

PHOTOMETRY OF SYMBIOTIC STARS: FIRST RESULTS FROM AN AM-PRO COLLABORATION WITH JAROSLAV MERC

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Abstract. In October 2022, a collaborative mission was undertaken by the IPSA Vega association and the SAF Double Star Commission at the Saint-Véran Observatory. During this mission, the esteemed Czech astronomer, Jaroslav Merc, provided the association with a curated list of 8 symbiotic binary star targets for the specific purpose of observing flickering phenomena. We processed the data to make light curves and finally got results of flickering for some of them. The Pro-am collaboration is continuing in order to observe more symbiotic stars and participate in the Jaroslav's database.

Keywords: symbiotic stars, photometry, Pro-Am

1 Introduction

The Saint-Véran Observatory is situated in the Queyras mountains atop the Pic de Châteaurenard and is positioned at a lofty altitude of 2936 meters, with a geographical location at 44°41' 56" North latitude and 6°54' 30" East longitude. These observations were conducted utilizing a 500mm external telescope, which was augmented by a Ritchey-Chrétien telescope boasting a substantial diameter of 50 cm and a generous focal length of 4 meters ($F/D = 8$). Jaroslav Merc holds the position of astrophysicist-researcher at the Institute of Astronomy, Charles University, located in Prague, Czech Republic. His primary research focus centers on symbiotic binary systems and their associated celestial entities. His work extends to the comprehensive examination of their distribution within the Milky Way and extragalactic regions, as well as the intricate photometric and spectroscopic analysis of symbiotic candidates. Notably, he has established a comprehensive database dedicated to candidate and confirmed symbiotic stars.

The collaborative relationship between IPSA Vega and Jaroslav Merc was initiated at the Observatoire de Haute-Provence and the collaboration began during the SAF mission to Saint-Véran in October 2022. Within this context, Mr. Merc provided a list of 8 stars for observation, including AS 357, IRAS 20434+5052, KIC4918300, MV Cyg, StHa 185, V1760 Cyg, V335 Vul, and DT Psc. The preliminary findings from this Pro-Am collaboration are presented in the following proceeding.

2 Symbiotic stars and flickering

Symbiotic stars are a binary system consisting of a cold giant and a hot star, often a white dwarf or neutron star. A transfer of mass from the cold giant to the hot star causes observable activity called flickering, resulting in complex light curves and variable star spectra. These binary systems are either detached or semi-detached, with orbital periods ranging from 600 days to tens of years. The flickering in the light curves of symbiotic systems has a large amplitude and is most visible at shorter wavelengths, whereas the flickering of accretions alone is predominant in UV light. Observations show that flickering can only be detected transiently in the presence of accretion disks around hot components.

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3 First results and evidence of flickering

The light curves were generated using the Muniwin amateur software, and comparison stars which were sourced from the AAVSO. An ensemble photometry approach was employed, predominantly utilizing the U filter, as it offers enhanced visibility of the accretion phenomenon in symbiotic stars at this wavelength. It is worth noting that the observation of flickering necessitates the use of the shortest available wavelength.

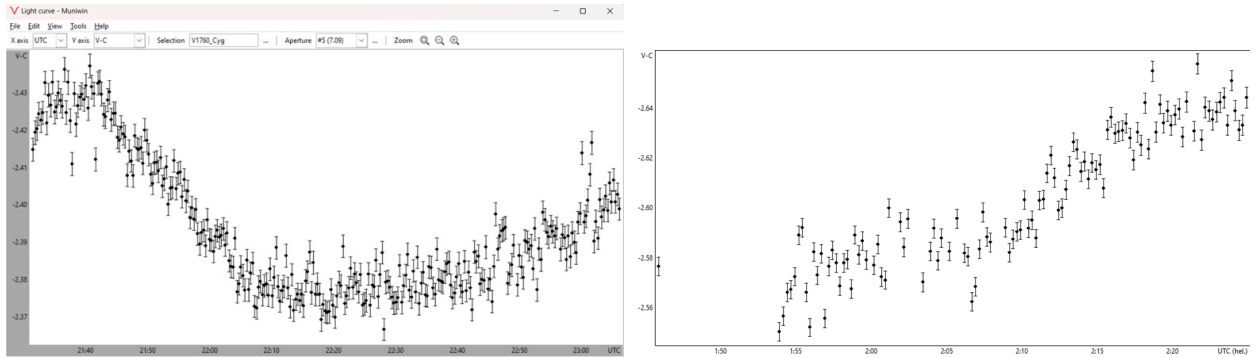


Fig. 1. Left: Lightcurve obtained with Muniwin software for V1760 Cyg showing a possible flickering in U-filter and 10s exposure time. **Right:** Lightcurve obtained with Muniwin software for MV Cyg showing a possible flickering in U-filter and 6s exposure time.

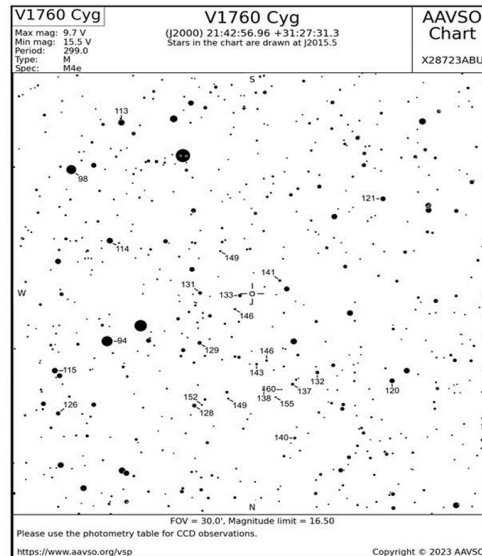


Fig. 2. AAVSO Chart for V1760 Cyg

4 Conclusions

Following consultation with the expert, the observed targets have been categorized as follows:

1. Stable or Non-variable Targets (No Flickering Observed): IRAS 20434+5052, KIC 4918300, StHa 185.
2. Targets Lacking Comparison Stars: DT Psc, EM AS 357.
3. Targets with Potential Flickering of Interest: V1760 Cyg, MV Cyg, and V335 Vul.

Another noteworthy target, V503 Her, has been suggested M. Merc for observation by IPSA Vega and SAF. Commencing in 2023 and extending into 2024, a comprehensive multi-wavelength follow-up will be initiated for these four designated targets. The team will engage in the acquisition of spectra utilizing LISA, contributing to the mutual Professional-Amateur collaboration with Mr. Merc.