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UBV PHOTOELECTRIC TIMES OF MINIMA OF THE ECLIPSING VARIABLE TV CASSIOPEIAE

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TV Cas is a short period semi-detached eclipsing binary that consists of a nearly spherical, more massive B9V star, and a larger, cooler and tidally distorted G5 IV-III component whose surface is in contact with its Roche lobe. The orbital period of TV Cas is 1.812596 days (de Landtsheer, 1983). The orbital and physical properties of TV Cas have been determined by Khalesseh et al. (1992) from the analysis of its light and radial velocity curves.

TV Cas was observed by us during 1994 and 1995 observing seasons with the 51-cm Cassegrainian telescope of the Biruni Observatory (Latitude = 29°36′ N, Longitude = 52°31′48″ E). We used an unrefrigerated RCA4509 photomultiplier tube and the observations were made through UBV filters which are closely matched to the standard UBV system. The comparison and the check stars were BD +58°24 and BD +58°22, respectively the same as used by Grauer et al. (1977).

As is frequently the case for Algol systems, the observations show evidence from phase shifts of primary and secondary minima. Figure 1 shows the UBV light curves of TV Cas where the phases were computed using the light elements of Grauer et al. (1977). Also, the depths of the primary and secondary minima are given in Table 1.

The probable errors of the individual observation were estimated to be about $0\overset{\mathrm{m}}{.}02$ in the B and V filters, and $0\overset{\mathrm{m}}{.}03$ in the U filter. These precision estimate were made from an examination of the scatter in the outside eclipse portions of the light curves. Table 2 contains observed minimum times, cycle number, and the $O-C$ values of the primary minimum after recalculating the other available $O-C$s reports according to Grauer et al. ephemeris. Finally the $O-C$ curve is plotted in Figure 2.

Our times of mid-eclipses were determined by making least-square parabolic fits to the observations inside the eclipses. The minimum times are the mean values of three different filters; the $O-C$ residuals were calculated using the ephemeris

$$\text{Min. I} = \text{HJD } 2443043.6265 + 1\overset{\mathrm{d}}{.}8126066 \times E$$

of Grauer et al. A new ephemeris, based on the recent timing, is

$$\text{Min. I} = \text{HJD } 2450049.3011 + 1\overset{\mathrm{d}}{.}812593 \times E.$$

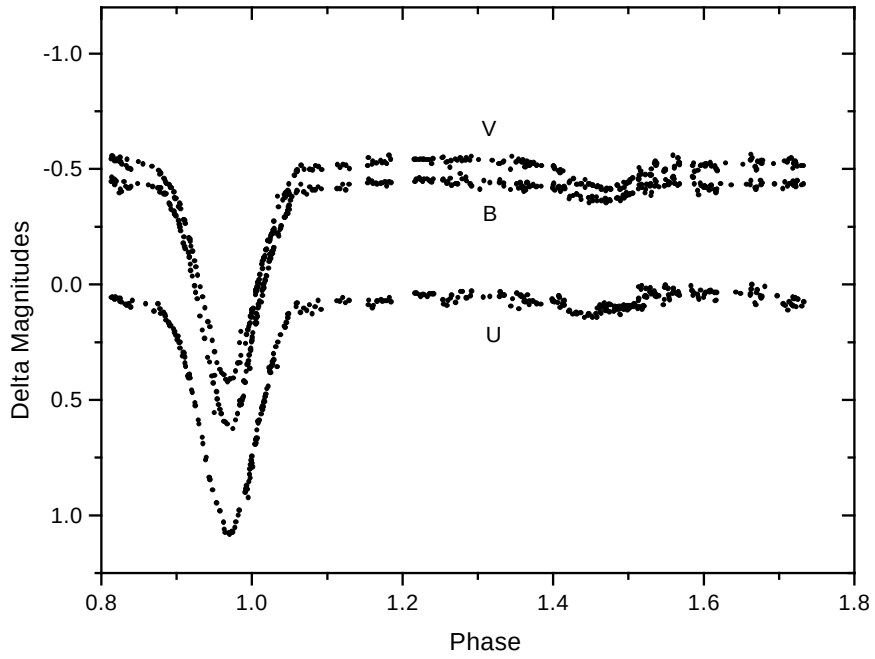

Figure 1.

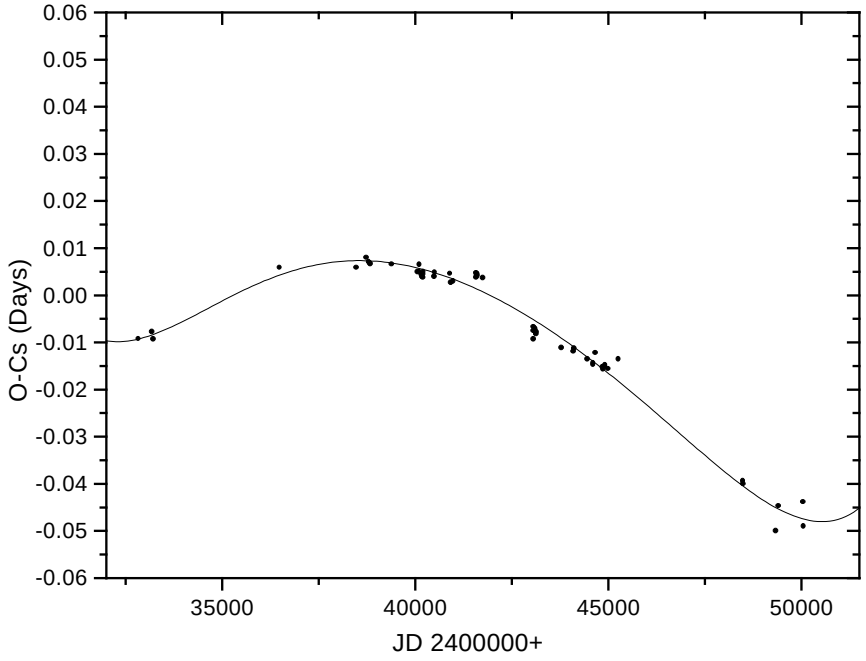

Figure 2.

