

UCT MSc Project

Studying the Evolution of Group Galaxies over Cosmic Time

Supervisor: Prof D.J. Pisano (UCT), pisano@ast.uct.ac.za

Background:

A galaxy's evolution is strongly influenced by its environment, both locally and globally. On the largest scales, we know that the gas content of galaxies is higher far away from filaments of galaxies, drops as they get closer, but rise again near the filament. Similarly, isolated galaxies seem to have higher gas content than those in groups and those in clusters. However, it is only now that we can study how the influence of environment on galaxies, on both large and small scales, changes over cosmic time with new surveys of atomic neutral hydrogen (HI) over cosmic time, such as CHILES and LADUMA.

The COSMOS HI Large Extragalactic Survey (CHILES) is a 1000-hour survey with the Very Large Array (VLA) capable of detecting HI from galaxies similar to the Milky Way from $z=0-0.5$. The observed field spans a wide range of environments from voids to filaments and isolated galaxies to dense galaxy groups. CHILES provides the first look at how time and environment affect the properties and evolution of galaxies over the past 5 billion years. It further serves as a pathfinder survey and independent confirmation on the results from the LADUMA (Looking At the Distant Universe with the MeerKAT Array) survey.

Since CHILES targeted the COSMOS field, there are copious amounts of ancillary data, including a group catalog (Knobel et al. 2012) and a catalog of filaments in the field (Luber et al. 2019). With these data, it is possible to characterize the near and far environment of all the galaxies in CHILES.

Aims:

The MSc student will use the existing COSMOS group and filament catalogs to fully characterize the environment of all the HI detections in CHILES. Using these data, along with the ancillary multi-wavelength data from COSMOS, to compare the expected HI masses of these detections with the measured HI masses. The end product of this project will be a quantifiable measure of the effects of environment on HI properties in galaxies over the past five billion years for the first time.