Long term multiwavelength monitoring of high mass X-ray binaries

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Abstract

Be X-ray binaries, the largest subclass of high-mass X-ray binary systems, consist of a neutron star orbiting a Be star companion in an eccentric manner. The Be star has a geometrically thin Keplerian disc around it. These systems are strong candidates for progenitors of gravitational waves since their evolutionary processes can ultimately lead to the formation of a binary system comprised of two compact objects, such as two neutron stars or a neutron star and a black hole. The interaction between the neutron star and the Be disc results in the accretion of matter, causing X-ray outbursts. These transient X-ray outbursts occur in two types: Type I (normal outbursts with luminosities less than 10^37 erg/s) and Type II (giant outbursts with luminosities greater than 10^37 erg/s). The variability of the disc is tracked through changes in the Balmer emission lines in the optical spectra, with the H-alpha emission line being the strongest and most well-studied. In this talk, I will present the optical, X-ray and radio analysis of several individual outbursting systems that have been monitored using the Southern African Large Telescope (SALT), OGLE, MeerKAT and X-ray missions like Swift and MAXI. The goal is to study the impact of the neutron star on the Be disc under various orbital configurations and environmental conditions. I will discuss the unusual long-term behavior of the Balmer lines observed over multiple orbits of the neutron star and draw conclusions about the structure of the Be disc. Additionally, I will highlight the behavioral differences among the systems and how variations in the orbital parameters affect the evolution of the Be disc and X-ray emission.