

## UCT MSc Project

### Radial profiles of Virgo cluster galaxies undergoing ram pressure stripping

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In collaboration with the Virgo Environment Traced in CO survey (VERTICO), PI Toby Brown  
(Herzberg Astronomy and Astrophysics Research Centre)

#### Background:

Most galaxies in the nearby Universe do not live alone, but are part of groups or even clusters. Being part of such a dense environment affects a galaxy's evolution. As a result, clusters harbour a relatively large fraction of passive galaxies compared to the "field" (the isolated galaxies), suggesting that their star formation is "quenched" prematurely. There are several environmental processes that are thought to contribute to this. One such mechanism is called "ram pressure stripping" or RPS. Besides harbouring hundreds to thousands of galaxies, clusters contain an "intracluster medium" (ICM), a very hot plasma that surrounds the galaxies. When galaxies move through the ICM at high velocity, they experience a strong "headwind" that can strip away their atomic and even molecular gas. This is ram pressure stripping, and it has been found to be very effective at removing gas from galaxies, eventually leading to the quenching of their star formation. On the other hand, evidence has also been found that star formation may be temporarily enhanced on the leading side of the galaxy, because of the compression of the gas on that side. However, this effect is subtle and not observed in all galaxies, and it is unclear whether it is ubiquitous.

#### Aims:

One of the two galaxy clusters closest to us is the massive Virgo cluster. Because of its vicinity, it has been studied in many wavelengths. Most notably, the VLA Imaging of Virgo in Atomic Gas (VIVA) and the Virgo Environment Traced in CO surveys have mapped the atomic and molecular gas in ~50 of its massive spiral galaxies. Six of these are currently undergoing active ram pressure stripping, as shown by spectacular gas tails trailing behind them. The main goal of this project is to create radial profiles of the atomic and molecular gas in galaxies in the Virgo cluster that are undergoing ram pressure stripping, using data from VIVA and VERTICO. The student will write a script to create these profiles, and come up with a useful way to analyse them. In particular, they will study the differences between the leading side and the tail of the galaxy, compare the atomic and molecular gas phases, and investigate whether there is any evidence for enhanced gas densities on the leading side of the galaxy.

This project requires programming in a language of choice, although Python is recommended.

This project is in collaboration with the VERTICO team. In addition, the blind MeerKAT Survey of the Virgo cluster is currently ongoing, and will discover and map the HI in tens to hundreds of additional galaxies. An additional RPS galaxy has already been discovered in the pilot field. If time permits, the analysis can be extended to galaxies in this survey in collaboration with the team.