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Radio and X-ray pulsars populations in the Magellanic Clouds

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Outline

The recent MeerKAT Legacy survey of the Small and Large Magellanic Clouds provide an unprecedented dataset with which to explore binary evolution. While radio pulsar searches in the Magellanic Clouds take are discovering pulsars through beam-forming observations, the imaging data from the Legacy survey allows us to search for unpulsed radio emission from the brightest high mass X-ray binaries (~100 microJansky).

A recent census of Galactic X-ray binaries (van den Eijnden et al. 2021) has resulted in the discovery of radio emission from sixteen high mass X-ray binaries -- a class of object previously thought to be radio quiet. The Small Magellanic Cloud contains over 100 high mass X-ray binaries (Haberl & Sturm 2015), covering a small on-sky area with relatively low and uniform extinction (see

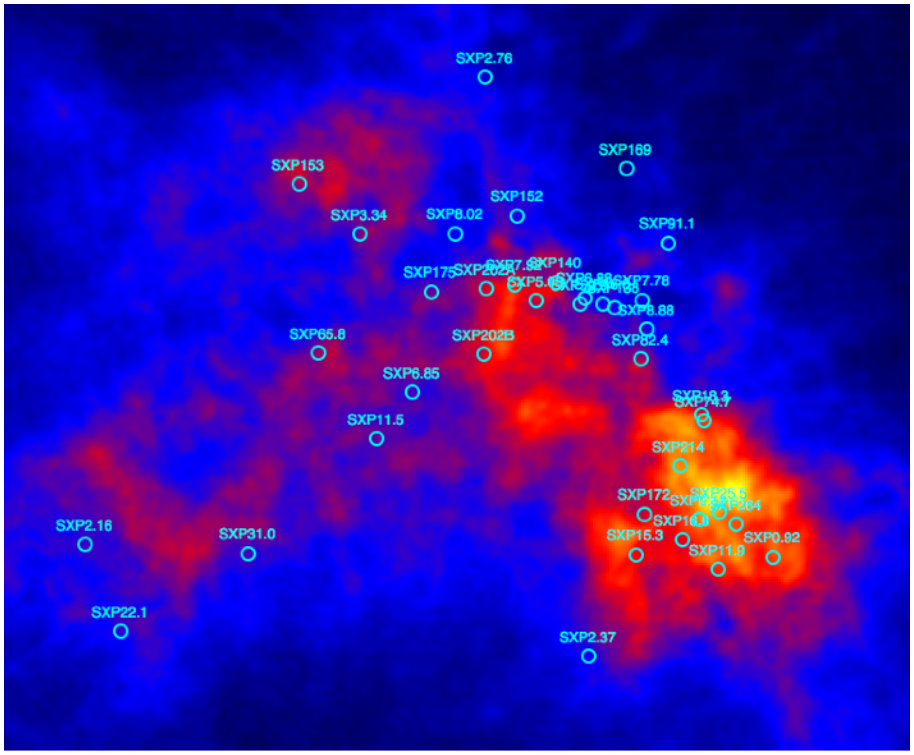

Figure 1. *Neutral hydrogen image of the Small Magellanic Cloud, showing the positions of some of the X-ray pulsars, labelled with their spin periods in seconds.*

Figure 1). It is thus an excellent test bed for the evolution of binaries containing compact objects, as shown by Titus et al. (2020). Using these Legacy data in combination with multiwavelength supplementary data, the radio pulsar census that will be delivered by the TRAPUM survey, and in context of the outputs of population synthesis models, we aim to grow a better understanding of the mechanism for radio emission in high mass X-ray binaries, and the evolutionary process from radio pulsar to accreting X-ray pulsar in binaries.

Aim

For this project we will be measuring the brightness and spectral index of radio point sources in the MeerKAT Legacy survey of the Magellanic Clouds. The data are already in-hand and processed. We will follow up with multi wavelength supplementary data.

References

Haberl & Sturm 2015, A&A, 586, A81
Titus et al. 2020, MNRAS, 494, 500
van den Eijnden et al. 2021, MNRAS, 507, 3899