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The role of neutral atomic hydrogen in the evolution of Seyfert galaxies

Abstract

The star formation (SF) history and nuclear activity (AGN) of a galaxy are regulated by the balance between gas accreting from its environment and the material flowing out of the galaxy disk. The morphology and kinematics of the atomic hydrogen (HI) gas in galaxies is excellent to identify both episodes of gas accretion and gas removal as they reveal past interactions between galaxies and their environment, as well as fast clouds driven by the AGN and SuperNovae winds. A complete understanding of the cold gas flow from the circum-nuclear scales (5 kpc) to the galaxy outskirts and environment (~500 kpc) has however been limited by the long integrations required to detect low-column density HI (<1e+20/cm^2) at high resolution (<20" and few km/s) with the available interferometers.
We propose MeerKAT-32k observations of five nearby (D<40 Mpc) Seyfert galaxies with known extended ionised- and molecular-gas outflows (as revealed by publicly available MUSE and ALMA data). We will reach a 3sigma HI column density sensitivity of 2.1e19/cm^2 (at 20" resolution over 20 km/s), to detect extended extra-planar gas as well as out-flowing and in-falling clouds. By studying the HI kinematics from the circum-nuclear (<5 kpc) to the circum-galactic environments (out to ~ 500 kpc), we will link small-scale properties of the molecular and ionised gas to the large-scale motion of the HI, providing a more comprehensive, multi-scale picture of the gas flow in these active galaxies.