

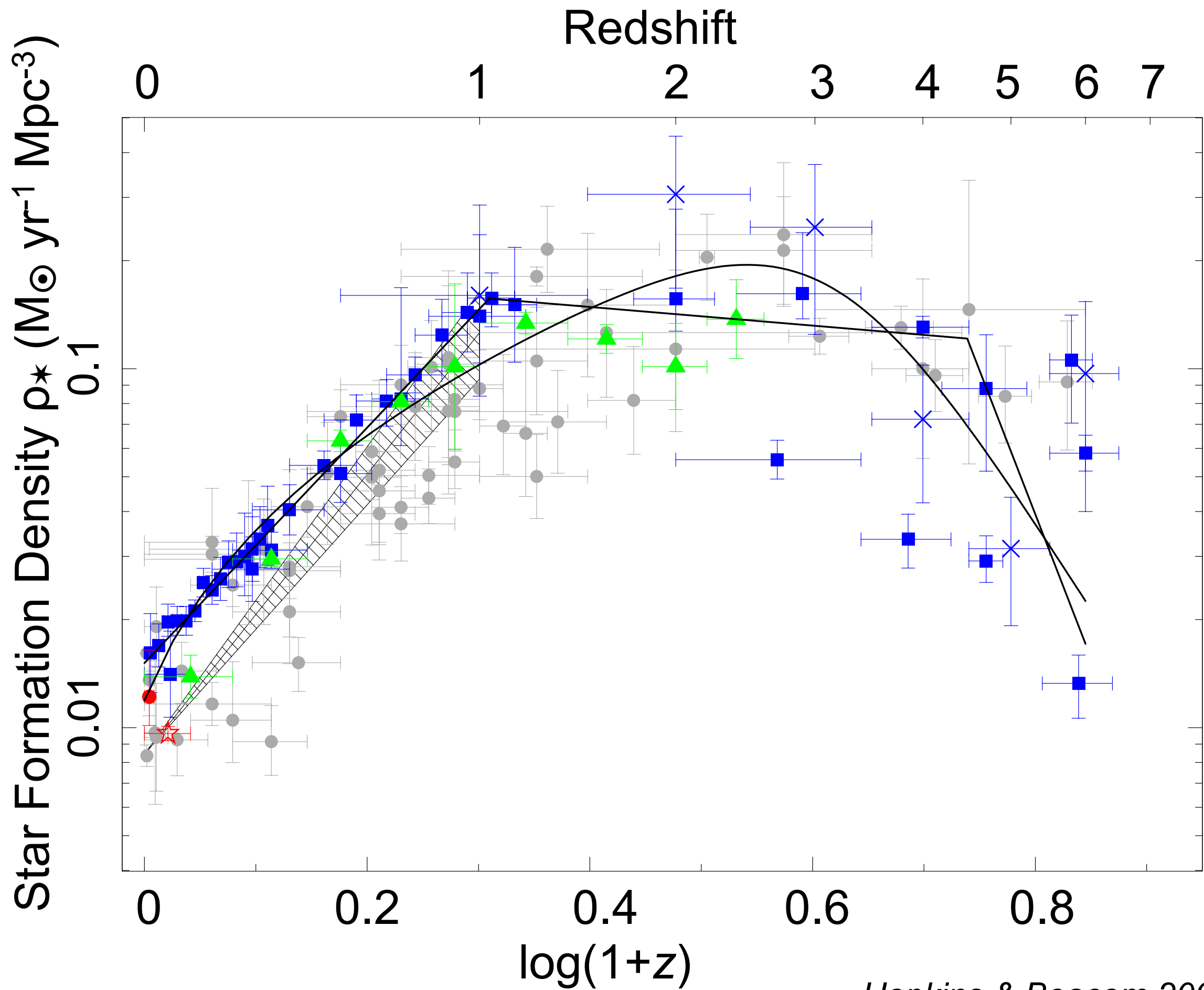
# *Next Generation HI surveys*

*Natasha Maddox  
Postdoctoral Fellow at*



*Image credit: SKA Organization*



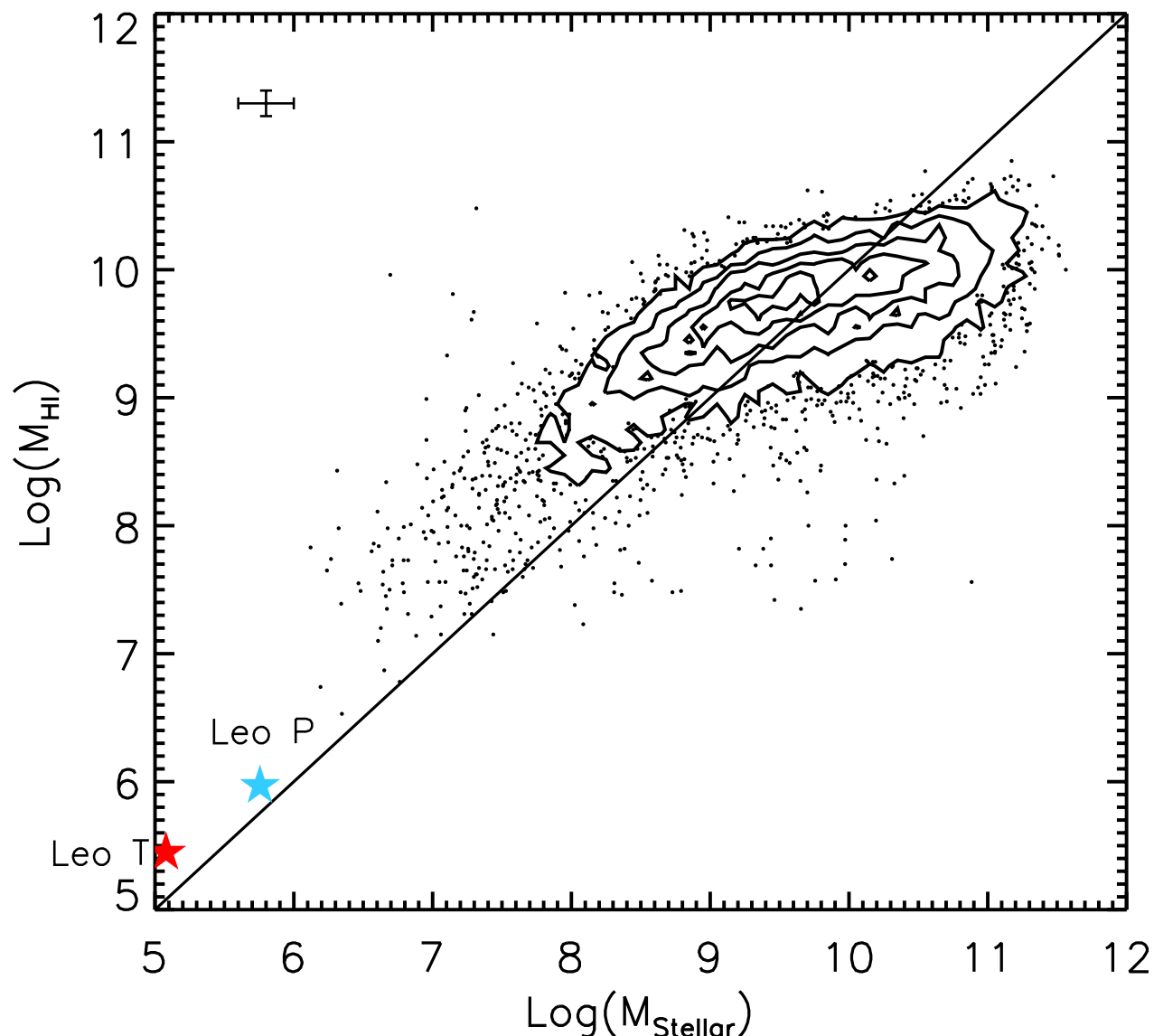


# *Why observe HI?*

- Stars form from gas (ignoring a lot of details)
- If you want to understand star formation, you must understand the reservoir of gas
- Evidence that stellar and gas content of galaxies not trivially related, physics missing from simulations (*Maddox et al. 2015*)

