COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5569

Konkoly Observatory
Budapest
14 October 2004

HU ISSN 0374 – 0676

NEW SU UMa-TYPE DWARF NOVA V344 Pav

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Maza & Hamuy (1990) reported the discovery of a dwarf nova in outburst at $m_{\rm pg} = 14.5$ in Pavo, which was designated as V344 Pav in Kazarovets et al. (1993). Mason & Howell (2003) reported a quiescent spectrum of V344 Pav, which exhibits typical features of dwarf nova in quiescence. Its quiescent magnitude was estimated to be $\lesssim 20$ mag. According to Mason & Howell (2003), the object was $V = 19.4$ at the time of their spectroscopic observation. Based on a relatively large amplitude of outburst, they commented that V344 Pav is likely a WZ Sge-type dwarf nova, or a TOAD (Tremendous Outburst Amplitude Dwarf novae; Howell et al. 1995).

An outburst of V344 Pav was reported to the VSNET on JD 2453233.04 at a visual magnitude of 14.4. We then initiated CCD time-series photometric observations at Universidad de Concepción. We used a Meade 30-cm Schmidt-Cassegrain telescope and an unfiltered ST-7XMEI camera. After correcting for the standard de-biasing and flat fielding, we performed the PSF photometry for the images. The differential magnitudes of the variable were measured against UCAC2 04225816 (11.42 mag in the UCAC system), whose constancy during the run was confirmed by UCAC2 04225753 (12.96 mag in the UCAC system). The log of observations is shown in table 1. Heliocentric corrections were applied before the period analysis.

Table 1. Observation log.

$T_{\rm start}$ (HJD)	ΔT (hr)	mag.	N
2453235.5377	2.08	3.996 ± 0.005	230
2453236.5829	6.09	4.307 ± 0.003	673
2453237.5355	4.86	4.902 ± 0.008	535
2453238.5337	3.92	6.498 ± 0.027	438
2453239.5339	3.57	7.235 ± 0.046	391
2453240.5290	1.84	7.432 ± 0.078	203
2453241.5270	1.71	7.341 ± 0.076	183
2453242.5263	0.86	7.614 ± 0.106	98
2453250.5350	1.32	7.943 ± 0.191	92
2453256.5259	1.45	7.890 ± 0.093	162

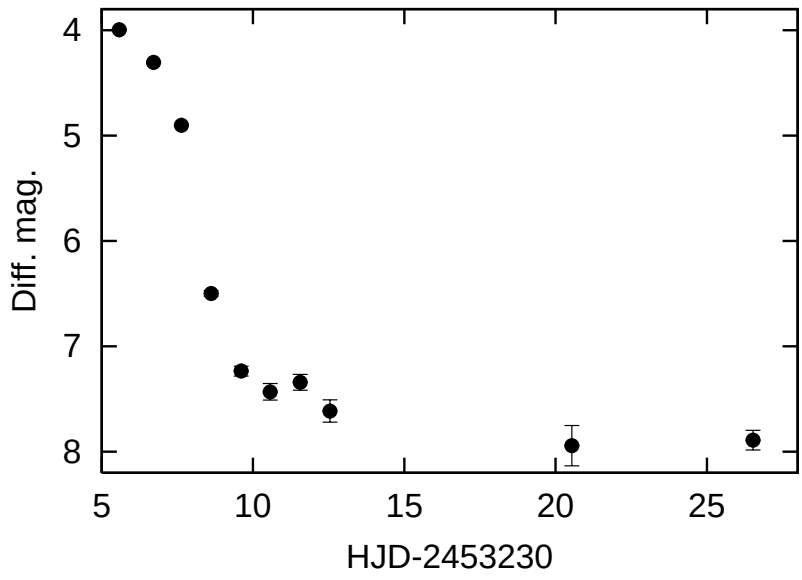

Figure 1. The overall light curve of the superoutburst of V344 Pav in August 2004. The abscissa and ordinate denote the time in HJD and the differential magnitude against a comparison star UCAC2 04225816 (11.42 mag in the UCAC system), respectively.

Figure 1 shows the overall light curve during the outburst. The object was gradually fading with a rate of 0.28 mag d^{-1} for the first two days, then entered a rapid fading phase on JD 2453237. After the rapid fading, the object returned to a quiescent level within 10 days. In the last two observations, the differential magnitudes are $\sim$ 7.9 mag, which indicates that the quiescent magnitude is around 19.3 mag if we use the UCAC2 magnitude of the comparison star (11.42 mag).

