Finanziato dall'Unione europea NextGenerationEU
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Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
INAF ISTITUTO NAZIONALE DI ASTROFISICA

SPRITZ+HI: pouring neutral hydrogen into the simulated sky cocktail

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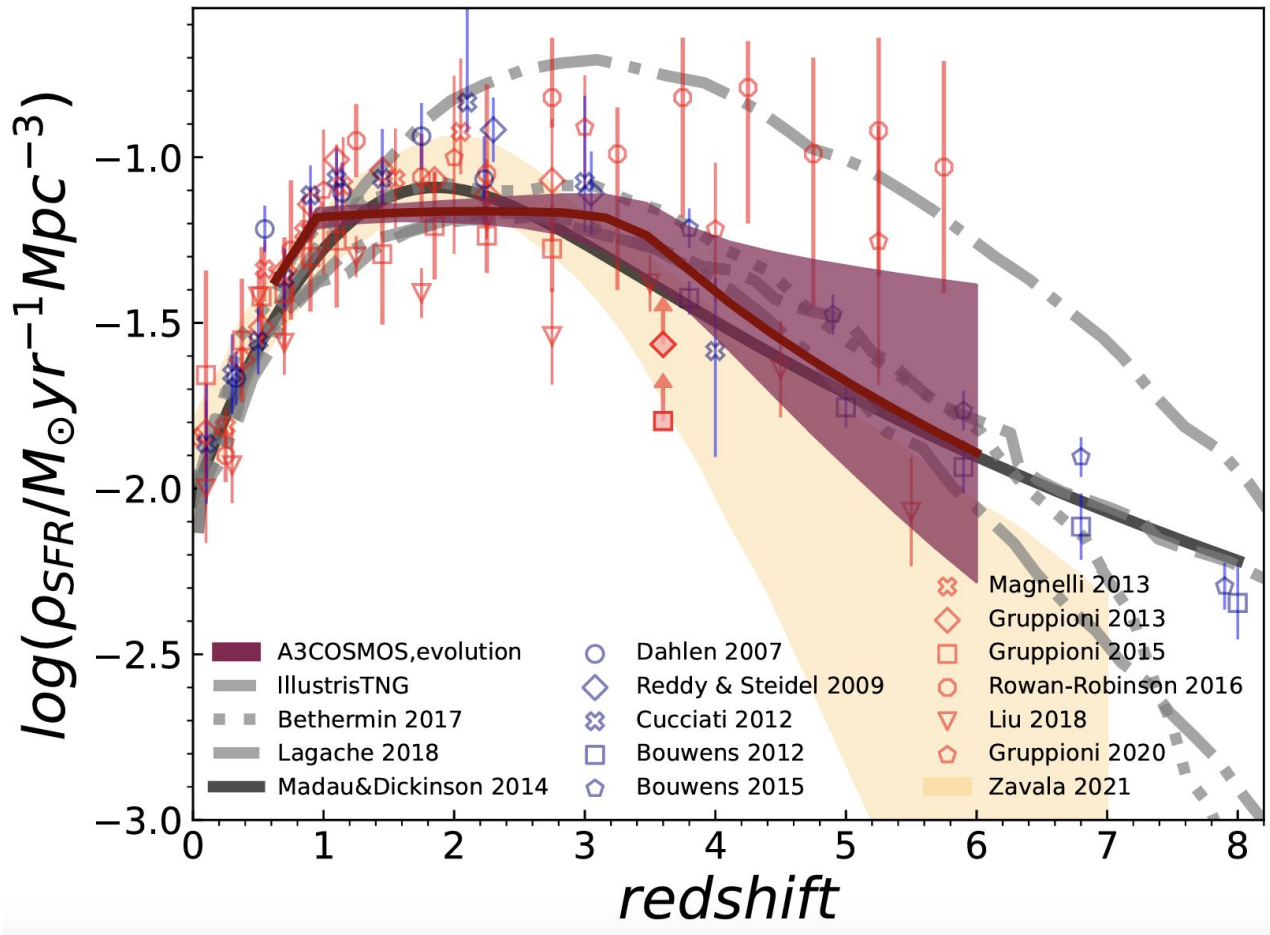
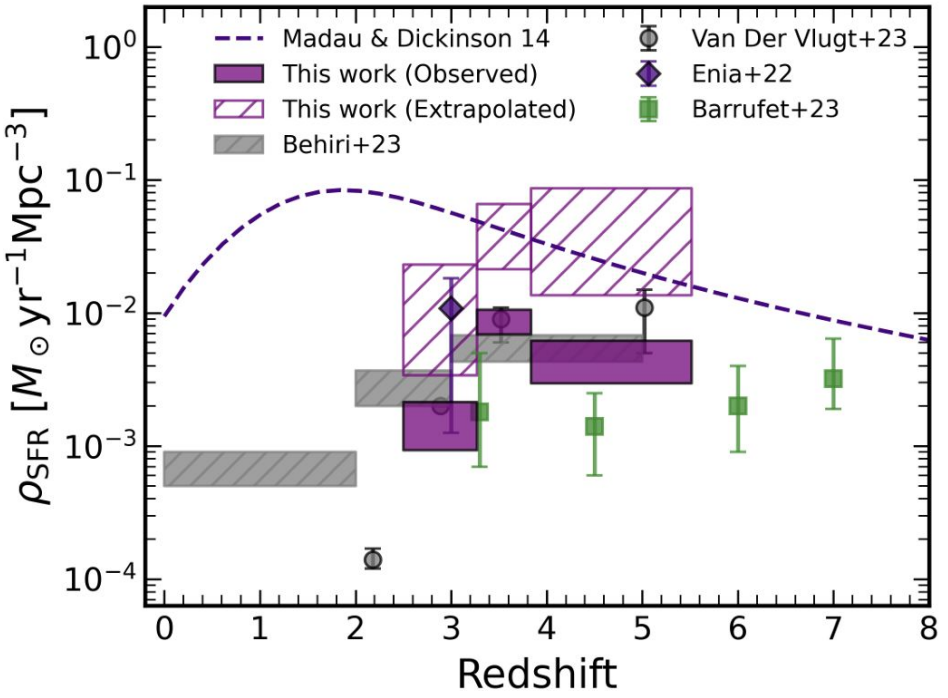
PNRR
Missione 4 • Componente 2
Investimento 3.1