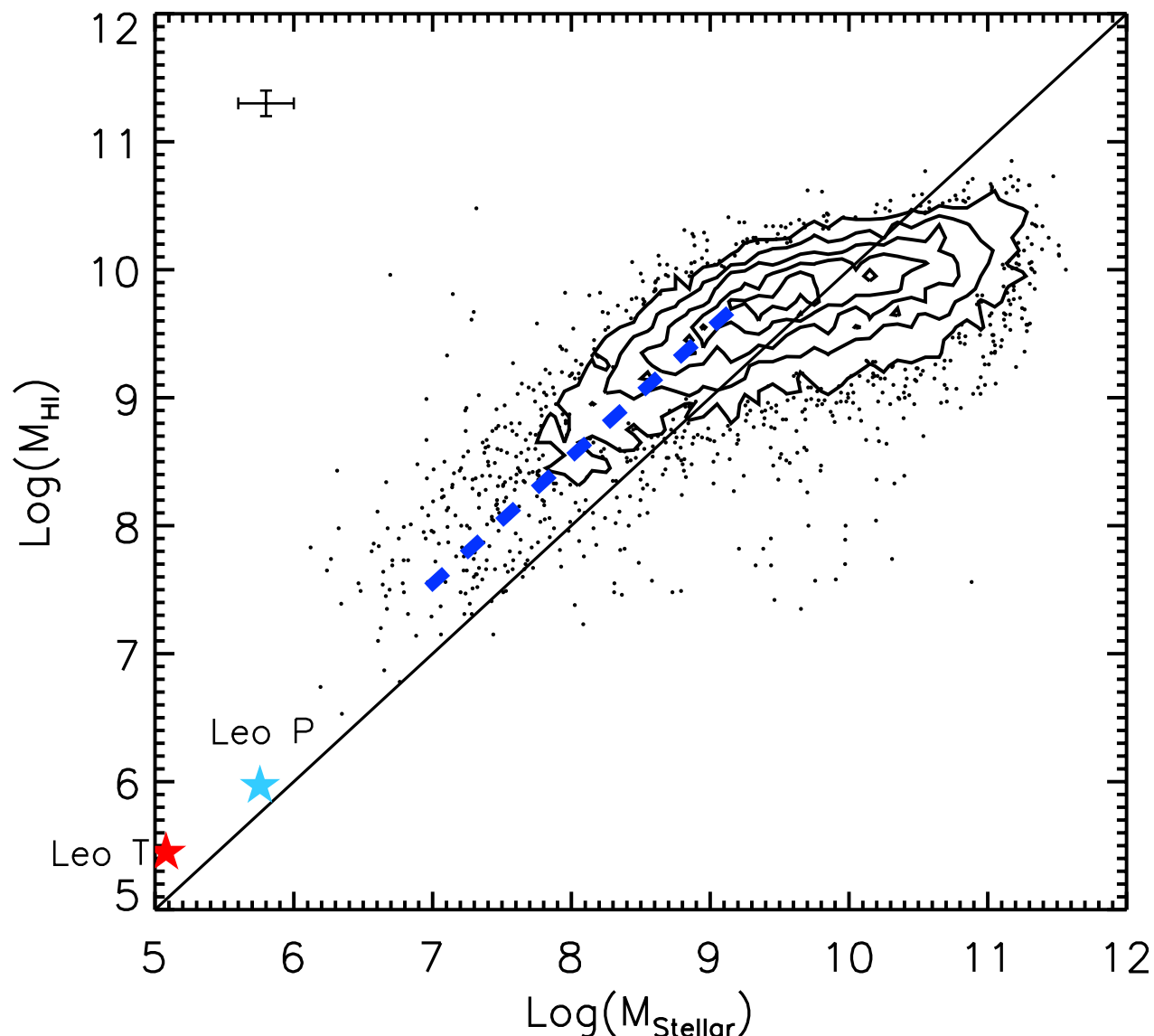
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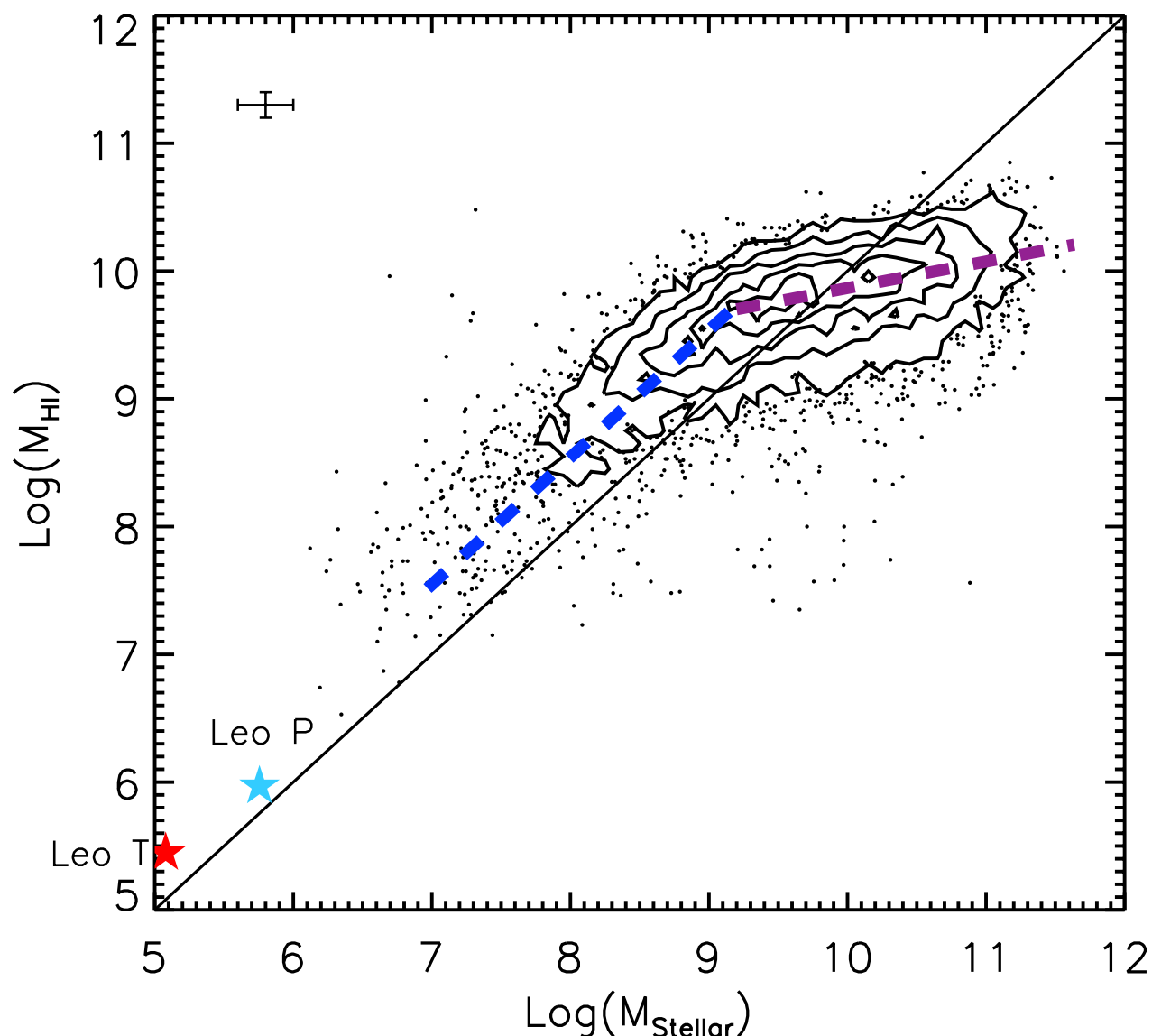
