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Long-term Be disc structural study of Be X-ray binaries using MeerLICHT

Be X-ray binaries (BeXBs) are a subclass of high-mass X-ray binaries consisting of a Be star and a compact object, typically a neutron star. The Be star features a Keplerian disc, known as a “decretion” disc, in its equatorial regions. This disc is thought to form due to the star’s rapid rotation. The interaction between the decretion disc and the neutron star leads to the accretion of matter, which results in increased X-ray emissions.

Variability in the decretion disc of BeXBs spans a wide range and is primarily observable at optical wavelengths. Key observational characteristics of Be discs include emission lines in optical spectra, photometric variability, and infrared excess. Understanding long-term variations within the decretion disc is essential, as it is this matter that ultimately contributes to the multiwavelength emission observed in these systems.

In this study, we use long-term multi-band photometric data from the MeerLICHT wide-field optical telescope to examine changes in various properties of the discs over different timescales. The optical data includes ugriz+q photometry, and we systematically analyse changes in brightness and color from a sample of BeXBs located in the Small Magellanic Cloud, each with distinct orbital parameters.

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