STILES – IR0000034
CUP C33C22000640006

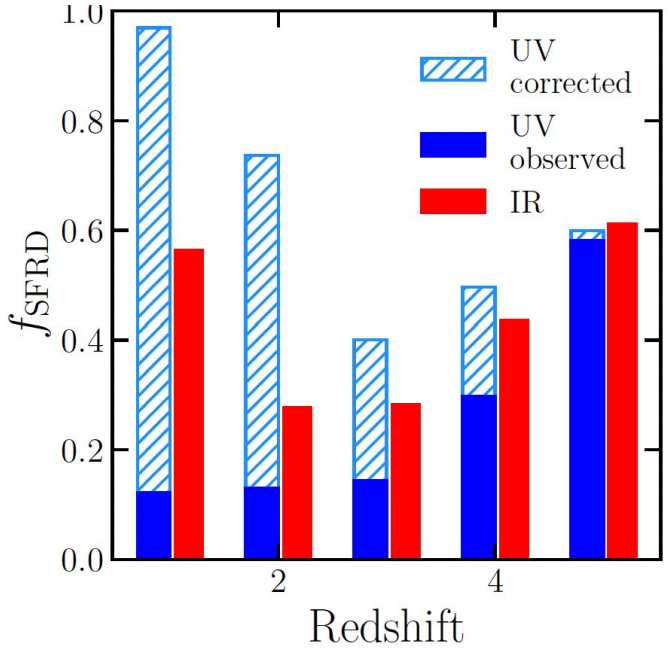
Piercing through the dust



Traina et al. 2024

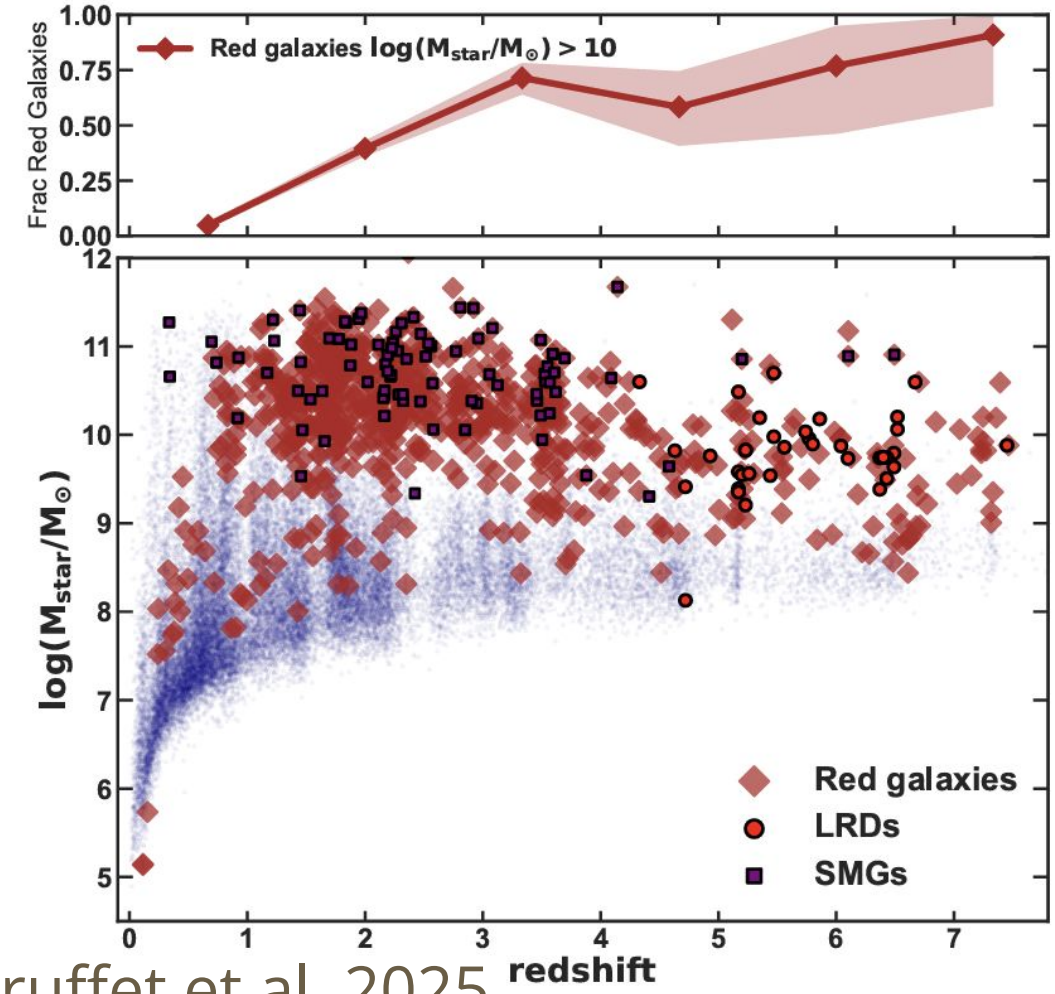


Gentile et al. 2025

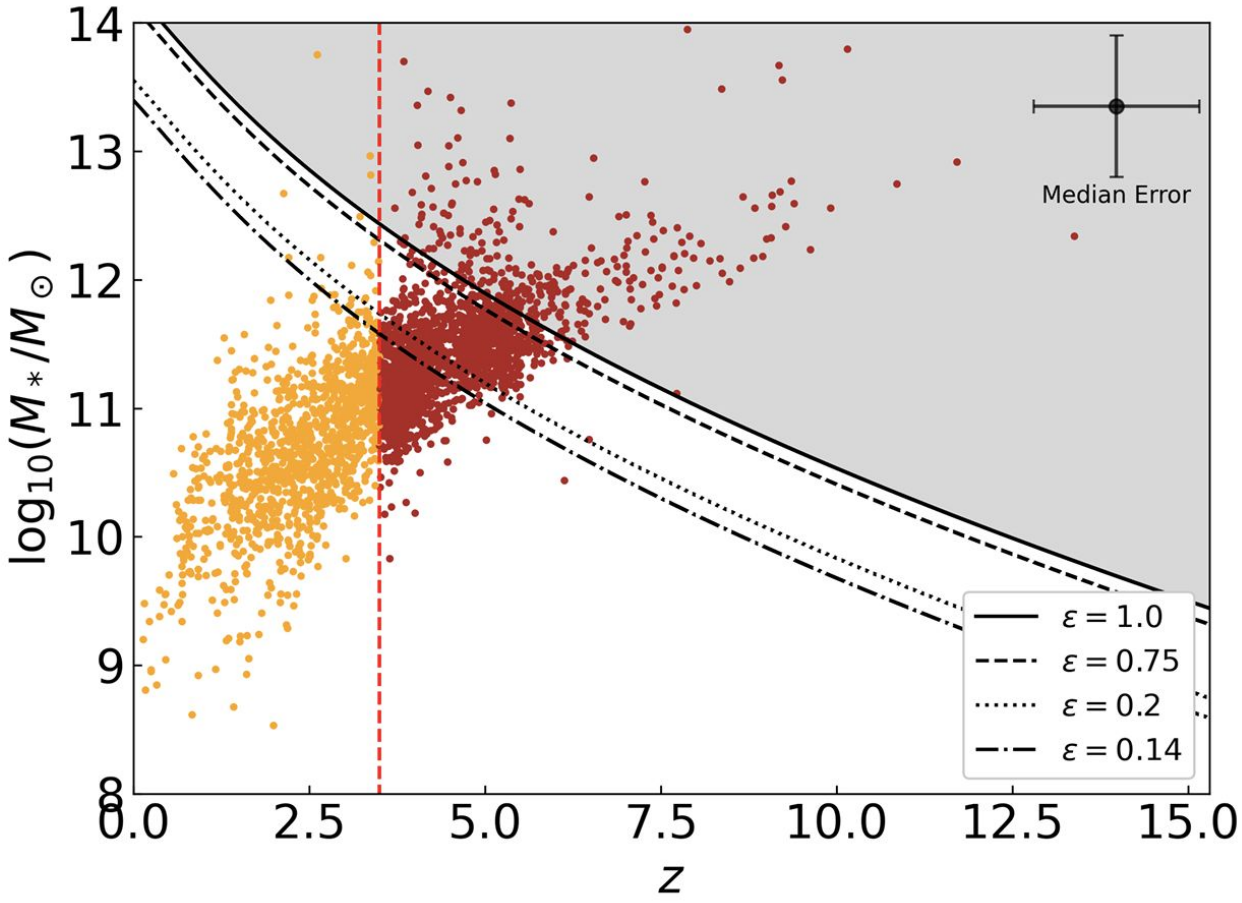


Traina et al. 2025

Piercing through the dust



Baruffet et al. 2025



Euclid Collaboration: Girardi et al. 2025

To study the most massive star-forming galaxies at different epochs you need infrared or radio data

…

This is valid for simulations as well!

