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PRECISION B,V LIGHT CURVES OF EK COMAE BERENICES

EK Comae Berenices was discovered by Kinman et al. (1966) in a study of fields near the north galactic pole. He identified it as a W UMa variable. The paper includes accurate positions, a finder chart, and a list of photographic magnitudes giving a range of 12.7 to 13.4 mag. This binary was brought to our attention by AAVSO observer Borovicka (1990), who conducted a thorough visual investigation determining the preliminary light elements to be:

$$\text{JD Hel Min. I} = 2447609.405 + 0^{\text{d}}.2666874 \times \text{E}. \qquad (1)$$
$$\pm .007 \pm \quad .0000001$$

making it among the shortest period non-degenerate systems known.

Our present observations were made on 11, 12 and 14 February and 9, 12 May, 1994 at Lowell Observatory, Flagstaff, Arizona. A thermoelectrically cooled EMI 6256S (S-13 cathode) PMT was used in conjunction with the 0.78 m National Undergraduate Research Observatory reflector. Approximate coordinates of the variable, comparison and the check star are given in Table 1 and are designated as star 33, d, and c, respectively, on the charts by Kinman et al. (1966). About 250 observations were taken in each passband.

Table 1

Star	R.A. (2000)	Dec. (2000)
EK Com	$12^{\text{h}}51^{\text{m}}20^{\text{s}}.2$	27°12'57"
Comparison	$12^{\text{h}}51^{\text{m}}55^{\text{s}}.7$	27°16'17"
Check	$12^{\text{h}}50^{\text{m}}59^{\text{s}}.2$	27°15'30"

Five mean epochs of minimum light were determined from the observations made during two 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. The five precision epochs, along with eight times of low light from Kinman et al. (1966), the epoch by Borovicka (1990) and the visual timing by Locher (1986) were introduced into a weighted least squares solution to obtain a linear ephemeris. A quadratic ephemeris was also determined. In both of these calculations, visual timings and photographic timings given a weight of 0.1. While photoelectric observations were given a weight of 1.0 with the exception of our last timing which was given a lower weight of 0.5. The improved ephemerides are:

$$\text{JD Hel Min. I}=2449399.0022 + 0^{\text{d}}.26668726 \times \text{E and}, \qquad (2)$$
$$\pm .0019 \pm \quad .00000011$$

$$\text{JD Hel Min. I}=2449399.0018+0.26668637 \times \text{E} - 2.05 \times 10^{-11} \times \text{E}^2 \qquad (3)$$
$$\pm .0018 \pm .00000036 \qquad \pm \quad .80$$

