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The WALLABY view of the gas cycle in galaxies

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Extragalactic HI-line surveys are crucial for understanding how cold atomic hydrogen (HI) flows into and out of galaxies and how this process is influenced by the environment. While past HI surveys in the local Universe were limited by the low spatial resolution of single-dish radio telescopes, next-generation instruments such as the Australian SKA Pathfinder (ASKAP) are now transforming the field. In this talk, I will present early results from WALLABY—the Widefield ASKAP L-band Legacy All-sky Blind surveY—which is delivering the most detailed census of HI to date, improving spatial resolution nearly tenfold over ALFALFA, the benchmark single-dish HI survey.

I will highlight new measurements of HI structural parameters across a diverse galaxy sample, including scaling relations between HI size, surface density, and galaxy properties. These reveal unexpected variations in HI distributions, challenging assumptions of uniform disk profiles. I will also discuss how these trends relate to star formation efficiency and the physical processes governing gas regulation in galaxy disks. Finally, I will outline how WALLABY sets the stage for the transformative capabilities of the full Square Kilometre Array in the coming decade.

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