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First glance at the recently discovered symbiotic star HBHA 1704-05 during its current outburst

A. Skopal[1], M. Sekeráš[1], E. Kundra[1], R. Komžík[1], S.Yu. Shugarov[1,5], C. Buil[2], P. Berardi[3] and A. Zubareva[4,5]

[1] *Astronomical Institute of the Slovak Academy of Sciences 059 60 Tatranská Lomnica, The Slovak Republic, (E-mail: skopal@ta3.sk)*

[2] *Castanet Tolosan Observatory, 6 place Clemence Isaure, 31320 Castanet Tolosan, France*

[3] *Bellavista Observatory, Via Carlo De Paulis 15, 67100 L'Aquila, Italy*

[4] *Institute of Astronomy, Russian Academy of Sciences, Russia*

[5] *P.K. Sternberg Astronomical Institute, M.V. Lomonosov Moscow State University, Russia*

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Abstract. In this contribution we introduce our photometric and spectroscopic observations of the newly (August 9, 2018) discovered outburst of the emission-line star, HBHA 1704-05, whose photometric variability and the spectrum during the outburst are both characteristic for a symbiotic star.

Key words: stars: binaries: symbiotic – individual: HBHA 1704-05

1. Introduction

Symbiotic stars are the widest interacting binaries consisting of a cool giant and a white dwarf (WD) accreting from the giant's wind. Their orbital periods can range from about one year to a few hundred years. During the so-called quiescent phase, the symbiotic system does not change its brightness significantly, except for a wave-like $\sim 0 - 1$ mag variation in their light curves along the orbit. Their spectrum can be similar to that of a normal red giant with superposed emission lines and a faint blue continuum in the optical. Therefore, their nature as a symbiotic star can be easily overlooked (see Sokoloski et al., 2017). Sometimes they experience unpredictable outbursts characterized by $\sim 1 - 3$ mag brightening in the optical with signatures of a mass-outflow that reveals their real nature.

According to "Transient Object Followup Reports" of CBAT[1] the star TCP J19544251+1722281 brightened from $V = 12.0$ on July 31.945, 2018 to $V = 10.7$ on August 8.938, 2018. The brightening was confirmed by the on-line ASASSN database for the SR variable ASASSN-V J195442.95+172212.6 as a possible symbiotic star in the outburst. On August 11, 2018, Munari et al. (2018) reported that this object coincides with an emission line star HBHA 1704-05 in

[1] http://www.cbat.eps.harvard.edu/unconf/followups/J19544251+1722281.html

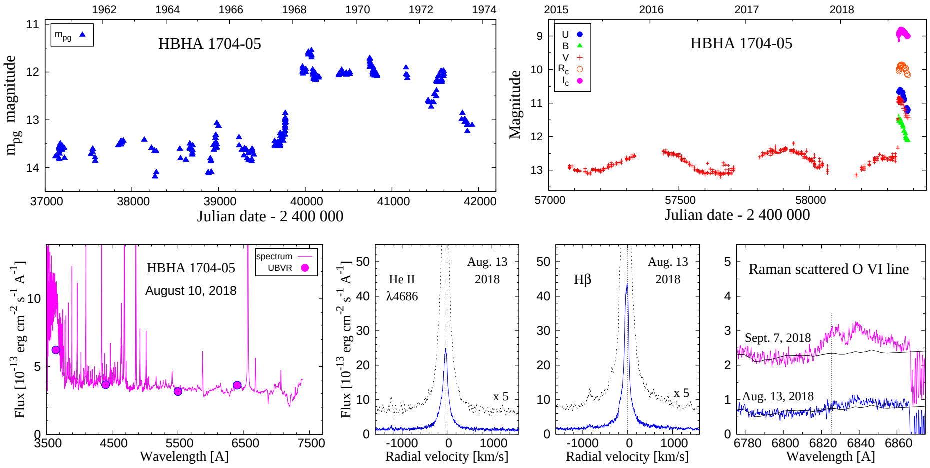

Figure 1. Top left: The historical light curve of HBHA 1704-05 obtained from photographic plates of the Moscow's archive. Top right: The V light curve measured within the ASASSN program indicating a new outburst from August 9, 2018. Bottom: The energy distribution between 350 and 740 nm and line profiles of He II 4686 Å, Hβ and Raman scattered O VI 6825 Å. The spectra were dereddened with $E_{\rm B-V} = 0.22$ mag.

the catalog of Kohoutek & Wehmeyer (1999) and is currently undergoing a "hot-type" outburst.[2] In the spectrum, they found features of an M-type giant, a strong nebular continuum with superposed emission lines of highly ionized elements (e.g., He II 4686 Å and [Ne V] 3426 Å). In this contribution we present examples of our photometric and spectroscopic monitoring of HBHA 1704-05 during the first month of its outburst.

2. Observations

We started to monitor HBHA 1704-05 from August 12, 2018. Our multicolour $UBVR_{\rm C}I_{\rm C}$ CCD photometry was carried out by the 0.6 m telescope at the Stará Lesná observatory (pavilion G2), while the optical spectra were obtained by the 0.6 m and 1.3 m telescopes at the Stará Lesná (pavilion G1) and Skalnaté Pleso observatories, respectively. Our spectroscopic observations were complemented with those available at the *Astronomical Ring for Access to Spectroscopy (ARAS)* database.[3] Here, the spectra obtained by P. Berardi at the Bellavista Observatory on August 9.856, 2018 (436–740 nm) and that made by Ch. Buil at the Castanet Tolosan observatory on August 10.932 (350–507 nm) were used.

[2]Originally classified as the 2nd-type of outbursts of symbiotic binaries (see Skopal, 2005)
[3]http://www.astrosurf.com/aras/Aras_DataBase/Symbiotics/TCPJ19544251+1722281.htm

3. Results

Figure 1 shows main photometric and spectroscopic characteristics of the newly discovered symbiotic star HBHA 1704-05. The ASASSN V light curve shows a wave-like variation – a typical feature of the light variability of symbiotic stars during quiescent phases, which is connected with the orbital motion. This suggests the orbital period of $\approx$500 days. The new outburst of HBHA 1704-05 was indicated by a rapid $\sim$1.5 mag increase in V at the beginning of August 2018 (Munari et al., 2018), which we confirmed by our $UBVR_{\rm C}I_{\rm C}$ photometry. Inspection of the Moscow's archive of photographic plates revealed another 2-mag-outburst in 1968.

Our low-resolution spectra (350 – 740 nm) indicate the presence of a strong nebular continuum with a prominent Balmer jump in emission, although features of a late type giant can be recognized in the long-wavelength part of the spectrum. The presence of strong He II 4686 Å and gradual emergence of the Raman scattered O VI 6825 Å lines on our medium-resolution spectra suggest a high temperature of the central ionizing source. The flux ratio $F_{4686}/F_{\beta} \sim 0.5$ on August 13, 2018, corresponds to $\sim$170 000 K.

4. Conclusion

Our preliminary analysis showed that the current outburst of HBHA 1704-05 is of a Z And-type and is very similar to that recently (2015) observed for AG Peg (see Skopal et al., 2017).

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