

UCT MSc Project

Searching for Extended HI Emission in the Fornax Cluster

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Background:

Most galaxies do not evolve in isolation. Their properties are impacted by their environment. Galaxy clusters are the most massive, densest, gravitationally bound structures in the universe comprised of thousands of galaxies contained within a region of a few cubic megaparsecs. In this environment, galaxies have frequent, high-speed interactions that disrupt their outer disks. Further, as they move through the hot, intracluster medium (ICM) their gas is removed through a process called ram pressure stripping. The Fornax cluster is the most massive galaxy cluster within 20 Mpc in the southern hemisphere and so is an ideal target for studying the effect of the cluster environment on galaxies. The MeerKAT Fornax Survey is currently mapping the HI in the cluster over 12 square degrees down to an HI column density of 10^{18} atoms per square centimeter in an attempt to detect the diffuse HI in the cluster, as well as to study the effect of the cluster environment on galaxies. To complement this HI survey, we have observed a portion of the Fornax cluster with the Green Bank Telescope (GBT) down to a similar HI column density. The GBT observations are well-suited for detecting extended, diffuse HI emission. When combined with the MeerKAT observations, we will have a more complete understanding of the HI distribution in the Fornax cluster down to faint levels of emission.

Aims:

The goal of this project is to combine MeerKAT and GBT data in order to get a high-fidelity map of the total HI distribution in the Fornax cluster and its galaxies. To do this, the student will have to test different algorithms for combining single-dish and interferometer data to find the one that produces the highest quality combined data cube. The final cube will then be analysed to identify new features not visible in either of the original datasets.

This project could be extended to a PhD project in collaboration with the MeerKAT Fornax Survey team.