MeerChoirs: Studies of galaxy interactions in different environments

Level: PhD

Supervisor: Dr Moses Mogotsi (SALT/SAAO)
Supervisor Contact: moses@saao.ac.za
**University of Registration:** UCT
Co-Supervisors: Prof. D.J. Pisano (UCT)

Project Description:
Galaxies can be found in different environments, from low density voids to galaxy groups and clusters, which are much more dense than voids. The morphology, gas content and star formation rates of galaxies varies across different environments; which suggests that the environment is an important factor to consider when studying how galaxies evolve. Groups can be thought of as a nice transition between low density field environments and high density cluster environments, therefore we can use them to study how things change between these environment extremes. MeerChoirs aims to study groups by using HI data from MeerKAT and optical data from telescopes such as SALT and WIYN. HI is an ideal tracer to look for the presence of galaxy interactions in groups, and MeerKAT provides us with high sensitivity data over a large field of view, which makes it ideal to study nearby groups and their environment. And optical data from SALT and other telescopes can help us to characterize the ionized gas and stellar kinematics and properties of such galaxies. There are are complementary programs also submitted to MeerKAT to observe ring galaxies and starburst galaxies, these study different interactions from those probed by MeerChoirs. And we plan to follow up subsamples of the galaxies covered by these surveys by JWST, ASTROSTAT and ALMA to cover the UV, near and mid-infrared, and millimetre emission in these systems.

In this project the student will perform studies of kinematics of galaxies different galaxy interactions in our samples and and look for the presence of gas that is a by-product of the interactions. They will study how the interactions affect the gas and star formation in the galaxies. This can involve both modelling of the interactions and gas flows, or of the gas in the galaxies themselves. Some of the MeerKAT data has already been taken, and we await the results of our other proposal submissions. But there is enough data to already perform studies of for the student's PhD. The student will also be involved in proposals for data from other telescopes such as JWST and ALMA. And the project will involve the analysis of multi-wavelength data.

Requirements: The student needs to be very comfortable with Python coding, and be familiar with handling fits files.
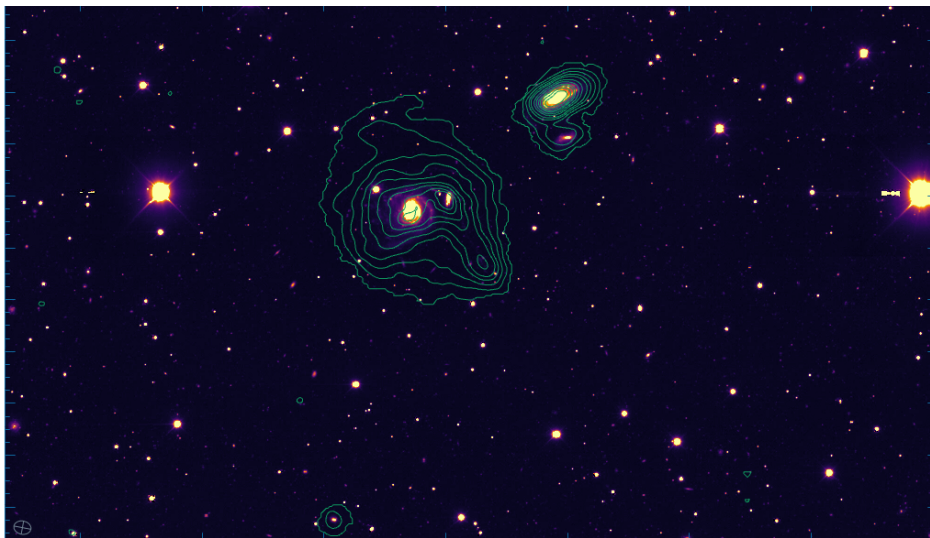
On the Left is an image showing recently imaged HI data for one of the MeerChoirs groups overlayed on a deep optical image of the central region of the group. This is only from half of the total exposure time. It is also worth noting that the MeerKAT field of view is larger than the shown region, and new sources have been detected outside of this region in the latest imaged data.