UCT MSc Project

What is happening to the MHONGOOSE galaxy UGCA319?

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In collaboration with Julia Healy and Erwin Blok (ASTRON)

Background:

One of the key open questions in the field of galaxy evolution is how exactly the accretion of fresh gas onto galaxies takes place. With MeerKAT it is now possible for the first time to obtain very deep maps of the neutral atomic gas in galaxies and attempt to image accretion directly. This is exactly the goal of the "MeerKAT HI Observations of Nearby Galactic Objects - Observing Southern Emitters" (MHONGOOSE) survey, which observes the HI in nearby galaxies for 50 hours per pointing, resulting in HI column densities down to ~5x10^-17 atoms cm^-2 (traditional surveys are typically around ~1x10^19 atoms cm^-2). Thus far, MHONGOOSE observations have resulted in some very spectacular and surprising HI maps. One such galaxy with an unusual HI morphology is dwarf galaxy UGCA 319. It is part of a small group consisting of the main target, UGCA320, UGCA319 itself, and a very low-mass dwarf which we have dubbed "the child". The unexpected HI distribution of UGCA319 suggests it may consist of separate clouds that are in the process of merging, possibly as a result of a past interaction with UGCA320. However, more detailed analysis is needed to figure out the history of UCGA319.

Aims:

The main goal of this project is to perform a Gaussian decomposition of the HI gas in UGCA319, in order to figure out the structure of its HI gas, and, with that, its history in the context of the small group in which it is located. After inspecting the galaxy in the VisLab, and analysing its moment maps and position-velocity diagrams, the student will have to decide on the appropriate software to use for this, and write a script that performs a suitable decomposition to pin down the origin of this galaxy. We also have accompanying deep VST imaging (~29-30 mag arcsec^-2) that will provide a clear optical picture of the galaxy. If time permits, the student can analyse this optical data, for example by creating a toy model, and combine it with the HI data to obtain a more comprehensive view of the story of UGCA319.
This project requires programming and can be done using any Gaussian decomposition codes, although the most common ones are Python based.

This project is a collaboration with the MHONGOOSE team, in particular Julia Healy and Erwin Blok (PI of the programme) who are based at Astron in the Netherlands.