Long-term multiwavelength monitoring of gamma-ray binaries (MSc project)

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1 Summary

Gamma-ray binary stars are true multiwavelength emitters that provide insights on various astrophysical processes. While a number of studies have been presented to explain some of these processes, a true understanding of the observed phenomena remain elusive. This project will utilise radio, X-ray and gamma-ray data to study the geometry and origin of the non-thermal emission of these systems.

2 The project

Gamma-ray binaries comprise a compact object (neutron star or black hole) in orbit around an early-type O/Be spectral type star. Only seven gamma-ray binary stars have been discovered so far, which exhibit emission across the entire electromagnetic spectrum that is typically modulated on the orbital period of the compact object. Due to the lack of certainty in the nature of the compact object two main scenarios are possible to explain the observed multiwavelength emission (Fig. 1): the accretion (microquasar) and pulsar wind model. Analysis of multiwavelength data for each object can help differentiate between the two scenarios.

The goal of this project is to use data from radio (MeerKAT), X-ray (*Swift*) and gamma-ray (Fermi) wavebands to measure time delays or correlations between the radio and high energy emission which will help to

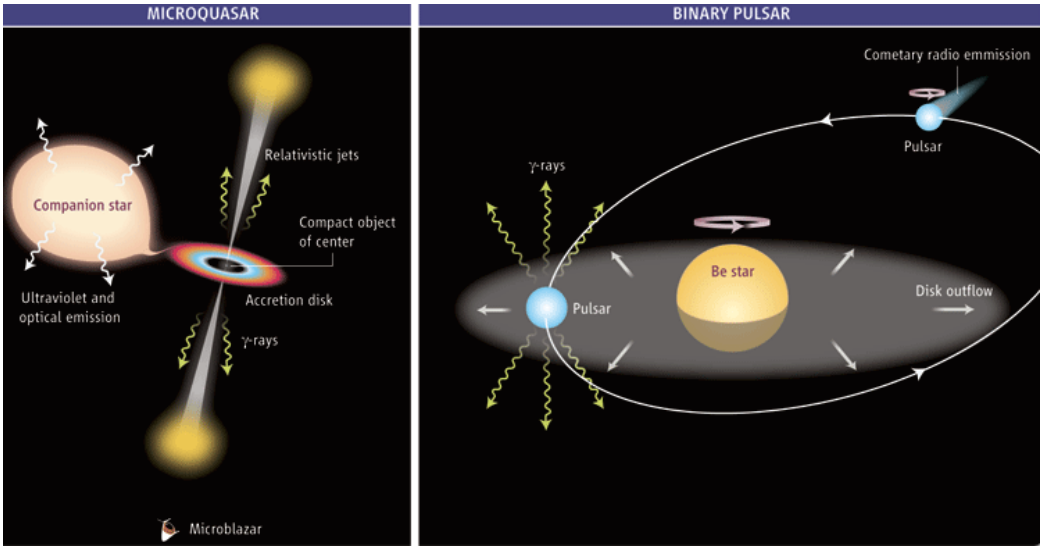

Figure 1: The microquasar (left) and pulsar wind model (right) for gamma-ray binaries. From Mirabel (2006).

constrain the origin of the emission. This will give insights on the geometry of the systems and help understand the particle distribution giving rise to the non-thermal emission.

3 Further reading

Dubus G., 2006b, A&A, 456, 801
Paredes J. M., Marti J., Ribo M., Massi M., 2000, Science, 288, 2340
Dubus G., 2013, A&A Rev., 21, 64