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ORBITAL PERIOD AND OSCILLATIONS IN V723 CASSIOPEIAE

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V723 Cas (Nova Cas 1995) was discovered by M. Yamamoto on August 24, 1995 (Hirosawa, 1995) and reached the maximum in $V = 7\overset{\mathrm{m}}{.}09$, $B = 7\overset{\mathrm{m}}{.}59$ and $R = 6\overset{\mathrm{m}}{.}59$ on December 17, 1995 in a short-lived flare. The faint star of $R = 17\overset{\mathrm{m}}{.}5$ and $B = 19\overset{\mathrm{m}}{.}0$ has been identified as the precursor of the nova (Goranskij et al., 1997). An overall decline from the maximum was accompanied by large flares in 1996. Since 1997 the continuous brightness decline was interrupted only by small flares (at JD 2450670 and 2450860) and variability on different time scales. The brightness of the nova declined to $V = 13\overset{\mathrm{m}}{.}66$, $B = 14\overset{\mathrm{m}}{.}29$ and $U = 13\overset{\mathrm{m}}{.}41$ on January 12, 2000.

The photometric observations taken before December 1996 did not show any strict short-term periodicity. The period analysis of the UBV photoelectric observations taken during quiescent stages (JD 2450421–468, 2450704–794) revealed two possible photometric periods: 0.6350 and 0.6818 days (Chochol & Pribulla, 1998). The folded light curve supported the former one.

The present study is based upon an extensive photometric monitoring at the Sternberg Astronomical Institute in Moscow (SAI), the Tel-Aviv University Wise Observatory (WO) and the Astronomical Institute of the Slovak Academy of Sciences (AISAS).

The SAI monitoring consists of 1203 R band frames taken with the SBIG ST-7 CCD during 19 nights from September to December, 1999 (JD 2451432–2451538). The 60-cm reflector of the Sternberg Institute Crimean station, 38-cm reflector of the Crimean Astrophysical Observatory, and 30-cm refractor of the Sternberg Institute in Moscow were used. The accuracy of CCD photometry varies in the range of $0\overset{\mathrm{m}}{.}005$–$0\overset{\mathrm{m}}{.}02$ in the R bandpass. Additionally a few night sets of CCD and photoelectric photometry in B, V and I bandpasses were obtained during the same time interval.

The WO monitoring performed by a 1-m telescope consists of 1913 R band frames taken with the Tektronix 1K CCD camera (described by Kaspi et al., 1995) during 23 nights from October 1996 to September 1998 (JD 2450378–2451064). The CCD photometry was performed also in U, B, V and I bandpasses.

The $UBVR$ photoelectric photometry at the AISAS using two 60-cm reflectors of the Stará Lesná and Skalnaté Pleso observatories was performed on 152 nights from August

