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UBV PHOTOMETRY FOR THREE NEW VARIABLE STARS

From November 23 to December 3, 1992 and during March 7-11, 1993 UBV photoelectric photometry of several bright M type stars was carried out.

The 60 cm reflector of Beijing Astronomical Observatory is equipped with a DC photoelectric photometer. Standard UBV filters are employed by this photoelectric system. During the run of observations differential determination of brightness of the program stars was used. Information about our program, comparison, and check stars is given in Table 1.

Table 1. Properties of program (V), comparison (CO), and check (CH) stars.

Star	SAO	V	Sp.	R.A.(1950.0)	Dec.
V	037673	7 <sup>m</sup> .9	M8	1 <sup>h</sup> 55 <sup>m</sup> 37.3	45°11' 33"
CO	037668	8.0	K5	1 55 26.1	44 52 48
CH	037657	8.1	G5	1 55 0.3	45 15 14
V	056225	7.5	MA	3 8 11.5	37 52 53
CO	056202	7.1	K0	3 6 17.5	37 6 44
CH	056178	7.6	G0	3 4 28.7	36 25 45
V	024927	6.9	M0	4 52 48.8	59 2 34
CO	025088	6.4	K0	5 10 47.0	59 20 57
CH	025003	6.4	K0	5 1 50.6	58 57 15

At each night three sets of stars listed in Table 1 were observed and UBV photoelectric observations of each set of stars (V, CO, CH) were usually made several times at different zenith distances. Therefore the observations of more than two comparison or check stars can be used for calculation of atmospheric extinction coefficients in UBV bandpasses. Average value of extinction coefficients derived from more than two stars was used to correct for extinction for each observation. For the first and second sets of stars in Table 1, differential magnitude was determined by subtracting the mean magnitude of comparison and check stars from magnitude of program star. For the last set of stars, because check star SAO 025003 is a variable (Wahlgren G., 1992, *AJ*, **104**, 1174) only one comparison star was used in reduction, therefore differential magnitude was magnitude difference between the program and comparison star. The resulting data were reduced to Johnson system through transformation equation given later. Light curves in V bandpass for three program stars are shown in Figures 1, 2 and 3. In Figures 1 and 2 filled circles show differential magnitudes of program stars and open circles magnitude differences between comparison and check stars. In Figure 3 filled circles indicate differential magnitudes of program star, open circles magnitudes of the comparison star. The light curves with open

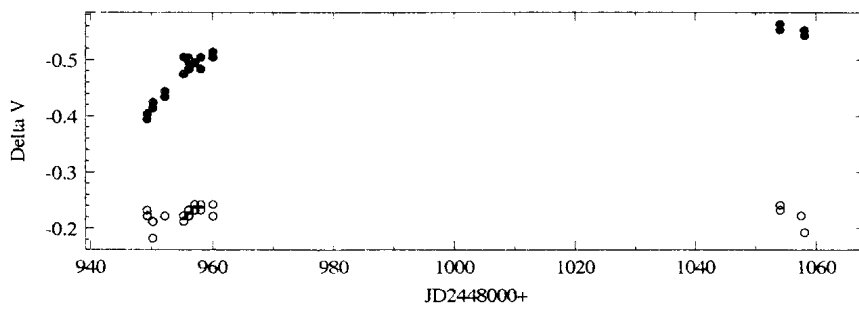


Figure 1. V light curve for SAO 037673.

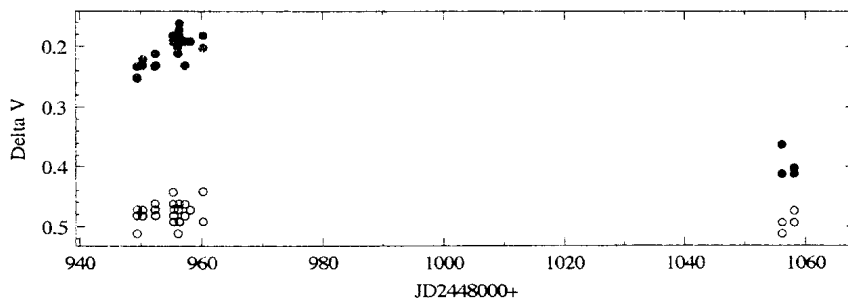


Figure 1. V light curve for SAO 056225.

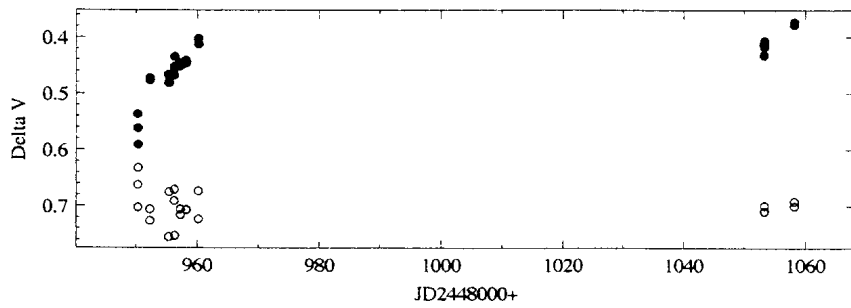


Figure 1. V light curve for SAO 024927.

