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PERIODIC LIGHT VARIATIONS IN TEN WEAK EMISSION T TAURI STARS IN TAURUS-AURIGA COMPLEX

We present results of BVR photometry of 22 weak emission T Tauri stars (WTTS) discovered in the Lick CaII survey (Herbig et al. 1986) and in the x-ray survey (Feigelson et al. 1987). These WTTS stars are distinguished by the presence of significant Li abundances, strong chromospheric emission, and none of the excesses common to the CTTS. The properties of WTTS have been described by Walter (1987), Walter et al. (1988), Strom et al. (1989), and Skinner et al. (1991).

The observations were obtained with the 48-cm reflector during 40 nights (August-September 1992) on Mt. Maidanak. The mean error of one observation of a program star is typically $\pm$ 0.01 mag. in V, B−V, and V−R.

We found rotation periods of 1.5−6.2 days for ten stars. The limits of the light variations, mean colours, number of observations, the period, and full amplitudes in B and V mag. are listed in Table I. Phase diagrams for light curve in the V filter for ten stars are displayed in Figure 1.

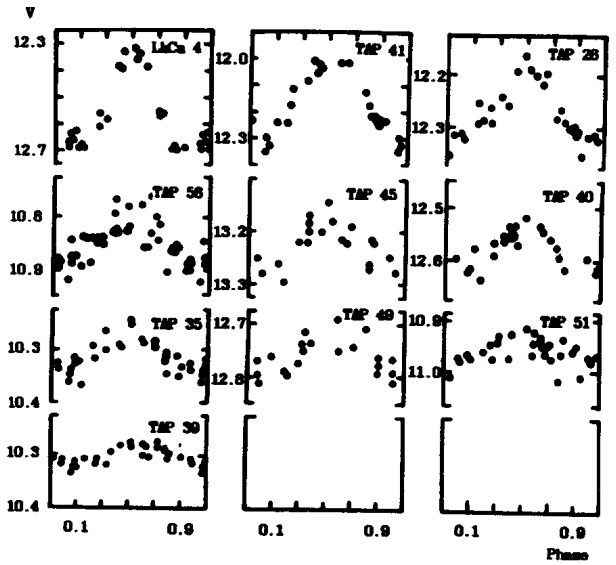

Figure 1. Phase diagrams for light curve in the V filter for ten WTTS

These ten stars, together with the six stars (V819, V827, V830, V836 Tau, HDE 283572, and NTTS 041636+2743) monitored by Rydgren and Vrba (1983), Rydgren et al. (1984), Walter et al. (1987), Bouvier et al. (1988), and Grankin (1992), form a sample of sixteen WTTS stars wtih known rotation periods. Figure 2 shows the dependence of x-ray flux on axial rotation period for this sample WTTS stars and CTTS. The x-ray fluxes and the rotation periods are from Bouvier (1990) for CTTS and the x-ray fluxes from Walter et al. (1988) for WTTS.

Despite a large scatter in the data, there is a trend toward descreasing F_x as the rotational period lengthens. The similar dependence of x-ray flux upon rotational period both in CTTS and in WTTS in Figure 2 points to a common magnetic origin for their x-ray emission.

We do not find any obvious rotational modulation effect in the V magnitude variations of all others stars. In many cases, this may be explained by poor sample of observational sets of the stars. It is necessary to carry out UBVR monitoring of these objects in the future.

Table I. WTTS stars in Tau-Aur.

