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THE FAST APSIDAL MOTION SYSTEM NSV 18773

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Recently the NSV catalogue (Kukarkin and Kholopov, 1982) and its supplement (NSVS) (Kazarovets et al., 1998) were searched for new eclipsing binaries (see Otero, 2003 for more details). After a candidate star was identified, its observations in the *ASAS-3* database (Pojmanski, 2002) were checked. This way, NSV 18773 = HD 99898; V range 9.34 - 9.52 (Min II= 9.50) was found to be an early-type (O9V according to Jaschek, 1978) EA-type system. It is also a visual binary, with components of magnitude 9.9 and 10.3V_T, and a separation of 0$''$.8 (Fabricius et al., 2002). From the *ASAS* data alone there is no way to tell which one of the visual components is the eclipsing binary.

A literature search revealed that the star was already listed in the *ASAS-2* catalogue (Pojmanski, 2000) as an eclipsing binary with a period of 5.048912 days. Combining the *ASAS-2* data (I_c magnitudes were shifted to the V values for the analysis) with the more recent *ASAS-3* observations (see Fig. 1) makes evident that this system shows very fast apsidal motion (Fig. 2) which makes it a specially interesting case. Fig. 3 reveals that no colour changes ($V - I_c = 0.49$) occur during primary (Min I) or secondary minimum (Min II), which is consistent with the observed similar primary and secondary eclipses (0.17 and 0.15 mag. deep respectively) although the third light affects the results and the amplitude. The eclipses are partial, with a duration of Min I= 0.566 days and of Min II= 0.283 days (0.112 P. and 0.056 P. respectively).

The current light elements are:
Min I = HJD 2450563.528 + 5.04913 × E
Min II= HJD 2450566.202 + 5.04983 × E

Table 1 shows times of minima and residuals for NSV 18773 as well as the phase of Min II based on the primary eclipse period to make the phase shift of the secondary eclipse evident.

Assuming an inclination of nearly 90 degrees, the current ratio of eclipse durations of 0.50 and the phase of Min II with respect to Min I (from Table 1) can then be used in the formulae given by Kallrath and Milone (1999), allowing the eccentricity $e = 0.36 \pm 0.03$ and apsidal period $U = 135 \pm 10$ years to be estimated. The uncertainties for these values have been estimated by varying the eclipse duration ratio and the phases of Min II within their uncertainty limits.

Table 1: Recorded minima of NSV 18773.

HJD-2400000	$O-C$	Min	Phase	Source
50583.704	−0.021	I		ASAS-2
51136.811	0.057	II	0.541	ASAS-2
51194.673	0.004	I		ASAS-2
51232.731	0.044	II	0.538	ASAS-2
51303.502	0.127	II	0.555	ASAS-2
51376.483	0.045	I		ASAS-2
51525.741	0.204	II	0.570	ASAS-2
51926.775	−0.018	I		ASAS-3
52103.488	−0.025	I		ASAS-3
52116.482	0.197	II	0.569	ASAS-3
52411.500	−0.010	I		ASAS-3
52512.482	−0.010	I		ASAS-3
52646.756	0.312	II	0.591	ASAS-3
52651.793	0.300	II	0.589	ASAS-3
52739.699	−0.004	I		ASAS-3
52747.725	0.299	II	0.589	ASAS-3
53052.731	−0.018	I		ASAS-3
53365.844	0.049	I		ASAS-3
53444.662	0.456	II	0.620	ASAS-3
53547.560	−0.004	I		ASAS-3

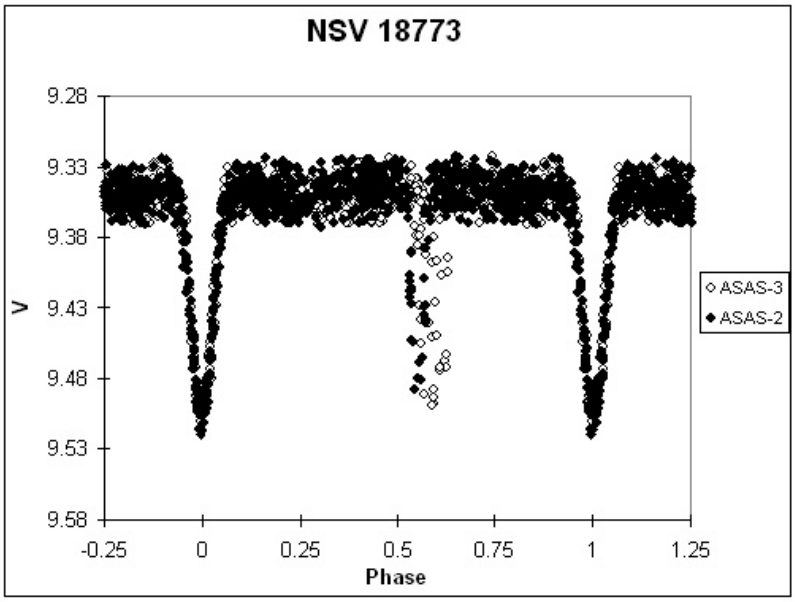

Figure 1. Light curve of NSV 18773 showing *ASAS-2* and *ASAS-3* observations.

