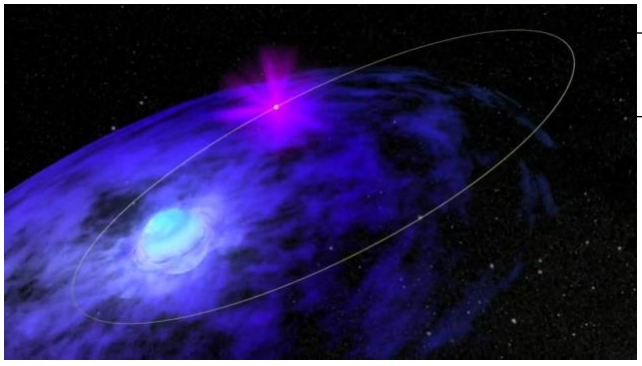
MSc/PhD project: Long-term Be disc structural study of Be X-ray binaries using MeerLICHT and SALT

Supervisor: Dr. Itumeleng Monageng (SAAO/UCT; itu@saao.ac.za)
The student will be expected to register at UCT

Project context and summary

Be X-ray binaries (BeXBs) are a subclass of high-mass X-ray binaries that are made up of a Be star and a compact object which is primarily a neutron star. The Be star has a Keplerian disc ("decretion" disc) in its equatorial regions which is believed to be formed by the fast rotation of the star and non-radial pulsations. The complex interaction between the disc and the neutron star results in accretion of matter, giving rise to enhanced X-ray emission.

The decretion disc in BeXBs shows a wide range of variability which is primarily seen at optical wavelengths. The main observational characteristics of Be discs are emission lines in the optical spectra, photometric variability and infrared excess. Studying long-term decretion disc variability is crucial since it is this matter that is ultimately responsible for the multiwavelength emission that is seen in these systems.
The project aims to use long-term multi-band photometric and spectroscopic data from the MeerLICHT wide-field optical telescope and SALT, respectively, to investigate changes of different properties of Be discs on various timescales. The optical photometric data comprise ugriz+q photometry which will be used to perform a systematic study of changes in brightness and colour (temperature) from a sample of BeXB systems with a wide range of orbital parameters. The photometric data will be combined with spectra to study the long-term evolution of the disc and understand how the complex geometric orientation of the neutron star orbit with the disc plane impacts the disc structure.



An artist's impression of a Be X-ray Binary.