature distributions in the heated photosphere indicates that in some cases a temperature inversion may be present. To make a rough estimate of the physical conditions which can induce the generation of an evaporative wind we have used two criteria: (i) the temperature inversion, (ii) the relation between radiative pressure and the effective gravitational acceleration. We assumed that the density varies exponentially with the height in the atmosphere of the illuminated star $\rho \simeq \exp(-\Phi/R_g T)$, Φ being the Roche potential. The integral equation following from the definition of the mean optical depth was solved numerically to establish the relation between the mean optical depth and the distance in the atmosphere of the cool irradiated companion. According to our estimates, the characteristic height scale for X-ray and EUV radiation is roughly 10^6–10^7 cm (for

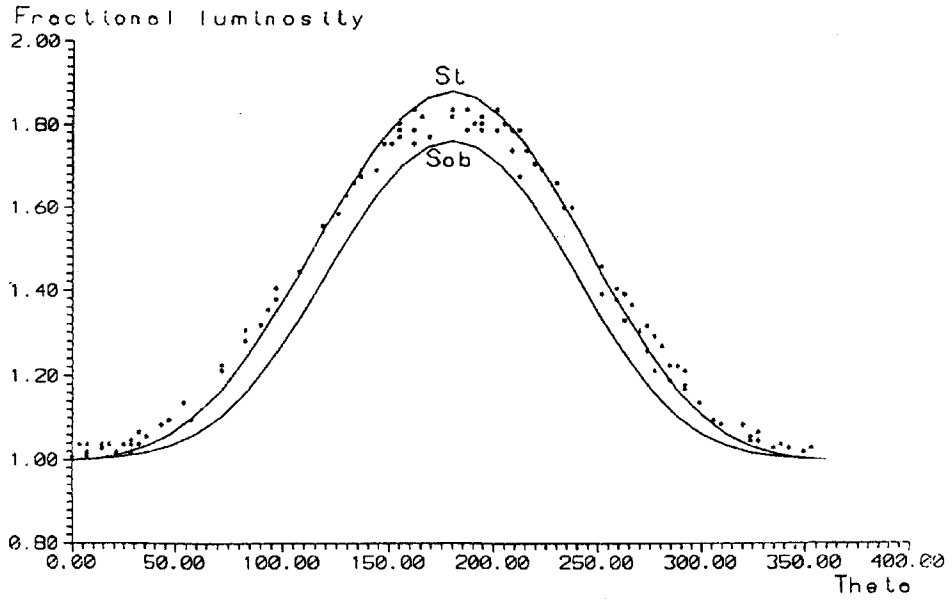

Figure 1 Light curves of the system EC11575–1845 in the U-band for two models. The phase angle is on the abscissa axis and the system relative luminosity is on the ordinate axis. The curve marked Sob corresponds to the Sobiesky's source function and the curve marked St to the Strittmatter source function. The points represent observational data.

concentrations of particles about 10^{13} cm^{-3}, characteristic for chromospheric layers). To check the validity of criterion (ii) we used a simplified model of a radially expanding evaporative stellar wind and mass flux J conservation condition along the stream tube of the form $J \sim \rho_s v_s r_s^2 \exp -(\Phi/R_g T)$ (Pustylnik, 1995) and found an order of magnitude estimate for the mass loss rate 10^{-12}–$10^{-11} M_\odot/y$. Although mass loss at such a rate cannot compete with the effects of angular momentum loss which is responsible for secular orbital shrinkage, the evaporative wind should significantly alter the structure of the the cool irradiated components.

References

Chen, A. O. *et al.* (1995) *Mon. Not. Roy. Astron. Soc.* **275**, No. 1, 100.
Napier, W. McD. (1968) *Astrophys. Sp. Sci.* **2**, No. 1, 61.
Pustylnik, I. (1995) *Baltic Astron.* **4**, No. 1, 64.
Sobieski, S. (1965) *Astrophys. J. Suppl.* **12**, No. 109, 263.
Strittmatter, P. A. (1974) *Astron. Astrophys.* **32**, 7.