

A MeerKAT view on galaxies in filaments falling onto the Virgo cluster (VirgoFil)

Abstract

Observations reveal that two main parameters govern star formation and galaxy evolution: galaxy stellar mass and environment. The latter manifests itself via tidal interactions, starvation and ram-pressure stripping. Its role has been intensively studied in nearby galaxy clusters such as Virgo and Coma. However, until now the cold gas content of galaxies along the cosmic filaments that feed clusters and can already alter galaxy properties (pre-processing) have been largely neglected. We have undertaken a multi-wavelength survey of the Virgo filaments that extends up to 7 virial radii away from the main cluster. It includes an accounting of the atomic and molecular gas content, and uses H α , UV, and infrared as tracers of stellar mass and star formation. We propose here a 4-pointing survey of the Virgo-III filament, to map about 18 massive and 41 dwarf galaxies. Our selection focuses on areas in which we have identified systems depleted in HI. We propose deep and high resolution observations which should reveal the physical origins of this depletion that is occurring before these galaxies even reach the core of the Virgo cluster. Our goals with MeerKAT are to i) have high spatial and spectral resolution inside these galaxy discs in order to trace tidal and ram-pressure shocks, and ii) detect possible tidal and ram-pressure tails outside galaxies, using smoothing and stacking procedures to reach higher sensitivity. This survey is unique and will enable a genuine leap forward for our understanding of the physical processes at play in galaxies falling onto cluster cores.