SKA precursor study of bright sources in the Southern sky

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This project aims to study the radio spectral properties and galaxy hosts of bright sources in the Southern sky using data from several SKA precursor instruments, including MeerKAT, ASKAP, and the MWA, as well as multiwavelength data from the Dark Energy Survey.

Rationale: Although mostly featureless, the radio spectrum of a galaxy contains information about the electron population and AGN drivers. The Sydney University Molonglo Sky Survey (SUMSS) at 843 MHz and 45 arcsec resolution has long been the only radio survey covering the sky south of -40 degrees declination. Thanks to precursor instruments for the Square Kilometre Array Observatory, we now have additional frequency coverage from sky surveys at ~100 MHz (GLEAM, 100 arcsec resolution) and 888 MHz (RACS, 25 arcsec resolution), from the MWA and ASKAP telescopes, respectively. Coupled with sensitive 1.3 GHz data from the MeerKAT from the MERGHERS Pilot survey, we can start to study the radio spectral properties of bright sources in the Southern sky across 1 GHz of bandwidth for the first time. With a resolution of ~8 arcsec, the MeerKAT data also allows us to resolve source structure that is unresolved by the available sky survey data. As all MERGHERS data has optical coverage from the Dark Energy Survey, we can obtain photometric redshifts and multi-band optical imaging to identify the host galaxy.
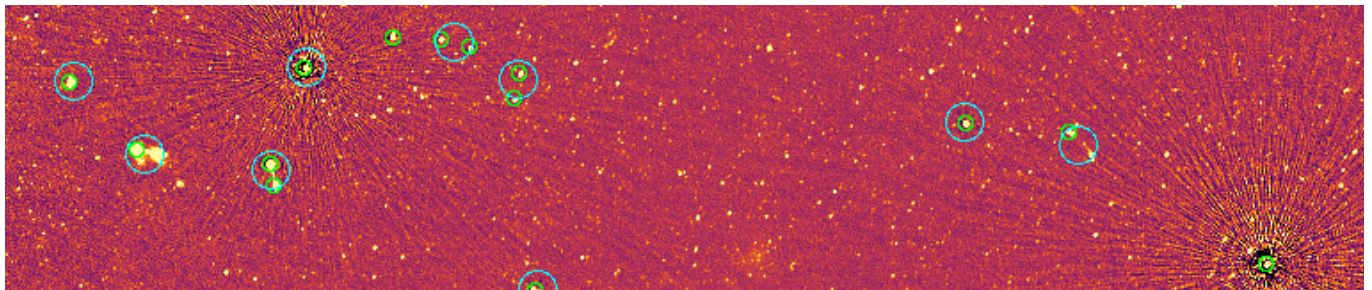

Fig. 1: Cutout of MeerKAT data from the MERGHERS Survey (Knowles et al. 2021a), with SUMSS and GLEAM source positions overlaid.

The project: Using a combination of radio data from ASKAP, MWA, and MeerKAT, we will study the spectral properties of bright radio sources in the MERGHERS pilot fields. Combined with optical imaging from DES, we will also identify and study the galaxy hosts.

The student will learn how to cross-match catalogues, how to work with catalogues of different spatial resolution, create/obtain image cutouts from multiwavelength surveys, and produce scripted code. They will also learn how to create multiwavelength composite images.

Required skills / knowledge: Familiarity with Python is required.

Interested students to please contact the supervisor well in advance of project selection deadlines. Interviews will be undertaken.