

ABSTRACT

Long-term photometric variation of the selected X-ray binaries with neutron star components are studied. We have obtained new VRI data of the selected systems at TÜBİTAK National Observatory (TUG) with 60cm Robotic telescope. We present long and short variations of these systems.

INTRODUCTION

Long-term light variations of X-ray binary systems provide information about the physical processes with a time scale of few decades. These variations can be due to the stellar activity of the component star, as well as hot stellar winds, and due to the disrupted shape of the component. In this project, it has been aimed to study long term V, R, and I filters light variations of binary systems consisting of a neutron star and an early or a late type component. All these data, then, will be collated to study the nature of long-term variations; observed in these systems. These variations can be due to the eclipsing feature of the systems as well as stellar activates.

SELECTED SYSTEMS

In this poster we presented our study on the systems Her X-1 and Sco X-1. These systems were classified as low-mass X-ray binaries (LMXB). Her X-1 was discovered in 1972 from UHURU observations. Her X-1 is an eclipsing binary system with a 1.7 days orbital period. The accreting pulsar has ~ 1.24 s rotation period. The masses are estimated to be 1.5 solar mass for the neutron star and 2.2 solar mass for the optical one, while the distance of the system is almost 6.6 kpc (Reynolds et al. 1997).

Sco X-1 is the first observed extra-solar X-ray source (Giacconi et al. 1962). Its optical counterpart, V818 Sco, was discovered by Sandage et al. (1966). Sco X-1 is the brightest persistent X-ray source (Steeghs & Casares 2002). The orbital period of the system is 0.787 days and its distance is about 2.8 kpc (Bradshaw et al. 1999). The mass of the compact component is 1.4 solar mass and the optical one is 0.42 solar mass (Wang et al. 2014).

NEW OBSERVATIONS and RESULTS

All the new observations done with 60cm robotic telescope at TÜBİTAK National Observatory (TUG), between 5 February and 20 May 2015. Observations of each night were reduced separately with standard procedure. The frame reduction performed by subtracting the bias and dark frames and finally dividing by flat-field frames. We used four comparison stars in this study which were used before in the literature.

Observational details of the observed systems are summarized in Table 1. In Fig.1 we plotted light variations for HZ Her and V818 Sco both in time and phase domain. Long-term light variations in both systems and the eclipsing property of the binary system HZ Her are apparent in our study. Our aim is to reveal the long-term light variations of the systems consisting a neutron star component by monitoring them and finally to study the physics behind these variations. We are planning to continue to their observations to obtain more accurate results.

REFERENCES

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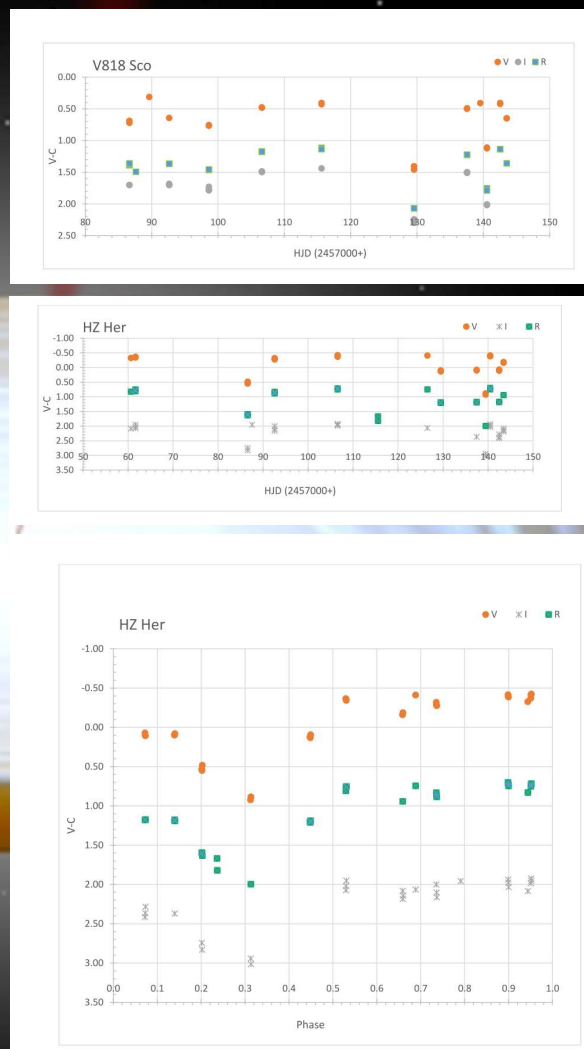


Figure 1. V, R, and I observations of V818 Sco and HZ Her.

Table 1. Observational properties of the selected systems.

System	Alias	α	δ	V	P (day)	Date range	Filter	N
V818 Sco	Sco X-1	16 19 55.1	-15 38 25.0	11.10	0.787	57058-57162	BVRI	103
HZ Her	Her X-1	16 57 49.8	+35 20 32.4	13.83	1.700	57058-57162	BVRI	109