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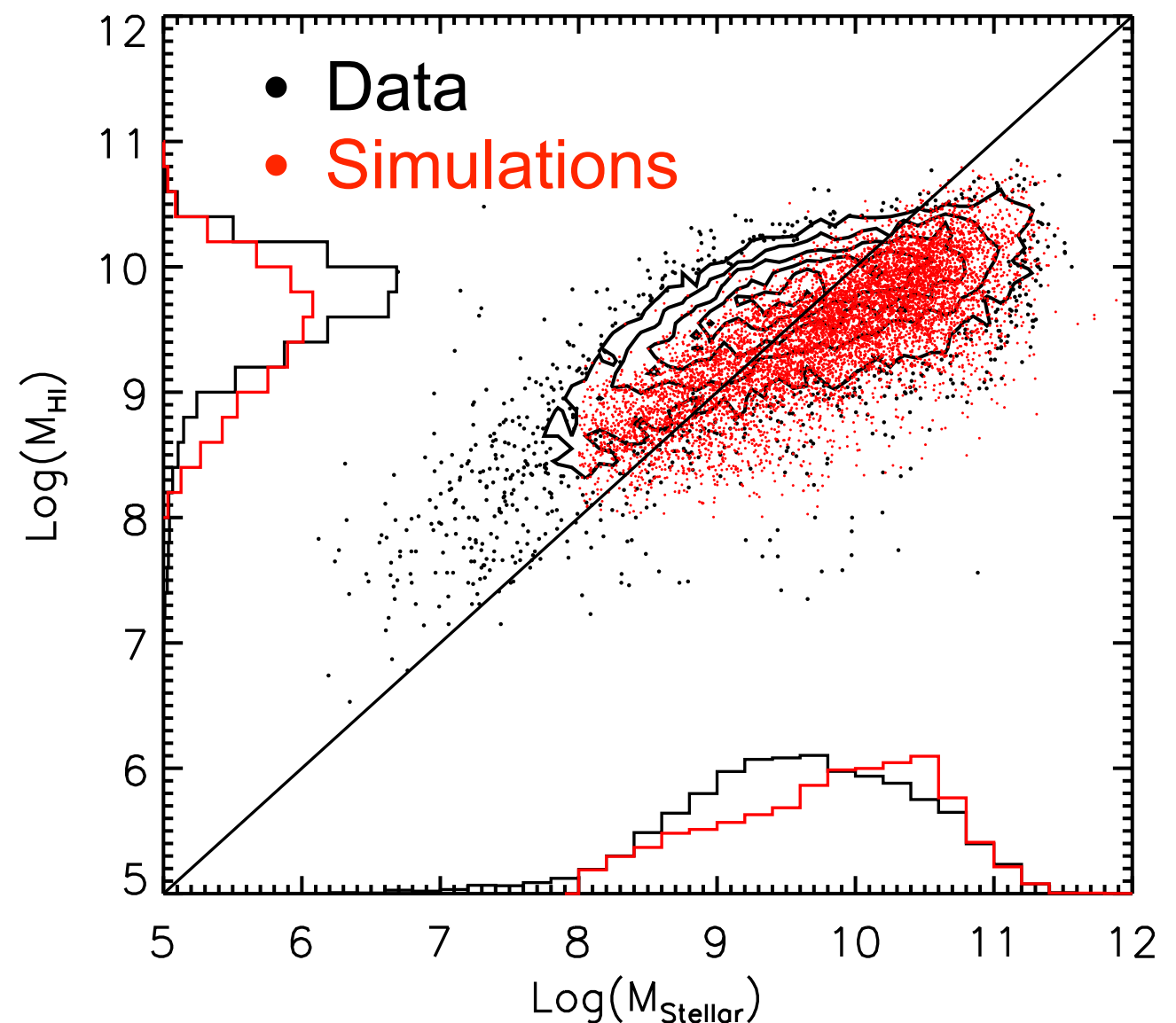
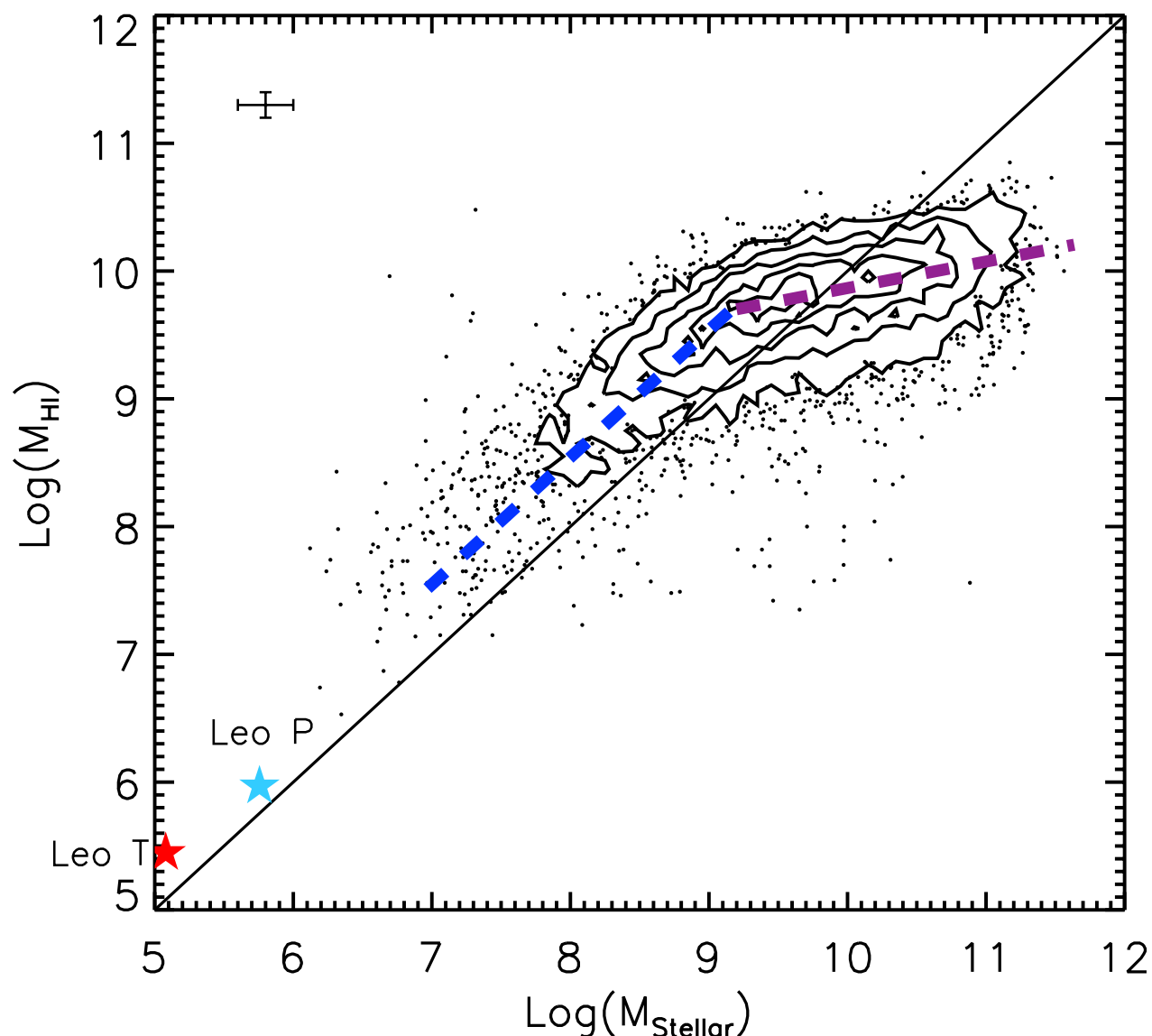
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