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**CCD OBSERVATION OF THE 1999 SEPTEMBER OUTBURST  
OF TY Vul**

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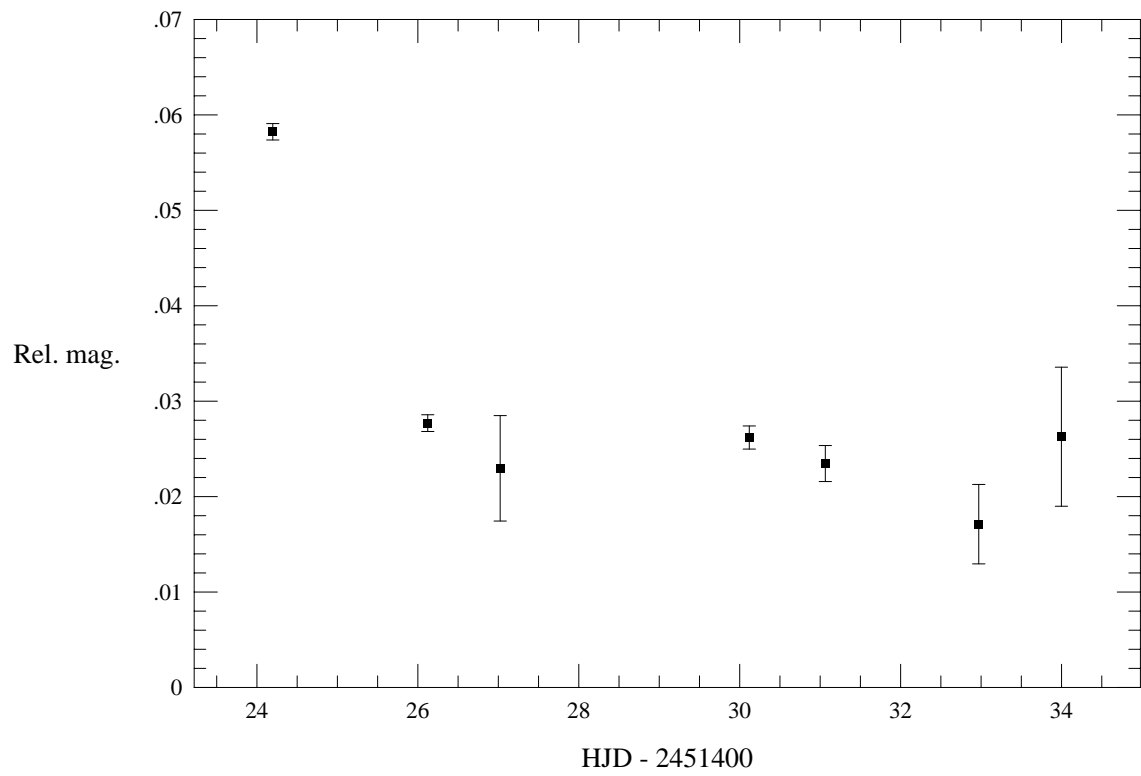
TY Vul is a rather obscure dwarf nova. Downes et al. (1997) presented an identification based on the chart by Meinunger (1980). This identification suggests a very faint quiescent counterpart. Bond (1978) reported the spectral type of F8:, which apparently refers to the close companion described below.

Schmeer (1999a,b) reported the apparently first-ever outburst since the study by Meinunger (1980). The reported maximum magnitude was  $V = 14.6$  on 1999 September 1. We started time-resolved CCD photometry upon this alert. The observations were done using an unfiltered ST-7 camera attached to the Meade 25-cm Schmidt-Cassegrain telescope. The exposure time was 30 s. The images were dark-subtracted, flat-fielded, and analyzed using the Java<sup>TM</sup>-based PSF photometry package developed by one of the authors (TK). The relative fluxes of the variable were measured against GSC 2174.1749 (USNO  $r$ -magnitude 11.9), whose constancy was confirmed by comparison with GSC 2174.319 (USNO  $r$ -magnitude 12.5). The astrometry of the outbursting object based on GSC 1.1 gave  $20^{\text{h}}41^{\text{m}}43^{\text{s}}89$ ,  $+25^{\circ}35'08''6$  (J2000.0), which agrees with the cataloged position of USNO 1125.16991372 ( $20^{\text{h}}41^{\text{m}}43^{\text{s}}82$ ,  $+25^{\circ}35'08''9$ , J2000.0). However, Schmeer (private communication) pointed out that TY Vul and USNO 1125.16991372 make a close pair on his CCD image. The astrometric coincidence in our measurement may have partly been caused by the distortion of the GSC 1.1 astrometric grid of this region.

