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PHOTOMETRY OF UZ Tau

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UZ Tau is a well-known classical T Tau star which is considered to be surrounded by a circumstellar disk (e.g. Ghez et al. 1994). The object is also a famous multiple system, composed of a visual binary system UZ Tau E and UZ Tau W, which are known to be spectroscopic and speckle binaries, respectively (Jensen et al. 1996; Mathieu et al. 1996). The object is also considered as a member of EXORs, or sub-FUORs (Herbig 1989), which show occasional outbursts lasting $\sim$ 100 d. More recently, one of EXORs, V1143 Ori, showed a short-term rise and fall with a time-scale of an order of magnitude shorter than those of the historically known outbursts of EXORs (Baba et al. 2001). We selected UZ Tau as one of our long-term monitoring project of EXORs.

The observations were done on 33 nights between 1996 November 14 and 1997 December 25, 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 20–30 s, depending on the transparency. 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 one of the authors (TK). UZ Tau is known to be a very close double (the fainter component has a B magnitude of 15.16, and a spectral type of M4Ve), but the present photometry was done for the combined light, since the separation of the components was impossible. The magnitudes were determined relative to GSC 1833.587 ($V = 13.74$), whose constancy during the run was confirmed using GSC 1833.381 ($V = 13.80$). The magnitudes of comparison and check stars were determined using HIP 21134 ($V = 9.74$, $B - V = +0.57$). Table 1 lists the log of observations, together with nightly averaged magnitudes.

The light curve is shown in Figure 1. In average, the object was $\sim 0\overset{\mathrm{m}}{.}5$ brighter in 1996 than in 1997, which suggests that UZ Tau experienced an active phase in 1996. The most remarkable phenomenon was a flare peaking on JD 2450432. Figure 2 shows the enlarged light curve of the flare. The rise of $\sim 0\overset{\mathrm{m}}{.}6$ took less than two days, and the overall time scale of the event was $\sim$ 10 d. Although the amplitude of the flare ($\sim 1\overset{\mathrm{m}}{.}0$) is smaller than those of other small outbursts in EXORs, the time scale of the event is comparable to the "rapid" flare observed in V1143 Ori (Baba et al. 2001). The presence of such rapid

Table 1: Nightly averaged magnitudes of UZ Tau

mid-JD[a]	mean mag[b]	error[c]	N[d]
50402.182	−1.136	0.080	3
50404.060	−1.216	0.019	3
50407.215	−0.974	0.004	5
50427.101	−1.202	0.006	5
50429.090	−1.128	0.007	5
50432.144	−1.627	0.013	5
50438.160	−1.588	0.007	3
50439.023	−1.245	0.020	3
50441.012	−1.184	0.042	3
50442.028	−1.111	0.039	3
50445.065	−1.066	0.010	5
50448.058	−0.815	0.008	5
50448.999	−1.201	0.009	3
50449.940	−1.136	0.029	3
50451.000	−1.512	0.034	3
50452.019	−1.710	0.075	7
50452.944	−1.631	0.011	5
50455.085	−0.841	0.072	5
50457.032	−0.824	0.011	3
50461.087	−0.984	0.006	3
50462.080	−0.953	0.019	3
50464.117	−0.735	0.010	3
50468.890	−0.973	0.011	5
50507.949	−0.525	0.016	5
50509.024	−0.554	0.007	5
50512.976	−0.459	0.006	5
50515.956	−0.738	0.005	5
50518.958	−0.636	0.007	5
50672.298	−0.472	0.029	2
50675.288	−0.577	0.029	3
50676.292	−0.792	0.011	3
50677.272	−0.581	0.015	3
50808.103	−1.078	0.019	3

[a] JD − 2400000
[b] Magnitude relative to GSC 1833.587 ($V = 13.74$)
[c] Standard error of nightly average
[d] Number of frames