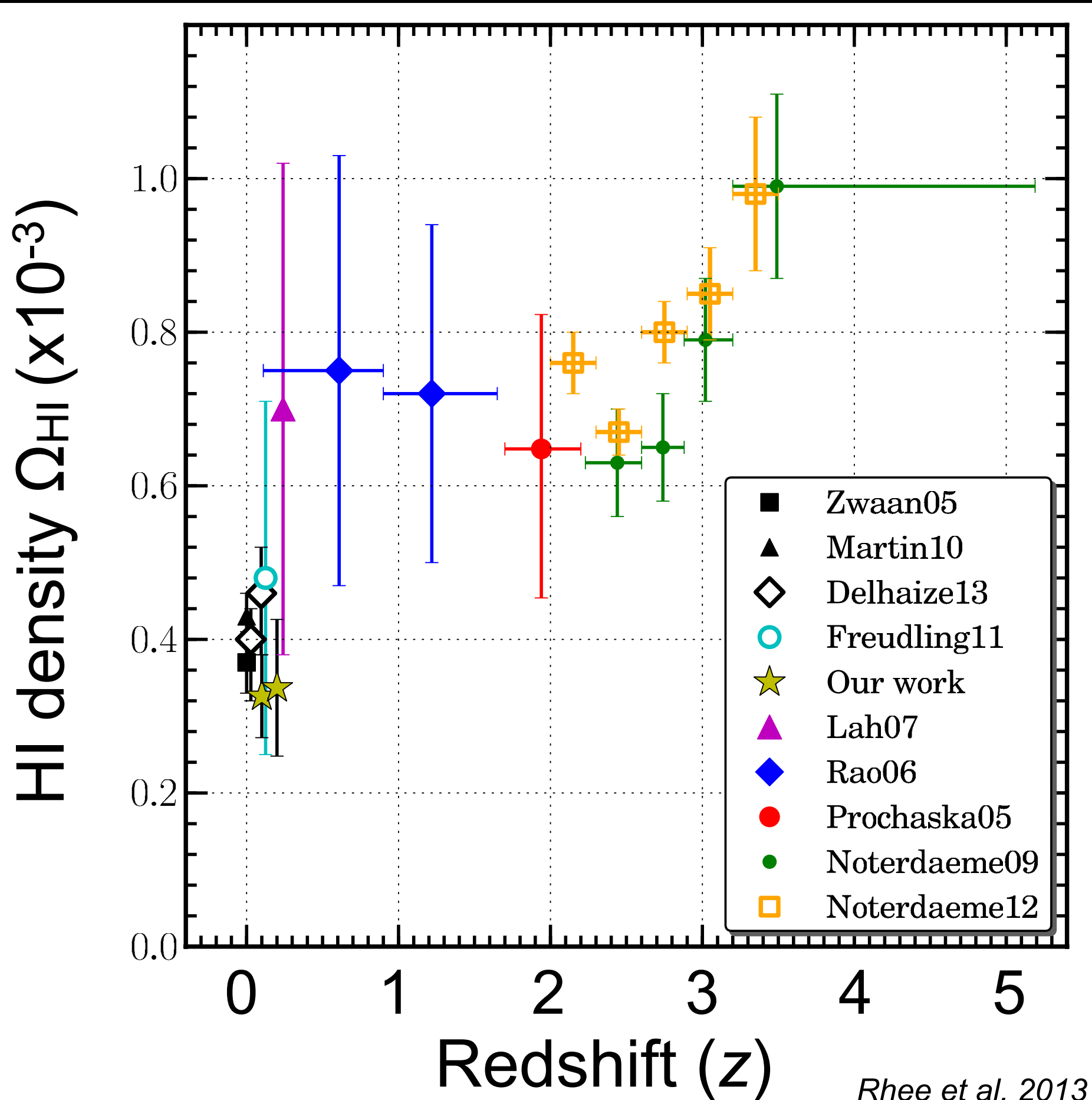
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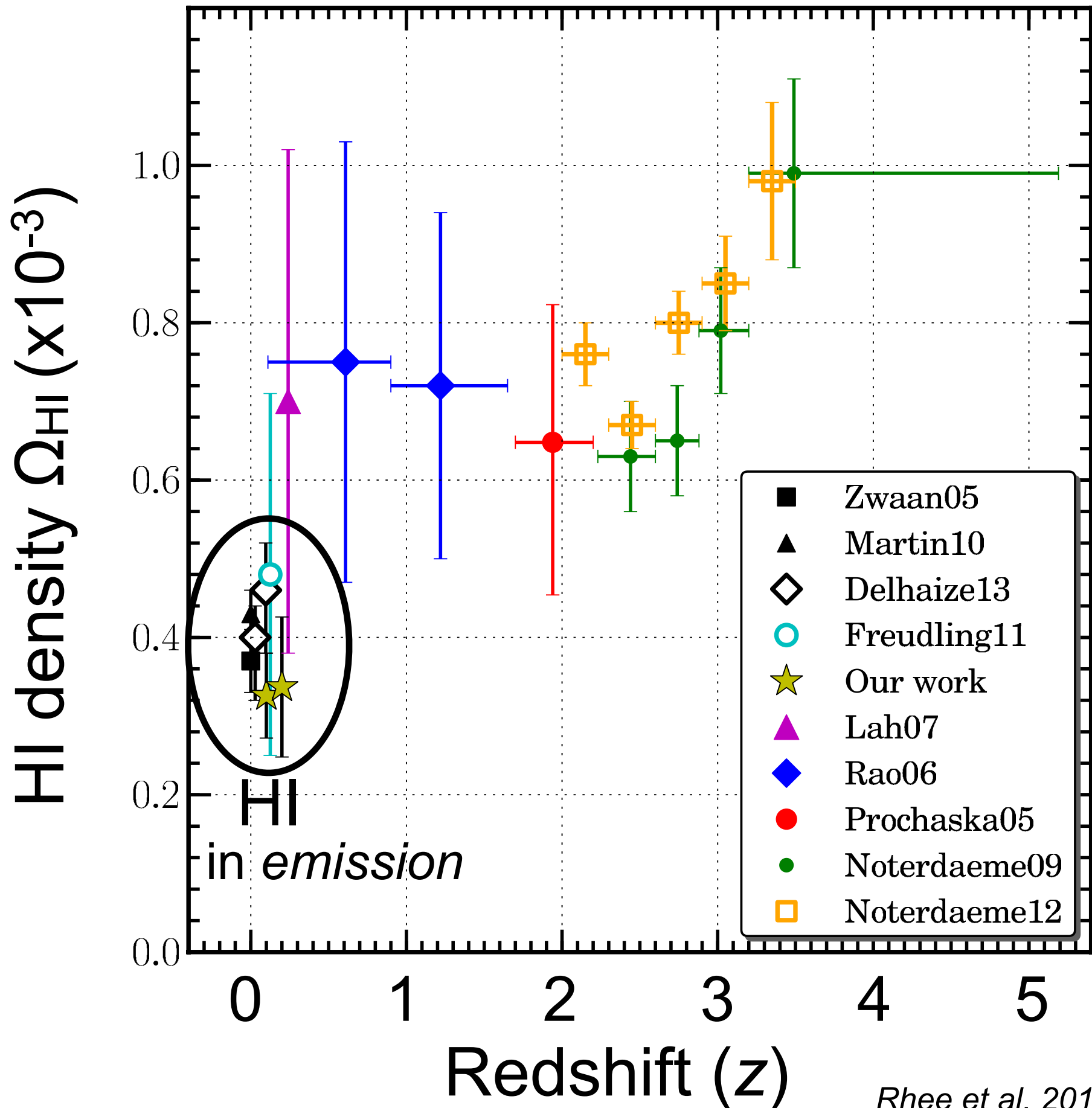


