

Constraints on HI at $z \sim 0.37$ by stacking galaxy spectra from the MIGHTEE survey

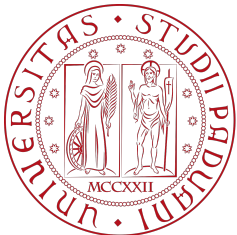
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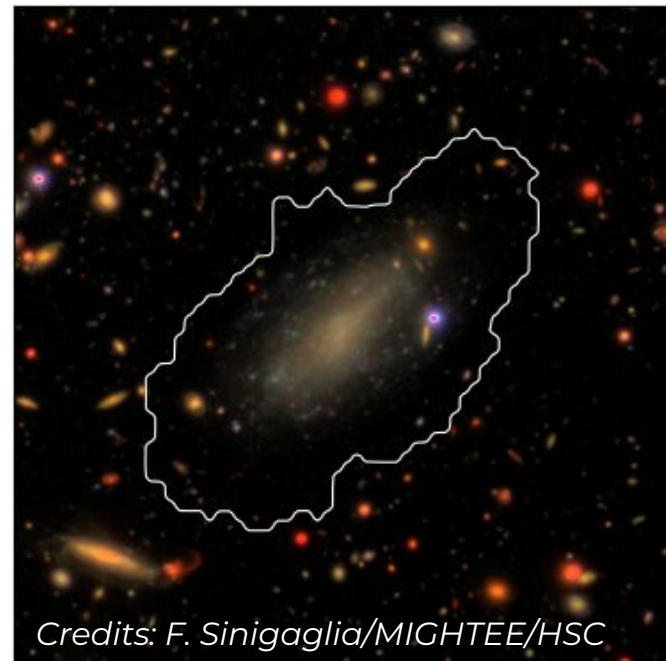
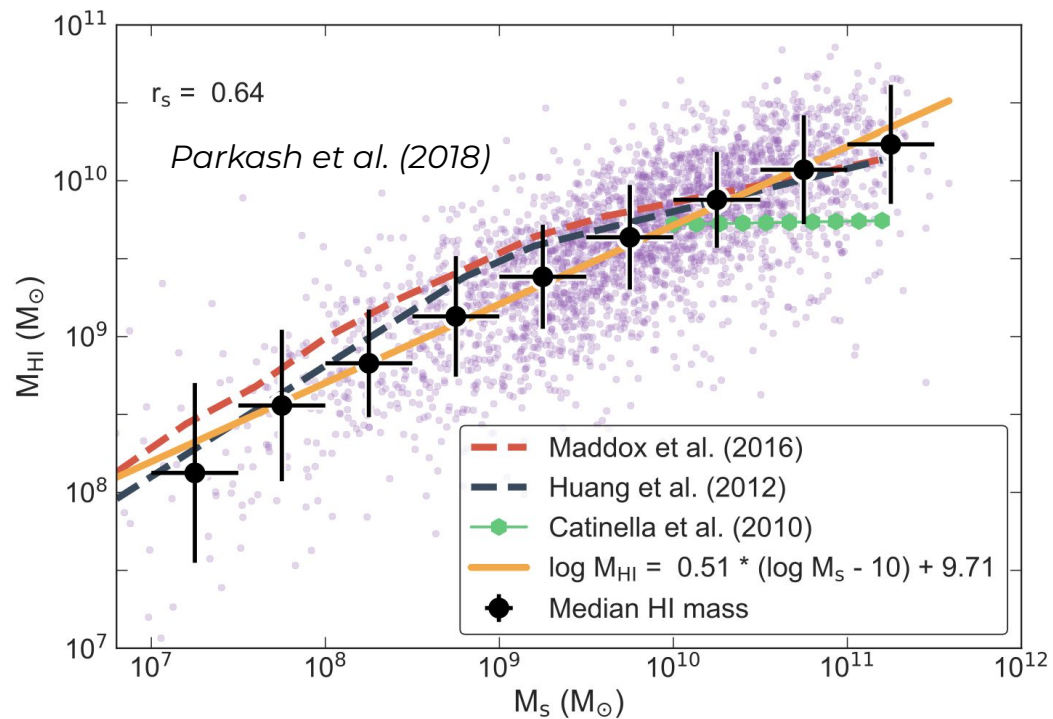
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Scientific rationale



