Using MeerKAT HI data to establish the distances to the low surface brightness galaxies (LSBG) projected near the Fornax galaxy cluster

Project Level: Honours
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Project description:

Using optical imaging from the Dark Energy Survey (DES; Abbott et al. 2018), Tanoglidis et al. (2021) reported a large number of low surface brightness galaxies (LSBGs) in an area ~ 5000 deg^2 mainly from the southern hemisphere sky. Unfortunately, this optical imaging does not provide information about the distance to these galaxies. This requires spectroscopic observations and at low redshift HI observations are a relatively efficient way of establishing distances to these galaxies.

While Tanoglidis' LSBGs were found to be distributed all across the southern sky, they were also found to be clustered, in projection, around prominent nearby galaxy groups and clusters. This clustering was significantly stronger amongst red LSBGs than blue LSBGs. Assuming this clustering of the LSBGs around these galaxy groups is also true in velocity space, and not just in projection, Tanoglidis et al. (2021) reported 80 such clusterings. Tanoglidis et al. (2021) also designated a fraction of those group-associated LSBs as Ultra Diffuse Galaxy (UDGs) candidates following van Dokkum et al. (2015) definition. However, confirming them as UDGs requires knowledge of their distances (redshifts), which HI is well suited to provide.

This project will use already reduced HI data from the MeerKAT Fornax Survey to search for HI detections at the coordinates of the Tanoglidis LSBGs in the Fornax cluster and investigate whether the LSBGs are genuine cluster members. Fornax is one of the closest galaxy clusters in the Tanoglidis sample of groups/ clusters and the MeerKAT survey has reached an HI mass sensitivity of 5 X 10^5 solar masses. Thus, this is the most sensitive HI data for Fornax and one of the best datasets available to address the clustering property of these LSBGs.

Requirement: The project will require searching and extracting archival data, plotting data and basic level coding. Thus experience with Python will be needed.

The project is being offered as an Honours project, with the option for it to continue as a Masters project.

Data availability: This project will be carried out in collaboration with the MeerKAT Fornax Survey team.

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