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# OBSERVATIONS OF THE SUPEROUTBURST OF VW HYDRI, NOVEMBER 1995

In recent issues of this Bulletin, Taichi Kato and his colleagues at Kyoto University have reported on CCD photometry of a number of SU UMa variables. In November 1995 a well-known member of this class, VW Hydri, underwent a prolonged superoutburst during which time CCD observations of it were made on 14 consecutive nights. It seems appropriate to detail here its behavior so that a comparison of its characteristics can be conveniently made with the results reported by Kato et al.

According to the catalogue of Ritter (1995), the V magnitude of VW Hyi at minimum light hovers close to 14 while during eruption, it climbs to V = 9.5 (during outburst) or V = 8.5 (during superoutburst). VW Hyi is a single-line spectroscopic binary with a period of 0.074271 days, and its superhump period is listed as 0.07714 days. Its superhump period excess, SPE = (Psh−Porb)/Porb, is 3.9% placing VW Hyi near the middle of the SPE range of other SU UMa-type variables. (See Howell & Hurst, 1994; Molnar, 1992). The beat period, $P_{sh} \times P_{orb}/(P_{sh} - P_{orb})$, is close to 2.00 days.

The observations reported on here were made with a CCD camera that uses a TC255 chip with 9 micron pixels. It is mounted at the "Newtonian" focus of a 20 cm Schmidt camera (focal length 30 cm, f/1.5) operating at the author's observing station in Vina del Mar, Chile. When used with a Corion "minus-IR" filter, this combination defines a high throughput passband centered approximately on the standard V band. Observations of standard stars show that the resulting instrumental magnitudes closely approximate that of the V-system; the color correction, $k_{(B-V)}$, nearly always falls in the range $0 < k_{(B-V)} < 0.10$.

Dark-subtraction and flat-fielding of the frames were conveniently handled with Santa Barbara Instrument Group's CCDOPS 1.06 software, and magnitudes were measured using square apertures of 5×5 or 7×7 pixels depending on image size. The primary comparison star, marked "94" on the RASNZ/AAVSO finding chart, lies 6.′3 to the southeast; it was used for all reductions when VW Hyi was brighter than CCDV = 10. Otherwise, several fainter stars (chart magnitudes of 10.4, 12.0 and 12.4) were used.

According the AAVSO records kindly provided by Janet Mattei, VW Hyi began its outburst on JD 2450033 when J. Smit and D. Overbeek reported it to be on the rise. Weather conditions permitted me to make a few observations two nights later, and detailed superhump observations began on JD 2450037. The total number of useful CCD frames taken was 601.

Figure 1 shows the overall light curve of VW Hyi including some selected AAVSO observations and a number of CCD measurements made before and after the superoutburst. Here it has been assumed that the V magnitude of the star labelled 94 is, in fact, 9.40. (The Hubble Guide Star Catalogue gives its magnitude as 10.1.) As can be seen from Figure 1, the total duration of the superoutburst was close to two weeks.