Star TAP	name NTTS	n	V_{max}	V_{min}	<V>	δV ⋆	<B−V>	n ♯	<V−R>	P days	ΔV	ΔB
4	032641+2420	26	12.06	12.22	12.15	0.046	0.87	8	0.82			
9	034903+2431	22	12.14	12.27	12.19	0.033	1.06	5	1.01			
10NE	035120+3154NE	26	11.91	12.35	12.20	0.111	0.88	–	–			
11	035135+2528 A+B	23	12.31	12.43	12.39	0.026	0.92	5	0.86			
	SAO 76411 A	32	8.86	8.94	8.89	0.018	0.58	32	0.50			
	SAO 76411 B	31	10.39	10.45	10.42	0.028	0.88	31	0.73			
14NE	040012+2545 N+S	22	12.86	12.98	12.91	0.160	1.00	5	0.93			
17	SAO 76428	31	9.46	9.53	9.48	0.017	0.53	31	0.47			
26	041559+1716	25	12.16	12.36	12.27	0.135	1.12	9	0.98	2.52	.14	.18
35	042417+1744	30	10.24	10.37	10.31	0.031	0.78	30	0.66	2.74	.07	.08
39	++	29	10.27	10.34	10.31	0.018	0.78	29	0.70	3.67	.04	.06
40	042835+1700	22	12.52	12.64	12.58	0.032	1.16	8	1.00	1.55	.10	.07
41	042916+1751	22	12.01	12.36	12.17	0.107	1.23	8	1.07	2.43	.25	.28
45	042950+1757	21	13.14	13.30	13.23	0.059	1.46	8	1.39	6.2	.10	.08
49	043124+1824	20	12.69	12.82	12.77	0.063	1.05	7	0.90	3.32	.07	.07
51S	043220+1815	29	10.92	11.02	10.96	0.024	0.83	29	0.73	3.2	.03	.03
56	045226+3013	28	10.75	10.92	10.84	0.040	1.02	28	0.86	2.24	.09	.09
57NW	045251+3016	25	11.53	11.67	11.60	0.050	1.29	20	1.11			
	LkCaII− 3 +	26	12.02	12.17	12.07	0.046	1.50	11	1.53			
	LkCaII− 4 +	25	12.31	12.83	12.57	0.144	1.42	11	1.34	3.37	.35	.38
	LkCaII− 15 +	22	11.98	12.59	12.16	0.173	1.26	7	1.13			
	LkCaII− 16 +	17	12.50	12.71	12.60	0.052	1.54	2	1.40			

Notes:

⋆ − δV is the standard deviation from the mean of the V magnitudes.

♯ − Number of observations for V−R colour.

++ − None exhibit detectable Li I 6707 Å. SB1. No orbit determined yet, $v sini \sim 30$ km/s (Walter et al. 1988).

\+ − From Herbig et al. (1986), not observed in x-rays.

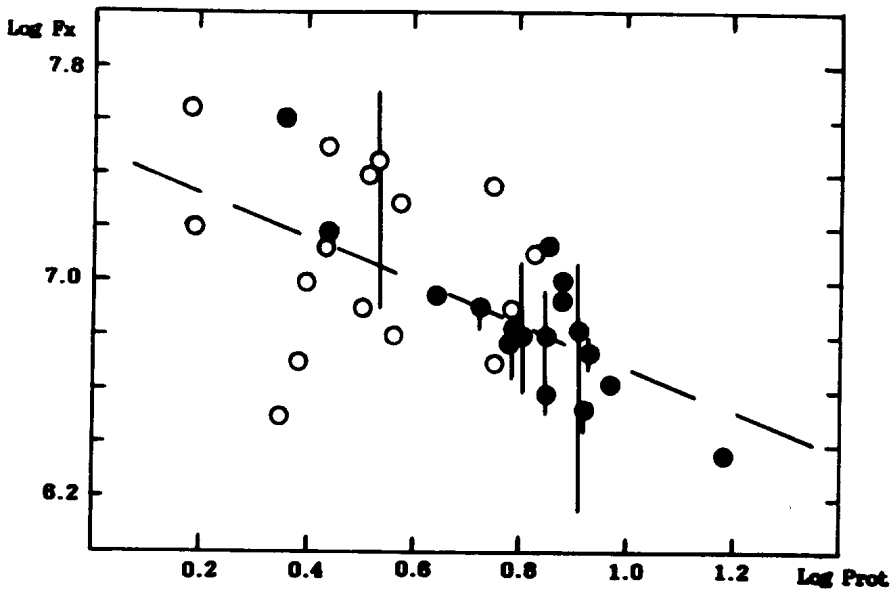

Figure 2. Dependence of x-ray flux on rotation period for TTS.
WTTS are shown as empty circles and CTTS as filled circles.

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