Spectro-Photometric Realisations of Infrared-selected Targets at all-z (Bisigello et al. 2021)

http://spritz.oas.inaf.it/

- Inputs: observed luminosity functions (mainly IR)
- Include star-forming galaxies, AGN, dwarf and ellipticals
- Physical parameters obtained from empirical relations
- Emission features from empirical/theoretical relations
- Outputs: simulated catalogues, images and spectra

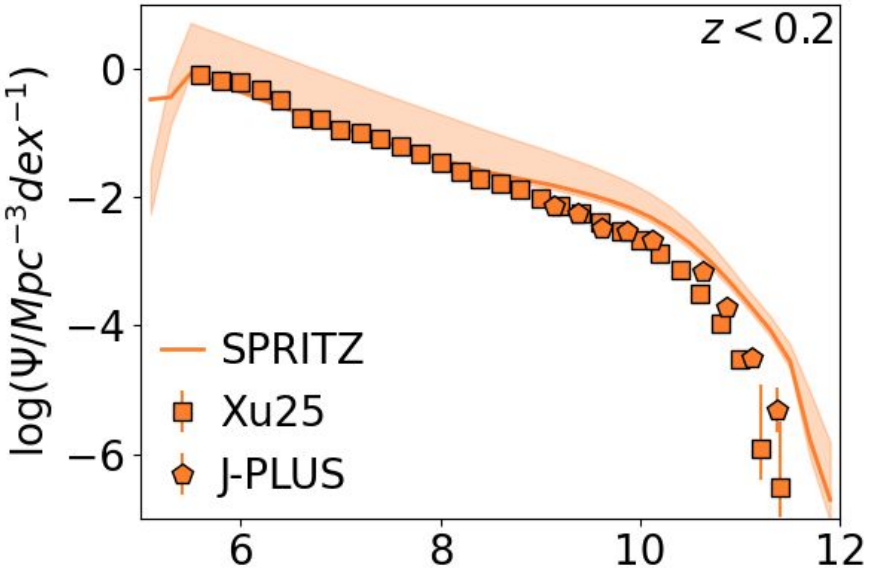
What's already included?

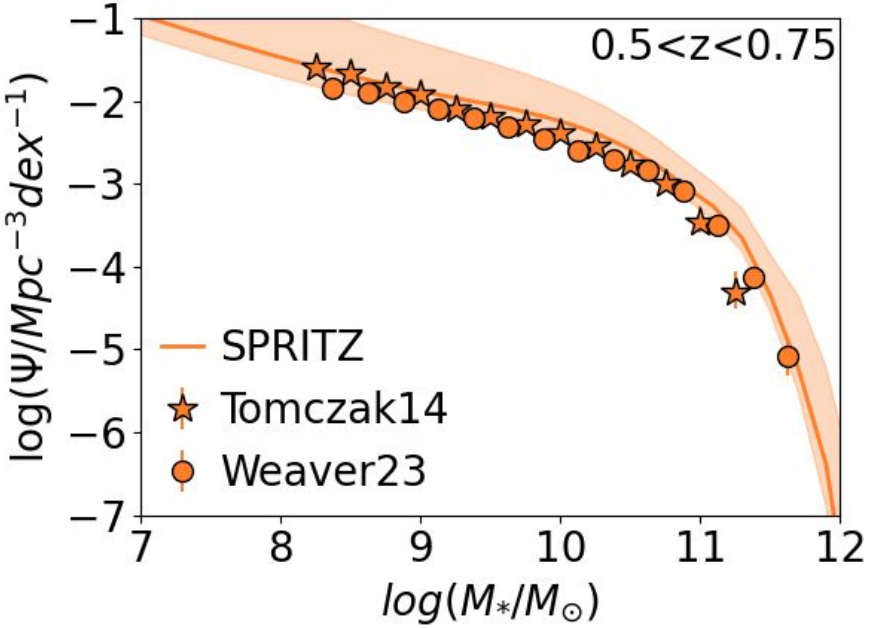
- Optical-to-FIR stellar and dust emission, including nebular lines
- Radio continuum emission coming from star formation
- Molecular gas: CO, [CII] (Bisigello et al. 2022)

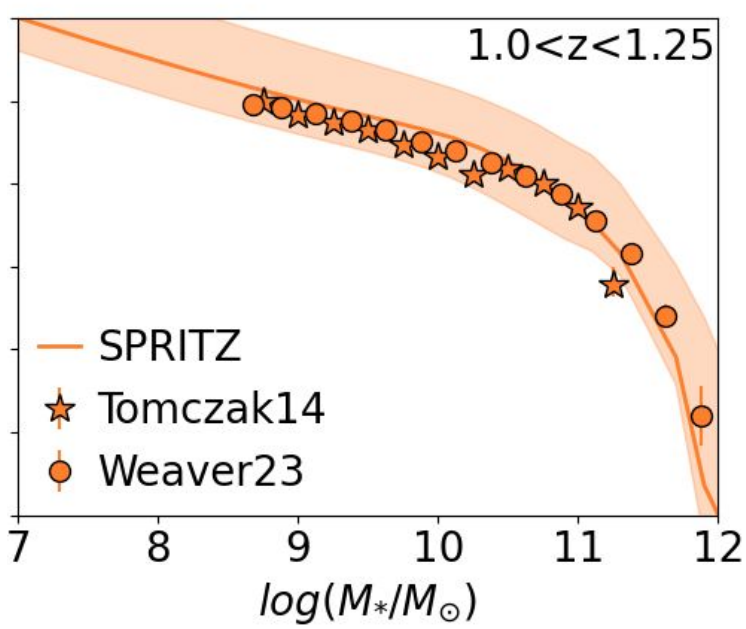
What's missing?

