

New M-type stars found in the BAO Plate Archive centered at $\alpha = +15^h$ $\delta = +58^0$

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Abstract

The BAO Plate Archive low-resolution spectral plate centered at $\alpha = +15^h$ $\delta = +58^0$ is analyzed to find new late-type stars. 23 new late-type stars have been detected. New objects were cross-correlated with *GAIA* DR3, 2MASS, AllWISE, TESS and SDSS catalogues. For the detected objects, we present luminosity classes estimated from Gaia DR3 and 2MASS photometry and available proper motions. The majority of the objects are M dwarfs. Two objects are M giants.

Keywords: *late-type -stars: M dwarfs*

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. 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 $\alpha = +15^h$ $\delta = +58^0$ were obtained at the Byurakan Astrophysical Observatory on 14/15 April 1983 with the 1m Schmidt telescope, equipped with a 4^0 prism.

2. New BAO Plate Archive late-type stars

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. 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). Figure 1 shows examples of two-dimensional, low-resolution spectral shapes for the newly detected 2 objects on BAO Plate Archive which are M dwarfs.

3. Gaia EDR3 data

All new objects were cross-matched with Gaia DR3 catalogue (CDS VizieR Catalogue I/355/gaiadr3) sources. The low-resolution spectra for two objects are not available in the Gaia DR3 data base. Gaia DR3 data (Brown et al., 2021) allows an independent verification of our classification, and the O-rich nature are confirmed for the new objects. Figure 2 presents Gaia DR3 low-resolution spectrum for the object Gaia DR3 1617231147460075776.

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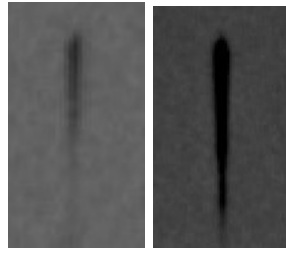


Figure 1. Low-resolution spectral shapes for the newly detected 2 objects on BAO Plate Archive.

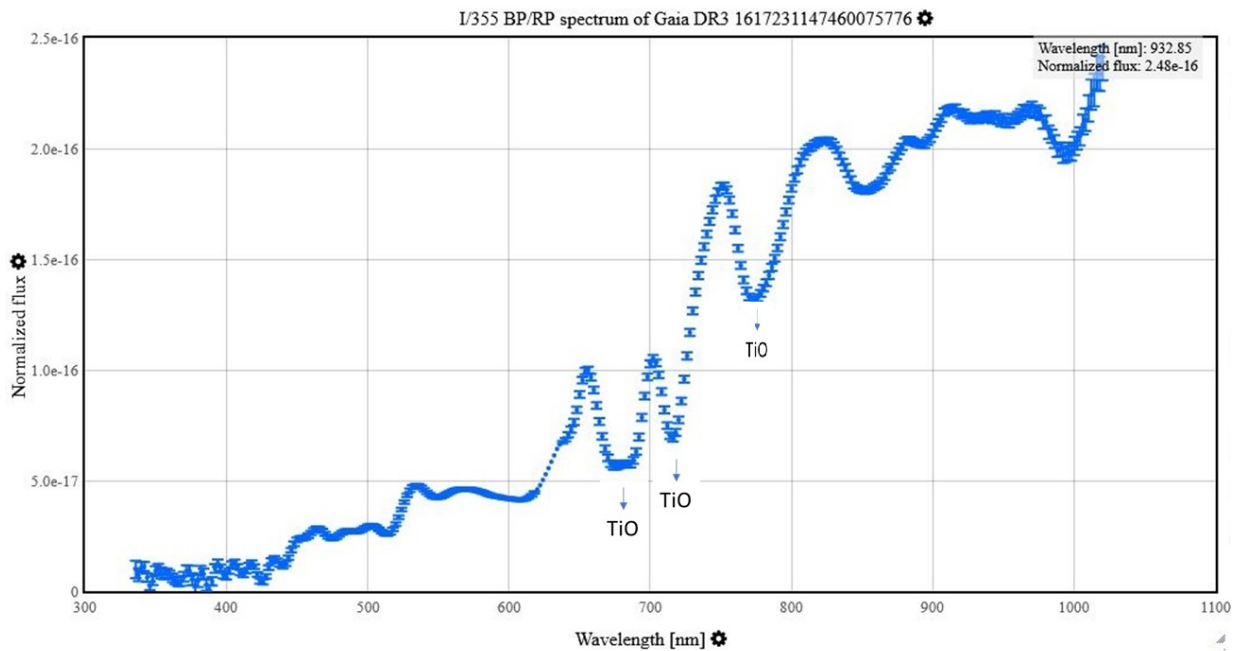


Figure 2. Gaia DR3 low-resolution spectrum for the object Gaia DR3 1617231147460075776..

4. Summary

23 new M-type stars have been found in the BAO Plate Archive. In order to gain more information on the M dwarfs identified in the BAO Plate Archive, GaiaEDR3 high-accuracy astrometric and photometric data and Transiting Exoplanet Survey Satellite data are used to characterize these M-type stars. We present luminosity classes estimated from Gaia DR3, 2MASS, TESS photometry and available proper motions. Gaia DR3 data allows an independent verification of our classification, and the O-rich nature are confirmed for the new objects. The majority of the objects are M dwarfs. Two objects are M giants.

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