Peremennye Zvezdy (*Variable Stars*) **40**, No. 5, 2020

Received 14 September; accepted 25 September.

DOI: 10.24411/2221-0474-2020-10006

BVI_c CCD Observations of the RR Lyrae variable T Men

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We present 3296 magnitude measurements in the B, V, and I_c filters acquired for the RR Lyrae star T Men.

1 Introduction

The high luminosity and large age of RR Lyrae variables make them ideal distance indicators and tracers for studies of the structure and kinematics of old Galactic subsystems, the halo and the thick disk. However, by 2011, the number of RR Lyrae variables with precise photometry in the extended solar neighborhood was rather limited – a total of about 300 stars (Dambis, 2009). This is why we started a program aimed at obtaining photometric observations for the greatest possible number of RR Lyraes. We published the first results of our photometric observations in our previous paper (Berdnikov et al., 2012), where we suspected the presence of Blazhko effect (Blazhko, 1907) in several stars, including T Men.

We continued to observe T Men, and here we present the results of our photometry.

2 Observational data

We performed CCD observations of T Men during three observing runs (in the JD 2455896 – 56676 range) with the 76-cm telescope of the South African Astronomical Observatory (SAAO) using a SBIG CCD ST-10XME camera equipped with BVI_c-band filters of the Kron–Cousins photometric system (Cousins, 1976). A description of the observing data reduction technique can be found in our previous paper (Berdnikov, 2012). We acquired a total of 2722 CCD frames with photometric errors close to 0.01 mag.

We also used the Las Cumbres Observatory Global Telescope (LCOGT) Network (Brown, 2013) to acquire 574 CCD BVI_c frames during the time interval JD 2456635 – 56687. We reduce LCOGT observations by performing differential photometry relative to secondary standards whose magnitudes we determined based on observations made in SAAO; the photometric errors of these observations are close to 0.02 mag.

All observations are available in a text file in the html version of the paper.

The light curves are shown in Fig. 1, where the enhanced scatter of points supports the presence of Blazhko effect. We plan to use our data to search for the Blazhko effect period of T Men.

On the base of our observations we constructed the B-, V- and I_c-band template curves which are presented in Table 1 and Fig. 2; together with them we present the g'-band template curve, based on observations from the ASAS-SN catalog (Jayasinghe et al., 2019). Table 1 lists the B-, g'-, V- and I_c-band magnitudes of T Men at phases from 0 to 0.995 with a step of 0.005.

We plan to use these templates to study the behavior of pulsating period of T Men.

Acknowledgments: This work was supported by the Russian Foundation for Basic Research (project nos. 18-02-00890 and 19-02-00611).

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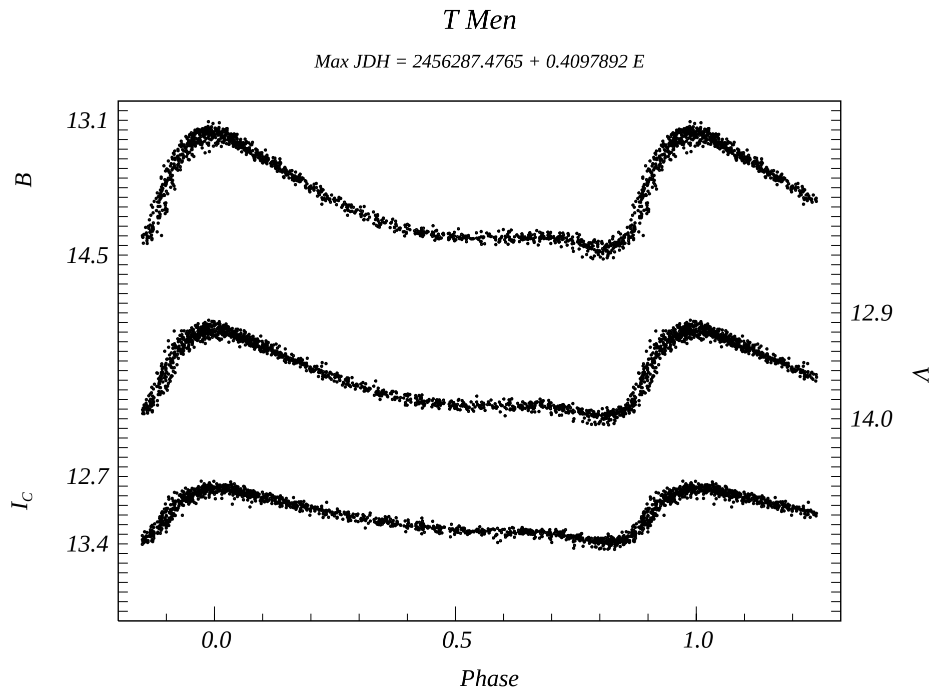