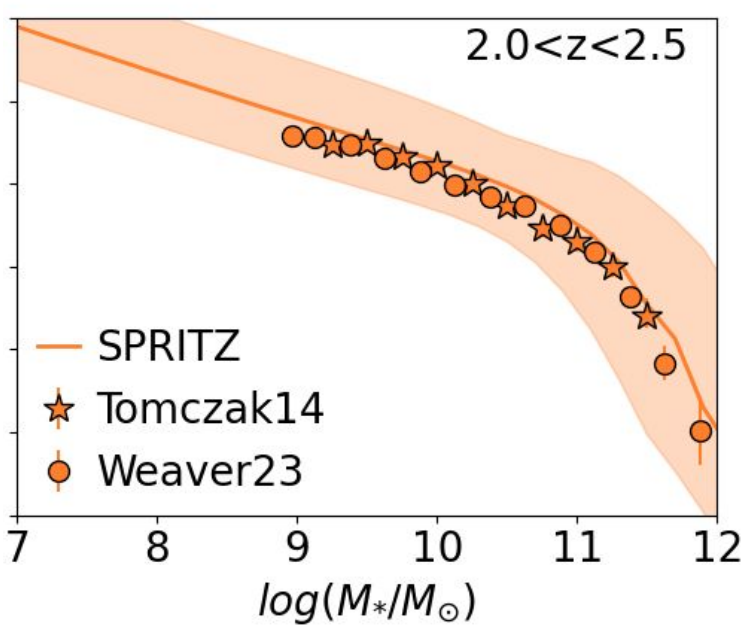
- **HI!!**

Stellar mass function of star-forming galaxies in SPRITZ

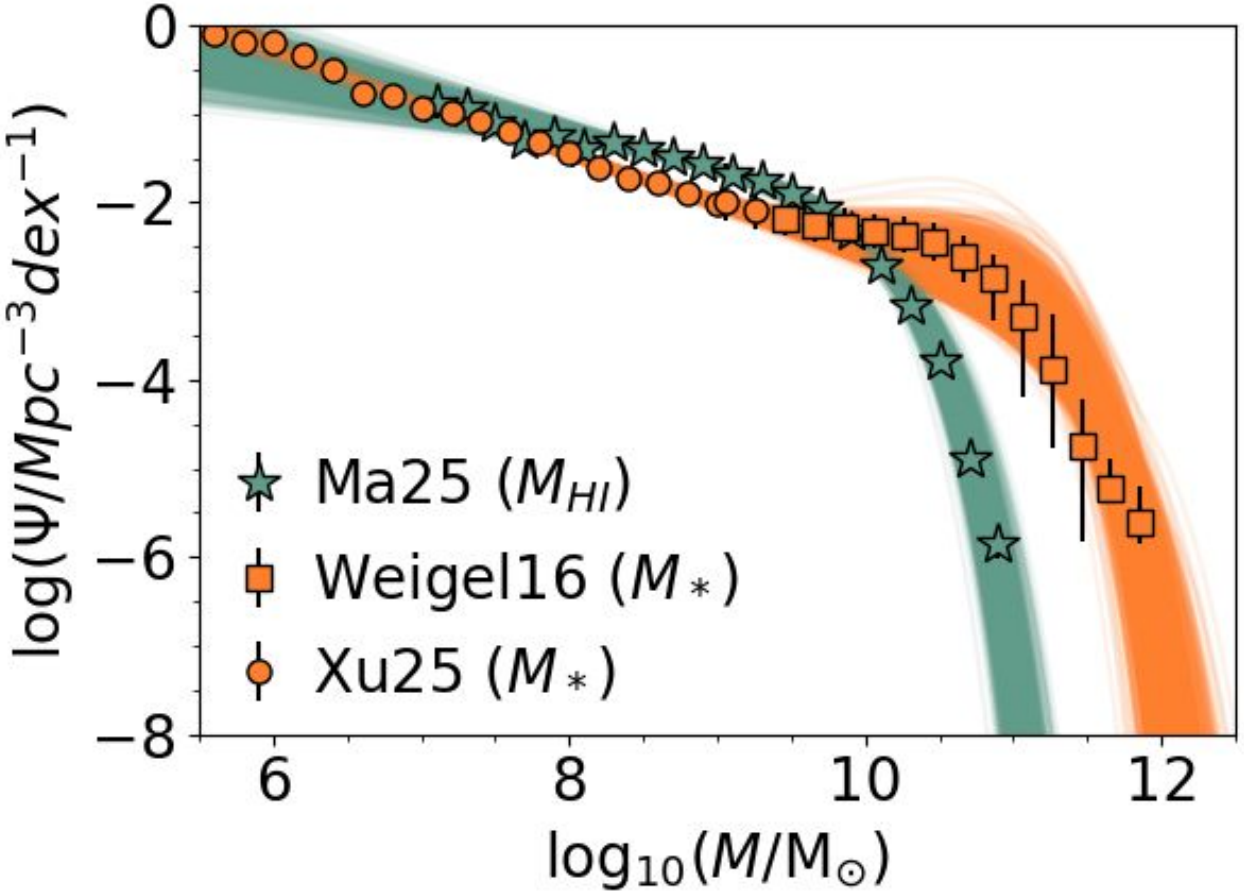








M_{HI}-M^* scaling relation



