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ORBITAL MODULATION DURING THE STANDSTILL OF VW Vul

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Since the work by Shafter (1985) VW Vul had long been suspected as an ultrashort orbital period (0.0731 d) dwarf nova, until the correct orbital period 0.16870 ± 0.00007 d was revealed by Thorstensen et al. (1998). The new orbital period is consistent with the observed presence of standstills, which are a signature of Z Cam-type dwarf novae.

During the 1995 standstill of VW Vul, we performed time-resolved CCD photometry, initially intending the detection of possible periodicity associated with the claimed short orbital period.

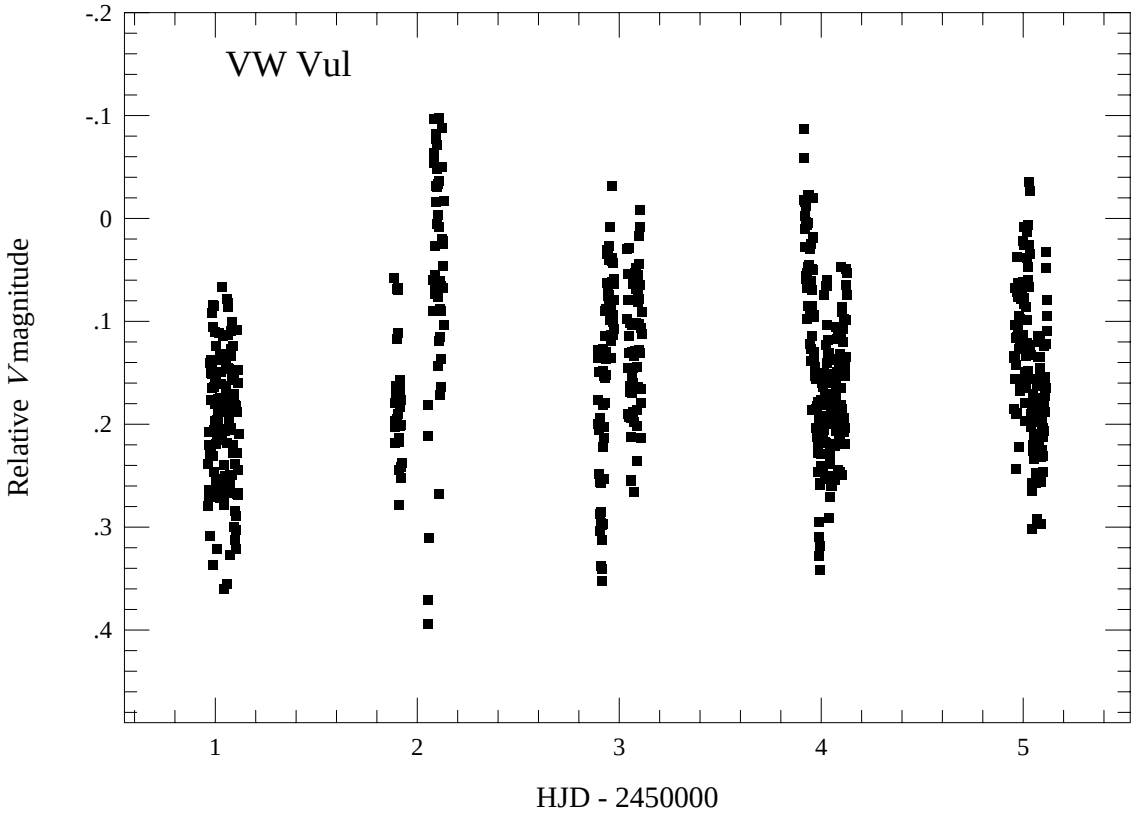

Figure 1. Light curve of VW Vul during the 1995 standstill

The observations were done on five successive night between 1995 October 10 and 14, using a CCD camera (Thomson TH 7882, 576×384 pixels, on-chip 2×2 binning adopted)

attached to the Cassegrain focus of the 60-cm reflector (focal length = 4.8 m) at Ouda Station, Kyoto University (Ohtani et al. 1992). An interference filter was used which had been designed to reproduce the Johnson V band. The exposure time was 90 s. The frames were first corrected for standard de-biasing and flat fielding, and were then processed by a microcomputer-based automatic-aperture photometry package developed by the author. The relative V magnitudes of the variable were determined against USNO–A1.0 1125.17783216 ($20^{\rm h}57^{\rm m}47\overset{\rm s}{.}00$, $+25°30'36\overset{''}{.}5$, J2000.0), whose magnitude was determined as $V = 14.54$ using the local comparison stars by Andronov et al. (1993). The constancy of the comparison was confirmed using GSC 2176.943. Figure 1 illustrates the overall light curve. The observed averaged magnitude during this standstill was $V = 14.66$.

