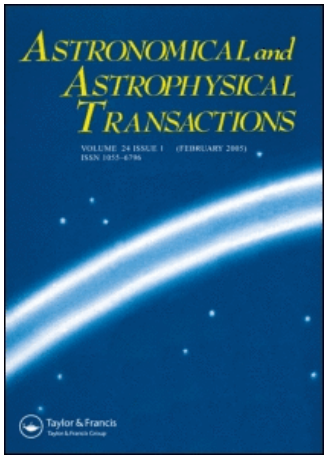

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UBV PHOTOELECTRIC PHOTOMETRY OF YOUNG STARS

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The results of UBV photoelectric photometry of 21 young stars of different types are presented, in all more than 300 individual measurements. Comparison with other authors' data has been carried out, the most interesting variability cases have been mentioned.

KEY WORDS Stars, pre-main sequence, optical photometry

1 INTRODUCTION

In the 1940s Joy (1945) selected about ten variable stars in a separate group of T Tauri type objects, and Ambartsumyan (1947) related their peculiar characteristics to their young age. Thus, rational study of the stars which have not achieved the main sequence stage began. By now considerable observation material on the pre-main sequence evolution problem has been accumulated, and the latest catalogue by Herbig and Bell (1988) numbers 742 young objects.

One of the main peculiarities of these stars is variability of optical brightness with different temporal and amplitude characteristics. In this respect accumulation and systematization of photometry data obtained in different observatories presents obvious interest. The first catalogues have been compiled (Rydgren *et al.*, 1984; Herbst *et al.*, 1994), and, correspondingly, the works on statistical analysis of colour-colour diagrams have begun (e.g., Safier, 1995). Now the leading role in the interpretation of the characteristics of the young stars belongs to the accretion disc theory and recently Gullbring *et al.* (1998) have demonstrated the possibilities which these diagrams might have for this theory.

Compilation of photometry catalogues will make it possible to construct historical curves of young stars' brightness with the aim of revealing long-term variations (Levreault, 1990). On the other hand, at the beginning of the 1980s the first reports of the discovery of low-amplitude brightness variations in young stars with period up to 15 d appeared (e.g. Kappelmann and Mauder, 1981). This phenomenon is connected, first of all, with the presence of temperature inhomogeneities (cool or hot

Table 1. *UBV* photometry of T Tau.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
45283.467	9.87	1.16	0.54	45349.307	9.84	–	–
45284.498	9.90	1.13	0.61	45567.546	9.86	1.19	0.61
45285.443	9.86	1.18	0.52	45578.528	9.80	1.20	0.61
45286.424	9.85	1.16	0.51	45582.521	9.89	1.19	0.62
45296.458	9.84	1.16	0.50	45608.508	9.80	1.17	0.62
45300.596	9.86	1.13	0.53	45613.572	9.77	1.14	0.55
45303.427	9.82	1.14	0.53	45615.487	9.73	1.16	0.65
45316.380	9.82	1.15	0.43	45617.478	9.71	1.13	0.56
45325.464	9.78	1.16	0.80	45619.434	9.78	1.13	0.59
45326.286	9.83	1.17	0.53	45622.581	9.74	1.14	0.54
45327.298	9.85	1.17	0.59	45674.375	9.73	1.13	0.55
45328.415	9.86	1.13	0.55	45682.528	9.76	1.16	0.68

spots) on the surface of a rotating object. Gradually, certain observational material has been accumulated, but it has also been subjected to critical analysis (Gahm *et al.*, 1993).

The author has been carrying out UBV photoelectric observations of young stars for more than 20 years in the Crimean Laboratory of the Sternberg State Astronomical Institute of Moscow University. The present paper includes photometry of 21 objects, the observation results for four of them were published to a considerable extent earlier (Kolotilov, 1983a; 1986; 1987; 1989). A separate paper will be devoted to the photometry analysis. Our observations of the fuors FU Ori, V1515 Cyg and V1057 Cyg will also be presented separately (some of the results have already been reported, Kolotilov, 1990 and references therein).

2 OBSERVATIONS

Measurements of young stars' brightness were carried out on a 60cm Zeiss-1 telescope with the photoelectric *UBV* photometer (Lyuty, 1971). A 13″ diaphragm was used and a 27″ diaphragm – at nights with bad seeing; the data on the adopted comparison stars is given below. The observational errors in all bands do not exceed 0.03 mag if the star's brightness is about 10.0 mag and can reach 0.1 mag if the star's brightness approaches 15.0 mag. The photometry results are given in tables 1–12 (more than 300 individual *UBV* measurements).