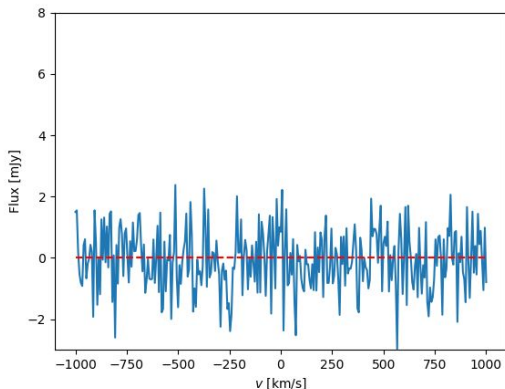
Get constraints on HI in galaxies beyond the nearby universe

HI spectral stacking

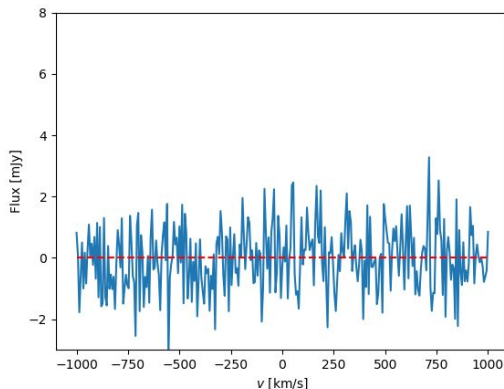
HI can be observed through the **21-cm emission line** ... but the line is **faint!**

At $z < 0.1$ direct detection is possible

At $z > 0.1$ direct detection not possible: use **spectral stacking**



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Signal $\propto N_{sp}$

Noise $\propto \sqrt{N_{sp}}$

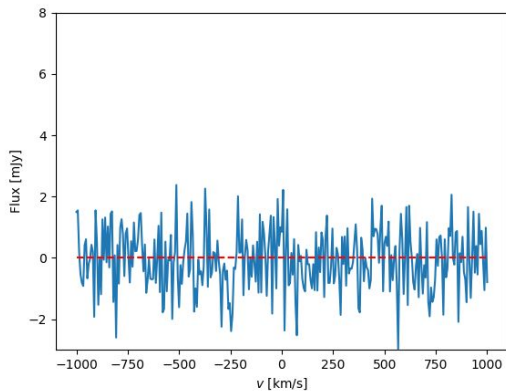
SNR $\propto \sqrt{N_{sp}}$

HI spectral stacking

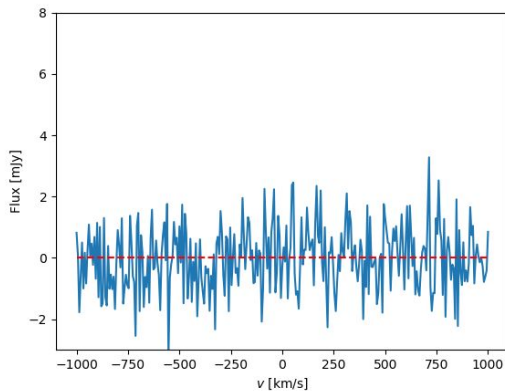
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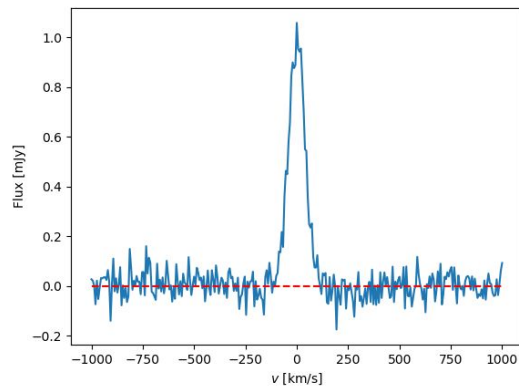
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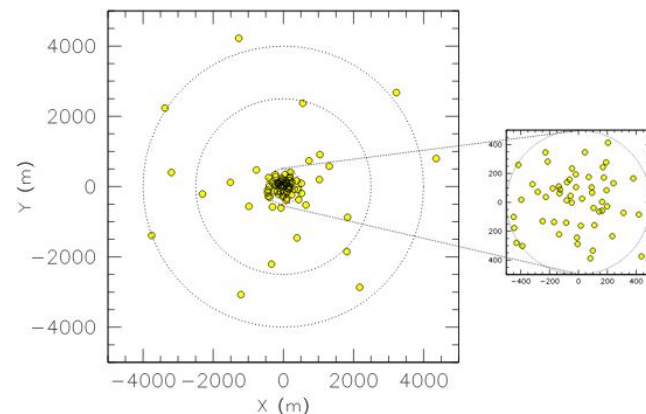
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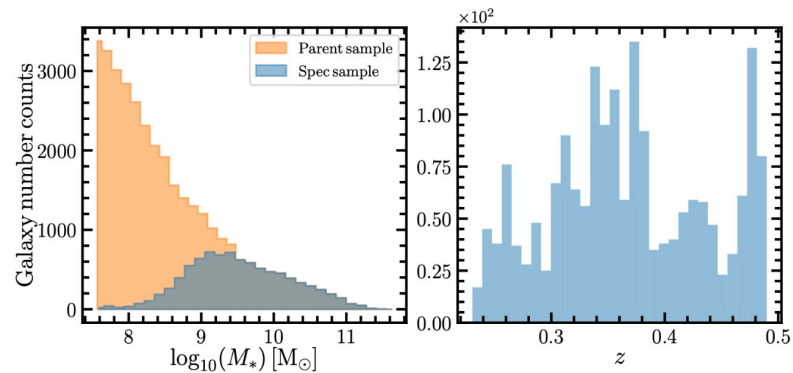