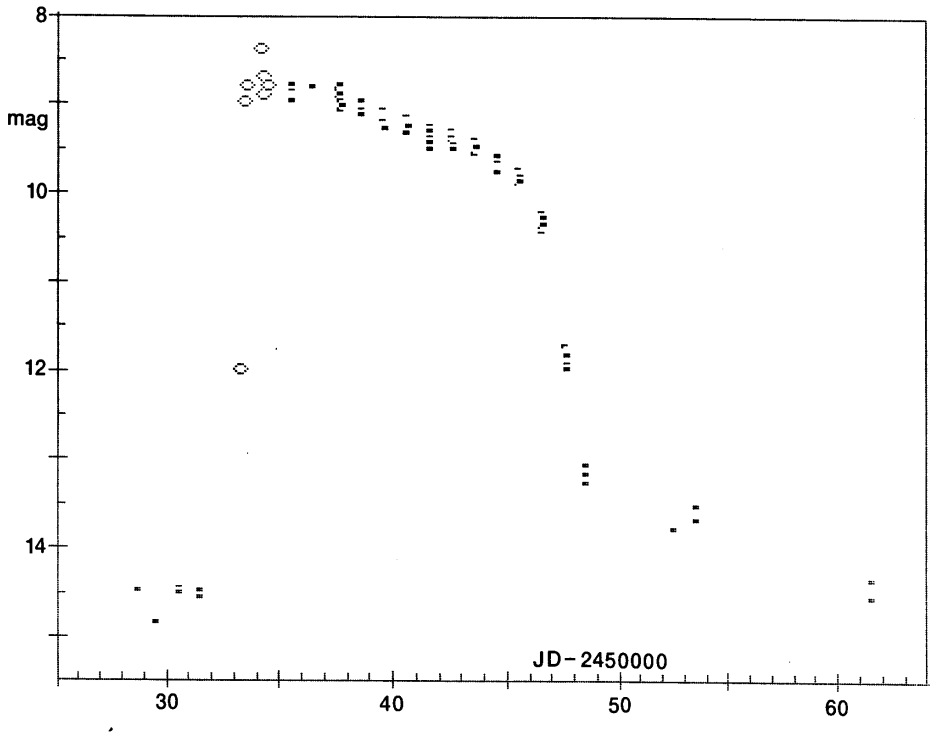


Figure 1. The light curve of VW Hydri during its November 1995 superoutburst. AAVSO observations are indicated by open circles.

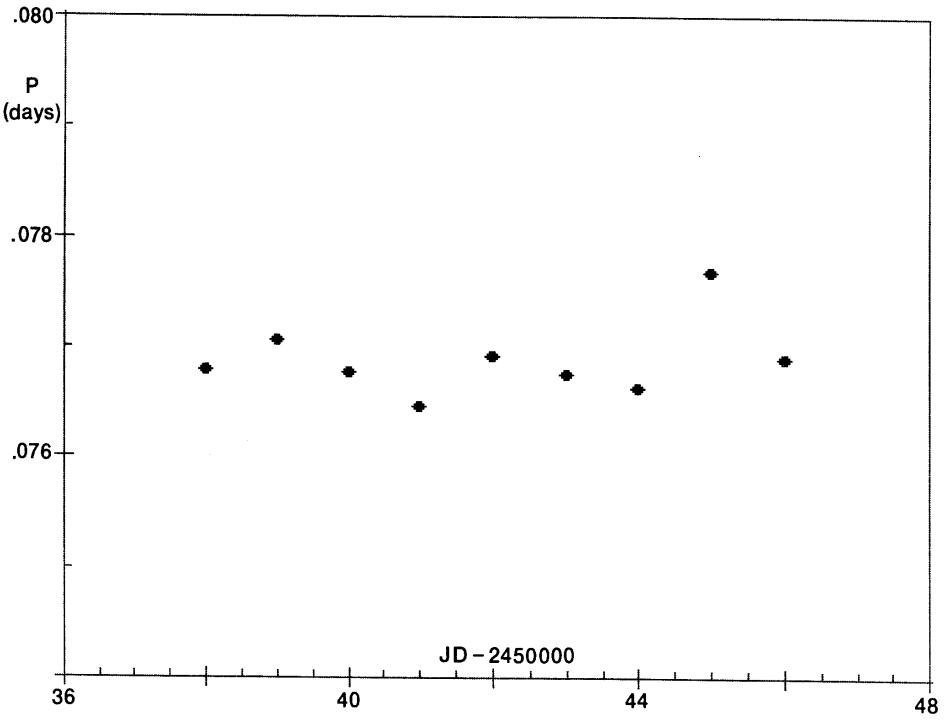


Figure 2. The periods of the superhumps of VW Hydri. The uncertainties average about $\pm 0.0003$ except for the last two nights when the smaller amplitudes raised the uncertainty.