3 RESULTS

T Tauri type stars. For this group of objects the comparison stars which were used are mentioned in the following papers by Kolotilov (1983b) for V1352 Aql and Zaijtseva (1978) for T Tau, DN Tau, DQ Tau and Haro 6–37.

Table 2. *UBY* photometry of V1352 Aql.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
45563.351	12.10	1.06	−0.01	46614.462	11.96	1.06	−0.05
45573.338	12.17	1.11	0.10	46615.448	11.93	1.19	–
45577.413	12.16	1.01	0.05	46617.398	11.93	1.01	0.15
45581.404	12.24	1.08	−0.07	46619.434	12.03	1.08	−0.17
45622.232	12.13	1.02	−0.23	46627.371	11.81	0.99	0.51
45624.187	11.64	0.96	0.10	46644.463	11.85	0.99	0.11
45634.170	11.97	0.93	−0.16	46671.365	11.87	1.05	0.19
45636.215	11.94	1.06	−0.32	46672.341	11.91	0.98	0.17
45657.174	12.15	1.11	−0.07	46674.303″	11.65	1.01	0.11
45659.185	12.01	1.03	0.02	46681.345″	11.71	0.94	0.23
45826.523	12.62	1.12	−0.16	46682.311	11.97	1.06	0.15
45877.331″	12.22	0.95	−0.05	46683.285	12.22	0.91	0.24
45879.453	12.06	1.03	−0.02	47013.321	12.17	0.92	−0.04
45880.318	12.05	1.04	0.02	47079.215″	12.24	1.11	0.03
45884.488	12.07	1.07	−0.16	47419.272	11.89	1.10	−0.05
45905.431	12.12	0.97	0.17	47421.269	12.03	1.07	−0.02
45907.436	12.44	1.06	−0.08	47712.348	12.17	0.95	−0.22
45913.418	12.33	1.19	0.10	47716.463	12.36	1.11	0.00
45942.431	12.41	1.07	0.10	48091.341	12.27	0.89	0.00
45944.408	12.50	1.15	−0.30	48097.363	12.34	1.08	−0.12
46208.471	12.36	1.07	0.08	48100.354	12.39	0.96	−0.30
46260.448	12.40	1.21	−0.20	48105.370	12.10	1.06	−0.11
46265.430	12.23	1.19	−0.19	48457.392	12.56	1.17	−0.16
46328.230	12.53	–	–	48478.345	12.52	1.07	−0.09
46330.220	11.98	1.09	0.08	48481.351	12.33	1.06	−0.03
46344.211	12.45	1.18	0.11	48746.487″	12.30	1.11	−0.01
46380.158″	12.20	1.17	−0.20	48747.481″	12.34	1.12	−0.18
46408.151	12.28	1.11	0.26	48748.461	12.65	1.05	−0.20

Note: Sign ″ marks the observations with 27″ diaphragm.

T Tau (Table 1). The long-term patrol *UBV* observations of T Tau have been conducted by Zaijtseva (1989) and our photometry complements these measurements in the JD 2445283–...5682 time interval.

V1352 Aql=AS353 (Table 2). According to the observations by Cohen and Kuhi (1979) approximately 7″ to the south of the main star A there is a weak satellite B of spectral type M0, difference in companions brightness is delta $V \approx 2$ mag. Accordingly, when measuring V1352 Aql, we were shifting the image of the main star from the 13″ diaphragm center to the south in order to withdraw the satellite beyond its border (Minikulov and Shakhovskaya, 1989, conducted their observations in the same way).

Besides, during several nights separate BV observations of companion *B* were carried out. They showed that it is also a variable object and the difference delta

Table 3. *UBV* photometry of DN Tau.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
45674.429	12.56	1.39	0.41	47549.171	12.39	1.38	1.09
46062.495	12.40	1.35	0.96	47569.519	12.40	1.29	1.05
46064.394	12.45	1.37	0.67	47570.233	12.40	1.42	1.05
46081.361	12.39	1.40	0.86	47861.377	12.28	1.34	0.54
46092.227	12.36	1.30	0.47	47920.251	12.29	1.34	0.54
46112.323	12.40	1.36	0.69	48150.493	12.35	1.27	0.43
46320.558	12.42	1.38	0.70	48159.489	12.25	1.24	0.19
46466.308	12.43	1.19	0.28	48276.228	12.35	1.39	0.71
46774.448	12.20	1.23	0.14	48535.488	12.40	1.31	0.38
47202.321	12.33	1.34	0.48	48540.465	12.35	1.29	0.22
47540.228	11.97	1.05	−0.11	48543.514	12.35	1.36	0.57
47548.199	12.25	1.48	0.27				

V between *A* and *B* has never been registered less than 2 mag. The satellite is red, the colour index (*B–V*) > 1.4. It agrees well with the results by Cohen and Kuhi (1979).