Table 2. Photometric data for SAO 037673.

JD2448000+	U	B	V
949.184	9.784	9.043	7.449
949.200	9.786	9.048	7.454
949.213	9.784	9.043	7.449
950.125	9.723	8.991	7.401
950.134	9.793	9.026	7.436
950.142	9.808	9.026	7.446
952.080	9.778	8.986	7.404
952.084	9.753	8.976	7.414
955.196	9.704	8.948	7.359
955.204	9.675	8.973	7.369
955.213	9.695	8.963	7.364
955.992	9.630	8.902	7.317
956.000	9.685	8.922	7.342
956.113	9.809	9.027	7.407
956.121	9.784	9.002	7.392
957.050	9.710	8.946	7.361
957.059	9.709	8.926	7.346
958.009	9.724	8.941	7.356
958.017	9.704	8.941	7.352
960.030	9.710	8.933	7.349
960.038	9.690	8.919	7.329
1053.980	9.732	8.963	7.297
1053.992	9.628	8.938	7.282
1057.988	9.717	8.933	7.297
1057.996	9.663	8.948	7.302

Table 3. Photometric data for SAO 056225.

JD2448000+	U	B	V
949.309	10.885	9.028	7.309
949.321	10.880	9.033	7.314
949.334	10.980	9.033	7.299
950.184	10.790	9.018	7.301
950.196	10.790	9.008	7.286
950.209	10.979	9.028	7.282
952.200	11.053	9.040	7.295
952.209	11.063	9.025	7.290
952.329	10.914	9.000	7.275
952.363	10.825	8.990	7.294
955.238	10.826	9.004	7.254
955.250	10.959	9.004	7.264
955.292	10.840	8.984	7.239
955.300	10.850	8.949	7.224
955.363	10.826	8.974	7.254
955.371	10.850	8.964	7.249
956.046	10.844	8.924	7.200
956.059	10.884	8.968	7.240
956.205	10.924	9.018	7.255
956.217	10.969	9.063	7.300
956.280	10.904	9.023	7.260
956.288	10.874	8.968	7.240
957.155	10.931	9.000	7.249
957.171	10.921	9.020	7.299
958.096	10.953	8.992	7.259
958.109	10.978	8.987	7.249
960.129	10.758	8.989	7.247
960.142	11.045	8.999	7.262
1056.050		9.156	7.390
1056.092		9.262	7.510
1058.050	10.981	9.179	7.464
1058.059	11.055	9.190	7.474

Table 4. Photometric data for SAO 024927.

JD2448000+	U	B	V
950.246	10.235	8.369	6.696
950.259	10.205	8.349	6.681
950.271	10.225	8.344	6.681
952.221	10.058	8.304	6.636
952.230	10.093	8.294	6.660
955.259	10.098	8.335	6.694
955.267	10.088	8.320	6.679
955.338	10.023	8.259	6.614
955.342	10.008	8.245	6.604
956.159	9.995	8.254	6.601
956.167	10.035	8.244	6.597
956.254	10.080	8.294	6.646
956.259	10.115	8.324	6.666
957.184	10.079	8.268	6.625
957.196	10.063	8.272	6.610
958.117	10.052	8.254	6.611
958.125	10.067	8.250	6.606
958.155	10.087	8.270	6.611
960.155	9.991	8.204	6.543
960.163	10.051	8.254	6.583
1053.150	10.206	8.258	6.599
1053.163	10.072	8.213	6.578
1053.188	9.845	8.238	6.574
1053.200	10.012	8.208	6.573
1058.071	10.112	8.209	6.535
1058.079	10.147	8.209	6.521

circles in all figures were shifted vertically to compare clearly with light curves of program stars.

For scientific analysis of photoelectric observations from different observers it is necessary to reduce the observations of these variables with longer timescales to the standard system. In the run of our observations 12 Johnson standard stars in Praesepe were also observed on three nights. After correcting for extinction, least squares fit was applied to the observations of these 12 standard stars. The following equations were obtained.

$$V=v+(0.012\pm 0.018)(B-V)+(7.823\pm 0.012)$$

$$B-V=(0.985\pm 0.006)(b-v)+(0.552\pm 0.002)$$

$$U-B=(0.991\pm 0.011)(u-b)-(1.105\pm 0.017),$$

where U, B and V are magnitudes in the standard system, u, b and v instrumental magnitudes after correction for extinction. Our photometric observations were finally reduced to Johnson system by the above equations. The UBV magnitudes are listed in Tables 2, 3 and 4 respectively.

Our limited observations have well indicated that stars SAO 037673, SAO 056225 and SAO 024927 are variable stars. The standard error of a typical observation in V bandpass is about 0.01 mag., however, the observations in U show larger scatter than that in B and V. The UBV light curves of stars SAO 037673, SAO 056225 and SAO 024927 derived from our observations show significant variations. They are small-amplitude red variables with period probably greater than 30 days.

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