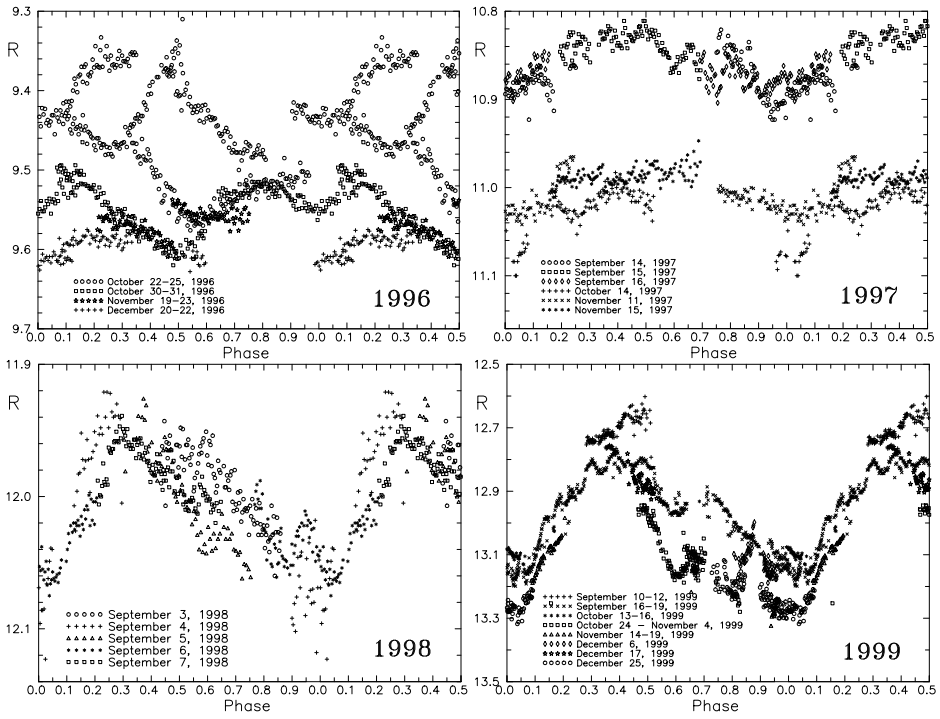

Figure 1. 1996 to 1999 evolution of the R folded light curve of Nova Cas 1995 obtained using the ephemeris (1). The 1996–1998 R data are in instrumental system. Note the different vertical scales for the respective panels

1995 to January 2000 (2449961–2451556). Part of the observations (till March 1998) was already published and analysed (Chochol & Pribulla, 1997, 1998).

The photometric period search was accomplished using the AISAS V observations during the quiescent stages (JD 2450421–468, 2450704–794) combined with the WO and the SAI R observations obtained after JD 2450437. To avoid the problems with the brightness decline and variability on a time scale of tens of days, only the longer runs or subsequent night's data were used. To ascertain the photometric period, the Fourier period analysis was applied. The most significant period in the range 0.1–1 day is $0\overset{\mathrm{d}}{.}69325$ (Chochol et al., 2000) close to the period $0\overset{\mathrm{d}}{.}6818$ suggested by Chochol & Pribulla (1998). The ephemeris for the brightness minima is

$$\begin{array}{c}\mathrm{Min\ (I)} = \mathrm{HJD}\ 2\,450\,421.4801 + 0\overset{\mathrm{d}}{.}69325 \times E. \\ \qquad\qquad\qquad\quad \pm 7 \qquad\quad \pm 18\end{array} \tag{1}$$

The evolution of the R band folded light curves in the years 1996–1999 is shown in Fig. 1. The dispersion of the light curves reflects the decay of the mean light combined with the long-term variability. The observations taken in October and November 1996 show only quasi-periodic variations. The periodicity of the brightness changes started to be visible in December 1996. During the 1997 observation season the photometric period displayed itself as a continuous wave-like variation. In 1998 the amplitude of the variation increased and the light curve changed to a saw-like shape. The full amplitude of the R variations increased from $0\overset{\mathrm{m}}{.}13$ in 1998 to $0\overset{\mathrm{m}}{.}35$ in 1999.

We have detected 5 minima times in B and R bands at JD 2451... 438.53, 441.27, 445.41, 467.64 and 538.33 during the 1999 observation season. The repeating dip in the phase of 0.6, seen in the 1999 data, may be an eclipse.

Besides, the apparent periodic oscillations were occasionally seen through the 1997–1999 observation seasons. For instance, three consecutive humps are well seen on the 1999 light curve (Fig. 1) near light maximum in the night of JD 2451441 with local maxima at $0^d.462$, $0^d.520$ and $0^d.587$ which suggest the period of $0^d.062$. The amplitude of oscillation during this night reached $0^m.05$. Other possible maxima of the humps are seen in the different orbital phases at JD 2451... 432.482, 432.533, 438.573, 485.500, 485.565, 492.517, which improves the period of the oscillation to $0^d.061512 \pm 0^d.000003$. The majority of night sets do not show the oscillation and period analysis of the total set did not reveal the corresponding frequency. During the 1998 observation season we detected only two humps on September 6 at JD 2451... 063.34 and 063.46 giving a twice longer period than in 1999. Several solitary humps were also recorded in 1997 (e.g. 2450706.37).

We have verified the constancy of the comparison star with two check stars. Therefore the oscillations have to be attributed to the nova.

Munari et al. (1996) pointed out that V723 Cas displays some resemblance to the classical novae like HR Del but also to symbiotic novae. Our photometry shows that V723 Cas is a cataclysmic binary system with a photometric period of $0^d.69325$, which we interpret as its orbital period.

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