As for the main companion *A*, according to our data, its brightness in the band *V* changed within the limits from 11.6 to 12.6 mag. Cases of sufficiently rapid variability up to delta $V \approx 0.5$ mag during two days were observed, for instance, in the process of outburst activity during JD 2445622–...5636 period.

DN Tau (Table 3). In general, our observations of DN Tau widen the limits of its brightness variability, which were registered earlier (Vrba *et al.*, 1993 and references

Table 4. *UBV* photometry of Haro 6–37 and DQ Tau.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
		Haro 6–37		48277.209	14.13	1.41	0.02
46301.550	13.82	1.76	–	48512.510	13.34	1.58	0.76
46325.569	13.90	1.54	–	48535.470	13.88	1.41	0.43
46379.563	14.21	1.56	−0.08	48540.449	13.90	1.62	0.45
46407.258	14.39	1.18	−0.08	48546.319	13.46	1.98	0.50
46467.231	13.52	1.60	0.19	49040.182	13.45	1.60	0.60
46469.267	14.29	1.46	0.00			DQ Tau	
47569.328	13.42	1.69	0.12	47127.302	13.60	1.22	0.68
47570.257	13.88	1.83	–	47569.317	13.66	1.49	1.27
47861.432	13.50	1.55	0.54	47861.427	13.51	1.42	0.49
48150.511	13.56	1.64	0.59	48150.517	13.58	1.57	0.64
48159.499	13.27	1.66	0.42	48546.328	13.62	1.73	−0.19
48276.211	14.05	1.46	0.05				

Table 5. *UBV* photometry of YY Ori type stars.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
		YY Ori		46407.538	13.86	1.07	−0.44
46035.561	13.44	–	–	46467.255	13.75	–	–
46378.537	14.17	0.61	−0.45			SY Ori	
		XX Ori		45296.498	13.74	0.71	−0.31
45286.545	15.41	0.91	−0.68	45300.575	13.83	0.68	0.02
		BO Ori		45326.518	13.68	0.83	−0.40
45642.592	14.08	1.21	0.14	45327.335	13.68	0.81	−0.67
		P 1931		45327.352	13.72	0.72	−0.19
45626.593	13.92	1.27	0.22	45349.345	13.65	–	–
45642.545	13.95	1.01	−0.24	45619.584	13.88	0.97	−0.39
45733.269	13.85	1.15	0.11	45642.600	13.38	0.74	−0.43

therein). It was proved, in particular, by the data in the JD 2447540–...7549 time interval, when a drop in an outburst phenomenon took place and a negative value of a colour index (*U–B*) was observed, which has never been mentioned before by other authors.

Haro 6–37 (Table 4). As it was mentioned in the paper by Cohen and Kuhi (1979), the Haro 6–37 object is a visual binary system (r = 2.7″, p.a. = 37°), i.e., during our observation time the common brightness of the companions was measured. According to the infra-red photometry results of Monetti and Zinnecker (1991), the individual components of system in terms of their physical characteristics are similar. According to our data, the Haro 6–37 brightness in the band *V* was changing within sufficiently wide limits from 13.3 to 14.4 mag, moreover, there were cases of rapid variations (delta $V \approx 0.8$ mag, JD 2446467–...6469). The noticeable variability of the object was also reported by Richter *et al.* (1992) according to the observations with the CCD photometer.

DQ Tau (Table 4). The greater part of our DQ Tau *UBV* photometry has already been published (73 nights, Kolotilov, 1989) and included in the computer-based catalogue, compiled by Herbst *et al.* (1994). The latest spectral observations of the star have revealed that it is a close binary system with the orbital period of $\approx$ 15.8 d (Mathieu *et al.*, 1997; Basri *et al.*, 1997). Moreover, having compared the spectral data with the photometry in general, the authors established dependence of the system brightness variations from an orbital period – when the companions get closer and the rate of mass accretion increases, the DQ Tau becomes brighter.

