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NSV 24505: A SEMIREGULAR VARIABLE

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NSV 24505 (GSC 1578-1162, $18^{\rm h}33^{\rm m}47\overset{\rm s}{.}58$, $+19°02'14\overset{''}{.}7$, $V = 11.2$) was found to be variable during the photographic survey conducted by Collins (1992) as part of the UK Nova Search Programme, and reported under the name TAV 1831+19, assigned by *The Astronomer* group. It is not recorded on the True Visual Magnitude Photographic Star Atlas but does appear on the Atlas Stellarum. The NSV designation was given in the recent supplement (Kazarovets et al. 1998) on the basis of Collins' report covering the first three years of observations. Photographic observations have continued up to the present time and an analysis of these, together with additional observations by Takamizawa and Haseda, is presented here.

The variable is the northern component of a close ($\sim 5''$) N-S pair with the slightly fainter star, GSC 1578-1746 ($V = 12.1$). The GSC and USNO A1.0 catalogues give similar positions but the pair does not appear in USNO A2.0. The variable is also identified with the weak infrared source FSC 18315+1859.

Collins' observations were made with a 135-mm fl $f/2.8$ lens and recorded on gas hypered Kodak TechPan 2415 film. Takamizawa and Haseda's observations were both made with 10-cm $f/4$ twin patrol cameras using Kodak T-Max 400 film. The band pass of all the systems giving $m_{\rm pv}$ is very broad. The magnitude of the variable was determined by visual inspection of the films, relative to nearby stars with GSC magnitudes.

The data were analysed using a least-squares sine periodogram, which is shown in Figure 1. The only significant peaks appear at a period of 163 days and its 1-year and 1-day aliases. A fit to the data with this period gives an amplitude, $\Delta m \sim 0\overset{\rm m}{.}7$ which is not unexpected for a semiregular variable. The phase diagram for this period is shown in Figure 2. After subtracting this variation from the data a search for secondary periods revealed nothing. The quantity of data merits a closer look at the light curve, which is shown in some detail in Figure 3. Different types of behaviour are clearly visible at different times. A strong cyclical, pattern consistent with the 163 day period can be seen (JD $\sim$ 2447600, 2449000) but there are also very rapid variations, where the whole magnitude range is covered in $\sim$ 30 days (JD $\sim$ 2448350, 2449850), and cycles with only marginal variation (JD $\sim$ 2448000, 2451300). Recent visual observations discussed by Collins et al. (2001) suggest more rapid variations, although their extent is difficult to assess.

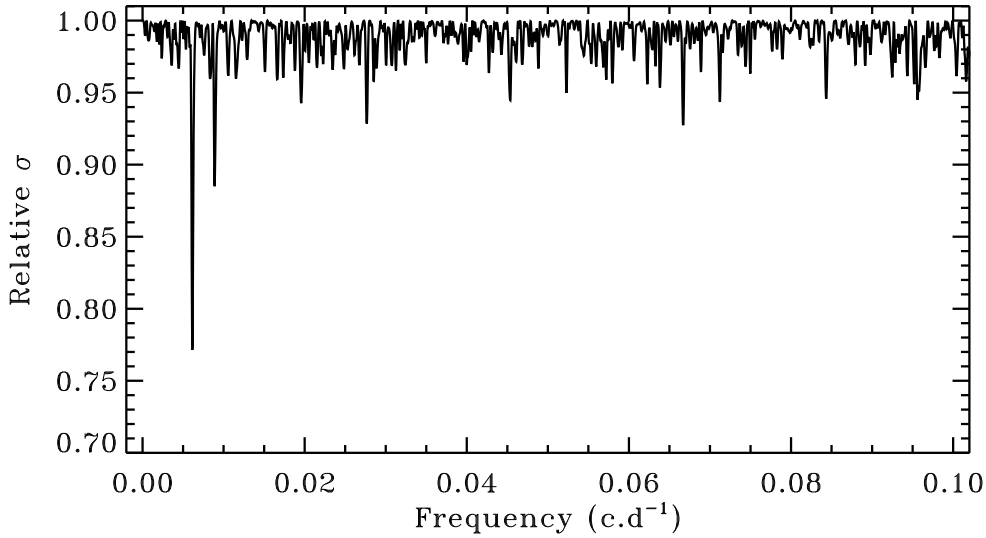

Figure 1. The least-squares sine periodogram of all the photographic data, showing the relative standard deviation with frequency. The main feature lies at a period of 163 days, while the second feature is the 1-year alias. Other than the 1-day aliases there are no significant features above 0.1 cycles day^{-1}

