PRECISION U, B, V, R, I, LIGHT CURVES OF LP CEPHEI

In our study of the eccentric eclipsing binary (EEB) candidates of Hegedüs (1988), we obtained UBVRI photoelectric light curves of LP Cephei. LP Cep (HBV 484 = SVS 681) was discovered by Wachmann (1972). He identified it as an Algol type variable, with the secondary displaced to approximately 0.55 phase. The paper includes accurate positions, a finder chart, a linear ephemeris, and a list of photographic magnitudes.

Our present observations were made on 21 through 25 (inclusive) September, 1994 at Kitt Peak National Observatory, Arizona. The CCD photometer system (CCDPHOT) was used in conjunction with the 0.9m Cassegrain reflector telescope. Approximate coordinates of the variable, comparison, and check star are given in Table 1 and are designated as star V, C, and K, respectively, on the CCD image taken during observation (Figure 1). About 400 observations were taken in each passband.

Table 1

Star	R. A. (2000)	Dec. (2000)
LP Cep	$21^h 19^m 50^s$	$60° 42'$ 28"
Comparison	$21^h 19^m 44^s$	$60° 41'$ 20"
Check	$21^h 19^m 47^s$	$60° 40'$ 24"

Four mean epochs of minimum light were determined from the observations made during one secondary and three primary eclipses. The bisection of chords technique was utilized in their determination. These minima are given in Table 2 accompanied by their probable errors in parentheses. We calculated a linear ephemeris using Wachmann's data alone (equation 1) and another ephemeris using our data alone (equation 2). From Wachmann's data we obtained

$$\text{JD Hel. Min I} = 2430517.4649 + 0\overset{d}{.}6930642 \times E \qquad (1)$$
$$\pm 8 \qquad\qquad \pm 4$$

in good agreement with Wachmann's (1972) ephemeris, while our observations yielded

$$\text{JD Hel. Min I} = 2449621.73239 + 0\overset{d}{.}693180 \times E \qquad (2)$$
$$\pm 3 \qquad\qquad \pm 7$$

Table 2

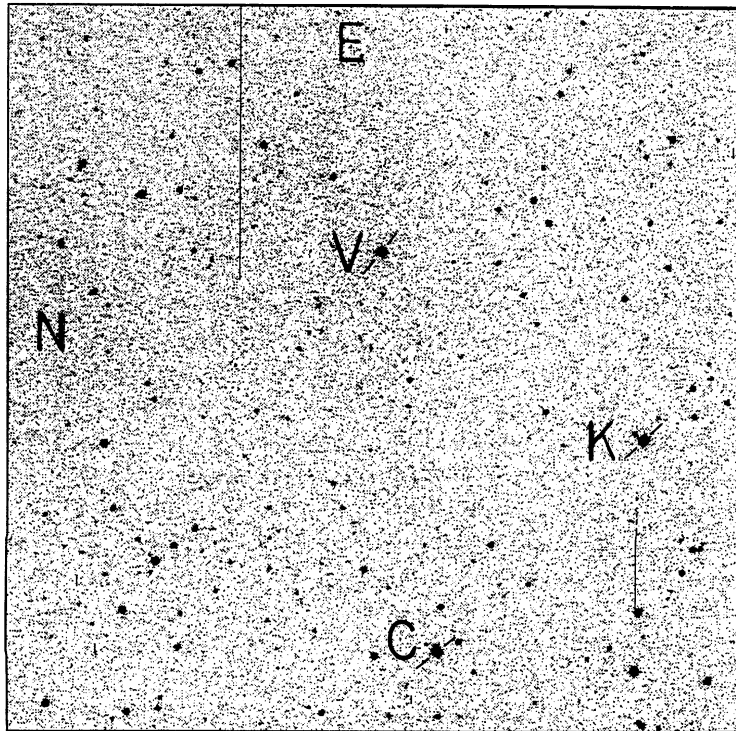| JD Hel. 2400000+	Minimum	Cycle	O−C
49617.9199 (11)	II	−5.5	0.0000
49618.9597 (2)	I	−4.0	0.0000
49619.6528 (2)	I	−3.0	−0.0001
49621.7324 (5)	I	0.0	0.0000