YY Orion type stars. At the end of the 1950s Walker (1961) according to spectral observations of young objects found out line profiles of the inverse P Cyg type in some of them, which directly points to the process of matter accretion. He named them the YY Ori type stars after the star which was discovered first. We observed 12 objects of this type from the Mundt and Bastian (1980) catalogue – five in Orion (comparison star see Kolotilov, 1986), five – in Taurus (comparison

Table 6. *UBV* photometry of DR Tau.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
46685.511	11.21	0.61	−0.66	47549.177	11.41	0.61	−0.50
46686.530	11.73	0.66	−0.77	47569.311	11.99	0.74	−0.25
46710.529	11.62	0.67	−0.60	47570.252	11.83	0.77	−0.22
46774.467	11.75	0.71	−0.38	47861.422	11.90	0.67	−0.54
47092.512	11.57	0.74	−0.77	47971.243	10.96	0.61	−0.55
47093.445	11.73	0.74	−0.65	48150.521	11.47	0.63	−0.57
47127.283	12.70:	0.92:	−0.37 :	48159.505	11.93	0.69	−0.38
47184.330	11.50	0.61	−0.56	48273.367	11.29	0.64	−0.49
47417.468	11.71	0.85	–	48276.208	11.79	0.72	−0.48
47536.213	11.73	0.72	−0.77	48277.207	11.28	0.63	−0.35
47536.404	11.34	0.63	−0.68	48512.505	12.10	0.76	−0.50
47540.239	11.35	0.53	−0.36	48535.467	11.38	0.68	−0.41
47547.196	12.00	0.61	−0.67	48540.444	11.69	0.72	−0.42
47548.175	12.20	0.61	−0.77	49040.177	11.95	0.77	−0.43

stars see Zaijtseva, 1978) and two – in Monoceros (the stars NN 196 and 212 from the Kasanasmas *et al.*, 1982, catalogue, as comparison stars).

Orion: YY, XX, BO and SY Ori and P1931 (Table 5). Practically all our observations of YY Ori itself have already been published (37 nights, Kolotilov, 1986). Later Bertout *et al.*, (1996) using this and his own data revealed the photometric period $P \approx 7$ d, but the next measurements cycle by Harder *et al.* (1998) did not show any periodicity.

Our XX Ori, BO Ori and P1931 photometry is consistent with the Mundt and Bastian (1980) data, but it is necessary to mention that in general these three objects have not been observed properly yet.

According to Mundt and Bastian (1980), the SY Ori star is sufficiently active in its photometric behavior, the variability amplitude is delta $V \approx 0.9$ mag. Our observations also point to the rapid object's variability in ultra-violet – delta $U \approx 0.4$ mag during delta $t \approx 30$ min in JD 2445327.

DR Tau (Table 6). The greater part of our DR Tau photometry has already been published (80 nights, Kolotilov, 1987). The new data not only confirms the noticeable brightness variability during a 24-hour period registered earlier (e.g., delta $V \approx 0.8$ mag, JD 2447548–...7549), but also points to rapid variability during hours (delta $V \approx 0.4$ mag during delta $t \approx 4$ h in JD 2447536). As for the cause of the photometric activity, Kenyon *et al.*, (1994) have recently worked out an accretion model with a magnetic field for DR Tau.

AA Tau (Table 7). According to other authors' observations (Vrba *et al.*, 1989; 1993), the star is very active in its photo metric behavior. Our data, first, widen the general limits of brightness variability; in the band V it is from 11.6 mag (JD 2446852) to 14.5 mag (JD 2447861). Second, our data confirm the object's