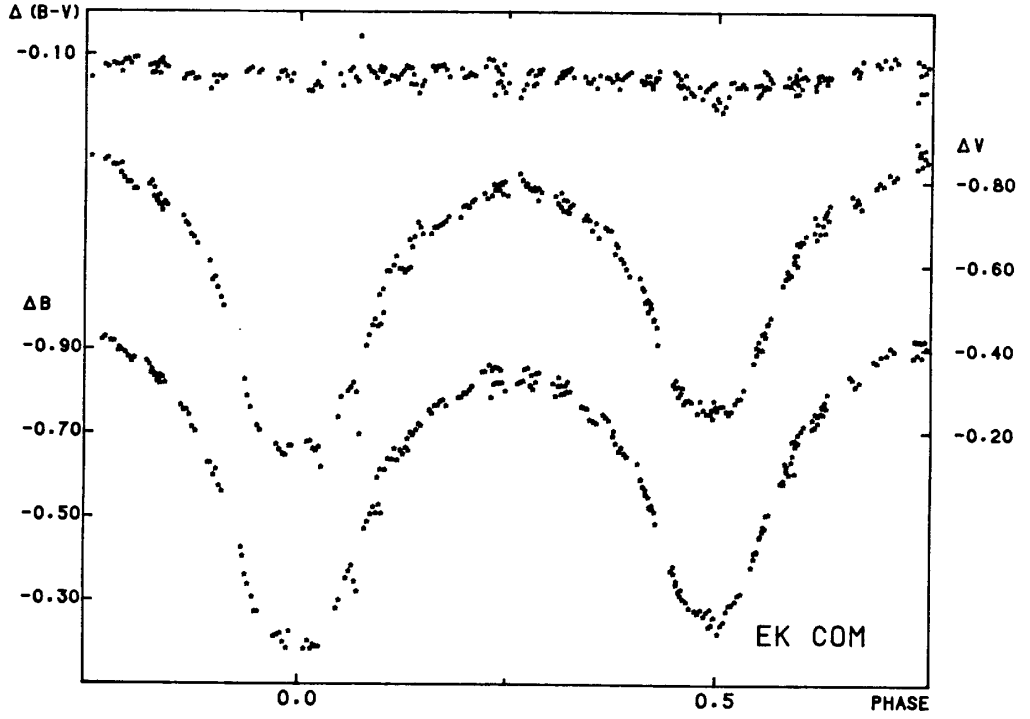

Figure 1. Photoelectric light curves of EK Com as defined by the individual observations.

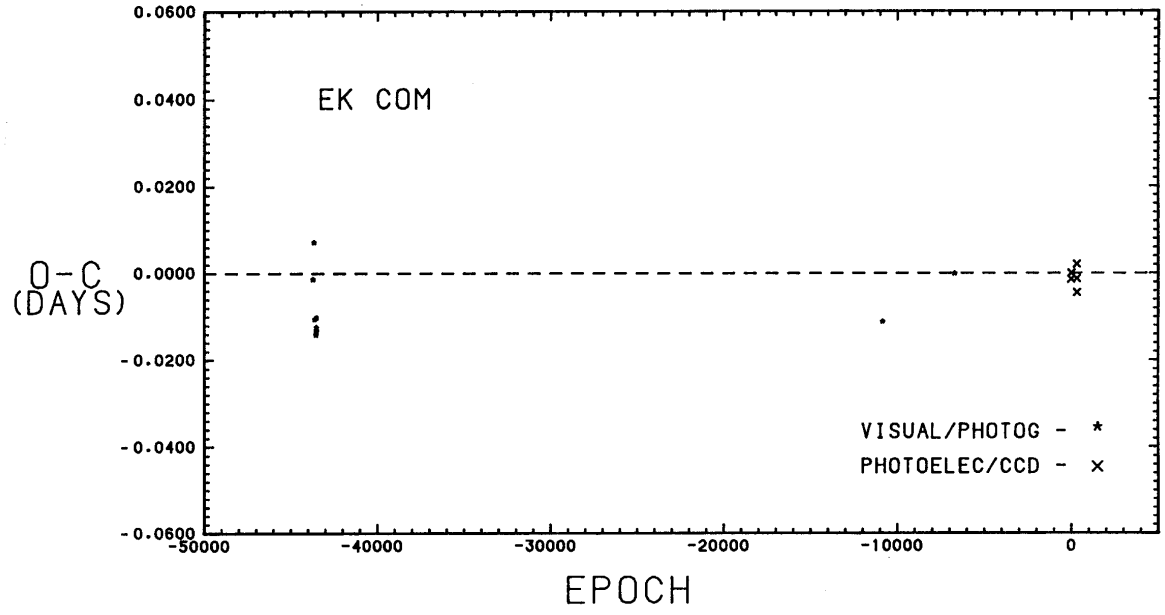

Figure 2. Period behavior of EK Com as calculated from Equation 2.

Table 2

JD HEL. 2400000+	Minimum	Cycles	$(O-C)_1$	$(O-C)_2$
49397.0006(3)	II	−7.5	−0.0015	−0.0011
49399.0022(5)	I	0.0	0.0000	0.0004
49482.7440(1)	I	314.0	−0.0020	0.0027
49482.8740(7)	II	314.5	−0.0013	−0.0007
49485.6710(13)	I	325.0	−0.0002	−0.0038

Equation 2 was used to calculate the $(O-C)_1$ residuals in Table 2 and the phases of the present observations. Equation 3 was used to calculate the $(O-C)_2$ residuals. The quadratic term in the second ephemeris is marginally significant and negative. Because of its small magnitude and doubtful significance, we cannot regard this as proof that the present period behavior of EK Com is dominated by magnetic breaking. More timings of minimum light are needed, both from photographic archives and future observations.

The B,V light curves of EK Com as defined by their individual observations are shown in Figure 1 as differential magnitude (variable–comparison) versus phase. The period behavior of the system as calculated from the linear ephemeris, equation (1), is shown as Figure 2. Our preliminary unspotted solution yields a mass ratio of 0.32 and a fill-out of 13% for this W-type W UMa system. The analysis of the observations is underway.

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