# Existing measurements of neutral gas density:

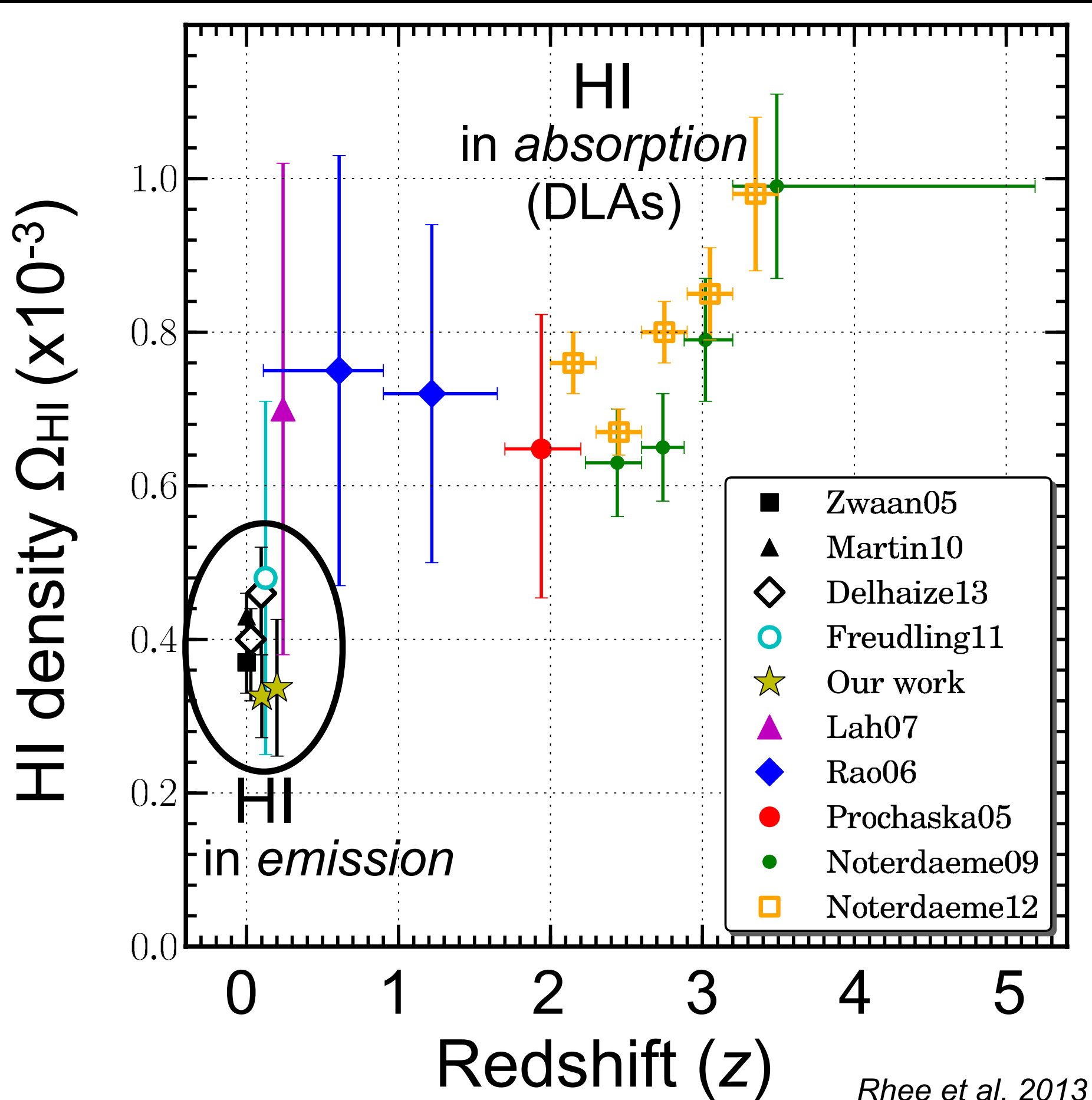


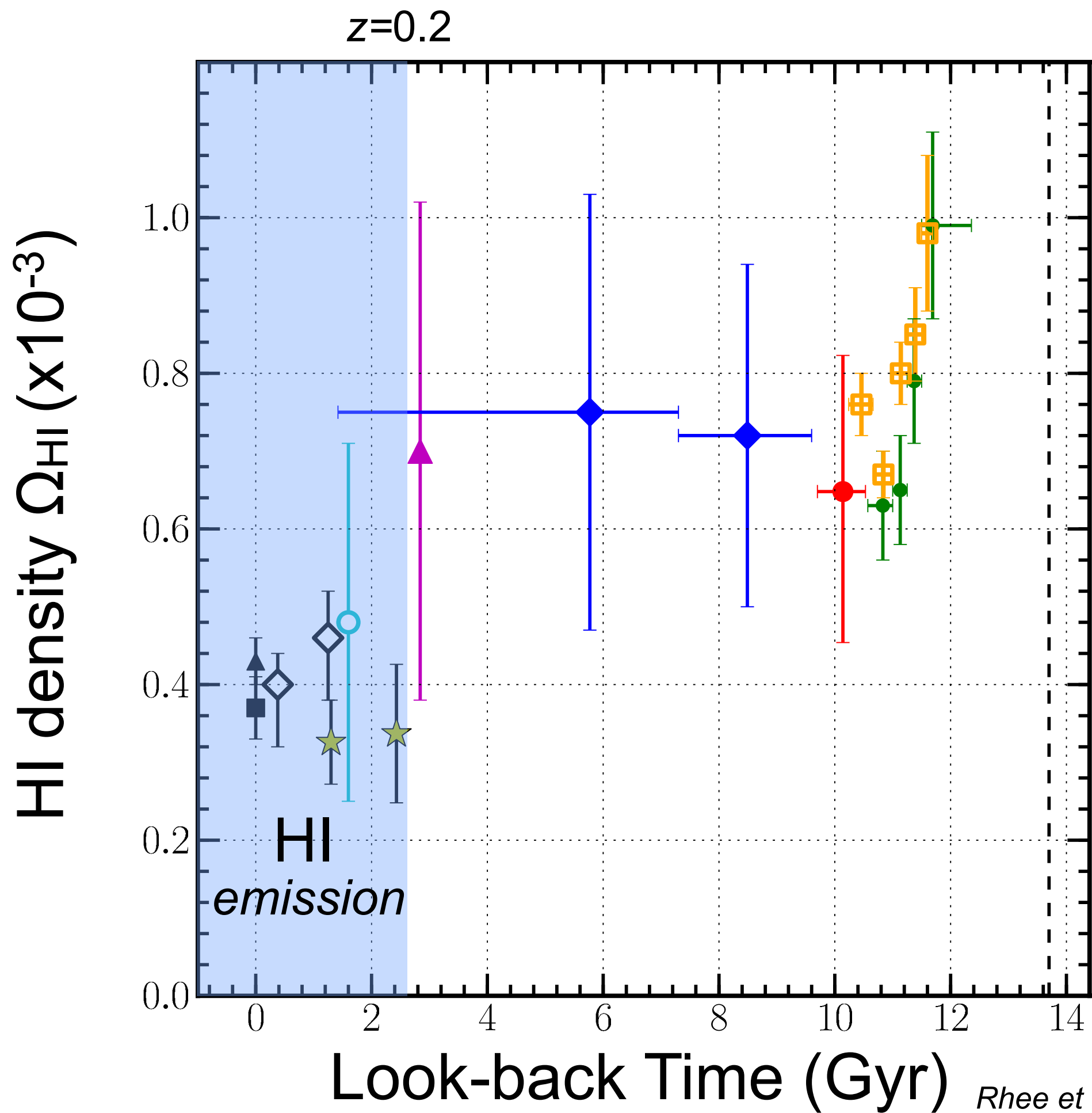


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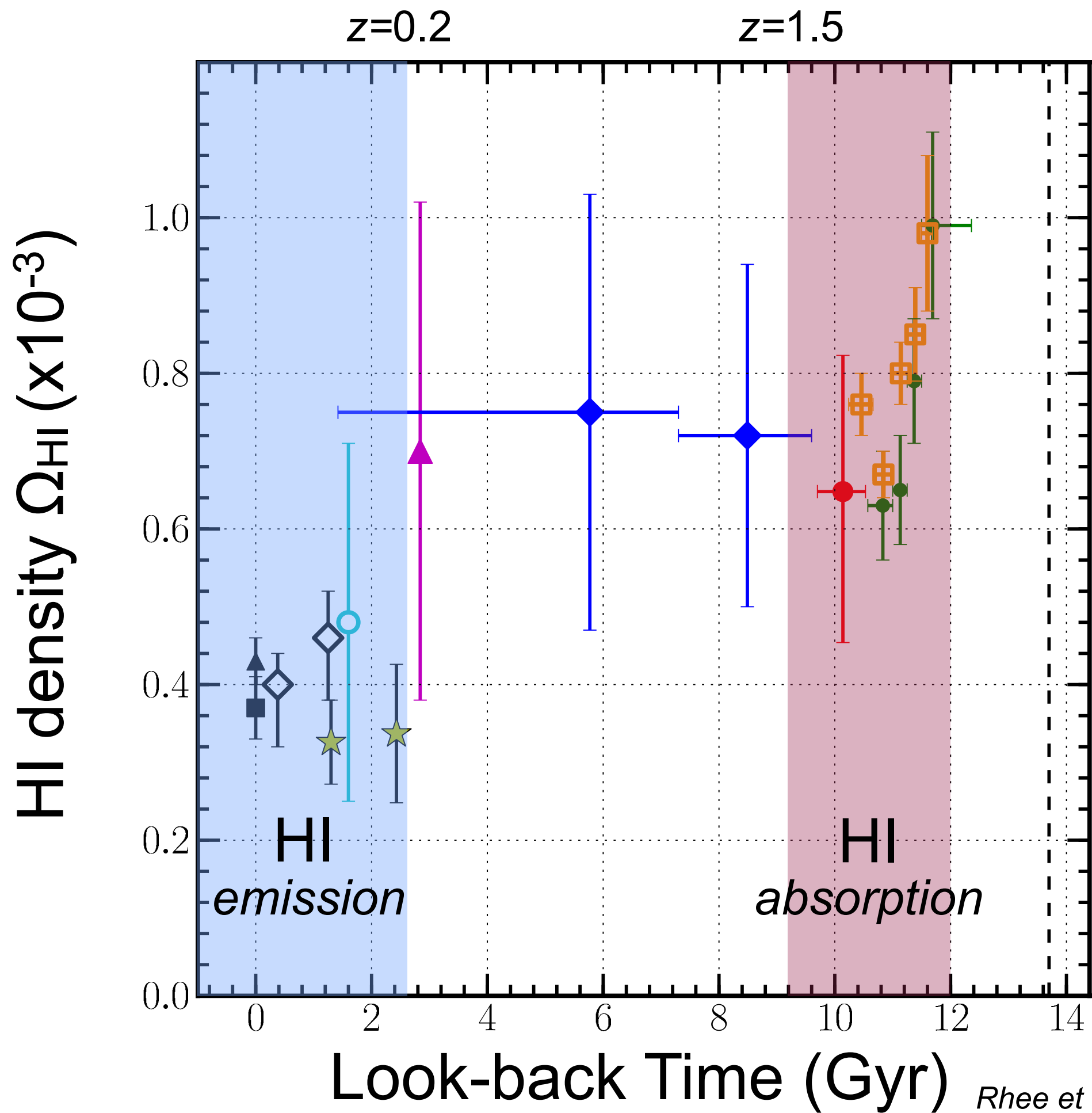