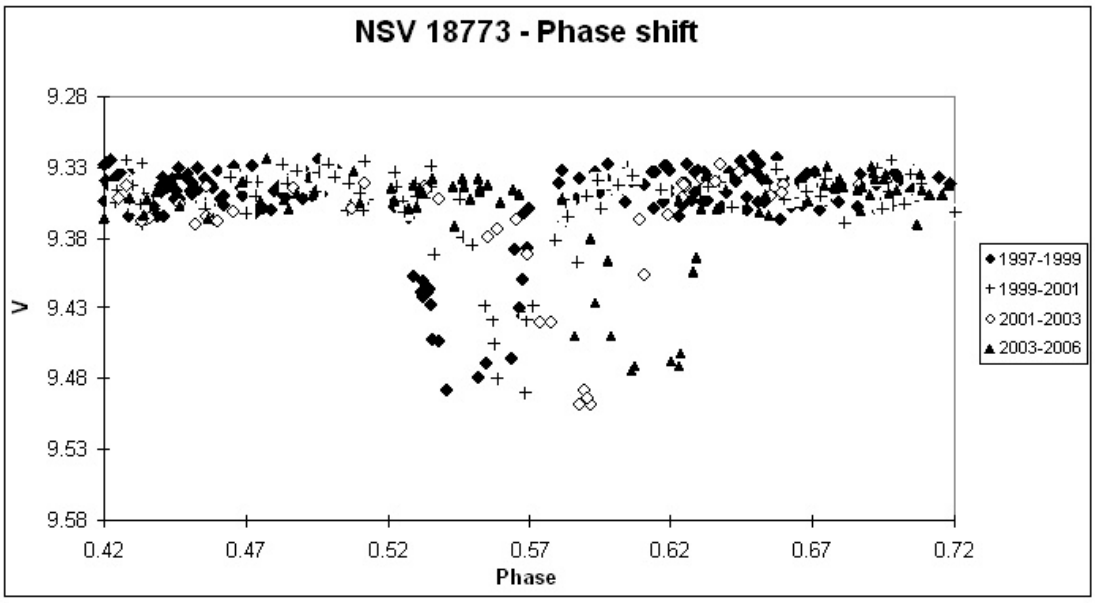

Figure 2. Phase shift in the secondary eclipse of NSV 18773.

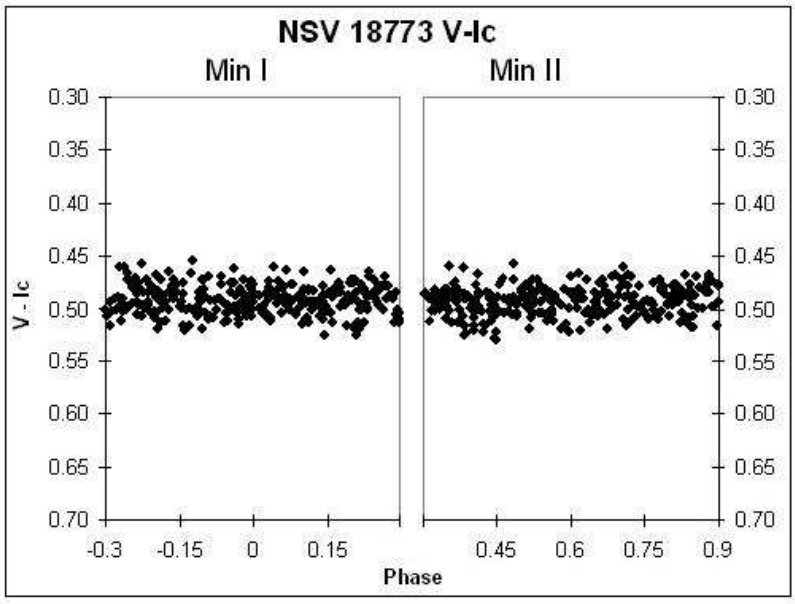

Figure 3. $V - I_c$ light curve of NSV 18773 showing no colour changes during eclipses.

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