

New late-type stars found in the BAO Plate Archive

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Abstract

The BAO Plate Archive low-resolution spectral plate centered $\alpha = +04^h$ $\delta = +24^0$ is analyzed to find new late-type stars. 25 new late-type stars have been detected. We have performed cross-correlations with GAIA DR3, USNO-B1.0, 2MASS, AllWISE, IRAS PSC/FSC, AKARI and SDSS. For new detected objects, we present luminosity classes estimated from Gaia DR3 and 2MASS photometry and available proper motions. The majority of the objects are red giants.

Keywords: *surveys-stars: late-type -stars, dwarf M stars, TESS and Gaia data*

1. Introduction

Byurakan Astrophysical Observatory (BAO) Plate Archive is one of the largest astronomical archives in the world. BAO archive holds some 37.000 astronomical plates, films or other carriers of observational data. It is the results of decades' hard work of Armenian astronomers and the work of BAO telescopes and other expensive equipment, as well as the results of their activities. A project on Digitization of BAO Plate Archive and creation of BAO Interactive Astronomical Database (shortly BAO Plate Archive project, BAO PAP) was aimed at preservation of BAO valuable observational material accumulated during 1947-1991 (Mikayelyan et al., 2021). The BAO Plate Archive low-resolution spectral plate centered at $\alpha = +04^h$ $\delta = +24^0$ were obtained at the Byurakan Astrophysical Observatory (BAO) on 26/27 September 1970 with the 1m Schmidt telescope, equipped with a 40 prism. Kodak IIaE emulsion was used with R filter.

2. New BAO Plate Archive late-type stars.

M-type stars are easily distinguished owing to the absorption bands of molecular TiO at wavelengths of $\lambda\lambda$ 4584, 4762, 4954, 5167, 5500, 6200, 7054, 7589, 8300, 8432 Å (Gahm, 1970, Nassau et al., 1964). Low-resolution spectral plate was analyzed with the help of standard image analysis software (FITSVIEW and SAOIMAGE ds9) and Aladin v11.0. This visualization allows us to detect red and faint candidate stars. Figure 1 shows examples of low-resolution spectral shapes for the newly discovered 10 objects on BAO Plate Archive which are M-type stars. Objective-prism low resolution spectra show the presence of the TiO molecule absorption bands at wavelengths at 7054, 7589 Å.

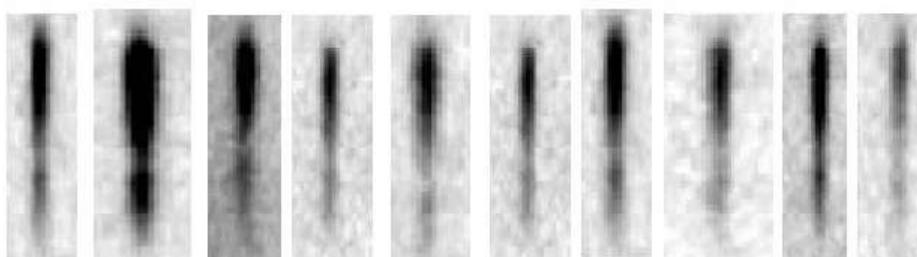


Figure 1. Low-resolution spectral shapes for the newly discovered 10 objects on BAO Plate Archive.

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Table 1. Gaia DR3 and 2MASS photometric data for the 12 new late-type stars

RAJ2000 "h:m:s"	RAJ2000 "d:m:s"	2MASS	J mag	H mag	K mag	G mag	BP-RP mag
04 36 42.24192	+25 55 11.7516	04364224+2555117	6.83	5.66	5.26	10.65	3.71
04 25 10.51704	+22 15 48.8268	04251051+2215488	7.44	6.45	6.06	11.04	3.43
04 30 02.96328	+22 16 13.6992	04300296+2216136	6.08	5.08	4.71	9.78	3.63
04 40 42.96000	+22 38 12.4332	04404296+2238124	4.61	3.55	3.08	9.23	4.80
04 29 55.31208	+22 58 57.9396	04295531+2258579	6.4	5.25	4.72	11.35	5.30
04 32 58.15776	+25 25 32.4480	04325815+2525324	9.53	8.42	8.00	13.07	3.39
04 26 18.33552	+24 05 21.6672	04261833+2405216	7.71	6.7	6.37	11.31	3.48
04 29 01.60248	+25 52 48.5472	04290160+2552485	8.11	7.12	6.72	11.89	3.79
04 26 30.07320	+25 53 44.5344	04263007+2553445	5.89	4.79	4.13	10.57	4.9
04 34 33.31008	+24 43 12.0252	04343331+2443120	7.16	6.06	5.59	11.49	4.69
04 36 35.13144	+25 26 42.5148	04363513+2526425	8.63	7.55	7.12	12.32	3.10
04 25 58.33440	+22 40 04.5984	04255833+2240045	8.15	7.14	6.79	11.61	3.22

3. Gaia DR3 and 2MASS photometry

Table 1 presents the Gaia DR3 and 2MASS (Two Micron All-Sky Survey) JHKs photometric data for the 12 new late-type stars (Brown et al., 2021). To discriminate dwarf/giant luminosity class, we used the traditional J-H vs. H-Ks color-color plots (Bessell & Brett, 1988). This diagram clearly shows that the majority of the new objects are red giants.

4. Summary

25 new late-type stars have been found in the BAO Plate Archive. We present luminosity classes estimated from Gaia DR3 and 2MASS photometry and available proper motions. The majority of the objects are red giants.

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