Figure 1. BVI_c phased light curves of the RR Lyrae type star T Men. The enhanced scatter is due to the Blazhko effect.

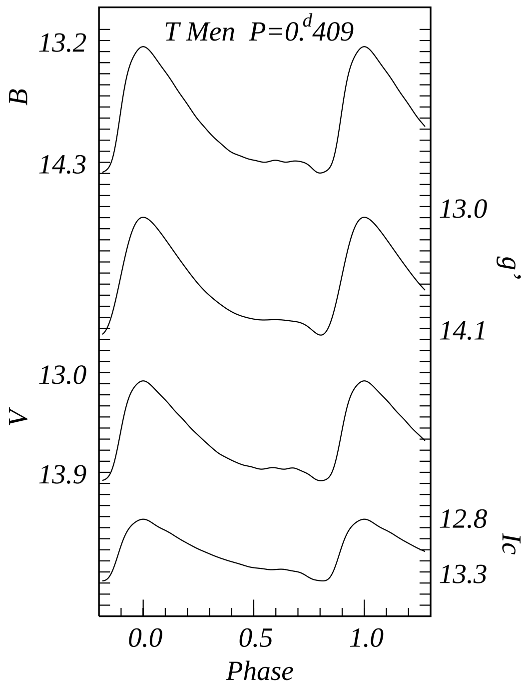

Figure 2. The B-, g'-, V- and I_c-band template curves of T Men.

