Massive Stars Near and Far
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Study of the Be/X-ray binary IGR J21343+4738 physical parameters based on the 15-years monitoring

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Abstract. We present the results of our long-term RTT-150 photometric and spectroscopic observations Be optical counterpart of the High-mass X-ray binary IGR J21343+4738.

Keywords. X-rays: binaries, stars: emission-line, Be, stars: individual (IGR J21343+4738)

1. Introduction

The hard X-ray source $IGR\ J21343+4738$ was detected by the IBIS telescope (Ubertini et al. 2003) of the INTEGRAL Space Observatory (Winkler et al. 2003) in December 2002 (Krivonos et al. 2007; Bird et al. 2007). In the paper of Bikmaev et al. (2008) for the first time optical counterpart was classified as a B3 star due to the presence of hydrogen HI and helium HeI absorption lines in the spectrum, and the absence of ionized helium HeII lines, and was showed that the optical component is a Be star. Reig & Zezas (2014) were able to determine the spectral class of an optical star more accurately as B1 IVe and find the parameters of its stellar atmosphere ($T_{\rm eff} = 25000K$, $\log\ g = 3.75$, $v\ \sin i = 380\ km\ s^{-1}$) during the absence of the circumstellar equatorial disk in August 2013.

2. Results

We performed long-term photometric and spectroscopic observations of the source in 2005-2019 using Russian-Turkish 1.5-m optical telescope RTT-150 (TUBITAK National Observatory, Turkey) and TFOSC instrument. The most striking traces of the disk's presence are shown by the H_α line profile, which acquires a complex structure: absorption is framed on both sides by emission peaks. The brightness drop occurs when the equatorial disk shields the star (Fig. 1a). The complex structure of the Ha line is due to the physical structure of a Be star consisting of a fast-rotating B1 star and an equatorial disk surrounding it, formed from photospheric plasma due to the rotation of the star. As a result, emission lines from the equatorial disk are superimposed on the absorption photospheric spectrum of the star. The difference between the wavelengths of the peaks (ΔV) can be interpreted as the outer radius of the emission line formation region, the velocity corresponding to this difference is the rotation speed of the outer parts of the equatorial disk. And since the rotation speed of the disk depends on the radius, from

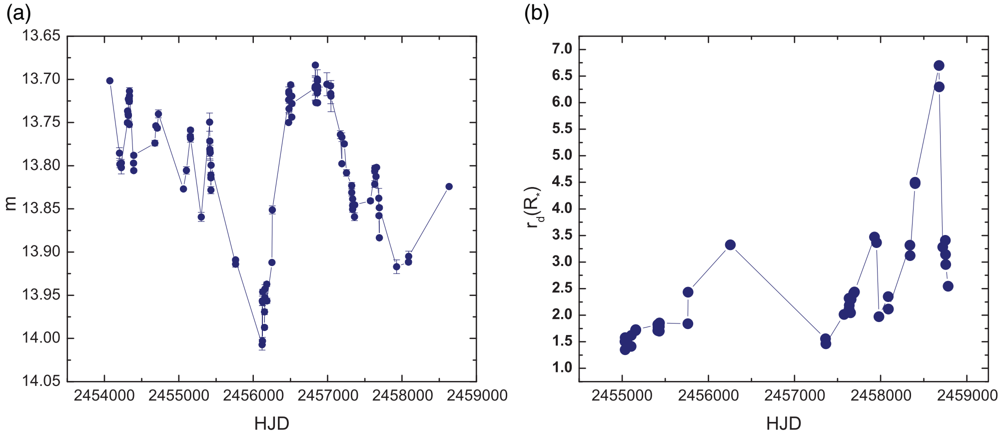

Figure 1. a: Photometric variability in white filter; b: Change in the radius of the equatorial disk with time.

here one can determine the size of the disk:

$$\frac{r_d}{R_*} = \left(\frac{2V_* \sin\ i}{\Delta V} \right)^{1/j},$$

where ΔV is the separation of peaks, defined as the difference between the central wavelengths of the red and violet peaks (Huang 1972). v_* and R_* are the velocity and radius of the star, $j = 1/2$ (for the Keplerian disk), $v \sin i = 380\ km\ s^{-1}$ (Reig & Zezas 2014). The change in the radius of the equatorial disk over time is shown in the Fig. 1b. A correlation is seen between the drop in photometric brightness and the increase in the size of the equatorial disk of the Be star.

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