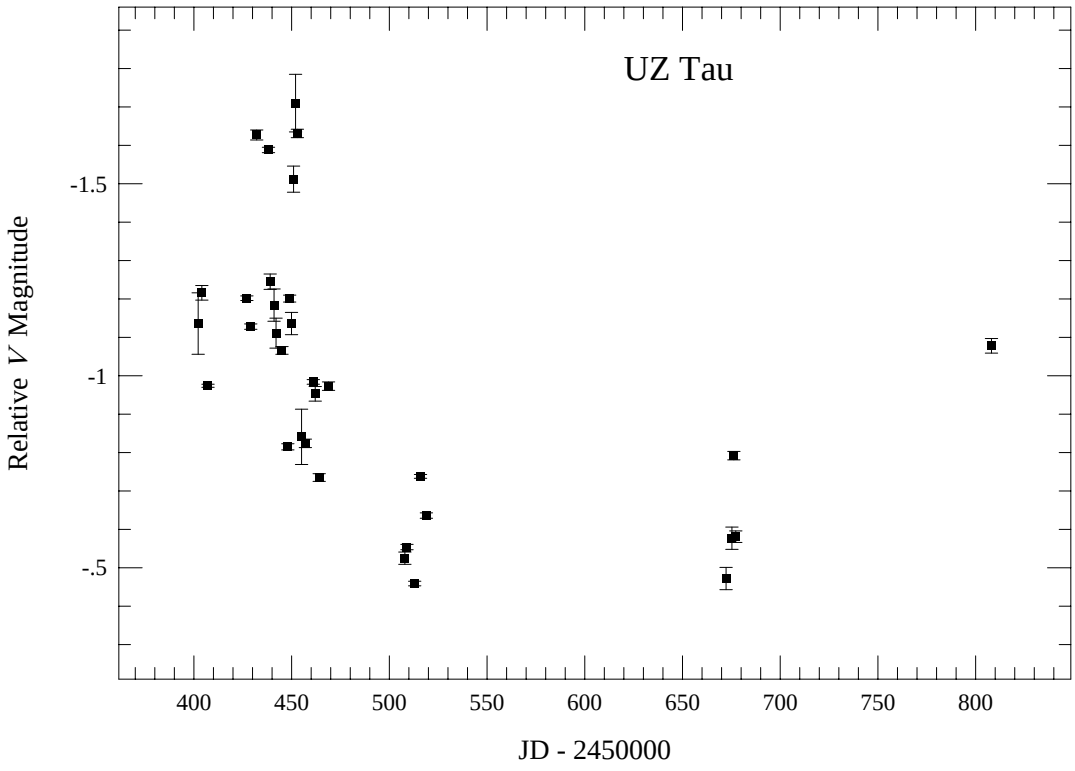

Figure 1. Overall light curve of UZ Tau

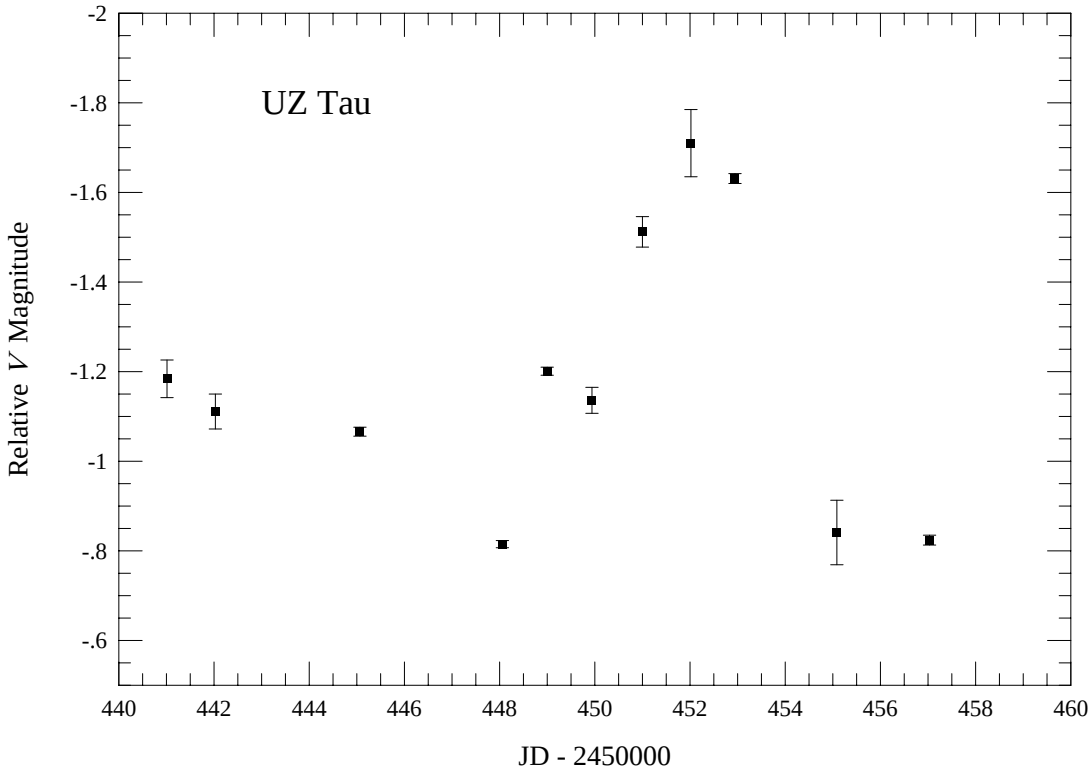

Figure 2. Flare (outburst) of UZ Tau

variation is difficult to explain by the viscous accretion in the protostellar disk. This may be another evidence of magnetically controlled accretion supposed in EXOR stars.

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