The MIGHTEE survey

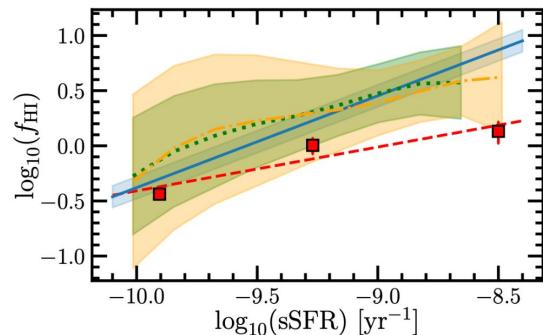
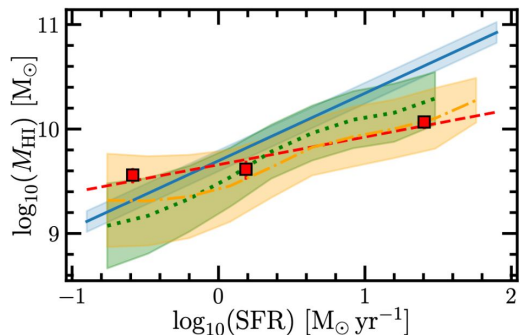
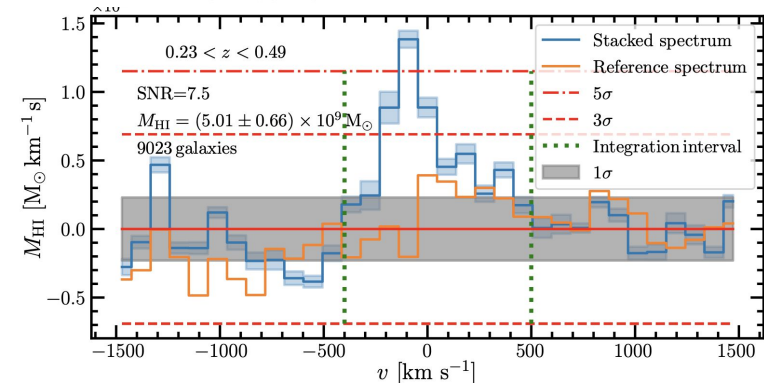
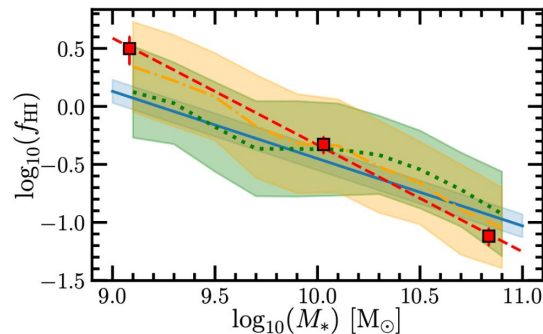
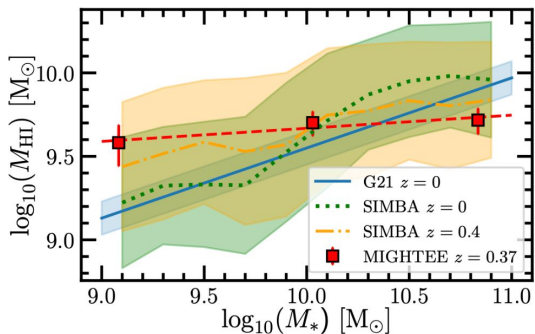
- **MeerKAT: 64 dishes (13.5m diameter)**
located in the Karoo Desert (South Africa)
- **Bandwidth: $0.90 < \nu < 1.67$ GHz**
(HI emission: $\nu \sim 1.42$ GHz)
- **Field: ~ 20 deg²**
(here just COSMOS)
- **Redshift range: $0 < z < 0.5$**