Table 1. B-, g'-, V- and I_C -band template curves of T Men

Phase	B	g'	V	I_C	Phase	B	g'	V	I_C
0.000	13.255	13.096	13.074	12.824	0.500	14.280	14.016	13.856	13.262
0.005	13.256	13.097	13.075	12.824	0.505	14.283	14.018	13.859	13.263
0.010	13.260	13.100	13.078	12.826	0.510	14.285	14.019	13.863	13.264
0.015	13.266	13.104	13.082	12.829	0.515	14.287	14.020	13.865	13.265
0.020	13.273	13.110	13.088	12.833	0.520	14.289	14.021	13.868	13.266
0.025	13.283	13.117	13.096	12.838	0.525	14.292	14.022	13.870	13.267
0.030	13.293	13.125	13.104	12.843	0.530	14.294	14.023	13.871	13.268
0.035	13.305	13.134	13.113	12.849	0.535	14.296	14.024	13.871	13.269
0.040	13.317	13.144	13.123	12.856	0.540	14.298	14.024	13.871	13.271
0.045	13.330	13.154	13.133	12.863	0.545	14.299	14.024	13.870	13.272
0.050	13.344	13.165	13.143	12.870	0.550	14.299	14.024	13.868	13.274
0.055	13.358	13.177	13.153	12.876	0.555	14.299	14.024	13.867	13.275
0.060	13.372	13.189	13.164	12.882	0.560	14.297	14.023	13.865	13.277
0.065	13.386	13.201	13.175	12.889	0.565	14.295	14.023	13.863	13.278
0.070	13.400	13.214	13.185	12.894	0.570	14.292	14.023	13.861	13.279
0.075	13.414	13.227	13.195	12.900	0.575	14.290	14.022	13.859	13.279
0.080	13.428	13.240	13.205	12.905	0.580	14.287	14.022	13.858	13.280
0.085	13.442	13.253	13.215	12.910	0.585	14.284	14.021	13.858	13.280
0.090	13.456	13.267	13.226	12.915	0.590	14.283	14.021	13.858	13.279
0.095	13.469	13.281	13.236	12.920	0.595	14.281	14.021	13.859	13.278
0.100	13.483	13.295	13.246	12.925	0.600	14.281	14.021	13.860	13.278
0.105	13.496	13.309	13.257	12.930	0.605	14.282	14.021	13.862	13.277
0.110	13.510	13.323	13.268	12.935	0.610	14.284	14.021	13.864	13.276
0.115	13.524	13.337	13.279	12.940	0.615	14.286	14.022	13.866	13.275
0.120	13.539	13.351	13.291	12.946	0.620	14.289	14.022	13.868	13.275
0.125	13.554	13.365	13.303	12.952	0.625	14.292	14.023	13.870	13.275
0.130	13.569	13.380	13.314	12.958	0.630	14.295	14.024	13.871	13.275
0.135	13.585	13.394	13.326	12.965	0.635	14.297	14.025	13.872	13.276
0.140	13.601	13.408	13.338	12.971	0.640	14.298	14.026	13.871	13.278
0.145	13.616	13.422	13.349	12.977	0.645	14.298	14.027	13.870	13.279
0.150	13.632	13.436	13.360	12.984	0.650	14.298	14.028	13.869	13.281
0.155	13.647	13.450	13.370	12.990	0.655	14.297	14.030	13.866	13.283
0.160	13.662	13.464	13.380	12.996	0.660	14.295	14.031	13.864	13.285
0.165	13.677	13.478	13.391	13.002	0.665	14.293	14.032	13.862	13.287
0.170	13.691	13.492	13.401	13.008	0.670	14.292	14.033	13.861	13.289
0.175	13.705	13.506	13.411	13.014	0.675	14.290	14.035	13.860	13.291
0.180	13.719	13.520	13.422	13.019	0.680	14.289	14.036	13.861	13.292
0.185	13.733	13.533	13.433	13.025	0.685	14.288	14.037	13.863	13.294
0.190	13.747	13.547	13.444	13.030	0.690	14.288	14.039	13.865	13.296
0.195	13.761	13.561	13.455	13.036	0.695	14.288	14.041	13.869	13.297
0.200	13.776	13.574	13.467	13.041	0.700	14.290	14.043	13.873	13.300
0.205	13.791	13.587	13.478	13.047	0.705	14.291	14.045	13.878	13.302
0.210	13.806	13.601	13.489	13.052	0.710	14.293	14.048	13.882	13.306
0.215	13.821	13.614	13.500	13.058	0.715	14.295	14.051	13.887	13.310
0.220	13.836	13.627	13.510	13.063	0.720	14.297	14.055	13.891	13.314
0.225	13.851	13.639	13.521	13.068	0.725	14.300	14.060	13.895	13.319
0.230	13.866	13.652	13.530	13.074	0.730	14.304	14.065	13.899	13.325
0.235	13.880	13.665	13.540	13.079	0.735	14.309	14.071	13.904	13.331
0.240	13.893	13.677	13.549	13.084	0.740	14.314	14.077	13.909	13.338
0.245	13.906	13.689	13.558	13.089	0.745	14.320	14.084	13.915	13.344
0.250	13.919	13.700	13.567	13.093	0.750	14.328	14.092	13.921	13.350
0.255	13.931	13.712	13.577	13.098	0.755	14.337	14.100	13.928	13.355
0.260	13.943	13.723	13.586	13.102	0.760	14.346	14.108	13.936	13.360
0.265	13.954	13.734	13.596	13.107	0.765	14.356	14.117	13.943	13.364
0.270	13.966	13.745	13.605	13.111	0.770	14.366	14.125	13.950	13.368
0.275	13.977	13.755	13.615	13.115	0.775	14.375	14.134	13.957	13.371
0.280	13.989	13.765	13.624	13.120	0.780	14.383	14.141	13.963	13.373
0.285	14.000	13.775	13.633	13.124	0.785	14.389	14.148	13.968	13.375
0.290	14.012	13.784	13.642	13.128	0.790	14.394	14.154	13.972	13.377
0.295	14.023	13.794	13.651	13.132	0.795	14.396	14.158	13.974	13.378
0.300	14.034	13.803	13.659	13.137	0.800	14.397	14.160	13.975	13.379

Table 1. Continued.

