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DEVELOPMENT OF LATE SUPERHUMPS IN YZ Cnc

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YZ Cnc is a well-known dwarf nova and is a prototype object representing for a population of SU UMa-type systems with short outburst recurrence times and long orbital periods. However, little photometric observation of superhumps had been done since its identification as an SU UMa-type star (Patterson 1979). We undertook time-resolved CCD photometry during its superoutburst in 1994 January.

The observations were done on three successive nights between 1994 January 1 and 3, 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 60–120 s depending on the brightness of the object. The frames were first corrected for standard de-biasing and flat fielding, and were then processed by a microcomputer-based aperture photometry package developed by the author. The magnitudes of the object were determined relative to GSC 1939.1130 (GSC magnitude 13.4), but its constancy was not confirmed because of the lack of suitable check stars in the same field. Barycentric corrections to observed times were applied before the following analysis. Table 1 lists the log of observations, together with nightly averaged magnitudes.

The light curve drawn from these data is presented in Figure 1. The light curve shows the declining portion from a superoutburst. Superhumps were evident on the first night, but became more complex on the next night, when the system entered the rapidly declining phase. The period analysis over the entire, or selected, data sets does not yield a coherent signal, because of the development of late superhumps as described below. So we used the primary superhump period of $P = 0^{\rm d}.09204$ (Patterson 1979) for the following analysis.

Figure 2 shows the phase-averaged light curves of 1994 January 1 (upper panel) and January 2 (lower panel). The January 1 light curve clearly shows typical superhumps, with a shoulder (secondary superhumps) on its declining branch. However, the phase of the maximum dramatically changed by $\phi \sim 0.3$–0.4 on the next night (lower panel). The newly appeared humps correspond to what are called "late superhumps" (Haefner et al. 1979), which is considered to reflect the modulation of the precessing accretion disk properties at the stream impact point (Hessman et al. 1992). The clear appearance of late superhumps in YZ Cnc may be consistent with its high mass-transfer rate.