Enlarged light curves are shown in Figure 2. Our observation clearly detects repetitive humps having amplitudes of 0.15 mag during the outburst, as can be seen in Figure 2. We performed a period analysis with the PDM method using the light curve between JD 2453235 and 2453237 (Stellingwerf 1978). Figure 3 is the resultant frequency–Θ diagram. The best period is calculated to be 0.079607 ± 0.000082 d. Figure 4 shows phase-averaged profiles of the humps on JD 2453235, 2453236, and 2453237. As can be seen from this figure, humps appeared even in JD 2453237, during the rapid fading stage. Secondary maxima appear in the hump profiles around the phase 0.4–0.5 in JD 2453235 and 2453236.

Although the observed duration of the outburst is short (3 d), features of the overall light curve and the humps resemble those of superoutbursts in SU UMa-type dwarf novae (cf. Warner 1985). We hence conclude that V344 Pav is an SU UMa type dwarf nova having a superhump period of 0.079607 ± 0.000082 d. It is possible that, at the time of the outburst detection, it had already been in a late phase of superoutburst. This is consistent with the presence of the secondary maximum in superhump profiles (Figure 4), since it generally appears in a late superoutburst phase. The outburst amplitude is > 3.9 mag, and probably $\sim$ 5 mag if one assumes a typical properties of superoutburst, that is, a fading rate of ~ 0.1 mag d^{-1} and a duration of about two weeks (Warner 1985).

The superhump period of V344 Pav is a typical one for ordinary SU UMa stars, rather than WZ Sge-type stars having very short periods, except for RZ Leo (Ishioka et al.

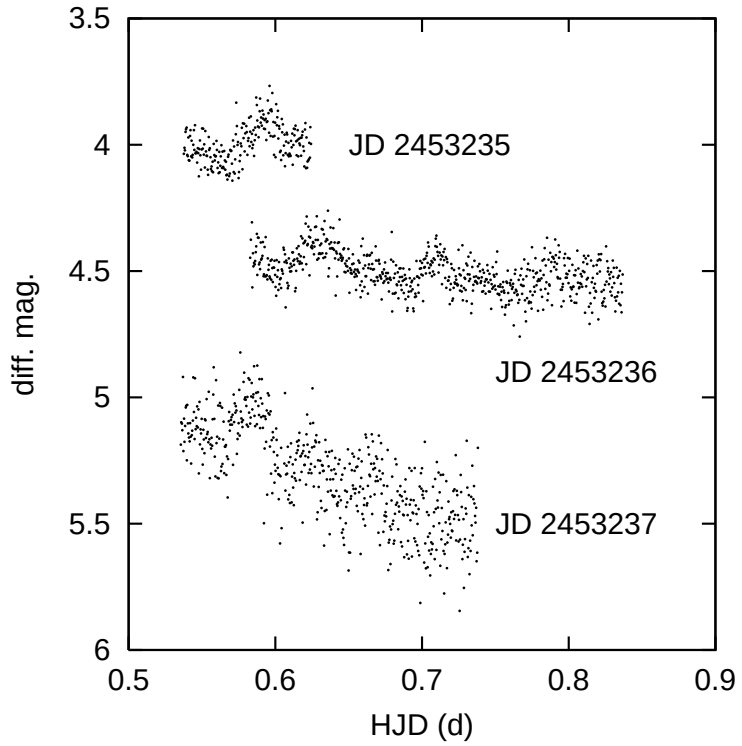

Figure 2. Enlarged light curves during the superoutburst of V344 Pav. The magnitude scales of JD 2453236 and 2453237 are shifted by +0.2 and +0.4 mag, respectively.