HI scaling relations at $z \sim 0.37$



9023 star-forming galaxies with spec- z at $0.23 < z < 0.49$



- First detection ever of HI scaling relations of star-forming galaxies at $z \sim 0.37$
- Need for efficient HI replenishment of HI over the last 4 Gyr
- Good agreement with cosmological simulations

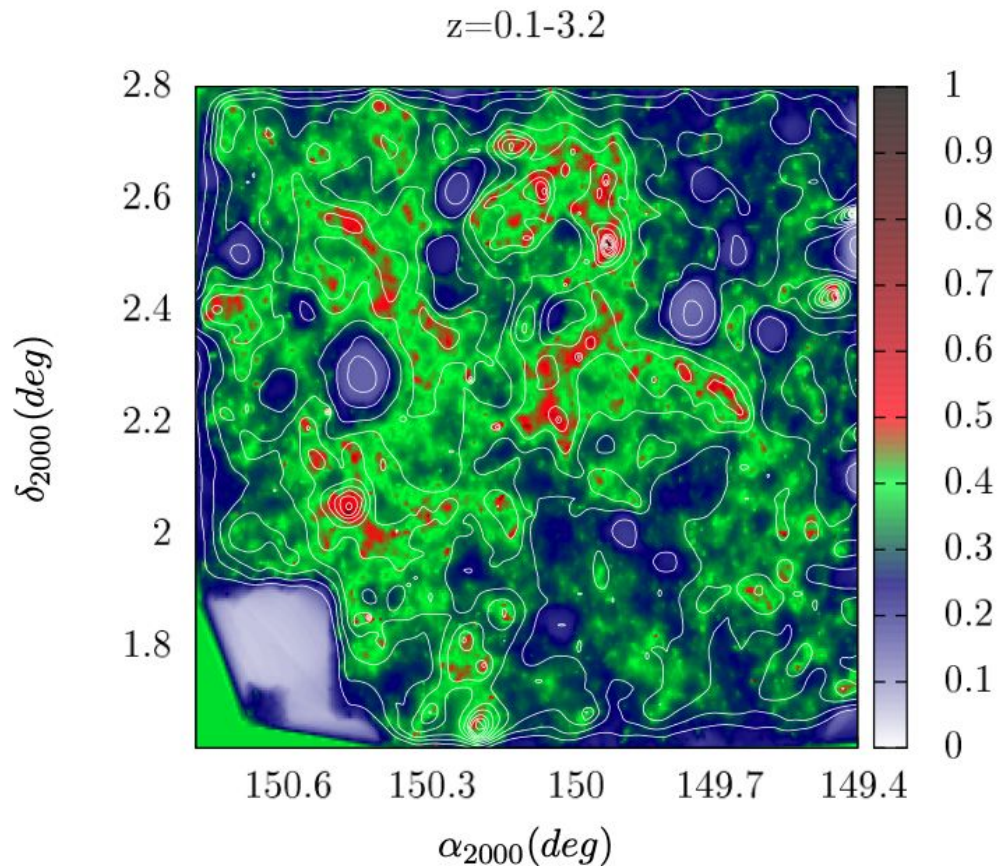
HI at $z \sim 0.37$ in the LSS environment (ongoing)