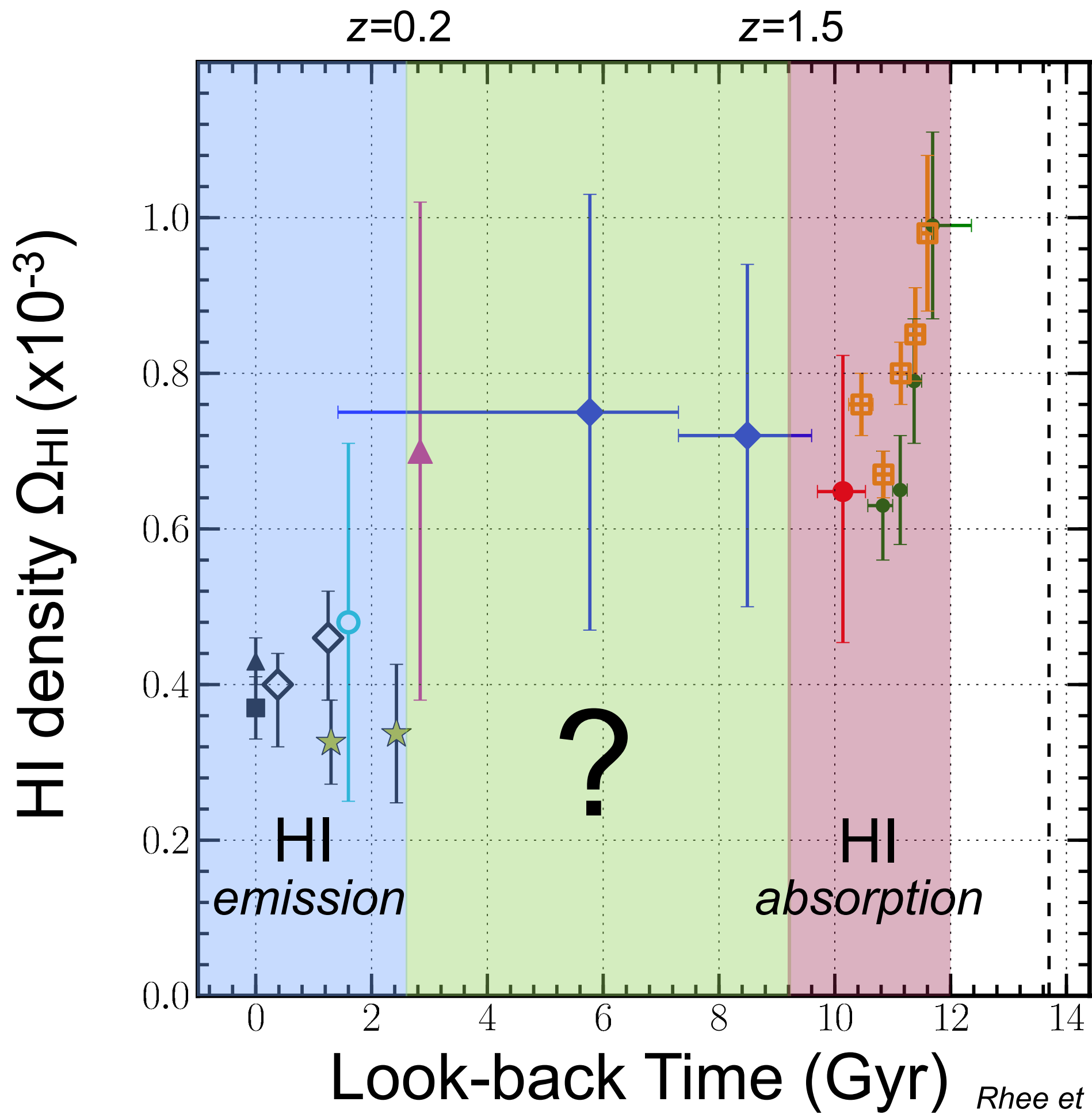
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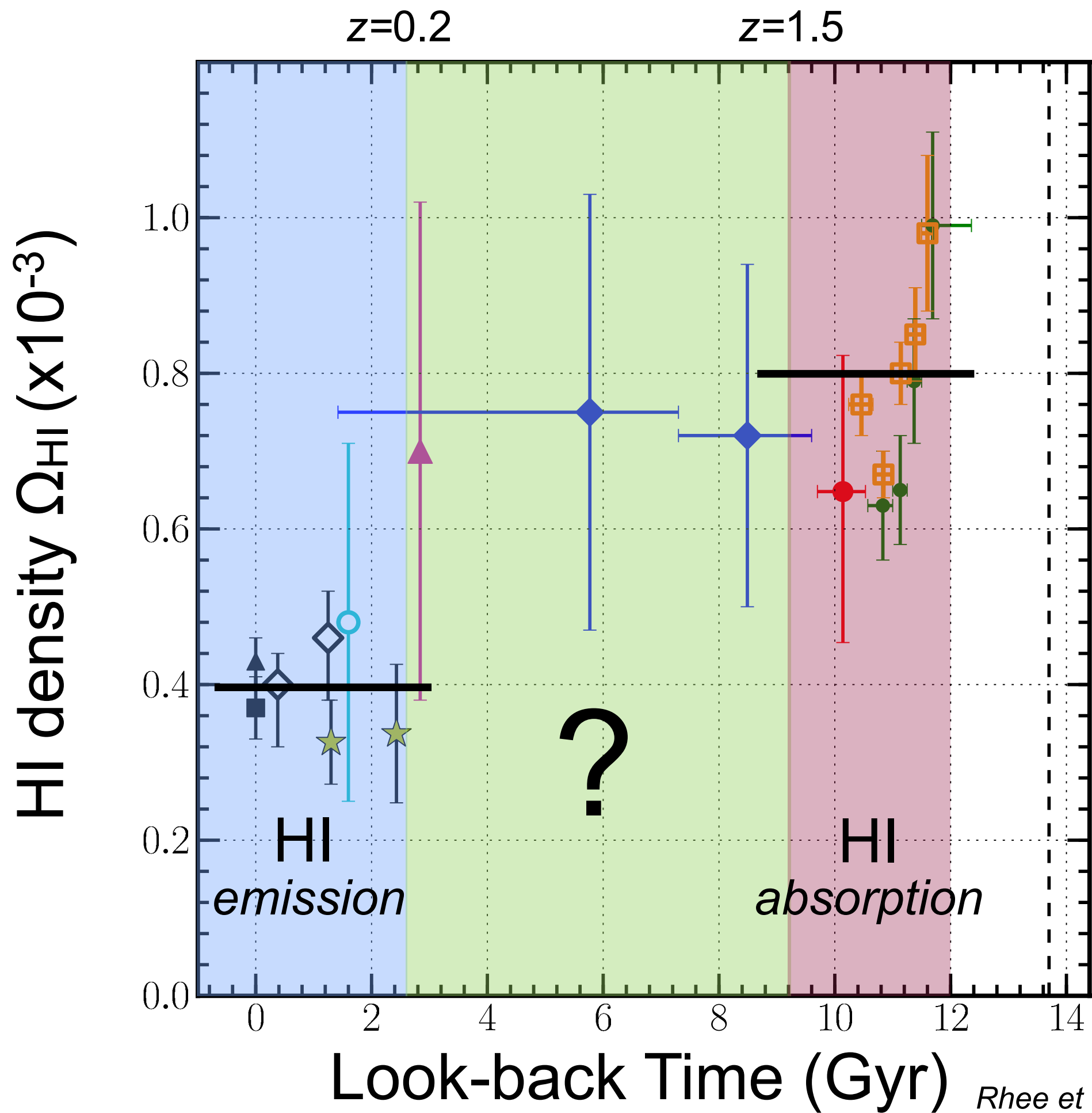








