How Do Powerful Radio Galaxies Effect Their Environment?

Research Field
Radio Astronomy

Project Suitability
PhD
Masters/Honours

Project Supervisor
Dr Nick Seymour
Nick.Seymour@curtin.edu.au

Co-Supervisors
Dr Guillaume Drouart
Dr Jess Broderick

Powerful radio galaxies in the distant Universe are unique beacons of massive black holes sitting in galaxy proto-clusters. These are dynamic environments with highly accretion black holes with powerful jets, as well as large amounts of star formation occurring in the proto-cluster members. These powerful radio galaxies have a direct impact on their environment, stimulating powerful outflows.

The aim of this project is to investigate this connection. How the powerful radio galaxy effects the proto-cluster it resides in and vice-versa. This project will take advantage of the new all-sky deep surveys from the Murchison Widefield Array and the Australian Square Kilometre Array Pathfinder to make unprecedented measurements of the radio jet. These will be supplemented by higher frequency observations from the Australian Telescope Compact Array and the Atacama Large Millimetre Telescope. We will also use X-ray observations from eROSITA.

The aims of this project are:

(i) measure and model the continuum and polarisation properties of a large sample of known powerful radio galaxies in the southern hemisphere in order to constrain their jet powers.

(ii) study how that jet power relates to the accretion onto the super-massive black hole.

(iii) compare the radio emission to the distribution of proto-cluster members to study their influence. Polarisation of the radio jet can reveal information about the intra-cluster medium.

(iv) use eROSITA X-ray observations to study the accretion and possible inverse Compton emission from these high redshift radio galaxies

(v) search for other powerful radio galaxies in the early Universe to expand the sample.

This project will involve close collaboration with researchers at the European Southern Observatory with the potential to spend time at the headquarters in Munich.

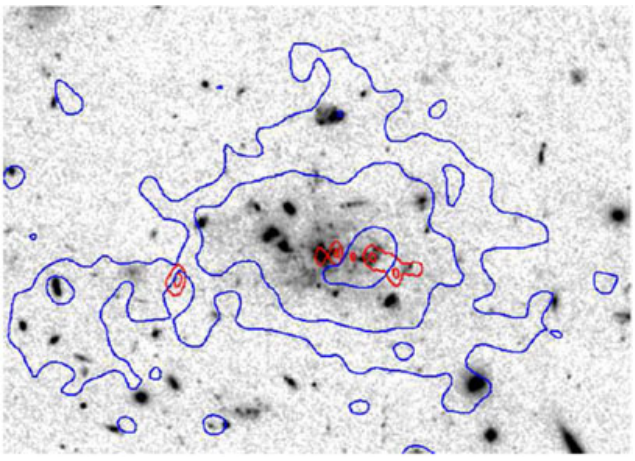

Figure The Spiderweb Galaxy. Deep Hubble image of the core of the MRC 1138-262 protocluster at z = 2.2 obtained with the Advanced Camera for Surveys. [From Miley et al. (2006)]. Superimposed on the HST image are contours of Lyα (blue, resolution ~ 1") obtained with ESO's very Large Telescope (VLT), delineating the gaseous nebula and radio 8GHz contours (red, resolution 0.3") obtained with NRAO's VLA, delineating the non-thermal radio emission. The gaseous nebula extends for > 200 kpc.