Table 7. *UBV* photometry of AA Tau.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
45623.531	13.93	1.23	0.24	46706.479	13.30	1.16	−0.10
45674.405	13.13	1.39	0.76	46710.555	12.60	1.33	0.29
46062.488	12.79	1.30	0.30	46774.440	12.61	1.19	0.19
46064.387	13.16	1.24	−0.07	46852.248	11.63:	0.55	−0.44
46081.354	12.54	1.02	−0.17	47202.314	12.54	1.19	−0.08
46092.221	13.18	1.31	0.25	47208.325	12.77	1.18	0.10
46112.317	12.62	1.34	0.45	47540.235	12.65	1.17	−0.05
46119.286	12.56	1.22	0.44	47569.351	12.86	1.22	0.67
46320.551	12.87	1.07	−0.18	47570.241	12.74	1.20	−0.06
46325.538	12.83	1.19	0.05	47861.451	14.46	1.23	0.38
46328.559	12.77	1.19	0.03	47920.244	12.80	1.12	−0.01
46357.609	12.83	1.45	−0.05	48150.483	12.88	1.33	0.02
46379.588	13.06	1.28	−0.01	48159.482	12.80	1.11	0.08
46406.519	13.06	1.31	0.23	48237.535	12.90	1.25	0.36
46407.278	12.76	1.24	−0.13	48272.281	12.90	1.34	0.58
46410.243	13.13	0.86	−0.44	48273.260	12.98	1.31	0.45
46413.222	13.09	1.32	0.38	48276.222	13.07	1.34	0.44
46464.321	12.73	1.42	0.92	48277.214	12.85	1.30	0.57
46466.285	12.73	1.25	0.30	48298.369	12.91	1.14	0.04
46467.241	12.69	1.07	−0.13	48512.522	13.05	1.34	0.19
46468.317	13.58	1.33	0.41	48535.483	12.91	1.33	0.24
46469.278	12.74	1.05	−0.07	48540.461	12.73	1.23	0.03
46686.535	12.37	1.68	0.67	48543.509	12.87	1.33	0.44
46703.551	12.60	1.20	0.10	49040.197	13.22	1.12	0.85

rapid variability character, which reaches delta $V \approx 0.9$ mag during 24 hours (JD 2446467–...6469).

DM Tau (Table 8). The star is weak, according to the Mundt and Bastian (1980) catalogue, the average mean of seven measurement nights is $V \approx 13.92$ mag. Our data (18 nights) widen the limits of the V brightness variation and the colour indices (U–B) and (B–V), given in this catalogue.

CI Tau and DL Tau (Table 9). Our observations of these objects are few and the obtained *UBV* values agree with the limits of photometric variability, given by Mundt and Bastian (1980) and Safier (1995).

MM Mon and MO Mon (Table 9). Our observations of these weak stars are very few and they conform well with other authors' scanty data (Mundt and Bastian, 1980).

The possible fuor V1331 Cyg (Table 10). Among young stars a scanty group of objects with novalike brightening, called fuors, was singled out a long time ago (Herbig, 1977). According to McMuldrock *et al.* (1993) the V1331 Cyg star is now in a pre-fuor stage, i.e. it has to show an eruptive phenomenon in future.

Table 8. *UBV* photometry of DM Tau.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
45642.488	14.18	1.26	−0.38	46469.284	14.06	1.04	−0.36
45674.388	13.84	0.88	−0.34	47202.345	13.53	0.78	0.12
46320.571	13.79	1.02	−0.35	47569.365	14.02	0.73	0.09
46325.547	14.29	1.35	0.02	48150.503	14.02	1.00	−0.23
46328.552	14.29	1.29	−0.19	48158.447	14.02	1.02	−0.35
46379.574	14.28	1.43	−0.20	48276.198	14.04	1.17	−0.39
46407.285	14.05	1.28	−0.23	48535.508	14.00	1.18	−0.53
46466.308	14.16	1.14	−0.33	48540.475	13.81	0.94	−0.55
46468.327	14.07	0.97	−0.18	48543.525	13.85	1.00	−0.36

Our photometry of this object in 1976–1982 has already been published (65 nights, Kolotilov, 1983b), in 1986–1994 observations were conducted by Shevchenko *et al.* (1991), Fernandez and Eiroa (1996) and Mel'nikov (1997). The data presented in this paper, belong to the period of 1983–1986 and fills in a certain 'gap' in the long-term V1331 Cyg brightness curve.

Exor VY Tau (Table 11). A group of young objects with recurrent brightness outbursts (the so called exors) was singled out several years ago, and the VY Tau star is one of them (Herbig, 1990). The observations by Grankin *et al.* (1991) show that in 1981–1991 the object was in an inactive state, and our data agree with this result.

Ae/Be Herbig stars. These objects are young stars, but more massive than the T Tau type stars (Herbig, 1960). Our programme included two objects: MWC 1080 = V 628 Cas (for the comparison star see Goransky and Kolotilov, 1988) and LkHα 25 = W 90 = V 590 Mon (the comparison star number 127 from the catalogue by Kasanasmas *et al.*, 1982).