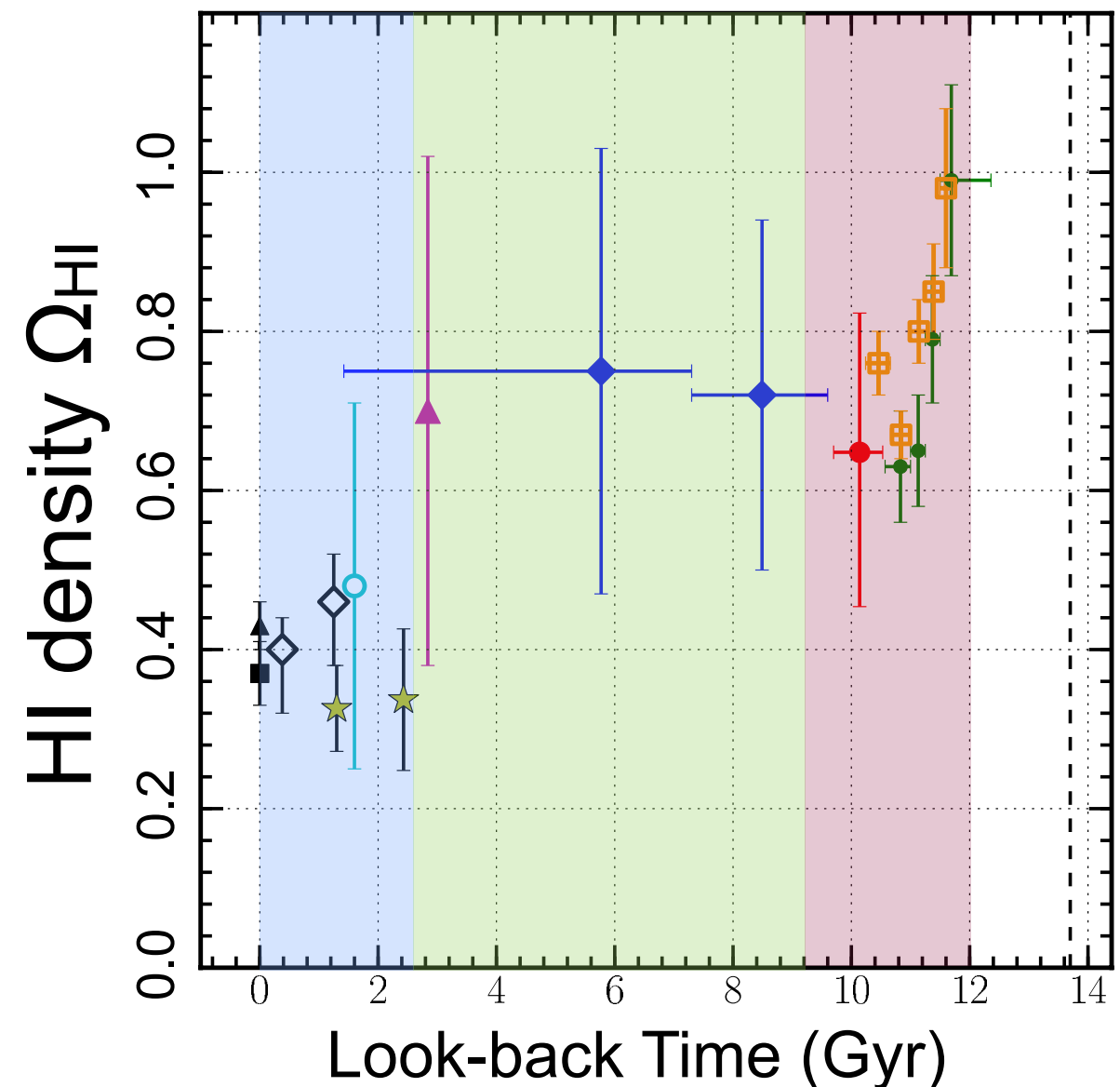
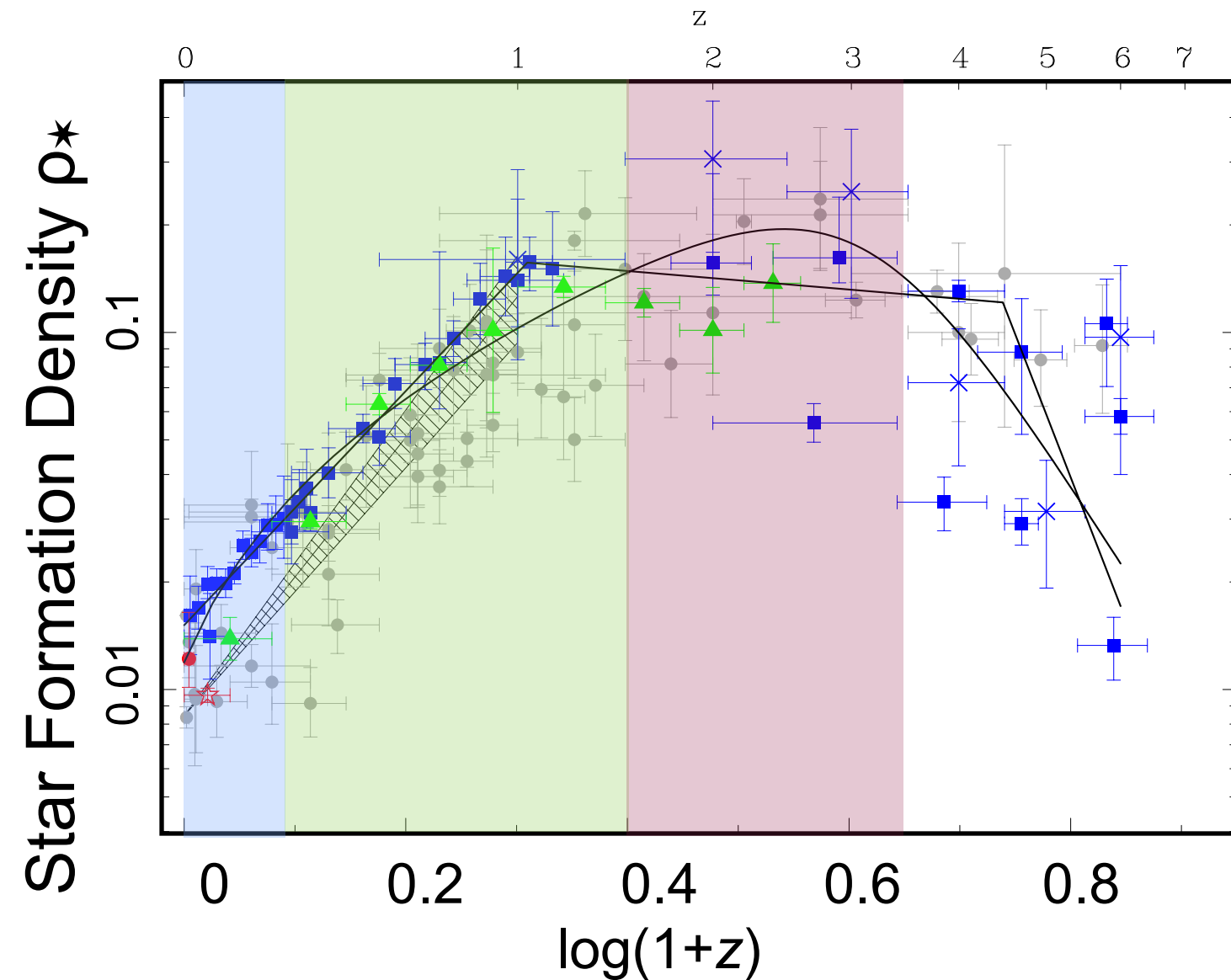






