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NEW PHOTOELECTRIC OBSERVATIONS OF BF AURIGAE

BF Aur (= BD+41°1051, HD 32419) is an early type eclipsing binary system with two B5 V components and an orbital period of 1.5832 days. The variations in brightness were discovered by Morgenroth (1935) and the photoelectric light curves in BV and UBV were given by Schneller (1961) and Mannino et al. (1964), respectively. Mammano et al. (1974) published a spectroscopic investigation of BF Aur. Based on the observations of Mannino et al., the photometric solutions were carried out by Schneider et al (1979) and Kallrath and Kamper (1992). They found that BF Aur is probably a semi-detached system with the more massive component in contact. The analysis of the period of this system was given by Guarnieri et al. (1975). It reveals that the orbital period of the system is increasing slowly.

During a joint observational program of close binary systems between the Beijing Observatory of China and the King Sejong University of Korea, BF Aur has been observed at the Xinglong station of Beijing Observatory. The observations were made photoelectrically in U, B, and V bands with the 60 cm reflector during the period of January 10-17, 1993. BD +41°1048 was used as a comparison star and BD +41°1046 as a check star, respectively. A total of 464 UBV observations covering two primary and secondary eclipses were obtained on six nights. All of the data were corrected for differential extinction and transferred to the Johnson's UBV system. Fifty five differential observations between the comparison and check stars give the mean accuracies $\sigma \sim 0^m.011$ in V, $0^m.013$ in B and $0^m.023$ in U band, respectively.

Four times of minimum light determined are listed in Table 1. The new minimum times, together with the recent p.e. times of minima collected by Guarnieri et al. (1975) and one visual given by Pietz (1989), are used to derive a linear ephemeris (1):

$$\begin{array}{lll} \text{Min.I(J.D.hel.)} = 2449002.02547 & + & 1.^d58322190 * E \\ & \pm 35 & \pm 8 \end{array} \qquad (1)$$

However, the O − C of the light minima based on the ephemeris (1) shows systematic deviations from the linear fitting. This means that the period of BF Aur is going on continuously increasing up to date. Therefore, a quadratic fitting of all the published observations of minimum times including the visual and photographic data (Mannino et al. 1964) is carried out with the weighted least squares method. We obtained the following ephemeris:

$$\begin{aligned} \text{Min.I(J.D.hel.)} = {} & 2449002.0258 && + 1.^{d}58322290 * E && + 1.64 && * 10^{-10} * E^{2} \\ & \pm \ 10 && \pm \ 25 && \pm \ 13 \end{aligned} \qquad (2)$$

Table 1. The times of minimum of BF Aur

JD.2440000+	m.e.	colour	Min.
8998.0678	0.0004	V	II
.0677	0.0004	B	II
9001.2344	0.0003	V	II
.2344	0.0002	B	II
9002.0267	0.0005	V	I
.0263	0.0001	B	I
9005.1921	0.0004	V	I
.1919	0.0004	B	I

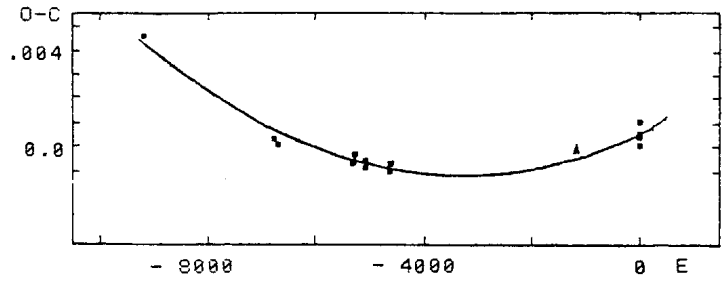

Figure 1. O-C diagram of recent minimum times of BF Aur

The quadratic term in the ephemeris (2) is nearly the same as that derived by Guarnieri et al. (1975), but the period P in the linear term is obviously the best representation of the present case of BF Aur. Therefore, a linear ephemeris T_0 (JD hel)= 2449002.0258+ $1.^d58322290*E$ is employed to combine our observations in complete light curves in Figure 2.

The rate of the period changes is found to be $\Delta P/P = 0.00658$ sec/yr from the ephemeris (2). The period increases of BF Aur can be explained by the possible mass transfer from the less massive component to the more massive one as the case assumed in the most of

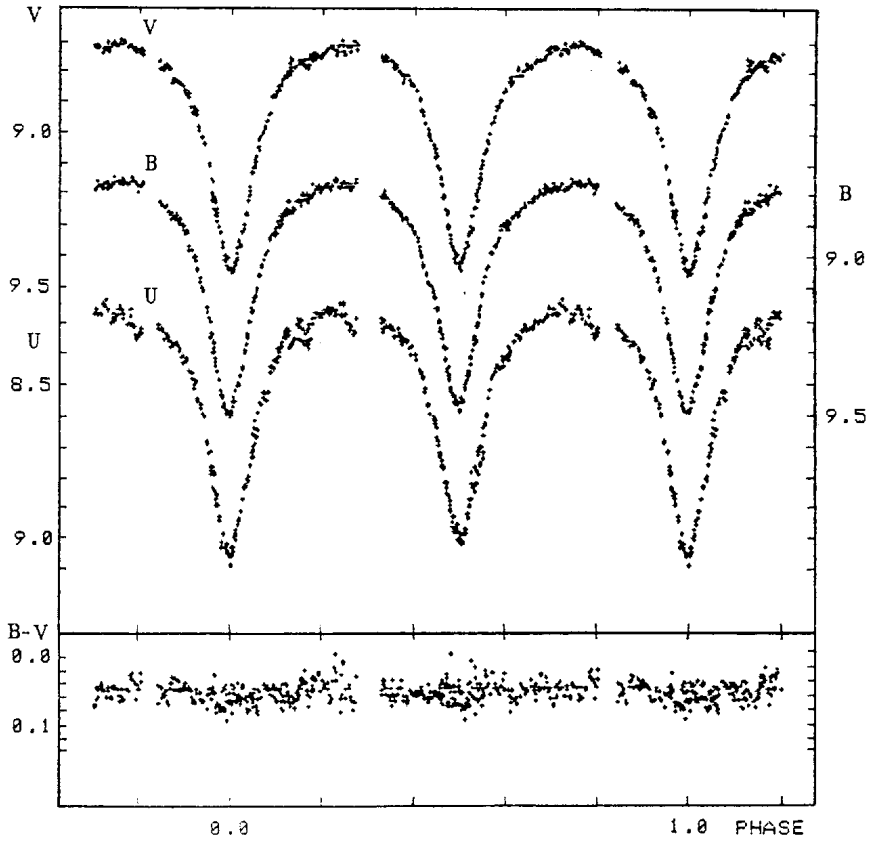

Figure 2. UBV light and color index curves of BF Aur in 1993

Algol systems. However, based on the old light curves many authors (Schneider et al. 1979 and Kallrath and Kamper 1992) argued that BF Aur is a semi-detached system with the more massive component in contact with its inner critical Roche lobe. This configuration is somehow discrepant with the assumed mass transfer direction suggested by the period changes. So it is important to carry out a new photometric analysis with our new observational data. A further investigation is in progress.

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