



Contribution ID: 187

Type: Oral Presentation

Optical Observations of the Be/X-ray Binary A0538-66

Friday, 3 July 2015 09:40 (20 minutes)

Abstract content **Formatting & Special chars**

The Magellanic Clouds, particularly the SMC, host a large number of high-mass X-ray binaries (HMXBs) when compared to our Galaxy. The majority of these HMXBs are Be/X-ray binaries (BeX) in which a neutron star orbits a rapidly rotating Be star in a very wide ($P \sim 20\text{-}200$ d) and eccentric orbit. Our study of the long-term superorbital variability in these systems using archival light curves from the MACHO and OGLE database had revealed 200-2000 days variations in almost all of them. These variations are likely to be related to the formation and dissipation of the Be star circumstellar disk, however the physical mechanisms controlling the evolution of these disks are poorly understood. I will present our recent results on the long-term spectroscopic observations of the prototype LMC BeX system A0538-66, using both broad-band (wide wavelength coverage) as well as high resolution optical spectra obtained from the Southern African Large Telescope (SALT). These observations enable us to probe both the evolution of the Be star envelope and the details of its interaction with the neutron star in its presumed highly eccentric ($e \sim 0.7$) orbit. The high resolution spectra allow us to derive its orbital parameters, spectral classification, and rotational velocity. In addition, we derived a refined orbital period and ephemeris from the recent OGLE-IV light curves.

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Session Classification: Astro

Track Classification: Track D1 - Astrophysics