Phase	B	g'	V	I_C	Phase	B	g'	V	I_C
0.305	14.045	13.811	13.668	13.141	0.805	14.396	14.160	13.976	13.380
0.310	14.056	13.820	13.677	13.145	0.810	14.394	14.158	13.975	13.380
0.315	14.066	13.828	13.686	13.149	0.815	14.391	14.153	13.973	13.380
0.320	14.075	13.837	13.695	13.153	0.820	14.387	14.146	13.970	13.380
0.325	14.085	13.845	13.703	13.157	0.825	14.382	14.135	13.967	13.377
0.330	14.094	13.853	13.711	13.161	0.830	14.375	14.121	13.962	13.373
0.335	14.103	13.861	13.719	13.165	0.835	14.368	14.104	13.955	13.367
0.340	14.111	13.869	13.726	13.168	0.840	14.357	14.083	13.945	13.359
0.345	14.120	13.876	13.733	13.172	0.845	14.344	14.058	13.932	13.347
0.350	14.129	13.884	13.739	13.175	0.850	14.326	14.031	13.916	13.333
0.355	14.138	13.891	13.745	13.179	0.855	14.302	13.999	13.895	13.315
0.360	14.147	13.898	13.750	13.182	0.860	14.272	13.965	13.869	13.294
0.365	14.156	13.906	13.755	13.186	0.865	14.235	13.928	13.838	13.270
0.370	14.165	13.913	13.761	13.189	0.870	14.191	13.889	13.802	13.243
0.375	14.173	13.919	13.766	13.192	0.875	14.140	13.847	13.761	13.214
0.380	14.182	13.926	13.771	13.195	0.880	14.082	13.803	13.717	13.184
0.385	14.190	13.932	13.776	13.198	0.885	14.019	13.757	13.669	13.153
0.390	14.197	13.938	13.781	13.201	0.890	13.953	13.711	13.618	13.122
0.395	14.204	13.944	13.786	13.205	0.895	13.885	13.664	13.566	13.091
0.400	14.210	13.950	13.791	13.207	0.900	13.817	13.617	13.514	13.061
0.405	14.215	13.955	13.796	13.210	0.905	13.751	13.570	13.464	13.033
0.410	14.220	13.960	13.800	13.213	0.910	13.688	13.524	13.415	13.007
0.415	14.224	13.965	13.805	13.216	0.915	13.630	13.479	13.370	12.982
0.420	14.228	13.969	13.809	13.219	0.920	13.578	13.435	13.328	12.961
0.425	14.231	13.974	13.814	13.221	0.925	13.531	13.393	13.290	12.941
0.430	14.235	13.978	13.818	13.224	0.930	13.489	13.354	13.256	12.924
0.435	14.239	13.981	13.822	13.227	0.935	13.453	13.316	13.227	12.909
0.440	14.243	13.985	13.826	13.230	0.940	13.422	13.282	13.202	12.896
0.445	14.247	13.988	13.829	13.233	0.945	13.395	13.250	13.180	12.884
0.450	14.250	13.992	13.833	13.237	0.950	13.371	13.222	13.161	12.874
0.455	14.255	13.995	13.835	13.240	0.955	13.350	13.196	13.144	12.865
0.460	14.259	13.998	13.838	13.243	0.960	13.331	13.174	13.130	12.857
0.465	14.262	14.000	13.840	13.246	0.965	13.314	13.154	13.118	12.850
0.470	14.266	14.003	13.842	13.249	0.970	13.300	13.138	13.107	12.843
0.475	14.269	14.005	13.844	13.252	0.975	13.286	13.125	13.097	12.837
0.480	14.272	14.008	13.846	13.254	0.980	13.275	13.114	13.089	12.833
0.485	14.274	14.010	13.848	13.257	0.985	13.267	13.106	13.083	12.829
0.490	14.276	14.012	13.851	13.259	0.990	13.260	13.101	13.078	12.826
0.495	14.278	14.014	13.853	13.260	0.995	13.256	13.097	13.075	12.824