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# Gas Dynamics in AGN Galaxies: First Results of the HI-NUGA Survey

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**Abstract.** The process of fueling Active Galactic Nuclei (AGN) in galaxies is commonly associated with gas aggregation onto a central supermassive black hole. Up to now a general picture of the AGN fueling is missing: What mechanisms are responsible for the various kinds of AGNs? How to remove angular momentum from the material far away from the gravitational influence of the central black hole? Over the last decade observations have been pointing towards a hierarchy of mechanisms that all combine to transport the gas from the large kpc scales down to the inner pc scales. In addition, fueling mechanisms excited by the galactic environment, e.g. through minor mergers and tidal interactions, have been suggested.

In order to study the gas transport from the outskirts of galaxies to the central AGN, we have embarked on a key project, NUGA (Nuclei of Galaxies): a high spectral and angular resolution CO and HI survey of low luminosity AGN in nearby galaxies (i.e. Seyferts, LINERs and transition objects).

For our detailed HI study, 16 nearby AGN galaxies were observed in their 21 cm line emission of neutral HI gas using the NRAO Very Large Array (VLA) interferometer in its C- and D-array configuration ($\sim 20''$ angular and $\sim 5.2$ km s$^{-1}$ spectral resolution). The spiral galaxies in our sample range in Hubble type from Sa to Sbc. For all galaxies high quality mm-interferometric CO data as well as optical/NIR imaging data are available.

Here, we present first results on the atomic gas distribution and kinematics in these galaxies: The HI gas properties are analyzed and then compared to the optical properties. Their HI morphology reveals a wide variety: rings, spiral arms, and central concentrated, where ring structures are mostly found in LINER hosts. The integrated surface brightness profiles show some significant differences between the HI gas and stellar light as well as their radial extent. Our analysis of the HI environment yields that 4 galaxies are surrounded by satellites and 8 galaxies have disturbed outer HI disks, probably due to ram pressure stripping and/or minor mergers. Our analysis of the HI kinematics provides rotation curves, dynamical masses and evidence for streaming motions for each galaxy.

The inclusion of recently obtained VLA B-array data will provide $\sim 7''$ resolution for more than half of the sample. We will utilize gravity torques based on a definite phase shift between the gravitational potential and the HI gas distribution to determine the gas inflow, and thus the efficiency for feeding the central black hole. Further, the combined CO+HI+NIR/opt data will allow us to develop dynamical models describing the gas flow in galactic disks from the large kpc scales down to the inner pc scales for selected galaxies in our sample.

**Keywords.** galaxies: active, galaxies: kinematics and dynamics, galaxies: interactions, galaxies: nuclei, galaxies: Seyfert, galaxies: spiral, radio lines: galaxies, atomic data

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