Figure 1. CCD field image, showing LP Cep (V), the comparison star (C), and the check star (K).
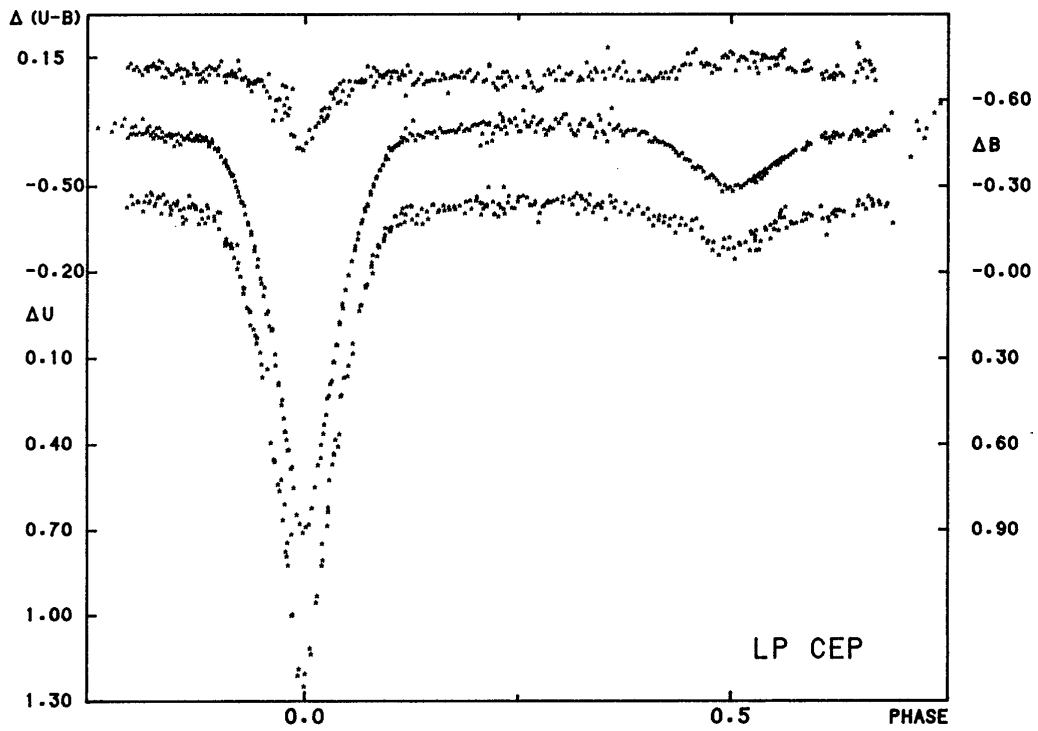

