

MeerChoirs Multi-wavelength Studies of Galaxy Evolution in Nearby Galaxy Groups

Level: PhD

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Potential Co-Supervisors: Prof. D.J. Pisano (UCT), Prof. I. Loubser (NWU)

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. These observations are the most sensitive and highest resolution HI observations of these groups, and are detect HI in galaxies that have had no previous HI detections. The SALT Slitmask IFU enables us to perform resolved spectroscopy of nearby galaxies, which greatly complements the MeerKAT HI observations.

In this project the student will use the HI observations to perform a census of the HI content of the galaxies in the group, determine their kinematics, look for signatures of galaxy interaction and for intra-group gas. The student will also utilize the new SALT Slitmask IFU to map the optical emission lines and continuum to determine properties of the ionized gas and stellar composition. They will then compare the HI properties to star formation and other galaxy properties using multi-wavelength data such as WISE near and mid-infrared observations and SALT longslit observations. And to study how the HI and galaxy properties are affected by environment and other processes. The MeerKAT data has already been taken, and the student might take part in reducing and imaging the HI for the particular group/s they are working on. Some of the SALT data has been observed, but further observations still need to be taken for the particular group/s the student will work on. In particular the student will get to propose for data with the new SALT slitmask IFU to study the ionized gas in the galaxies. This will be used in addition to existing optical, UV and mid-infrared data. The student may also take part in proposals to obtain data and in galaxy simulations to model the interactions in the group/s. The student will also get to work with the wider international MeerChoirs team.

The project is relatively flexible and can be tailored towards the student's interests and strengths.

Requirements: The student needs to be very comfortable with Python coding, and be familiar with handling fits files.