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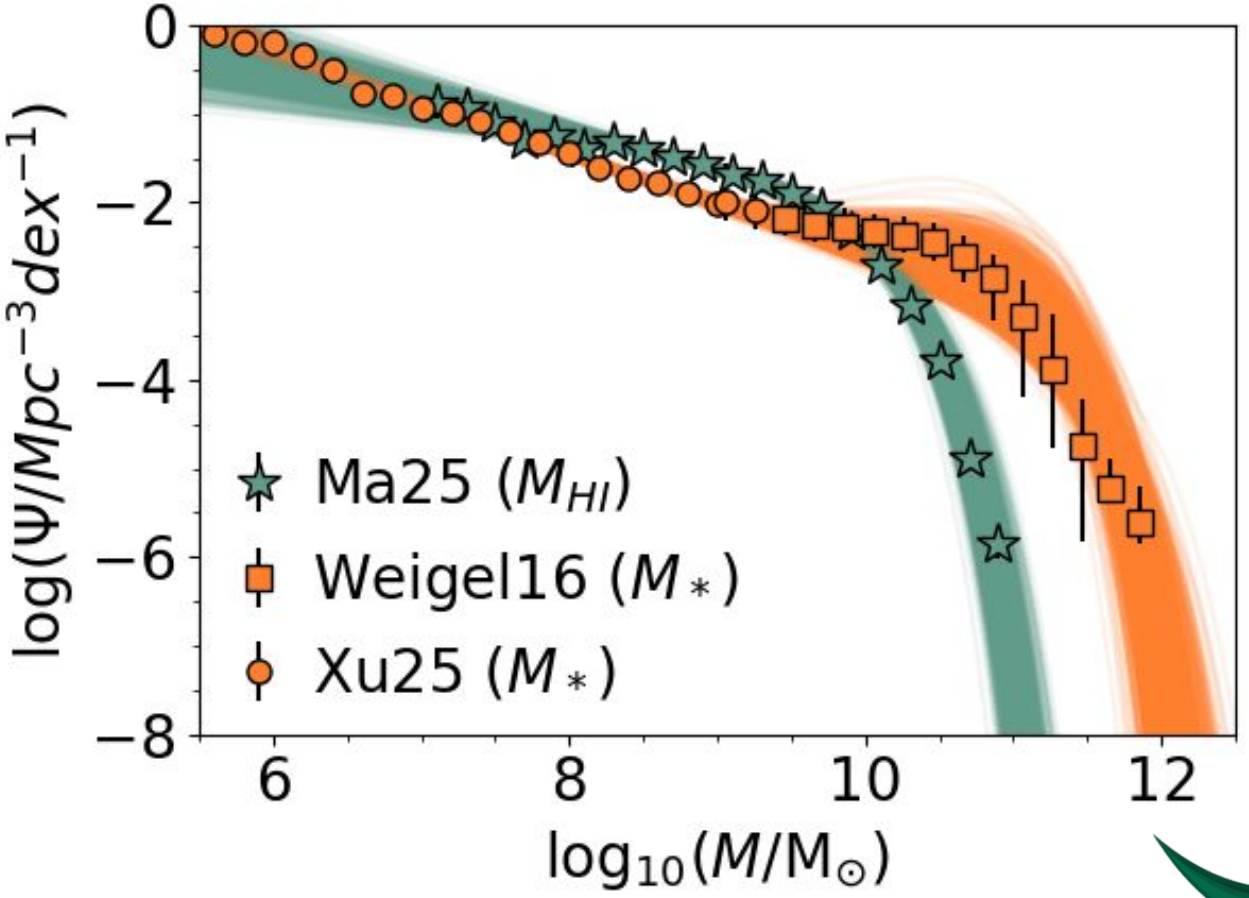
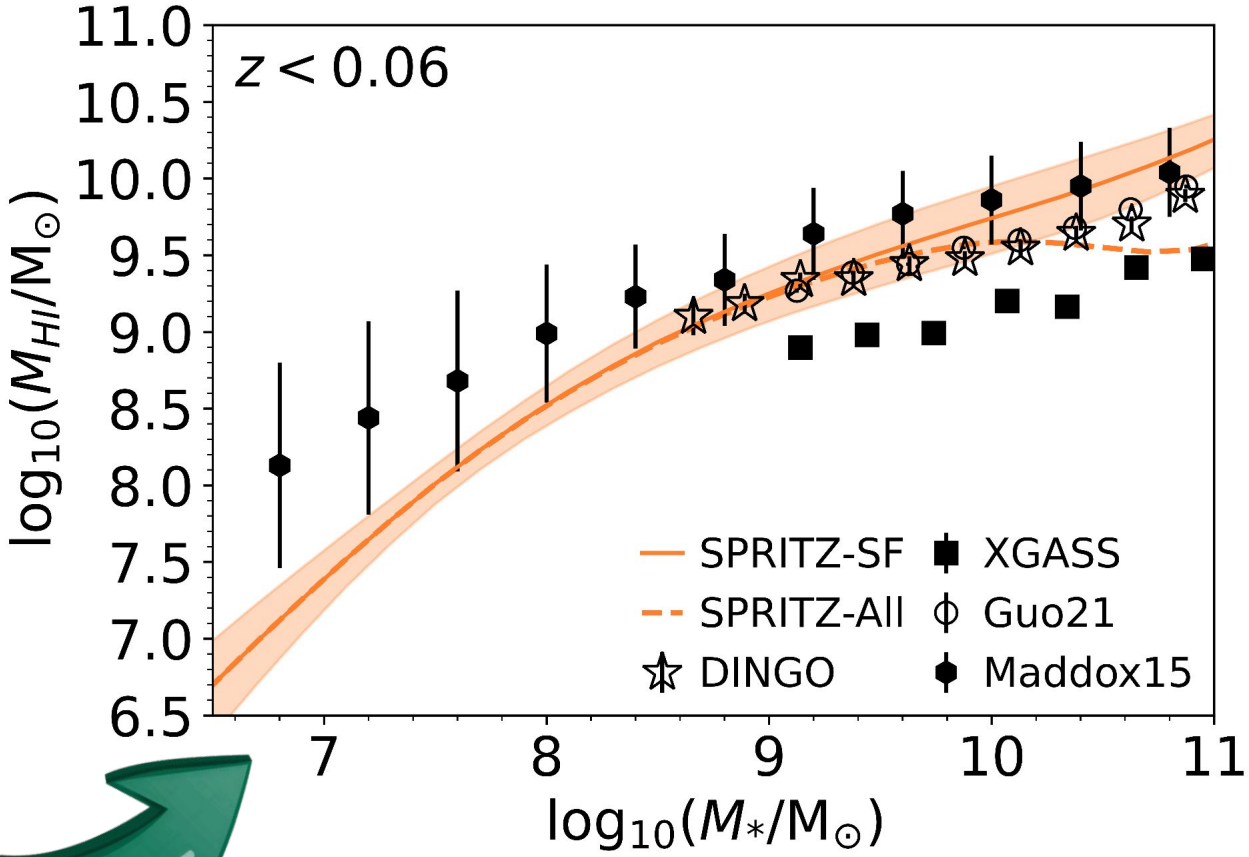
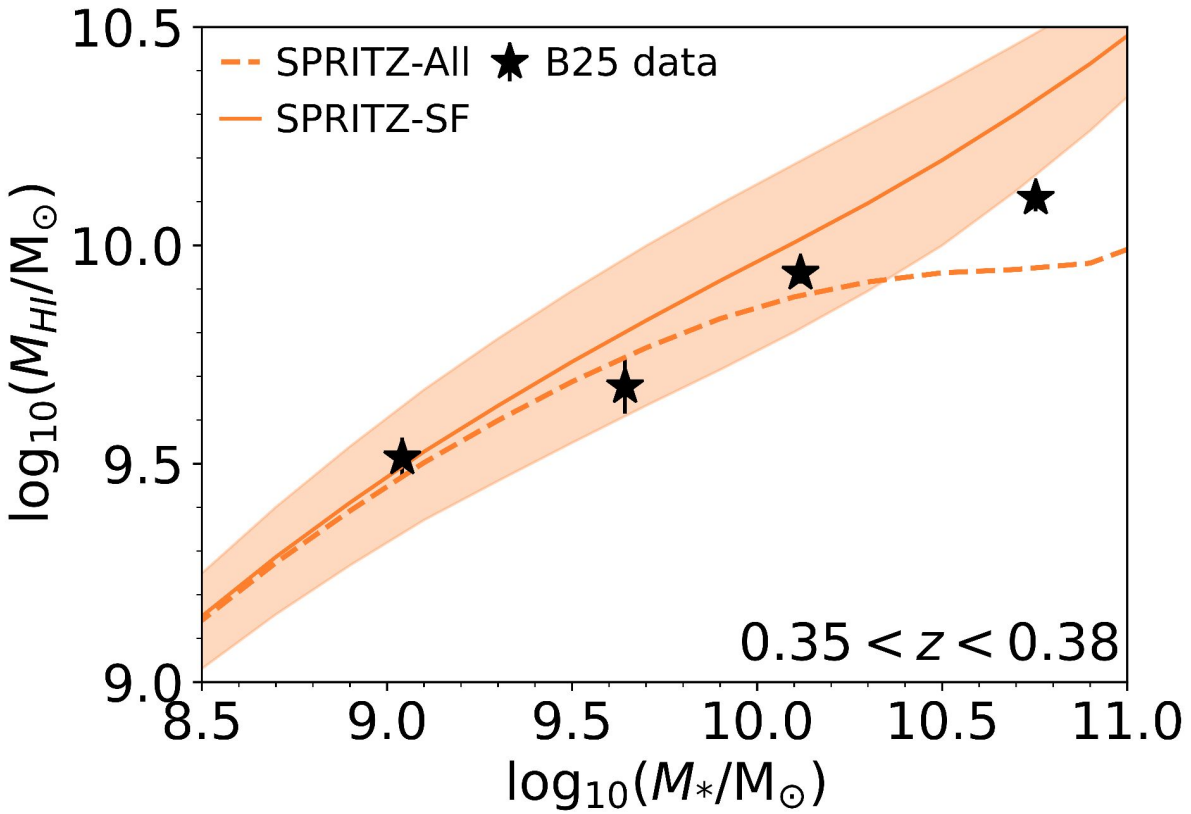