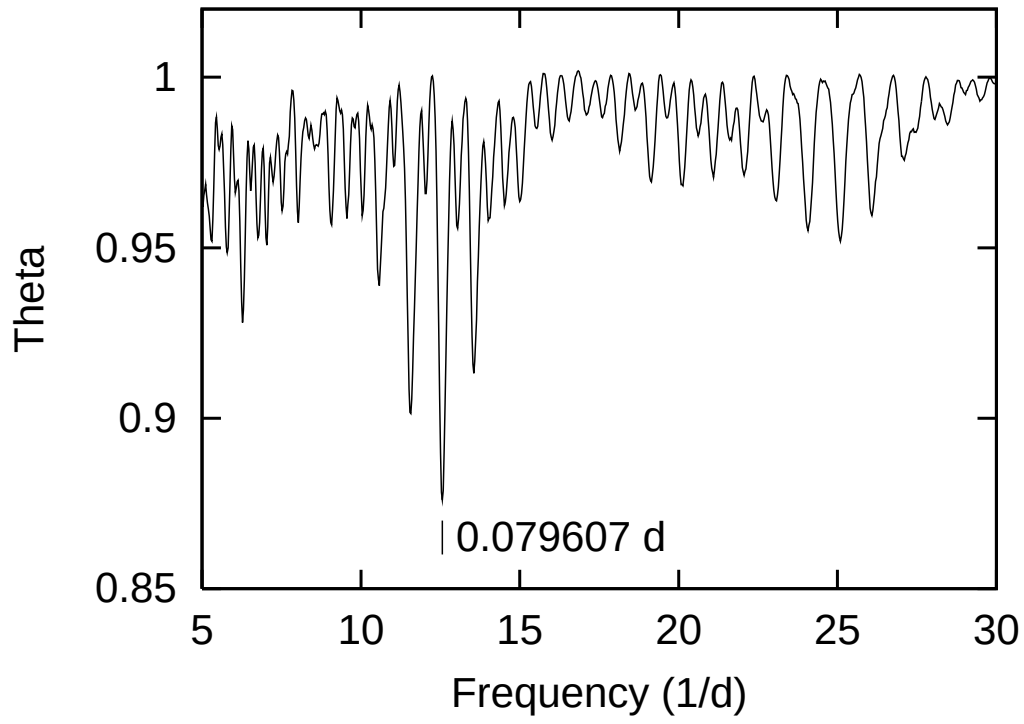

Figure 3. Frequency–Θ diagram calculated with the PDM method for superhumps in V344 Pav.

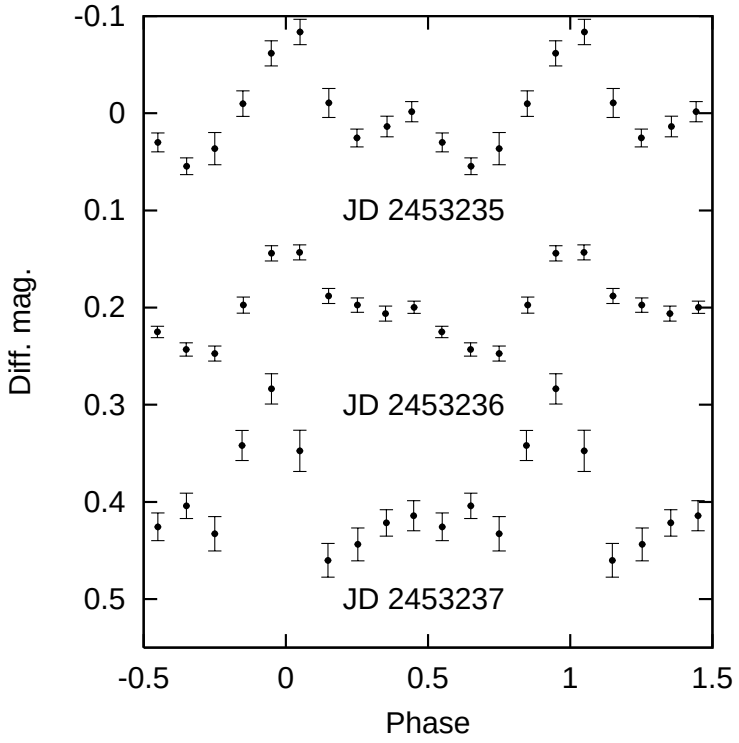

Figure 4. Average superhump profiles. The magnitude scales of JD 2453236 and 2453237 are shifted by +0.2 and +0.4 mag, respectively.

2001). The ordinary SU UMa-type nature for V344 Pav is also supported by its relatively high frequency of outbursts. According to Mason & Howell (2003), outbursts of V344 Pav are recorded in September 1983 ($m_{\rm pg} = 14.5$), March 1984 ($m_{\rm pg} = 16$), July 1990 ($m_{\rm pg} = 14.5$), September 1999 ($m_{\rm vis} = 14.3$), July and September 2000 ($m_{\rm vis} = 14.6$ and 14.4), and May 2001 ($m_{\rm vis} = 14.3$). In the VSNET data base, we find an additional outburst records in September 2003 ($m_{\rm vis} = 14.4$). In conjunction with the superoutburst in this paper (August 2004; $m_{\rm vis} = 14.5$), the supercycle is probably 1–2 years, much shorter than those of WZ Sge-type stars ($\gtrsim 10$ years). The faint outburst in March 1984 may be a normal outburst, which implies that a number of normal outbursts have been overlooked.

References:

Howell, S. B., Szkody, P., & Cannizzo, J. K., 1995, *ApJ*, **439**, 337
Ishioka, R., Kato, T., Uemura, M., Iwamatsu, H., Matsumoto, K., Stubbings, R., Mennickent, R., & Billings, G. W., 2001, *PASJ*, **53**, 905
Kazarovets, E. V., Samus, N. N., & Goranskij, V. P., 1993, *IBVS*, 3840
Mason, E., & Howell, S. B., 2003, *A&A*, **403**, 699
Maza, J., & Hamuy, M., 1990, *IAUC*, 5073
Stellingwerf, R. F., 1978, *ApJ*, **224**, 953
Warner, B., 1985, in Interacting Binaries, ed. P. P. Eggleton, & J. E. Pringle (Dordrecht: D. Reidel Publishing Company), 367