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# Unveiling small-scale dark matter structure with starless halos: Are mass and concentration estimates reliable?

*Thursday 11 September 2025 16:00 (30 minutes)*

RELHICs (REionization-Limited HI Clouds) are a population of gas-rich, starless dark matter halos predicted by the ΛCDM model. Being in hydrostatic equilibrium with the dark matter and the UV background, their gas distribution provides a unique opportunity to directly probe the structure of dark matter halos on small scales. These systems have recently become accessible to observations thanks to deep radio surveys as FAST. I will present results from high-resolution cosmological simulations from the EAGLE project, focusing on the performance of mass and concentration estimators applied to simulated RELHICs. Using a physically motivated model for the HI and gas profiles, we can infer halo properties directly from observable quantities. We find that mass estimates are unbiased on average, though systematic deviations appear in the most HI-rich systems due to environment pressure effects. This analysis provides guidance for current and future observational efforts with upcoming facilities such as SKA.

## References

Alejandro Benitez-Llambay and Julio F. Navarro 2023 ApJ 956 1- Alejandro Benitez-Llambay , Carlos Frenk, Volume 498, Issue 4, November 2020, Pages 4887–4900, https://doi.org/10.1093/mnras/staa2698

**Author:** TURINI, Francesco (Università degli studi Milano-Bicocca)

**Presenter:** TURINI, Francesco (Università degli studi Milano-Bicocca)

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