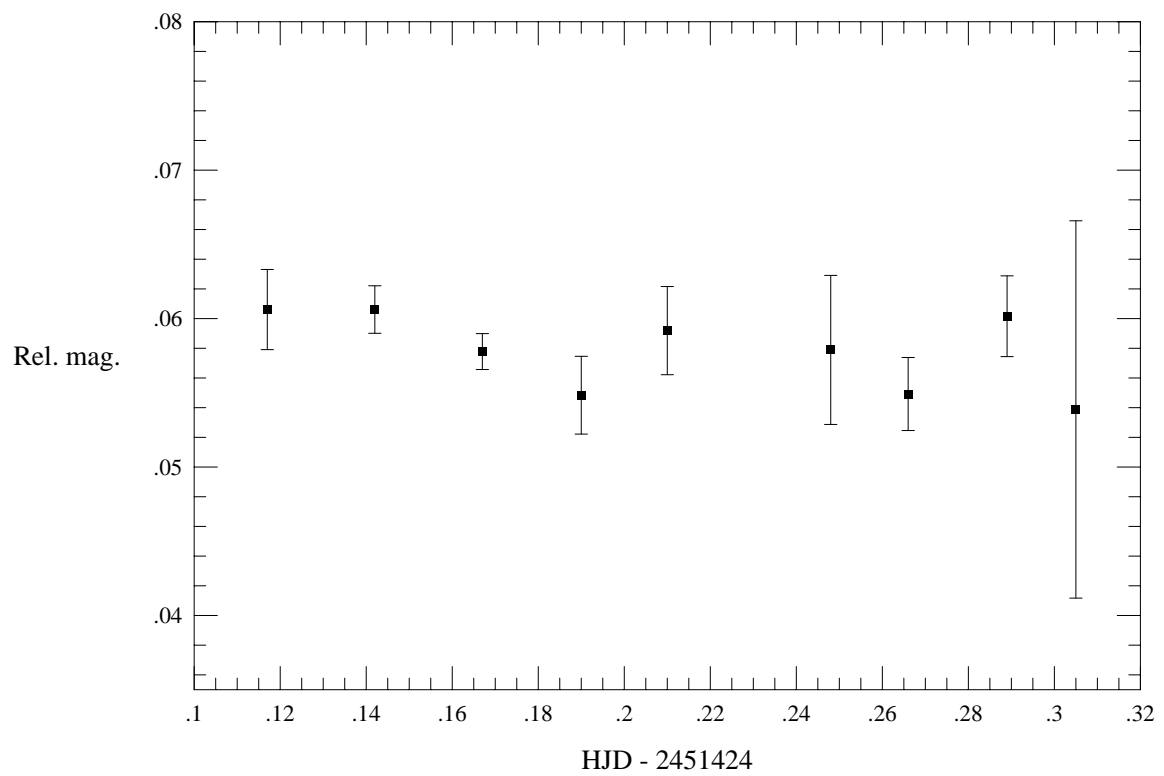
TY Vul and the companion being unresolved on our CCD images, our measurements give the combined light of the two stars. Table 1 and Figure 1 show the nightly averaged fluxes.

TY Vul rapidly faded on the night of 1999 September 2 (JD 2451424), and the combined flux was virtually constant after September 4 (JD 2451426). We determined the averaged flux, as representing the flux of the companion, between the September 5 and 12 observations and subtracted it from the outburst observations. The rate of decline determined from the first two nights' observations was  $1.1 \text{ mag d}^{-1}$ .

Figure 2 shows the enlarged light curve (combined light) on 1999 September 2. A general decline consistent with the above rate was observed during the run, but no apparent light modulation was detected.



**Figure 1.** Light curve of TY Vul



**Figure 2.** Light curve of TY Vul on 1999 September 2

Table 1: Nightly averaged fluxes of TY Vul

JD start <sup>a</sup>	JD end <sup>a</sup>	mean flux <sup>b</sup>	error <sup>c</sup>	$N^d$
51424.101	51424.302	0.0582	0.0009	351
51426.102	51426.138	0.0277	0.0009	50
51426.978	51427.038	0.0230	0.0055	48
51430.103	51430.126	0.0262	0.0012	60
51431.046	51431.090	0.0235	0.0019	61
51432.961	51432.974	0.0171	0.0042	32
51433.992	51433.996	0.0263	0.0073	10

<sup>a</sup> JD – 2400000

<sup>b</sup> Combined flux (TY Vul and companion)  
relative to GSC 2174.1749

<sup>c</sup> Standard error of nightly average

<sup>d</sup> Number of frames

The relatively large rate of decline, the lack of light modulation and the large outburst amplitude suggest the present outburst may be a normal outburst of an SU UMa-type dwarf nova.

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