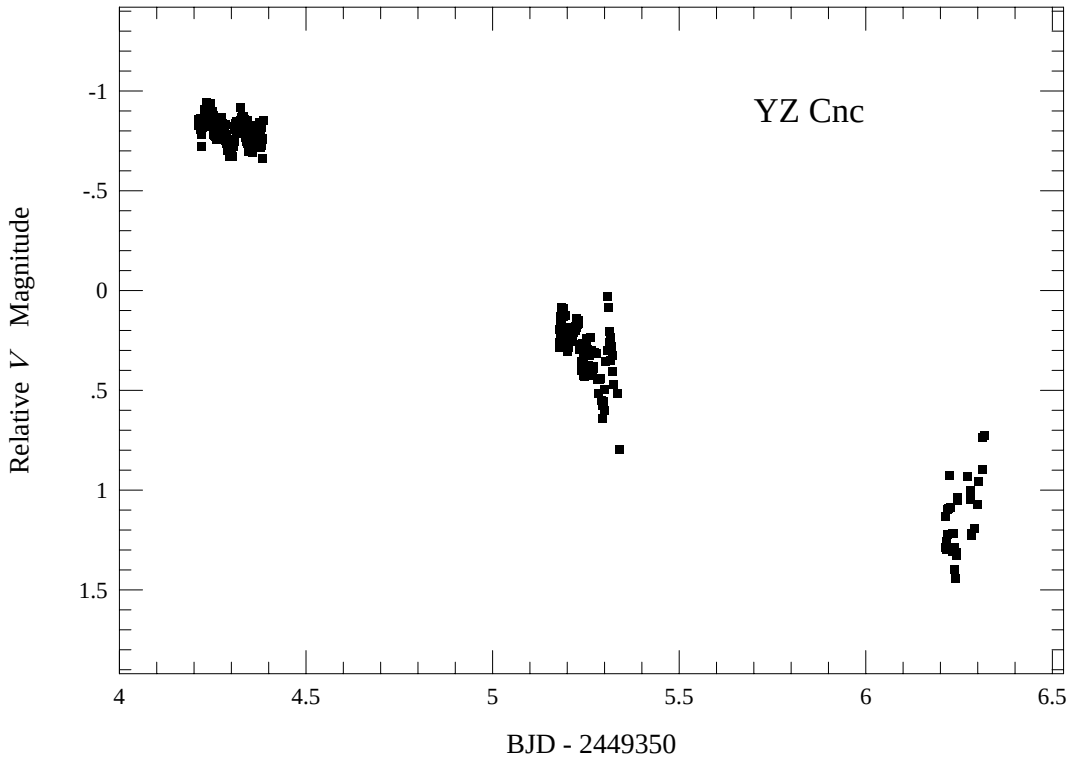

Figure 1. Light curve of the 1994 January superoutburst of YZ Cnc

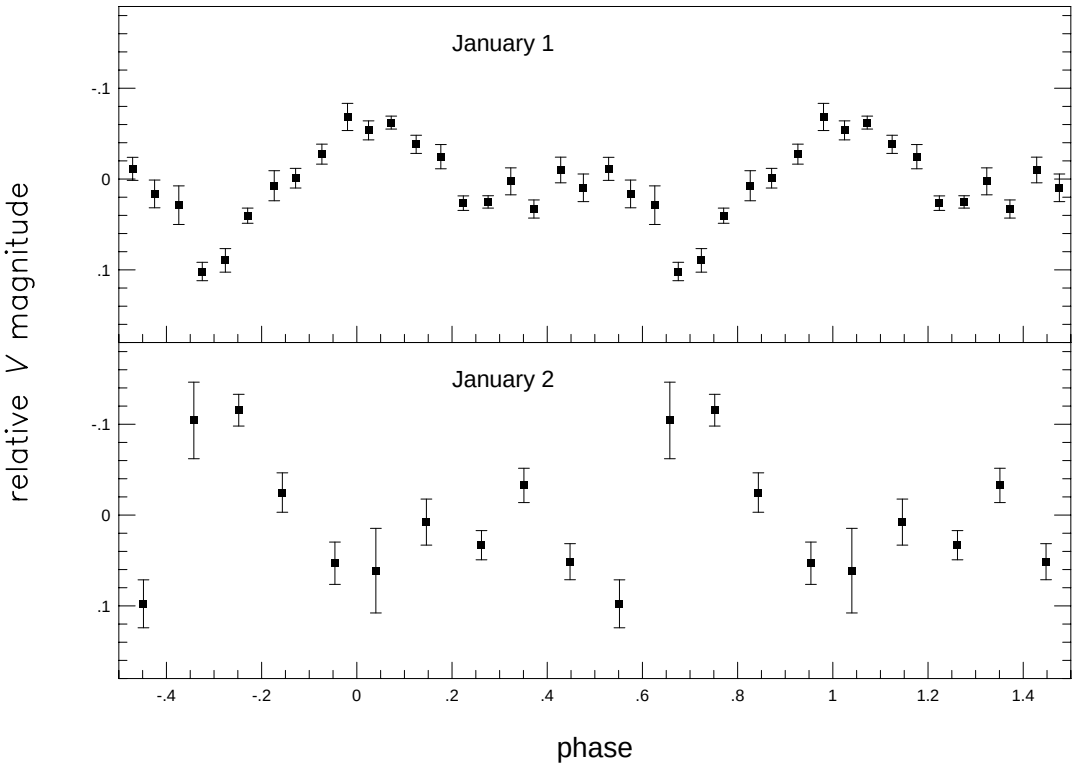

Figure 2. Phase-averaged light curve of YZ Cnc, assuming the superhump period of $0^{\rm d}.09204$. The origin of the phase is arbitrarily taken as BJD 2449350

Table 1: Log of observations

start[a]	end[a]	mean mag[b]	error[c]	N[d]
49354.211	49354.385	−0.800	0.005	162
49355.178	49355.340	0.285	0.014	94
49356.213	49356.317	1.119	0.035	30

[a] BJD − 2400000
[b] Magnitude relative to GSC 1939.1130
[c] Standard error of nightly average
[d] Number of frames

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