

MeerKAT - uGMRT Combined Survey of the Saraswati Supercluster: Towards the SKA

Abstract

Superclusters are matter over-densities on scales of \sim hundred Megaparsecs, where the number density of galaxies and galaxy clusters is higher than the average field in the Universe. We propose to survey the \sim 200 Mpc scale Saraswati Supercluster, containing 48 galaxy clusters, with the L-band of MeerKAT and obtain its deepest image to date to study the properties of galaxies and inter-cluster magnetization. The proposed survey will provide us with a wide spectral coverage between \sim 250 MHz to 1750 MHz over \sim 9 sq degrees sky area when combined with uGMRT band-3 (250-500 MHz) data. This first of its kind proposed study will enable us to probe multiple properties like SFR, AGN activity of galaxies as well as study several galaxy clusters and other foreground and background objects. Observations with MeerKAT will lead to images with rms of \sim 10 to 15 μ Jy/b, which will be complemented by our low-frequency uGMRT band-3 images with rms 40 μ Jy/b. MeerKAT's high sensitivity to low surface brightness features will unveil several interesting features in wide-ranging objects, especially galaxy clusters with mini halos, radio halo and relics (non-thermal diffuse radio emission). These also trace relativistic electrons and magnetic fields and hence allow us to study their content and strength in the supercluster environment. We request a total of 82 hours of observations with overheads to cover 30 MeerKat pointings of the Saraswati Supercluster. This uGMRT - MeerKAT combined study will provide a glimpse of what awaits to be uncovered with the Square Kilometre Array.