Radio Astronomy:

Radio Studies of Low-mass, Low-luminosity Active Galactic Nuclei

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The Active Galactic Nuclei systems having black holes with masses in the range ~10^3 – 10^6 solar masses are often termed as low-mass Active Galactic Nuclei (LMAGN) or intermediate-mass AGN (IMAGN). Compared to the "normal" population of AGN harboring supermassive black holes, the properties of LMAGN and the associated processes are much less understood. The LMAGN are low-luminosity systems with the Eddington ratios (L_{bol}/L_{Edd}) typically ranging from ~0.01 to 1. These objects generally resemble Narrow Line Seyfert 1 (NLS1) galaxies which are thought to have low mass black holes with high accretion rates (Greene & Ho 2004; Boroson 2002). The relation between the black hole mass and the host bulge velocity dispersion (the M_{BH} - σ relation: Ferrarese & Merritt 2000; Gebhardt et al. 2000a; Tremaine et al. 2002) signifies the role of some kind of black hole feedback process in galaxy evolution. The observational study of AGN with low-mass black holes can provide useful constraints on the initial conditions of galaxy evolution or the seed black holes from which the supermassive black holes eventually form.

Under the framework of this project, a comprehensive radio study of a larger sample of LMAGN using existing and new data from the VLA telescope in the USA and ATCA telescope in Australia. With this work, the following key questions will be addressed:

- How well does the extended sample of LMAGN, including those with very low Eddington ratio, follow the trend of decreasing radio loudness R with increasing Eddington ratio L_{bol}/L_{Edd}?
- How is the jet formation related to the BH mass? Does the LMAGN population has fewer systems with jets compared to normal AGN/QSOs?
- To what extent do the radio properties of low L_{bol}/L_{Edd} LMAGN differ from those of high L_{bol}/L_{Edd} LMAGN?

PhD Student Profile:

- Ideally MSc in Astronomy or Astrophysics (or at least MSc Physics with an affinity for Astrophysics).
- Familiarity with a programming language (preferably Python) is desirable.
- Some experience or understanding of data analysis and interpretation would be advantageous.
- Any previous experience (e.g. Masters thesis) in observational astronomy, particularly radio would be a major plus.
- Proficiency in English.