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AN ENIGMATIC CLOSE BINARY V699 CYGNI

The eclipsing binary V699 Cyg (=OV25; m=12.17-13.24 pg; spectrum B2) was discovered to be a variable by Whitney (1952). The binary is situated in the region of Cyg OB1.

110 UBVR photoelectric observations were carried out with the 60 cm telescope during 1990/91 on Mt. Maidanak in Uzbekistan. As a comparison the star BD+38°3989 was chosen ($V=8^m.312$, $U-B=-0^m.50$, $B-V=0^m.325$, $V-R=0^m.239$).

According to our estimations the probable error of a single observation of V699 Cyg is $0^m.01$ in V; for $U-B=0^m.012$; for $B-V=0^m.007$ and for $V-R=0^m.012$. The results of our observations are presented in Figure 1 as V light and color curves. The phases have been calculated using the following ephemeris (Whitney, 1952):

$$\text{MinI} = \text{JDH}2432708.664 + 1^d.55152 \cdot E$$

The photographic observations (Whitney, 1952; Romano, 1969) of V699 Cyg are given in the lowest part of the Figure for comparison purposes. It shows a significant decrease of the amplitude of the primary minimum (A). Whitney gives $A=1^m.17$pg, Romano gives $A=0^m.5$pg, but we have got only $0^m.1$B. Whitney's observations were obtained between 1932 and 1950, those of Romano during 1951 - 1967. Comparing both authors' results we have to suppose a discontinuous decrease of the amplitude A.

Nowadays, a number of eclipsing systems is known to show an essential decrease of the variability amplitude. So, the minima of SS Lac disappeared (Zakirov, Azimov, 1990). Soderhjelm (1974, 1984) supposed that the change of the variability amplitude is due to the precession of the binary orbital plane by influence of the gravitational field of a distant component. In our case this hypothesis brings out two questions:

1) How to explain sudden the decrease in the amplitude A?
2) Why is the photoelectric minimum longer than the photographic one?

The photographic light curve of V699 Cyg was solved by Lavrov's direct method. We obtained the following photometric elements of the binary:

$$r_2/r_1 = 0.75 \quad \text{(fixed)}$$

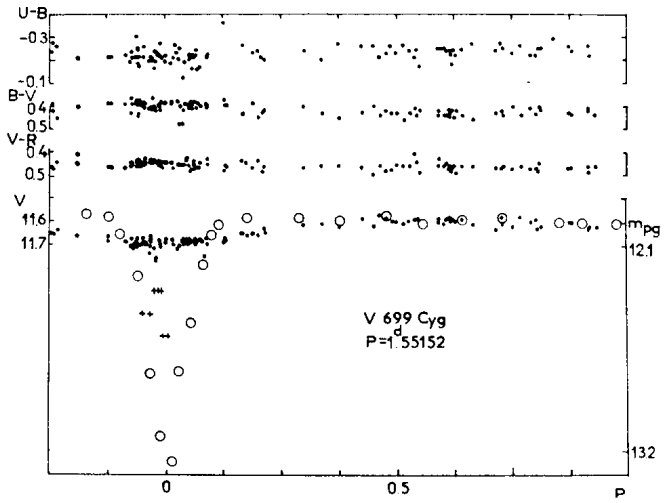

Figure 1. The light curves of V669 Cyg (o-Whitney; +-Romano; .-our).

$$r_1 = 0.333 \pm 0.006$$
$$L_1 = 1.00 \pm 0.01$$
$$i = 89^{\circ}.1 \pm 2^{\circ}.7$$

If the primary is assumed to be a normal B2V star the nature of the secondary is not quite clear.

We suggest the following interpretation of the amplitude change in V699 Cyg. The massive and hot primary filled its Roche lobe. The secondary is a small cool star surrounded by a thick disk. The disk was formed from the matter of a massive primary. Now the process of the primary expansion is slowing down and the density of the disk decreased due to accretion. The present form of the disk is close to the previous one.

Our observations of V699 Cyg are continued.

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