Figure 2a. U, B photoelectric light curves of LP Cep as defined by the individual observations.
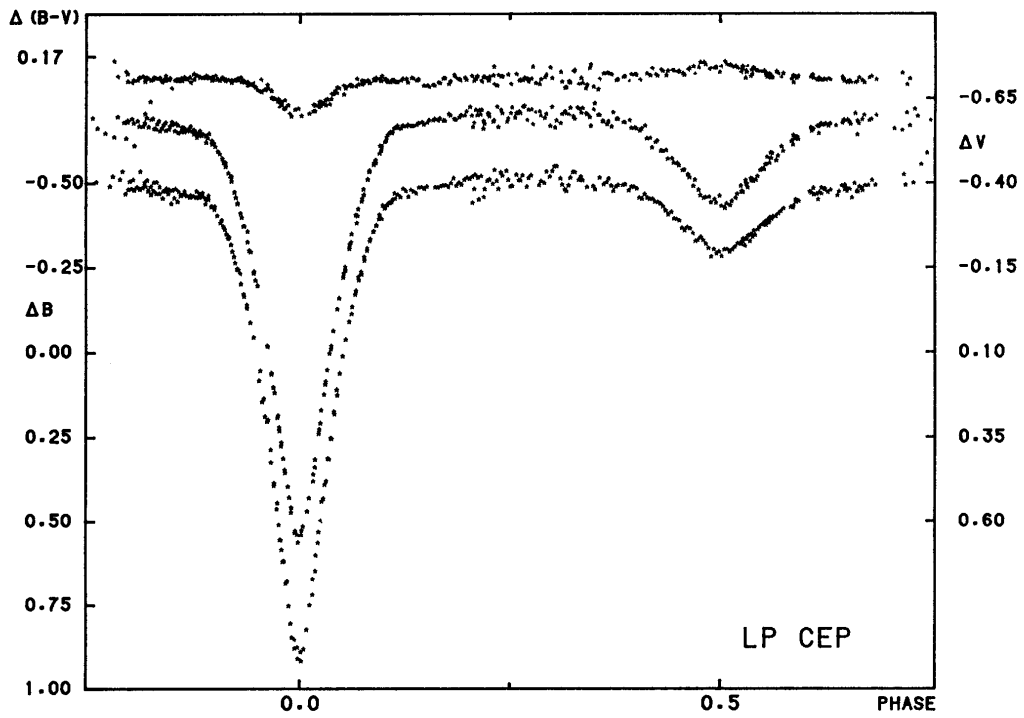
Figure 2b. B, V photoelectric light curves of LP Cep as defined by the individual observations.
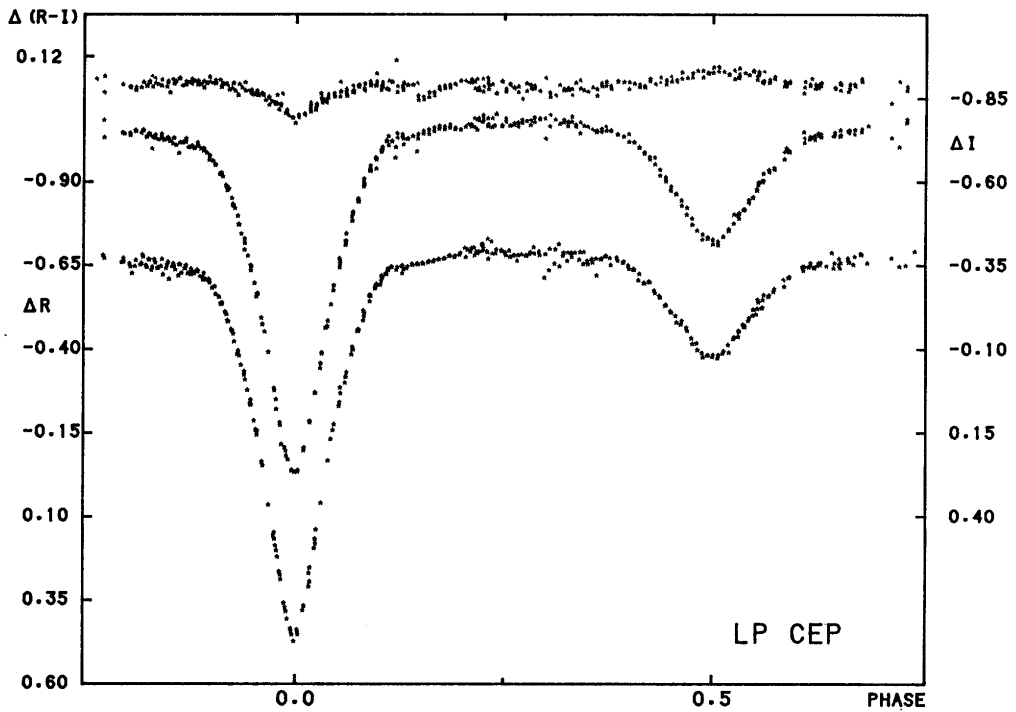

Figure 2c. R, I photoelectric light curves of LP Cep as defined by the individual observations.

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The linear ephemeris determined by equation 2 was used to calculate the $O-C$ residuals and the phases of our present observations. The calculated periods of each data set indicate a period increase of ~10 s; however, the large gap in timings and the sparsity of the data make it unclear if this period change is real. More timings of minimum light are needed, both from photographic archives and future observations, so that the period behavior of the system can be determined.

The U, B, V, R, I light curves of LP Cep as defined by their individual observations are shown in Figure 2 as differential magnitude (variable−comparison) versus phase. We have obtained a preliminary solution, which indicates that LP Cep is a typical short-period Algol with the secondary component filling its Roche lobe and the primary component attaining a fillout of ~80% . The temperature difference between the components is ~2800 K. Further analysis of the observations is underway.

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