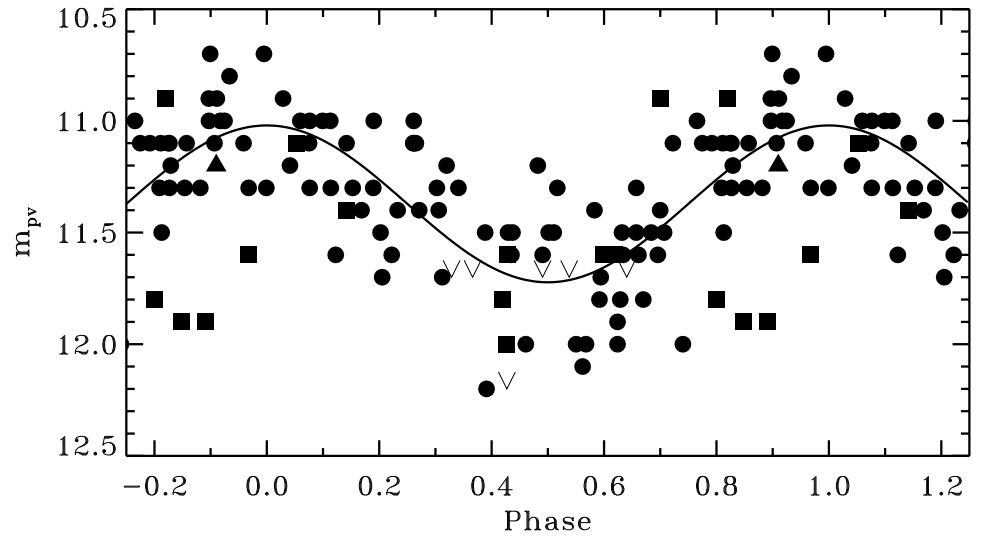

Figure 2. The phase diagram of the photographic data folded with a period of 163 days, with the data of Collins (filled circles and upper limits), Takamizawa (filled squares) and Haseda (filled triangles) identified

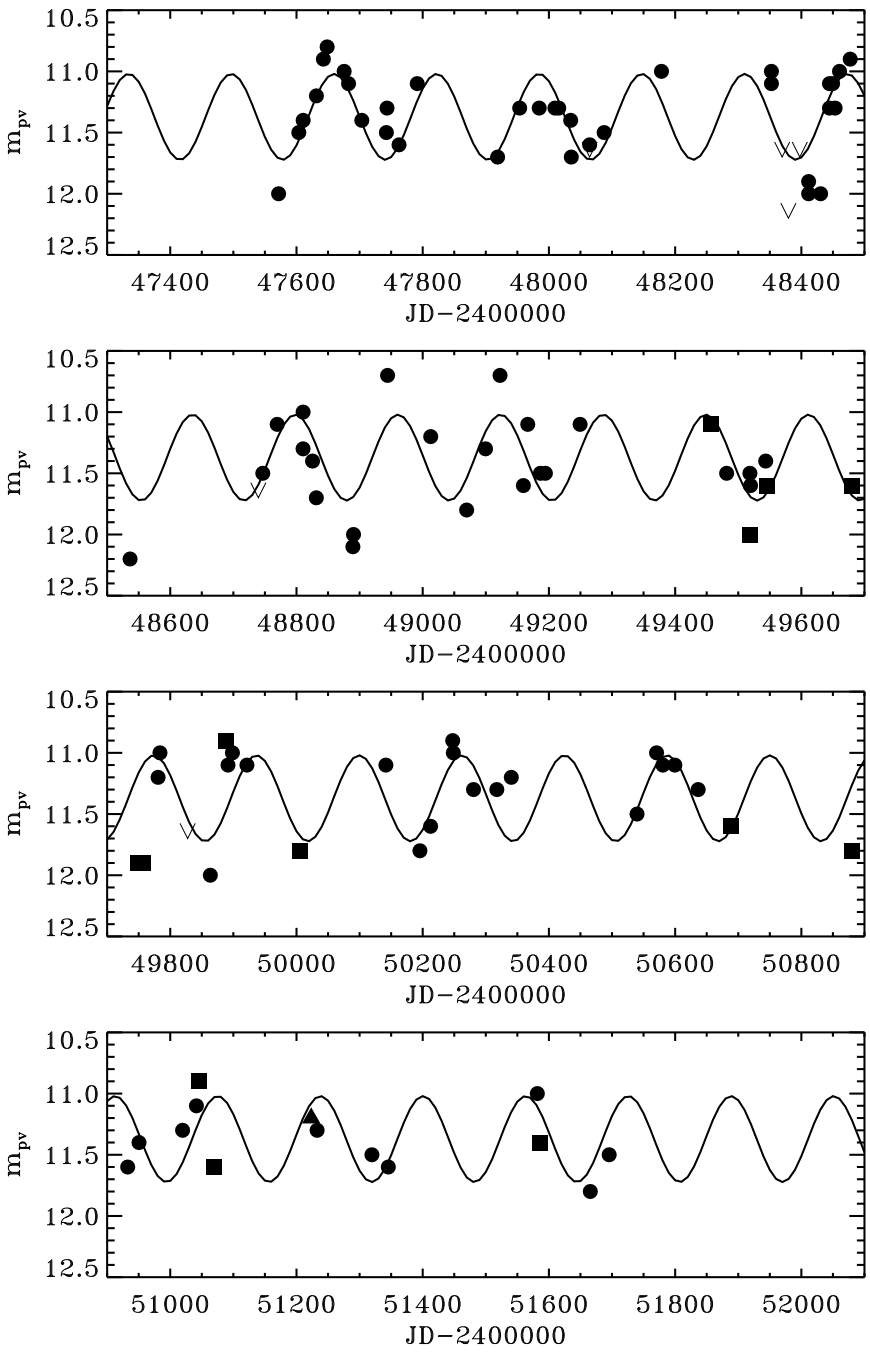

Figure 3. Light curve of NSV 24505 for 1989–2000, from the photographic observations. The same symbols are used as in Figure 2. Each panel shows 1200 days and the different phases of cyclical, marginal and rapid variation can be seen. The mean light curve from Figure 2 has been over plotted

NSV 24505 is shown to be a semiregular variable with a basic period of 163 days, which has remained viable through over ten years of data. Significant additional variation in the form of larger and more rapid variations are superimposed together with periods of reduced activity. There do not appear to be any significant secondary periodicities.

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