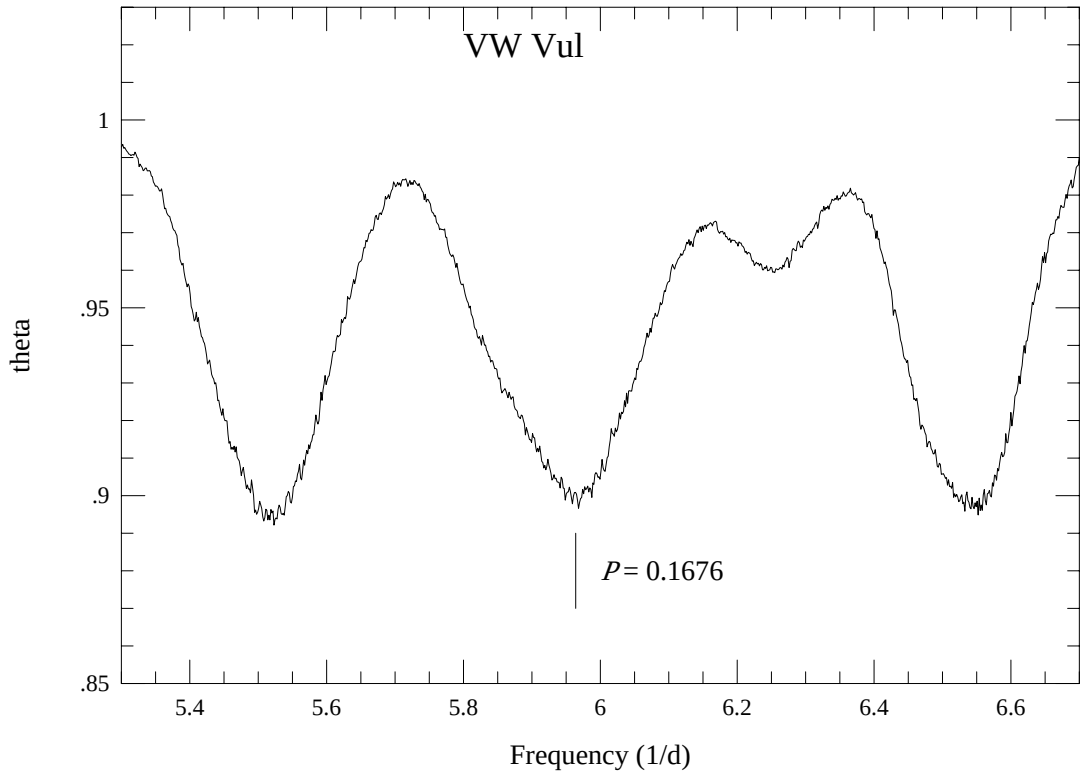

Figure 2. Period analysis of VW Vul

The light curve was analyzed using the Phase Dispersion Minimization (PDM) method (Stellingwerf 1978). The theta diagram is shown in Figure 2. While one-day aliases are unavoidable due to the limited run lengths, the existence of periodicity very close to the orbital period strongly implies the presence of orbital modulation. The significance level of the period is 8% using F-tests. The best period (assuming this alias selection) determined from the PDM analysis is 0.1676 ± 0.0006 d. The period is very close to the orbital period, but can be 0.6 ± 0.4% shorter.

The folded hump profile by the 0.1676 d period is shown in Figure 3. The profile is singly peaked, suggesting the orbital humps as the origin. The amplitude of the hump is $\sim$0.10 mag. The epochs of hump maxima during this period can be expressed by the following ephemeris.

$$\mathrm{Max(HJD)} = 2450000.089 + 0\overset{\rm d}{.}1676 \times E. \qquad (1)$$

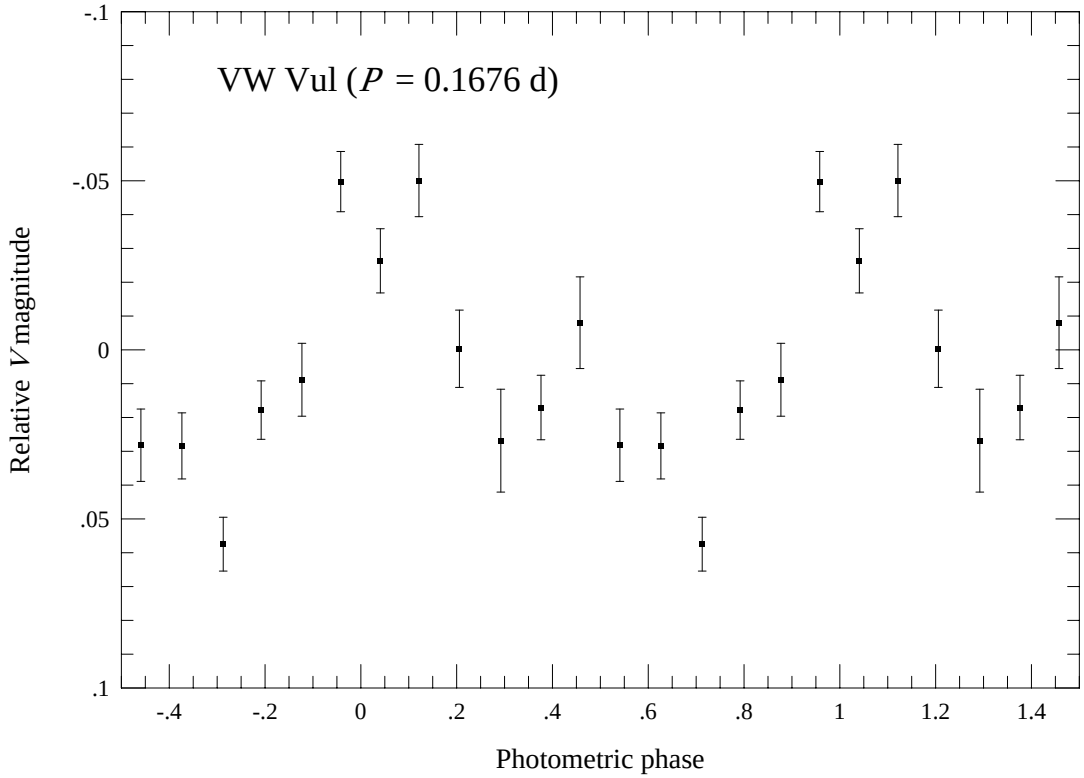

Figure 3. Hump profile of VW Vul

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