Pulsations in the Eclipsing Binary NSV 10993

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I present the discovery of a pulsating component in light variations of the known eclipsing binary NSV 10993 based on the NSVS and ASAS-3 publicly available data.

The variability of NSV 10993 = S 4320 = GSC 1032–01378 was discovered by Hoffmeister (1949). Later the star was re-investigated by Götz & Wenzel (1956). In both papers, their authors ascribe the variable to eclipsing binaries, possibly to the W UMa stars. According to Otero & Wils (2005), NSV 10993 is an EA eclipsing binary with the elements:

$$\mathrm{Min} = \mathrm{HJD}\,2451448.350 + 40\overset{\mathrm{d}}{.}0 \times E.$$

The study of the last cited authors was based on the NSVS (Woźniak et al., 2004) and ASAS-3 (Pojmanski, 2002) publicly available data. The light curve they published shows a scatter quite unusual for a not too faint star, suggesting a possibility of additional periodic or aperiodic components in the variations.

I re-analysed the NSVS and ASAS-3 data (NSVS 10974803, NSVS 11094130, and ASAS 183213+1217.1) using the WINEFK package by Dr. V.P. Goranskij and found pulsations superposing the eclipsing light curve. The light elements of the eclipsing and pulsating components of the light variations are the following:

$$\mathrm{Min} = \mathrm{JD}\,2451448.67 + 40\overset{\mathrm{d}}{.}0 \times E$$

and

$$\mathrm{Max} = \mathrm{JD}\,2451413.280 + 4\overset{\mathrm{d}}{.}2243 \times E.$$

The corresponding light curves based on the NSVS observations are shown in the Figure. The pulsating light curve is asymmetric, $M-m = 0.35P$. The eclipsing light curve is similar to the EB-type curves. The ASAS-3 data do not contradict the proposed interpretation. The variability ranges are $12\overset{\mathrm{m}}{.}6$–$13\overset{\mathrm{m}}{.}2$ (R, NSVS) and $12\overset{\mathrm{m}}{.}55$–$13\overset{\mathrm{m}}{.}05$ (V, ASAS-3).

From these results, we may consider the system as a good candidate to eclipsing binaries with a Cepheid component, similar to the recently discovered variable TYC 1031 01262 1 (Antipin et al., 2007).

NSV 10993 = GSC 1032-01378 = NSVS 10974803 = NSVS 11094130

NSVS data
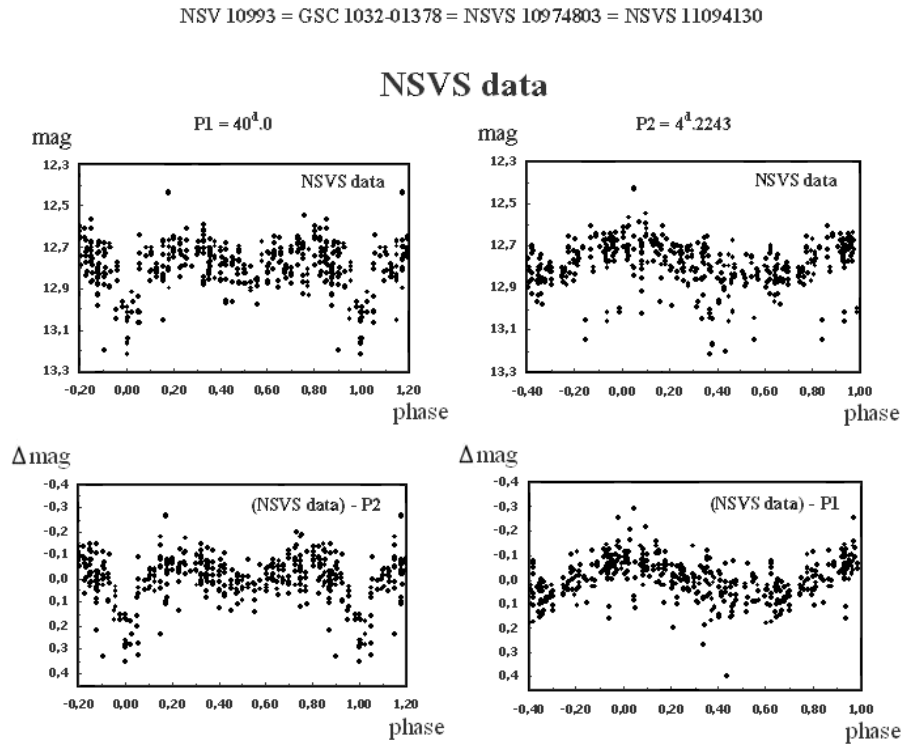
Figure 1. The phased light curves for eclipsing and pulsating components of the light variations. The top panels are based on the original NSVS observations, the bottom panels are constructed for deviations from the mean light curve of the other periodicity.

References:

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