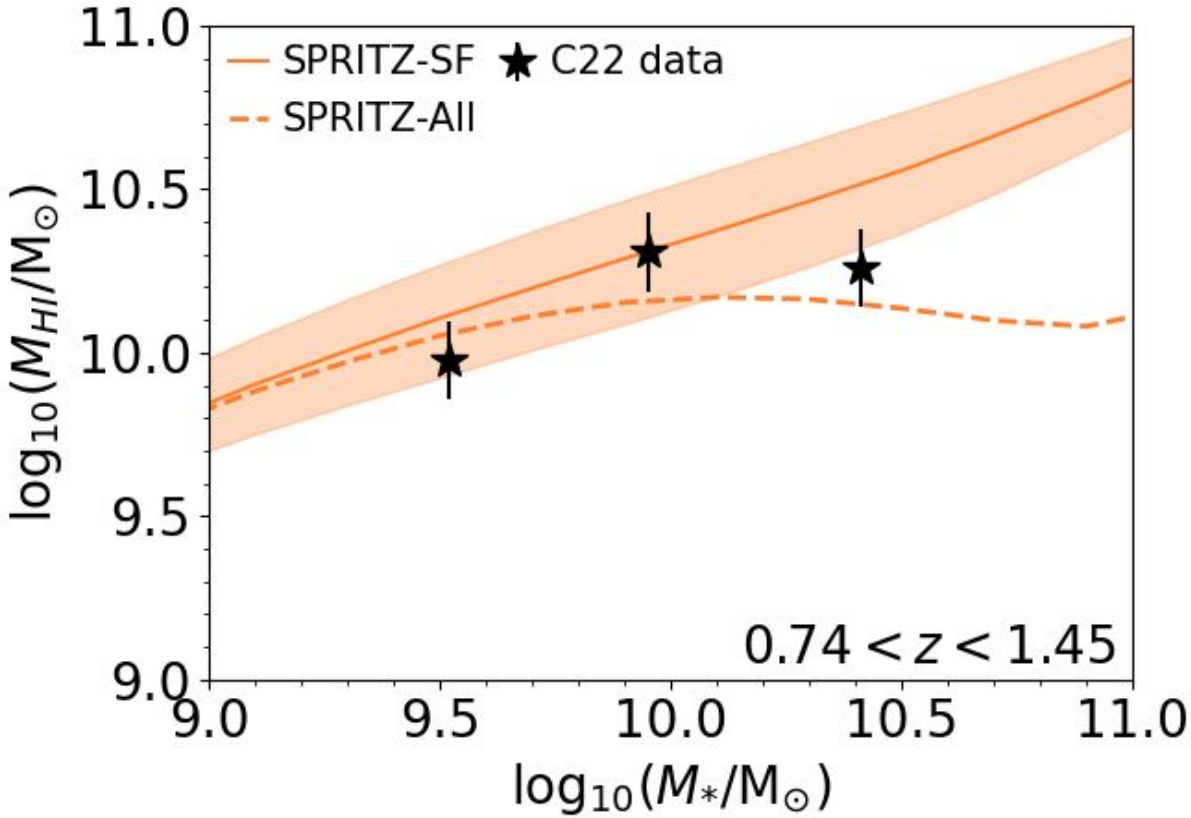


Abundance matching

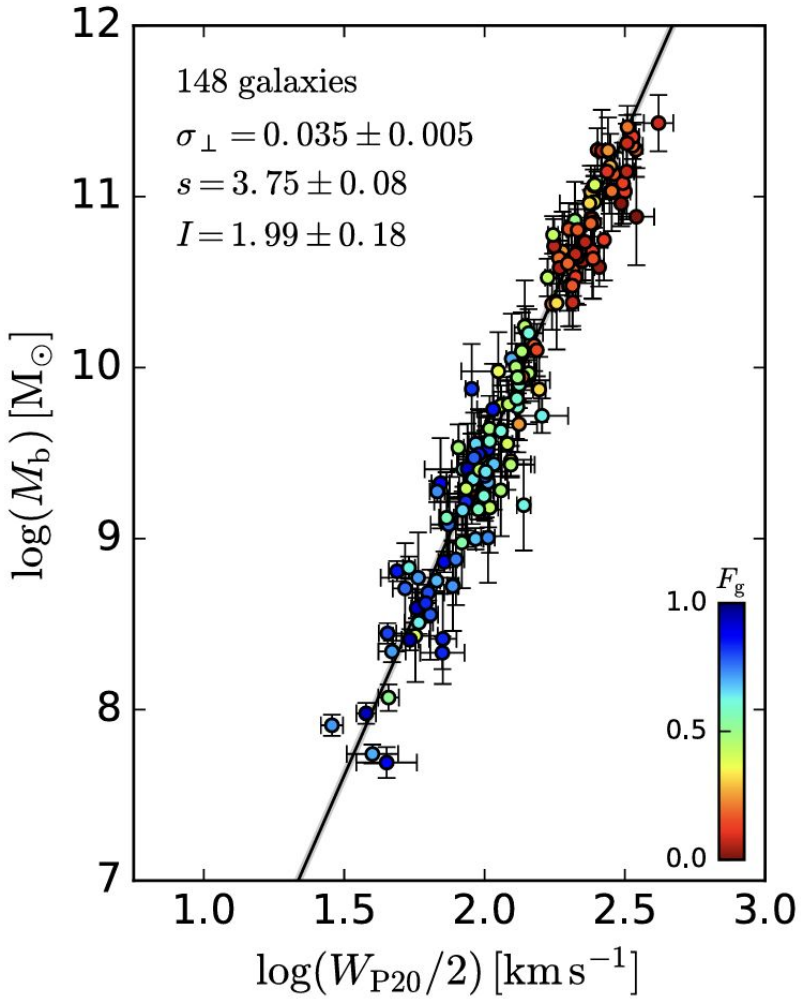
M_{HI}-M^* scaling relation - redshift evolution