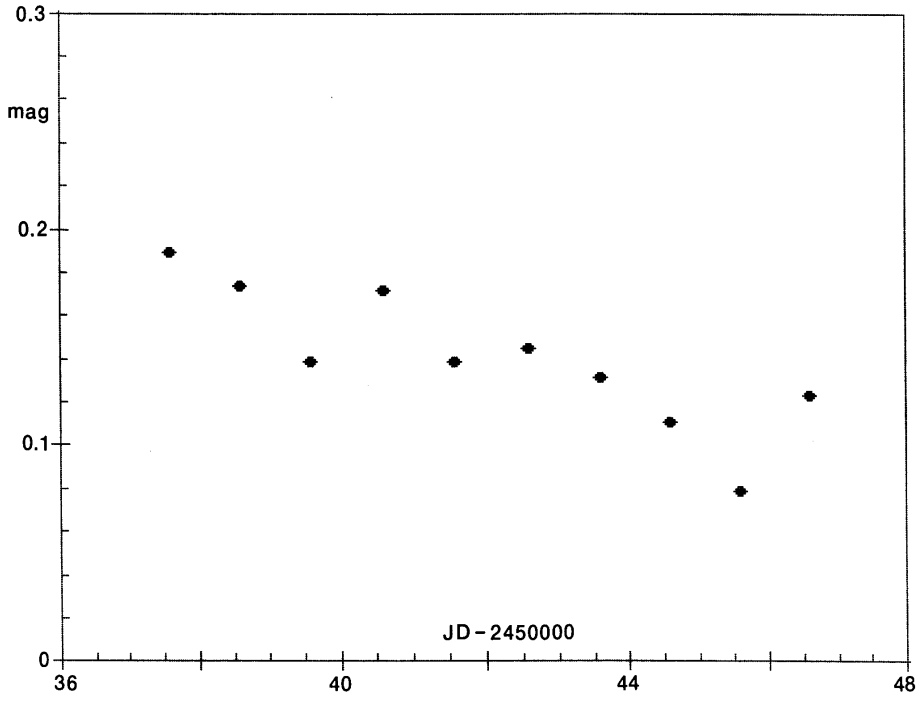


Figure 3. The amplitudes of the superhumps of VW Hydri. The uncertainties average about $\pm 0.02$ magnitudes.

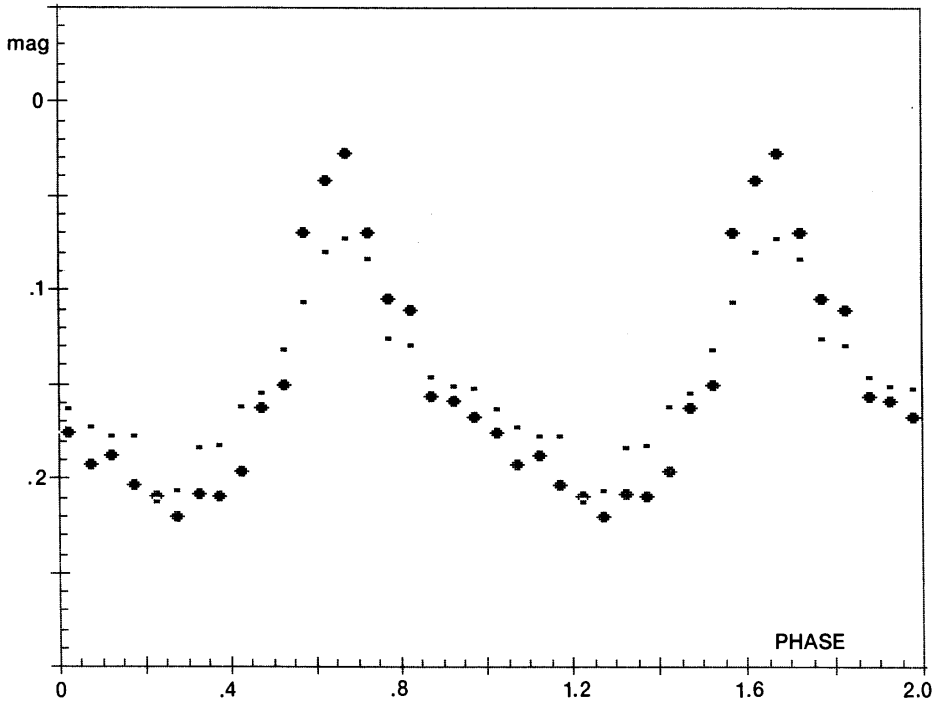


Figure 4. Average light curves of the superhumps of VW Hydri derived from the first five full nights of observations (filled circles) and from the last five full nights of observations (dots).

The period of the superhumps changed little if any during the time of superoutburst. Figure 2 depicts the period derived from each successive pair of nights using the discrete Fourier transform method described by Belserene (1988) and modified by the author. After application of a small heliocentric correction, the best period derived from all the data was found to be 0.076646 days with an estimated uncertainty of $\pm$0.00003 days.

That the amplitude decreased rather steadily during the run can be seen in Figure 3 where the full amplitudes of the best-fit sine curves are plotted against Julian date. (The true amplitudes are approximately 50% greater.) Shown in Figure 4 are the average folded light curves using the data from the first five photometric nights (JD 2450037-041) and from the last five photometric nights (JD 2450043-047). No evidence was found for variability at or near the beat period, here determined to be 2.40 days.

On one night (JD 2450045), VW Hyi was monitored for a full light cycle using a filter system approximating the B system (a blue dichroic plus a minus-IR filters). As has been noted elsewhere (see O'Donoghue 1992 for example), the amplitude of variability for SU UMa variables is less at shorter wavelengths indicating that the temperature of the emitting region on the accretion disk is cooler than that of the system as a whole. On this night the the sinusoidal amplitude in the blue was 0.029 mag compared to the CCDV amplitude of 0.078 mag.

Because VW Hyi appears frequently on observing lists of space telescopes, the star has been under observation from here in Vina del Mar for some while thanks to the encouragement of the AAVSO and its capable Director Janet A. Mattei. A more detailed report on my own observations will be published elsewhere.

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