Same approach and techniques as before,

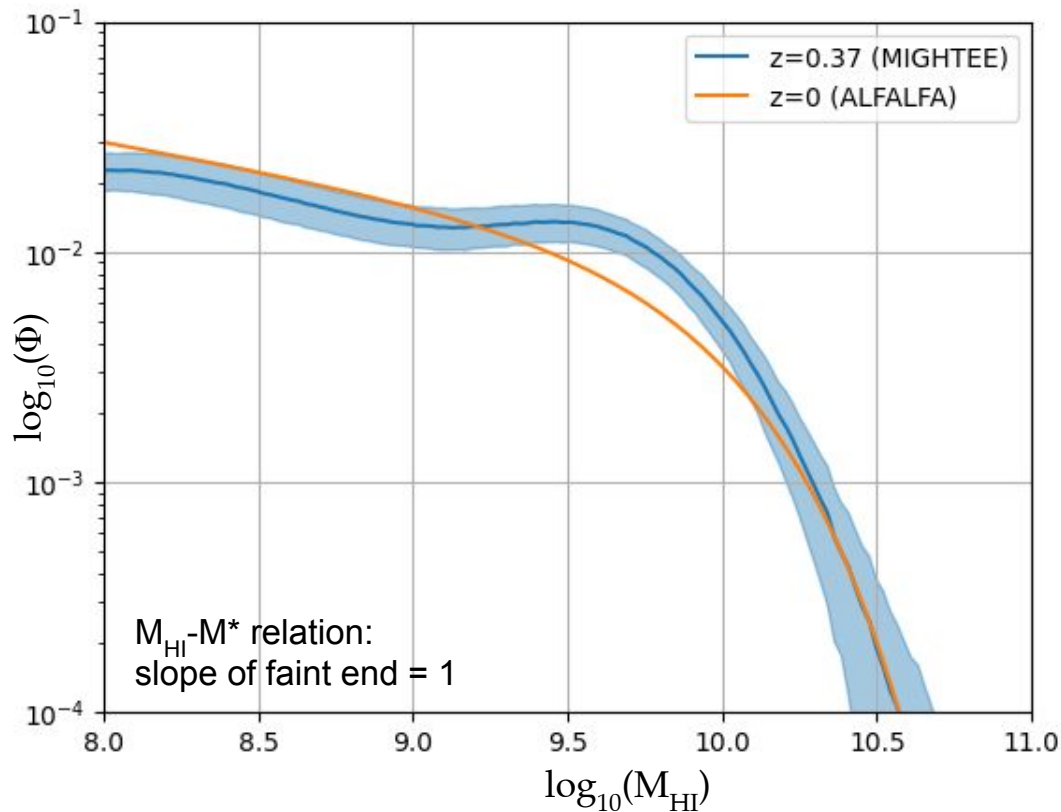
but subdivide galaxies by:

- bins of galaxy overdensity field
- centrals/satellites, after running a Friends-of-Friends group finder
- field, filament or cluster membership, based on the curvature tensor

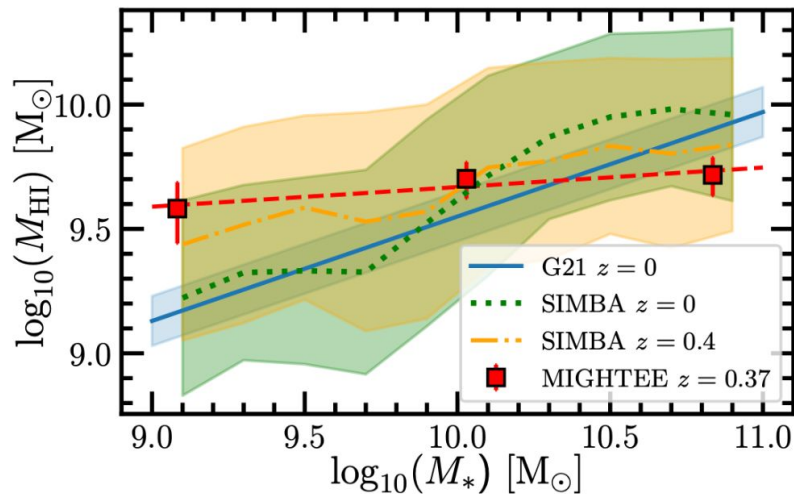
Classification available from Darwish+15,+17



HI mass function at $z \sim 0.37$ (ongoing)



Disclaimer: very very preliminary...



Start from empirical M^* MF (e.g. Sobral+14)
Sample from it
Convert M^* to M_{HI} via the scaling relation
Build the resulting HI MF

The $M_{\text{HI}}-M^*$ must bend and become steeper towards low M^* , otherwise Ω_{HI} explodes