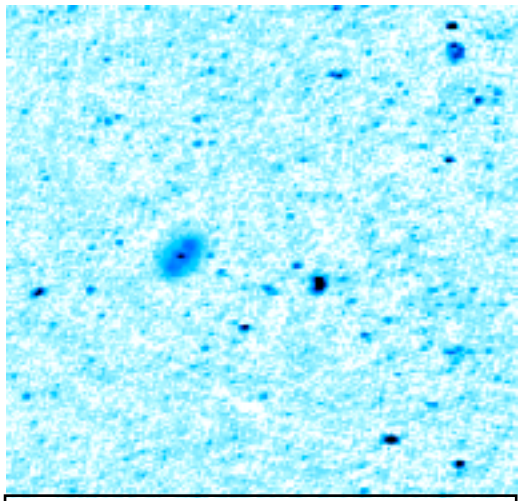
MeerHoGS: The role of environment in the baryon cycle of galaxies

Supervisors: Prof. Thomas Jarrett, UCT E-mail: jarrett@ast.uct.ac.za
Dr. M. Cluver (Swinburne Uni) : mcluver@swin.edu.au
Dr. G. Józsa (SARAO) : gigjozsast@gmail.com

One of the key aspects of galaxy evolution is how different environments (pairs, triplets, groups, clusters, and filaments of galaxies) impact their baryonic cycle, i.e. how neutral atomic gas fuels star formation and builds stellar mass. Central to this kind of study is the accurate determination of environment, as well as multi-λ photometry. The southern GAMA G23 region offers both these: a high completeness of spectroscopic redshifts, and therefore well-defined environmental measures, as well as multi-band photometry from KiDS (optical), VIKING (near-IR), WISE (mid-IR) and Herschel (far-IR).

Basis: We have executed a MeerKAT survey of a 5 deg^2 area within G23, focussing on a compact group and the filament it is embedded in, at a z~ 0.03. Our successful pilot proposal, The MeerKAT Habitat of Galaxies Survey (MeerHoGS), mapping the continuum and HI emission from galaxies form the basis of this MSc/PhD project.

Project: This will entail studying the relationship between the distribution and kinematics of high column density gas (≥ 10^{20}cm^{-2}), star formation and stellar mass within loose, compact and rich groups, as well as filaments/tendrils, providing the most complete picture to date of the internal vs external evolutionary processes at work. Sensitive HI imaging combined with extensive ancillary data will facilitate an unprecedented study of the Extended Kennicutt- Schmidt relation (Shi et al.



A tiny glimpse of a MeerKAT radio continuum map from the MeerHoGS project showing both resolved (local Universe) and background galaxies.

2018) across environment, tracing the build up of mass via regulated star formation, within large scale structures.

Potential Impact: The impact of this study is: a) a better understanding of the how galaxies evolve, b) the role of environment in galaxy transformation, c) the role of gas in fueling star formation and the baryonic cycle, d) the importance of galaxy groups and large scale structure in mass assembly.

Alignment with National Imperatives: This project utilizes and exploits the South African MeerKAT radio interferometer, one of the primary science drivers in South Africa, under the auspices of the Minister of Science, and the Department of Science and Innovation, and the National Research Foundation. This project aligns with the following national imperatives: i) NRF Broad Category: Environmental, Material, Physical and Technology: Astronomy is a physical technical discipline and strong usage will be made of cutting-edge technology in South Africa (MeerKAT, SAAO telescopes). ii) National Priority: Transformation: the training of transformed, science-and-technology based researchers is the basis of South Africa's future in the Fourth Industrial Revolution. iii) Grand Challenge: Astronomy: this project is astronomy, where usage is made of South Africa's cutting-edge technology to understand the Universe and our place in it. iv) Sustainability Goals: Quality Education. Astronomy is a STEM-discipline that forms the basis of the future development of South Africa and an educated population.

National Infrastructure Platforms: SARAO, MeerKAT, IDIA/Ilifu