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PHOTOELECTRIC PHOTOMETRY OF THE ECLIPSING BINARY STAR EG CEPHEI

EG Cep (BD+76°790=HD 194089=BV 200) was discovered by Strohmeier (1958) as an eclipsing binary with a period of P=0^d.54. The star was observed photoelectrically by Geyer (1961), Cochran (Wood, 1971), Van der Wal et al. (1972), Kaluzny and Semeniuk (1984). Kaluzny and Semeniuk analyzed their light curves with the Wilson-Devinney method. They found that EG Cep is most probably a semidetached system in the slow stage of case A mass exchange evolving to a contact configuration.

The system was observed photoelectrically at the Ege University Observatory. The observations were performed in the observational seasons of 1991 and 1992. The 48 cm (f/13) Cassegrain reflector equipped with an unrefrigerated EMI 9781A photomultiplier tube was used. All observations were made with the B and V filters of the UBV system. BD+76°791 and BD+76°789 were used as comparison and check stars respectively. The atmospheric extinction coefficients in each colour for every nights were calculated from the observations of the comparison star using conventional methods. Then, all the differential observations (variable minus comparison) were corrected for differential extinction.

A total of 550 observational points were obtained in each colour. During the observations moments of six primary and four secondary minima were obtained which are given in Table I. The $(O-C)_1$ values were computed using the following light elements given by Mallama (1980):

$$\text{Hel Min I JD}=2442594.3825+0^d.54462183\times E \qquad (1)$$

Table I. Times of minima of EG Cep

J.D. Hel.	Min	Method	Filter	E	(O-C)I	(O-C)II
2448483.3901	I	pe	B	10813	0.01175	0.00206
48483.3904	I	pe	V	10813	0.01205	0.00236
48489.3805	I	pe	V	10824	0.01131	0.00161
48489.3819	I	pe	B	10824	0.01271	0.00301
48495.3696	I	pe	B	10835	0.00957	-0.00014
48495.3709	I	pe	V	10835	0.01087	0.00116
48516.3389	II	pe	B	10873.5	0.01093	0.00117
48516.3395	II	pe	V	10873.5	0.01153	0.00177
48523.4174	II	pe	B	10886.5	0.00935	-0.00043
48523.4181	II	pe	V	10886.5	0.01005	0.00027
48810.4333	II	pe	V	11413.5	0.00954	-0.00091
48810.4323	II	pe	B	11413.5	0.00854	-0.00191
48841.4739	II	pe	V	11470.5	0.00670	-0.00383
48841.4760	II	pe	B	11470.5	0.00880	-0.00173
48843.3851	I	pe	V	11474	0.01172	0.00119
48843.3858	I	pe	B	11474	0.01242	0.00189
48850.4651	I	pe	V	11487	0.01164	0.00109
48850.4623	I	pe	B	11487	0.00884	-0.00171
48855.3652	I	pe	B,V	11496	0.01014	-0.00042

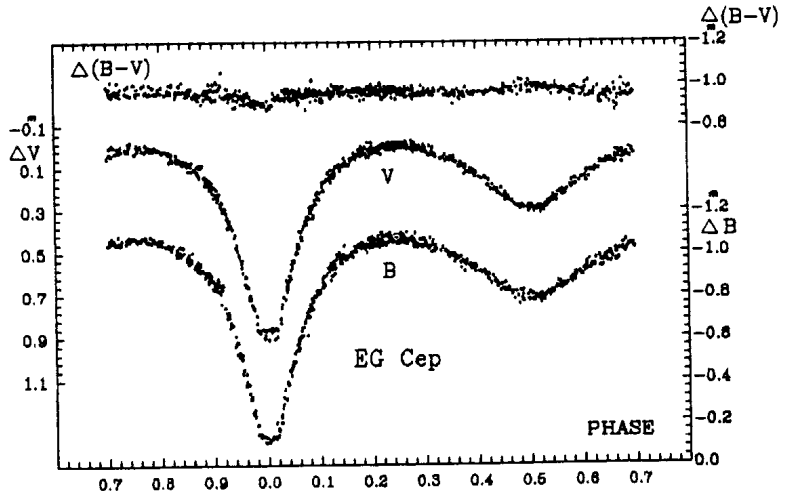

Figure 1. The O−C diagram for EG Cep

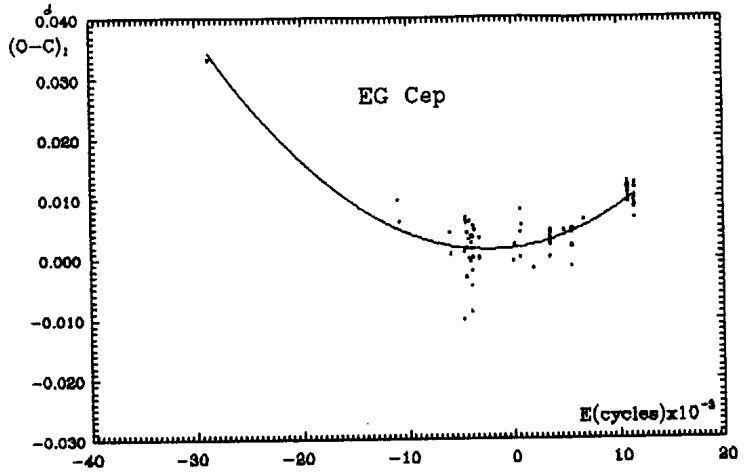

Figure 2. Differential B and V light and
B−V colour curves of EG Cep for 1991 and 1992

The $(O-C)_1$ diagram of EG Cep is shown in Figure 1. This diagram contains other times of minima which can be found from the literature. As it is clearly seen from the figure, EG Cep shows a parabolic variation indicating a continuous increase in the period. The period increase is found to be about 0.55±0.04 second per century. Using the times of minima plotted in Figure 1, quadratic light elements have been calculated by the least squares method as follows:

$$\begin{array}{c} \text{HJD Min I}=2442594.3842+0^{d}.54462206\times E+0^{d}.473\times 10^{-10}\times E^{2} \qquad (2) \\ \qquad\qquad\quad \pm 4 \qquad\quad \pm 5 \qquad \pm 35 \end{array}$$

The $(O-C)_2$ values in the table are calculated with these new light elements. However, the following linear ephemeris can be used in the near future:

$$\begin{array}{c} \text{HJD Min I}=2448850.4640+0^{d}.54462314\times E \qquad (3) \\ \qquad\qquad\quad \pm 4 \qquad\quad \pm 5 \end{array}$$

Our individual differential observations in both colours and the B−V colour curve are plotted in Figure 2. The phases were calculated with the formula (3). The shape of the light curve is typical of β Lyr type. Kaluzny and Semeniuk (1984) found that the phase of the secondary minima in yellow is earlier than that of the secondary minima in blue, and the light curves of EG Cep are not quite symmetric. We could not see the same effects in our secondary minima nor in the light curves. The primary minimum is an annular eclipse. The amplitudes are about $0^{m}.945$ and $0^{m}.875$ at the primary, $0^{m}.275$ and $0^{m}.290$ at the secondary minimum in blue and yellow light, respectively. The colour curve in Figure 2 shows that the system is slightly redder at the primary and bluer at the secondary minimum. So, the spectral type of the secondary component is later than that of the primary.

The photometric analysis of the light curves is in progress and will be published elsewhere.

A. ERDEM
B. KILINÇ
Ö. L. DEĞIRMENCI
Ö. GÜLMEN,
C. SEZER and N. GÜDÜR
Ege University Observatory
Campus, 35100
Bornova, Izmir, Türkiye

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