Table 1: The depth of minima, according to the present study.

Filter	Min. I	Min. II
U	$1\overset{\mathrm{m}}{.}08 \pm 0.02$	$0\overset{\mathrm{m}}{.}13 \pm 0.02$
B	$1\overset{\mathrm{m}}{.}04 \pm 0.01$	$0\overset{\mathrm{m}}{.}10 \pm 0.01$
V	$1\overset{\mathrm{m}}{.}04 \pm 0.01$	$0\overset{\mathrm{m}}{.}19 \pm 0.01$

Table 2: The photoelectric times of primary minimum used in the $O-C$ curve.

Hel. JD 2400000+	E	$O-C$ (days)	Source
32827.7665	−5636	−0.0092	Huffer & Kopal (1951)
33184.8515	−5436	−0.0077	Huffer & Kopal (1951)
33213.8516	−5436	−0.0093	Huffer & Kopal (1951)
36483.8091	−3619	+0.0059	Chou (1959)
38472.2386	−2522	+0.0059	Lavrov (1966)
38733.2560	−2378	+0.0080	Bakos & Tremko (1973)
38791.2585	−2346	+0.0071	Lavrov (1966)
38829.3230	−2325	+0.0068	Lavrov (1966)
38840.1985	−2319	+0.0067	Lavrov (1966)
39389.4182	−2016	+0.0066	Bakos & Tremko (1973)
40056.4558	−1648	+0.0050	Frieboes-Conde & Herczeg (1973)
40105.3960	−1621	+0.0050	Frieboes-Conde & Herczeg (1973)
40105.3977	−1621	+0.0065	Frieboes-Conde & Herczeg (1973)
40154.3360	−1594	+0.0044	Bakos & Tremko (1973)
40183.3372	−1578	+0.0039	Bakos & Tremko (1973)
40194.2127	−1572	+0.0038	Bakos & Tremko (1973)
40201.4632	−1568	+0.0038	Bakos & Tremko (1973)
40203.2765	−1567	+0.0045	Bakos & Tremko (1973)
40203.2770	−1567	+0.0050	Frieboes-Conde & Herczeg (1973)
40493.2930	−1407	+0.0040	Frieboes-Conde & Herczeg (1973)
40502.3569	−1402	+0.0049	Frieboes-Conde & Herczeg (1973)
40899.3175	−1183	+0.0046	Frieboes-Conde & Herczeg (1973)
41575.4190	−810	+0.0038	Papousek (1974)
41595.3579	−799	+0.0041	Papousek (1974)
41595.3581	−799	+0.0043	Papousek (1974)
41595.3584	−799	+0.0046	Papousek (1974)
41604.4210	−794	+0.0041	Papousek (1974)
41604.4214	−794	+0.0045	Papousek (1974)
43063.3585	11	−0.0067	Grauer et al. (1977)
43063.5577	11	−0.0075	Grauer et al. (1977)
43063.5559	11	−0.0093	Grauer et al. (1977)
43090.7471	26	−0.0072	Grauer et al. (1977)
43090.7467	26	−0.0076	Grauer et al. (1977)
43130.6234	48	−0.0082	Grauer et al. (1977)
43130.6239	48	−0.0077	Grauer et al. (1977)
43130.6237	48	−0.0079	Grauer et al. (1977)

Table 2: (cont.)

Hel. JD 2400000+	E	$O-C$ (days)	Source
43786.7841	410	−0.0111	de Landtsheer (1981)
44094.9264	580	−0.0119	de Landtsheer (1981)
44114.8657	591	−0.0113	de Landtsheer (1981)
44453.8209	778	−0.0135	de Landtsheer (1981)
44602.4534	860	−0.0147	de Landtsheer (1981)
44602.4537	860	−0.0144	de Landtsheer (1982)
44662.2719	893	−0.0122	Borkovits & Hegedüs (1996)
44843.5296	993	−0.0152	de Landtsheer (1982)
44859.8426	1002	−0.0157	Margrave (1982)
44910.5965	1030	−0.0147	de Landtsheer (1982)
44912.4089	1031	−0.0150	de Landtsheer (1982)
44990.3503	1074	−0.0156	de Landtsheer (1982)
45256.8056	1221	−0.0135	Margrave (1983)
48481.4069	3000	−0.0394	Wolf & Diethelm (1992)
48490.4693	3005	−0.0400	Wolf & Diethelm (1992)
49333.3267	3470	−0.0500	Present study
49402.2066	3508	−0.0477	Present study
50040.2385	3860	−0.0438	Present study
50049.3011	3865	−0.0490	Present study

Grauer et al. conclude that an approximate 39 years periodicity exists in the $O-C$ curve of TV Cas. Our observations lend some support to this idea.

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