Table 9. *UBV* photometry of YY Ori type stars.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
		CI Tau				MO Mon	
48159.523	12.96	1.24	−0.11	47207.372	13.82	0.95	−0.02
48540.465	13.12	1.29	−0.40	47208.376	13.93	0.84	0.31
48543.514	12.98	1.29	−0.04			MM Mon	
		DL Tau		47208.385	14.03	0.72	−0.24
48540.441	12.72	0.94	−0.36				
48543.501	12.83	0.91	−0.10				
49040.247	13.35	0.88	−0.16				

Table 10. *UBV* photometry of the possible fuor V 1331 Cyg.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
45433.579	12.43	1.09	0.31	45608.461	12.12	1.02	0.22
45448.511	12.32	1.13	0.41	45617.386	12.13	1.09	0.36
45466.470	12.19	1.09	0.30	45622.278	12.11	1.08	0.45
45470.463	12.16	1.07	0.32	45624.225	12.20	1.02	0.38
45522.466	12.11	1.06	0.35	45634.231	12.13	1.08	0.50
45523.456	12.17	1.06	0.33	45636.264	11.94	1.01	0.51
45525.455	12.47	1.04	0.26	45642.331	12.20	1.07	0.45
45530.341	12.07	1.09	0.48	45657.238	12.26	–	–
45531.338	12.04	1.07	0.44	45659.233	12.25	1.09	0.56
45532.460	12.08	1.07	0.42	45673.142	12.09	1.09	0.47
45551.488	12.13	1.04	0.25	45691.239	12.33	1.10	0.57
45552.526	12.04	1.06	0.36	45793.585	12.15	–	–
45562.515	12.31	1.05	0.22	45796.580	12.24	–	–
45566.485	12.13	1.05	0.30	45826.497	12.01	1.02	0.31
45567.512	12.00	1.07	0.32	45874.461	12.31	1.14	0.48
45571.358	12.08	–	–	45880.365	12.04	1.05	0.35
45573.362	12.12	1.06	0.38	46035.231	12.27	1.08	0.48
45578.488	12.08	1.04	0.52	46262.441	12.31	1.06	0.28
45582.486	12.16	1.12	0.48	46408.202	11.92	1.03	0.21
45591.413	12.17	1.10	0.60	46706.375	11.91	1.08	0.38

V 628 Cas (Table 12). According to our *UBV* measurements the V 628 Cas average brightness value $V = 11.53$ mag and the color indices $(B - V) = 1.48$ and $(U - B) = 0.09$; the cases of rapid variability with the amplitude delta $V = 0.2$ mag per 24 hours have been observed. All this agrees well with the character of the star photometric variability, given by Shevchenko (1989, p.186 and Table 6.1).

V 590 Mon (Table 12). As follows from different authors' measurements, collected by Shevchenko (1989, Table 6.1), V 590 Mon on the average is a weak object, but with considerable brightness variability amplitude (delta V up to 1 mag). Our observations are in accord with this data.

Table 11. *UBV* photometry of the exor VY Tau.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
48159.541	13.78	1.45	1.09	48512.531	13.62	1.48	1.01
48277.235	13.59	1.42	1.01	48535.529	13.74	1.46	1.22
48294.345	13.74	1.39	1.35	48540.493	13.74	1.45	0.97
48298.359	13.77	1.48	0.78	48543.542	13.75	1.50	0.87

Table 12. *UBV* photometry of the Ae/Be Herbig stars.

JD 24..	*V*	*B − V*	*U − B*	*JD 24..*	*V*	*B − V*	*U − B*
		V 628 Cas		45947.467	11.64	1.42	0.01
45234.415	11.31	1.44	0.05	46380.217	11.55	1.39	0.12
45266.241	11.51	1.33	0.12	46382.278	11.53	1.35	0.16
45267.235	11.41	1.37	0.16	46388.264	11.59	1.32	0.21
45617.431	11.59	1.40	−0.01	46407.237	11.64	1.33	0.05
45622.317	11.52	1.46	−0.02	46682.379	11.55	1.33	0.12
45634.288	11.48	1.37	0.06			V 590 Mon	
45659.327	11.55	1.45	0.13	47207.349	12.67	0.25	−0.10
45913.466	11.65	1.46	0.03	47208.359	12.58	0.24	0.27
45946.521	11.44	1.34	0.17	47569.401	12.94	0.09	0.30

4 CONCLUSION

Our observations have considerably widened the scope of the known *UBV* photometry data for a great number of young objects. Interesting cases of rapid variability during 24-hours period and even during several hours have been registered. All this should be taken into consideration when developing theoretical models of young stars' activity.

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