$\log(M_{HI}) \propto 1.99(1+z)$ Bianchetti et al. 2025

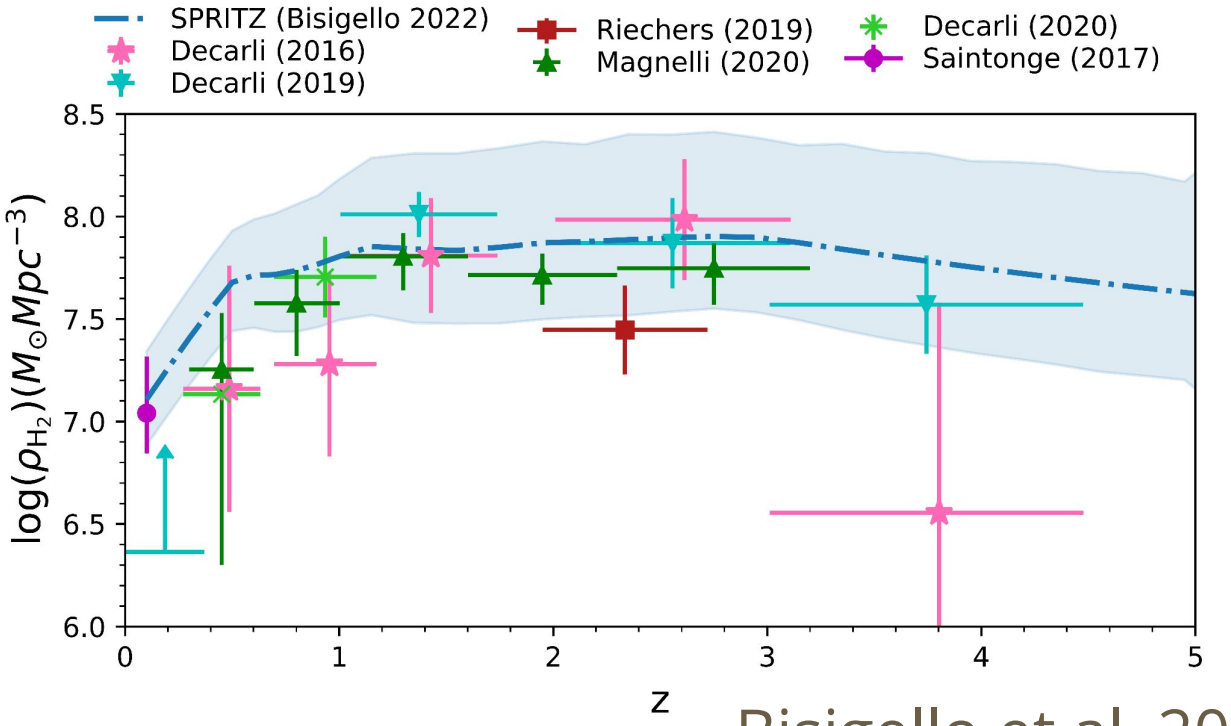




From HI mass to HI flux



Lelli et al. 2019

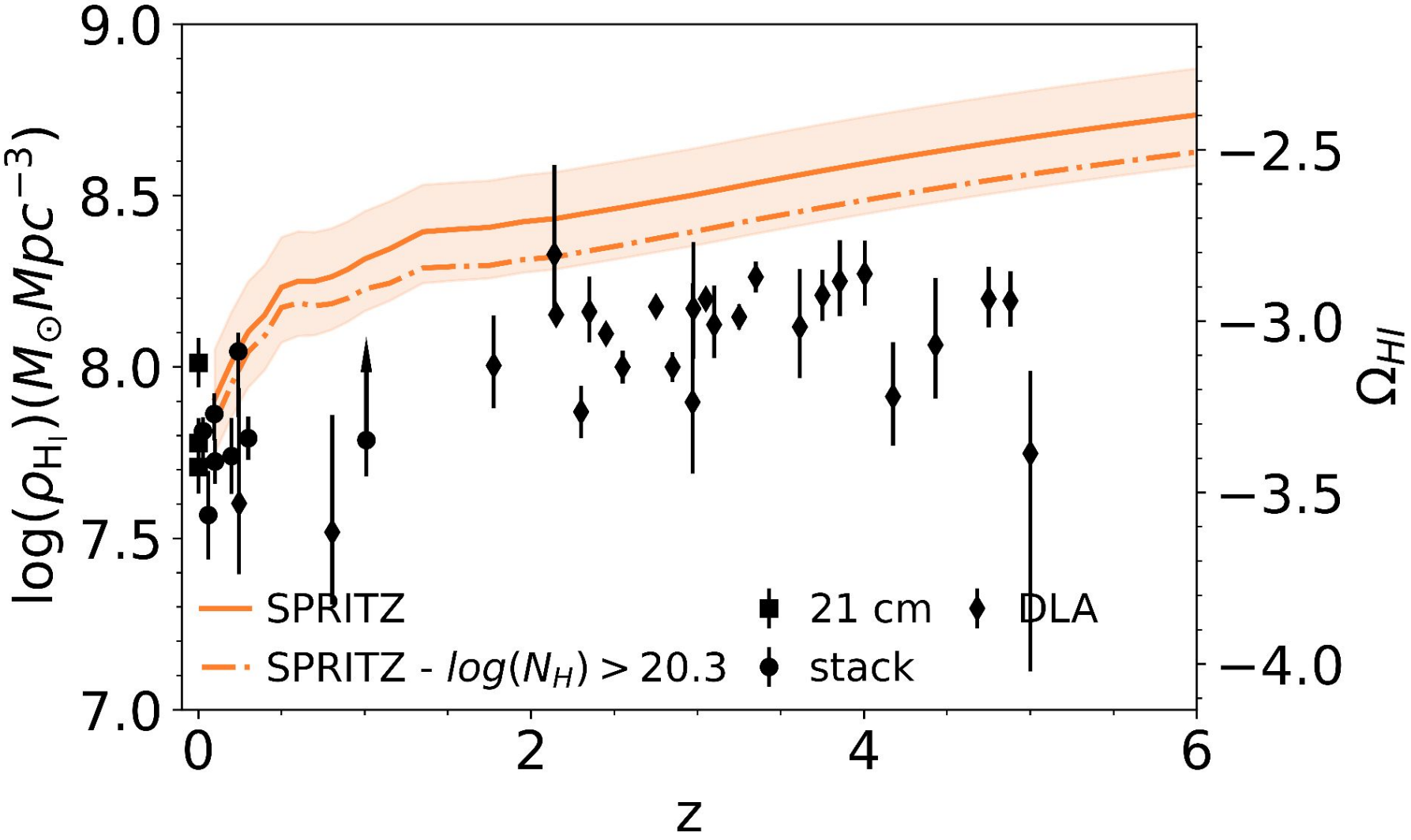


Bisigello et al. 2022

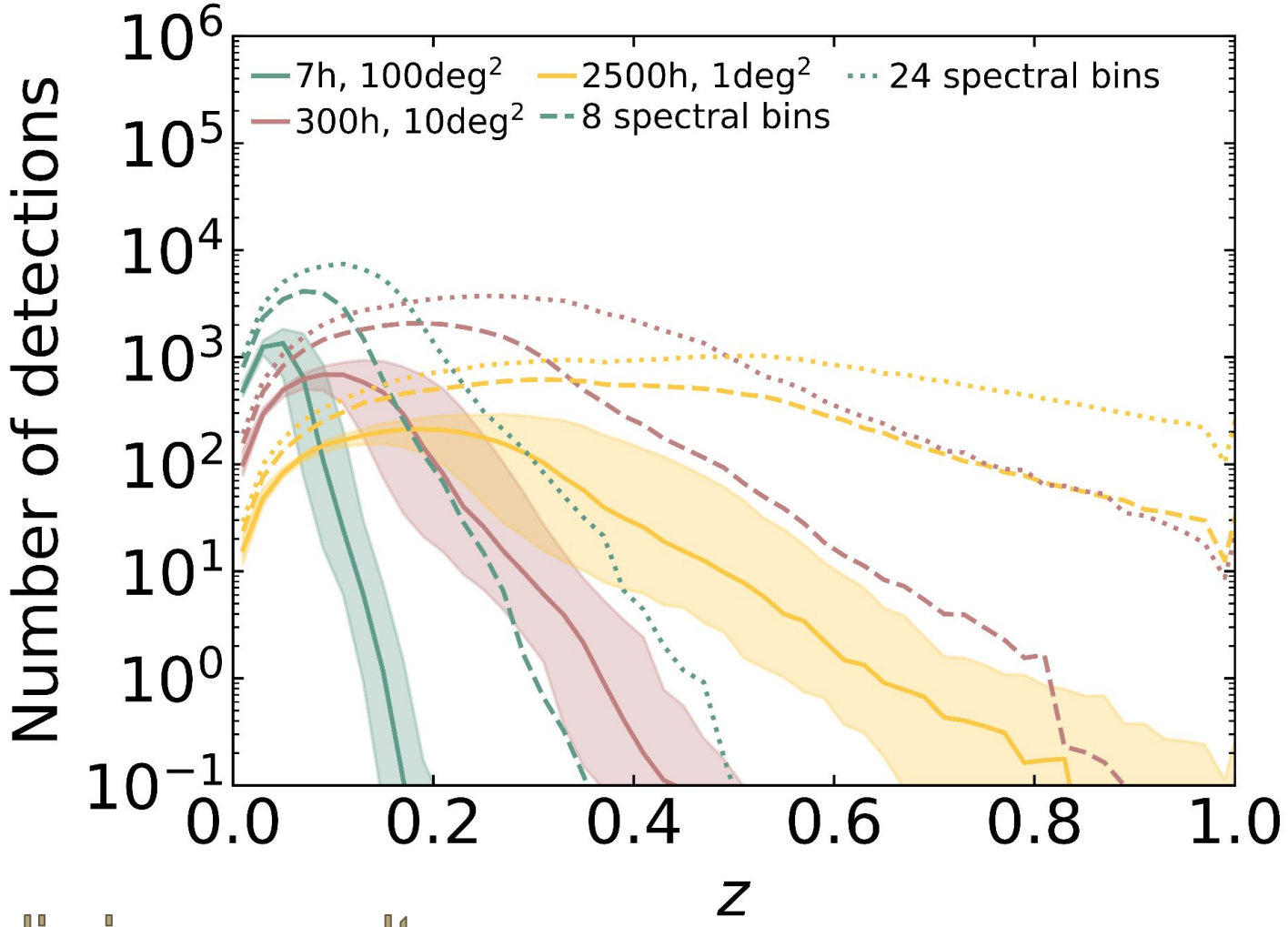
$$M_b = 1.33 \times M_{HI} + M^* + M_{H2}$$

Preliminary results

HI cosmic density



Forecast for SKA



Spectral resolution at 1.4GHz:

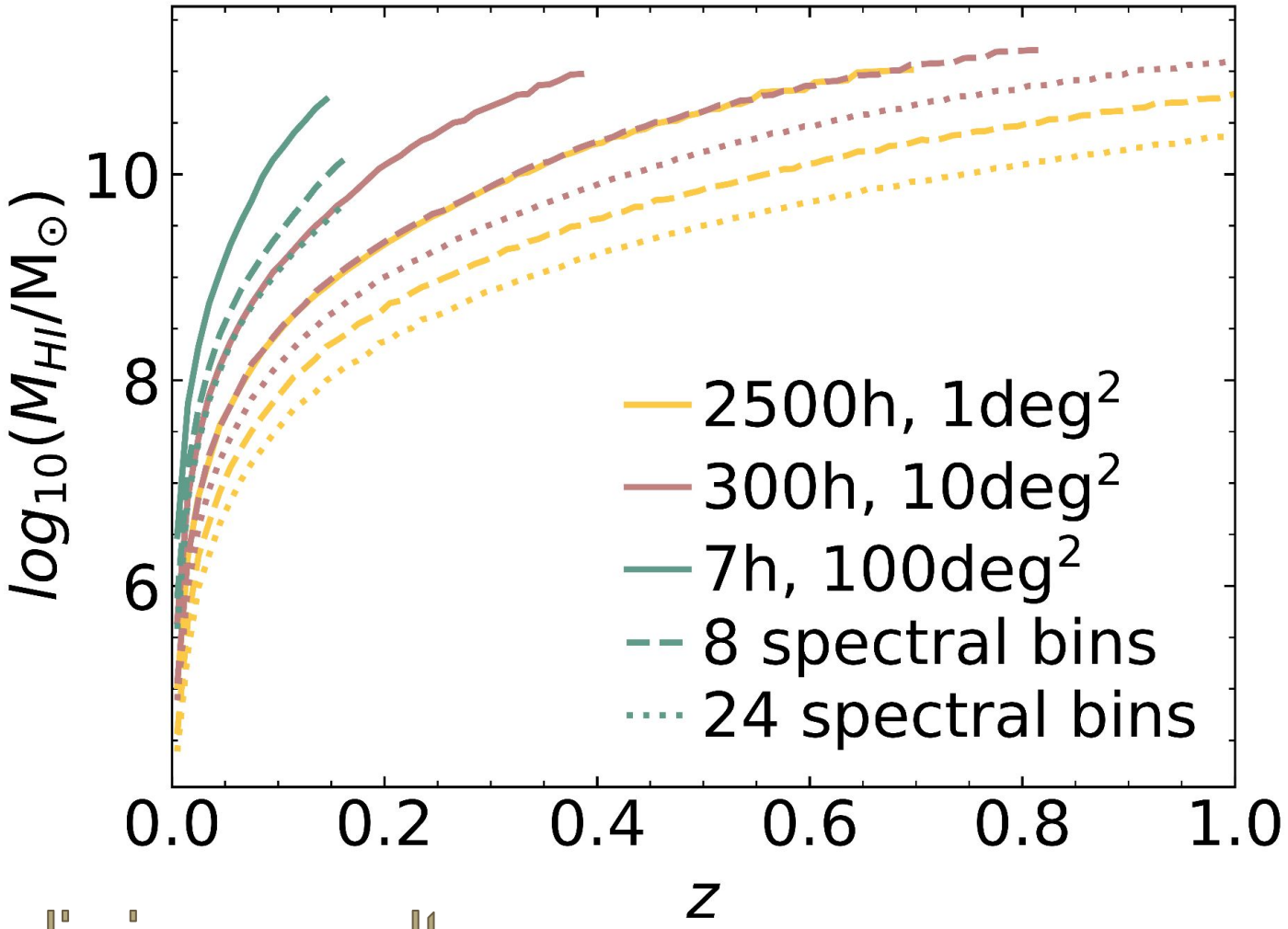
- 2.9 km/s
-- 23.2 km/s (8 spectral bins)
... 69.6 km/s (24 spectral bins)

Configuration:

- SKA-mid band 2
- AA4 configuration
- Briggs robust weighting, slope 0

Preliminary results

Forecast for SKA



Preliminary results

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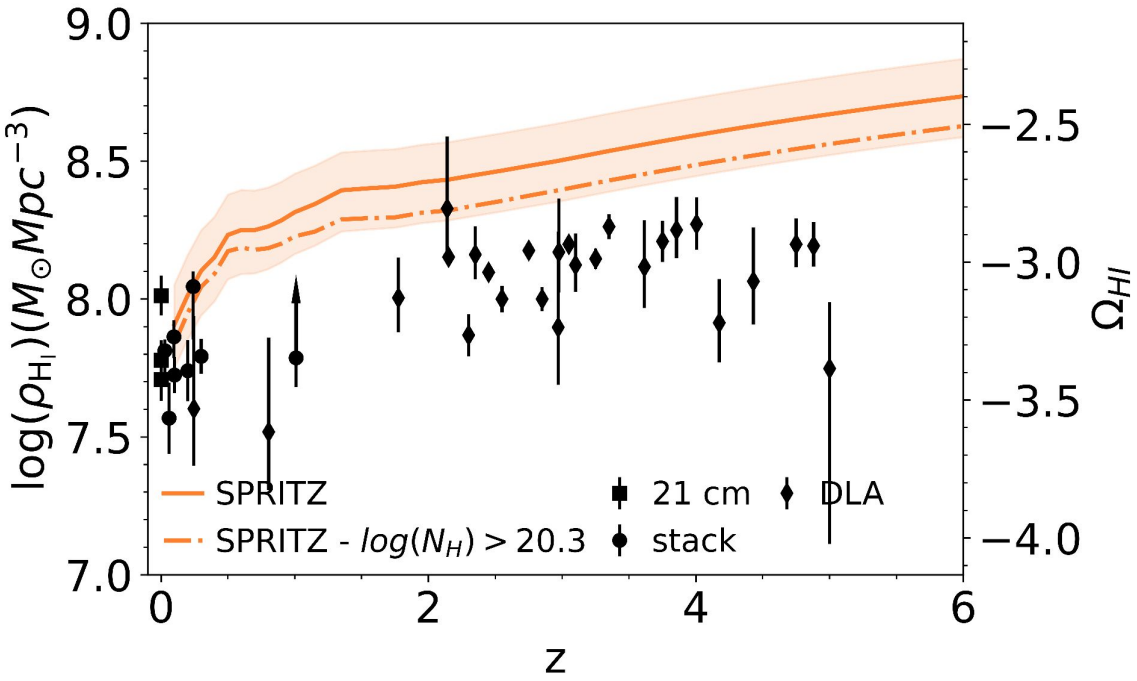
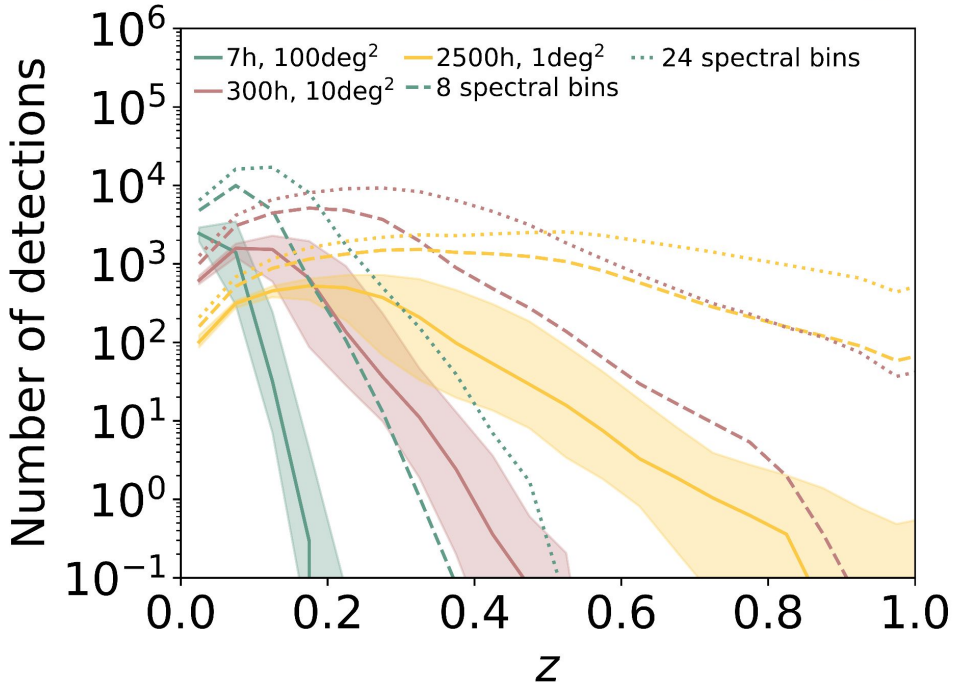
It is ideal to investigate synergies between facilities from optical to radio.

1. Stay tuned for more predictions!
2. Do you have an idea? Come talk to me!





HI mass function