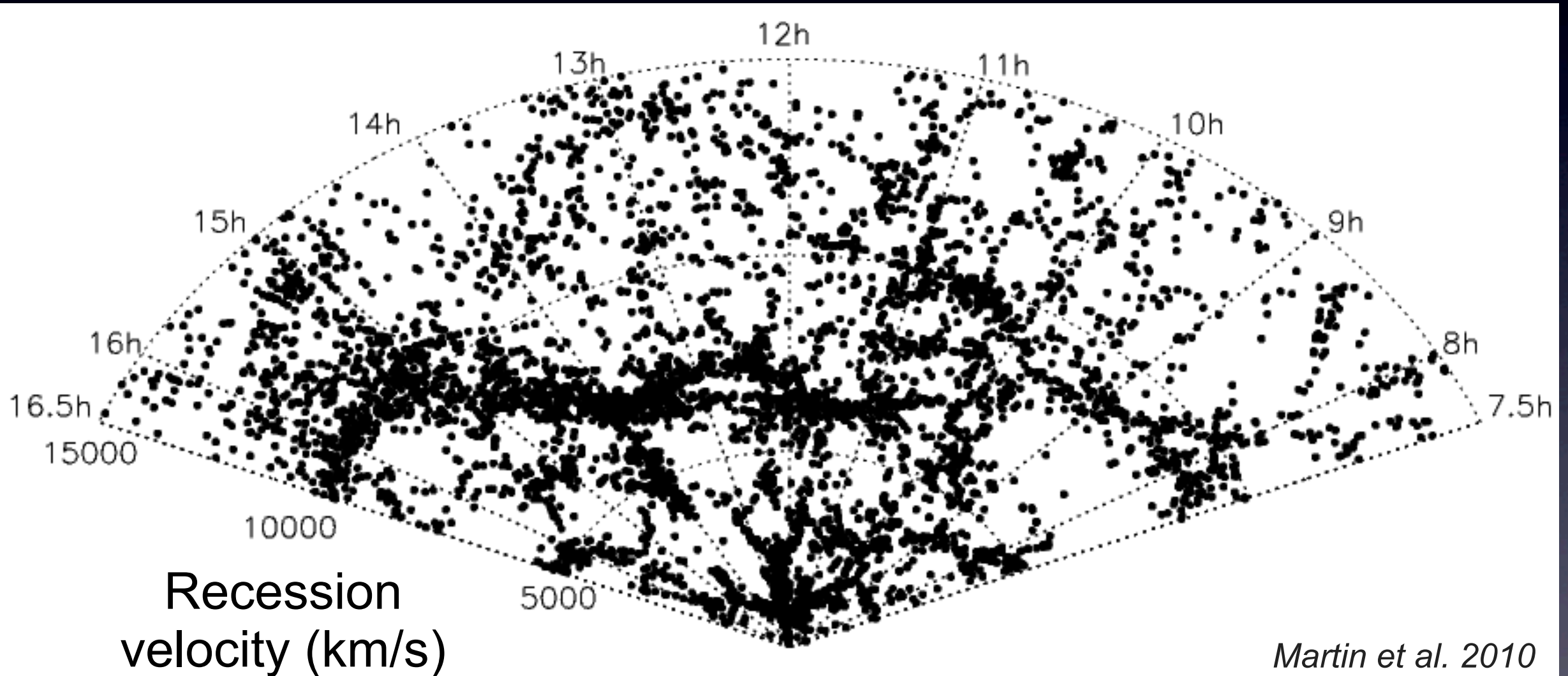
# The need for new HI surveys

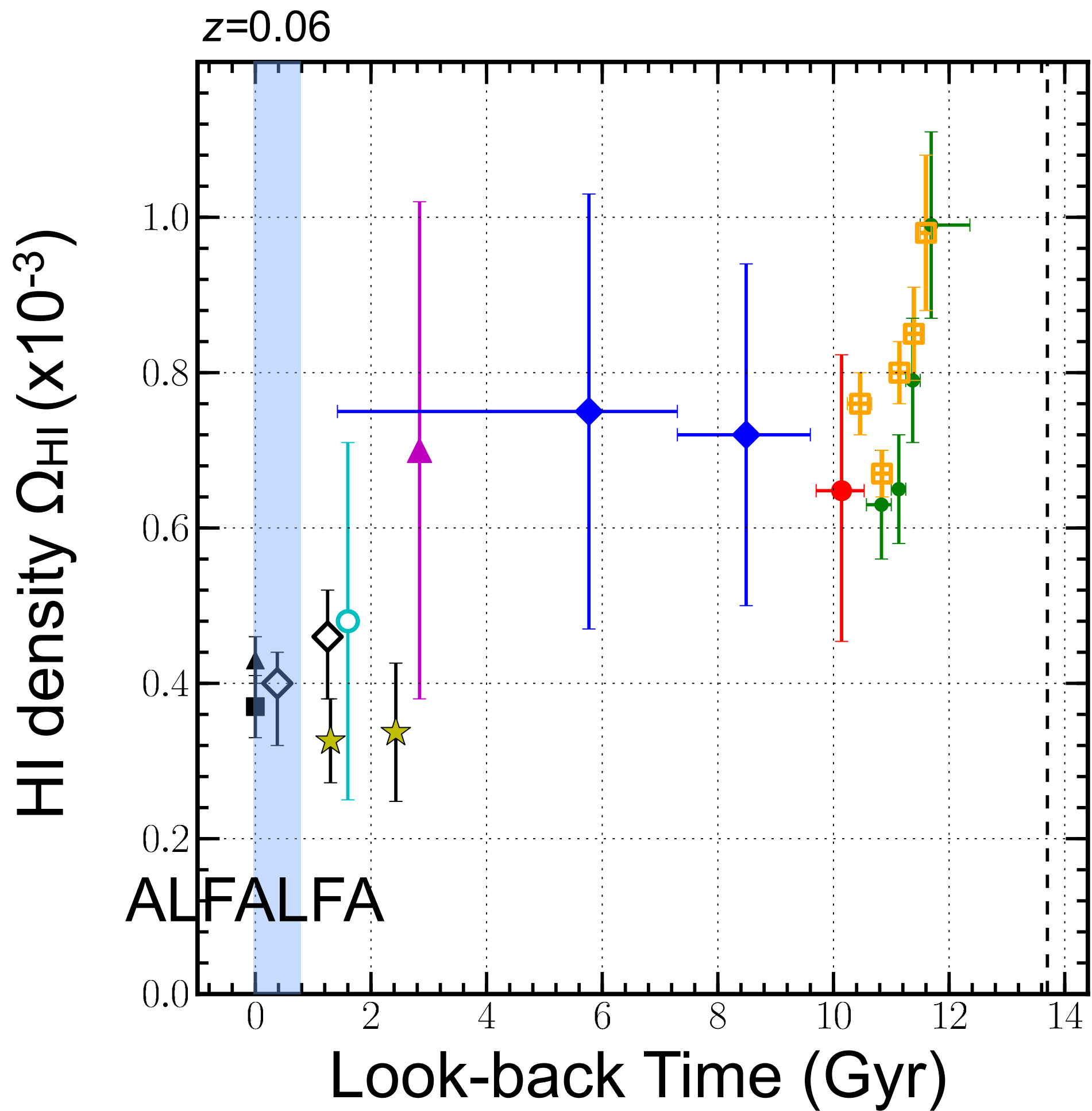
- Star formation and HI density evolve differently at  $0 < z < 1$
- The new generation of radio telescopes will enable spectral line observations over cosmologically interesting redshift ranges



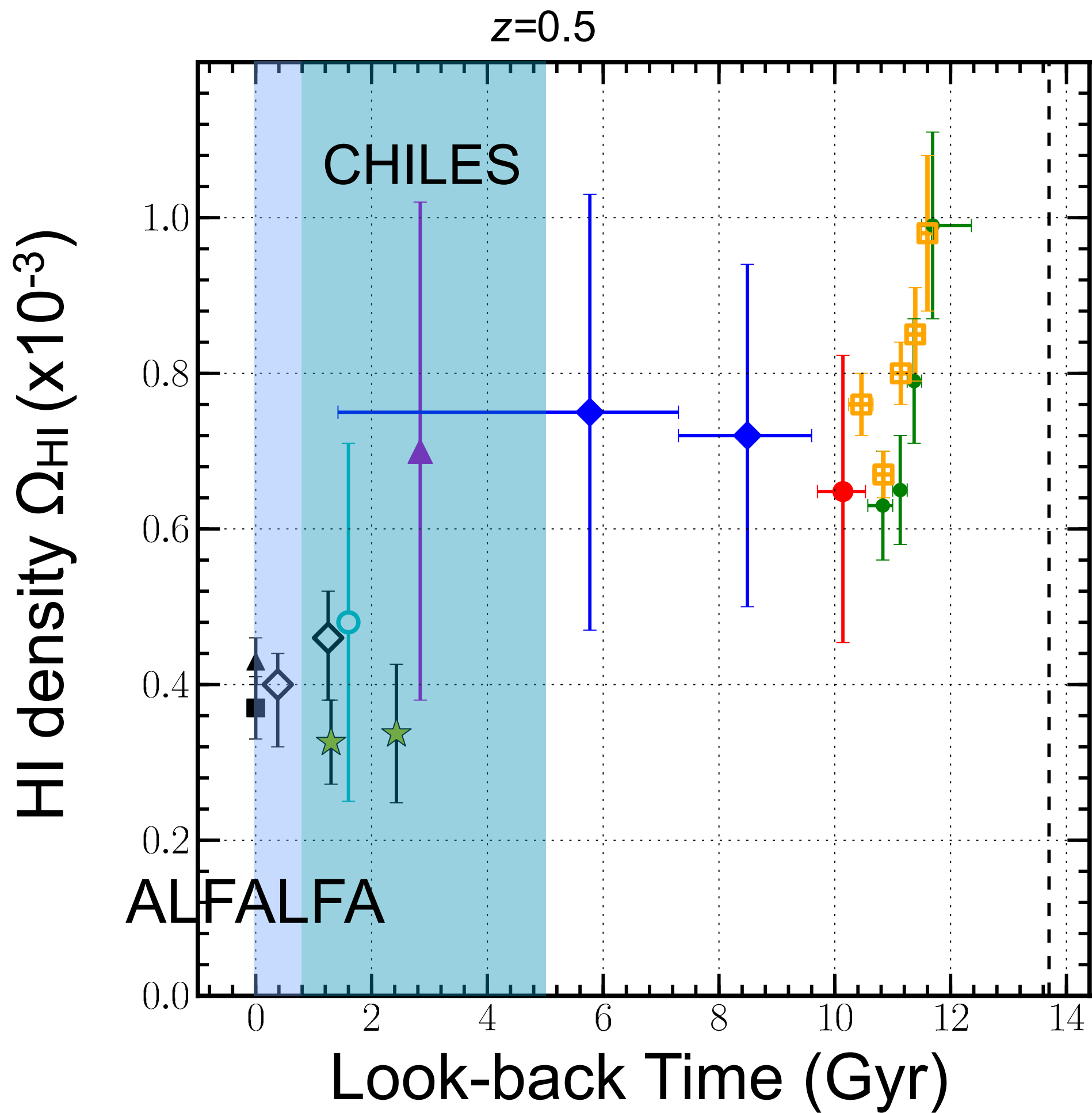
# Arecibo Legacy Fast ALFA Survey

- ALFALFA is a large area, blind HI survey with Arecibo
- Contains >30,000 galaxies over 7000 deg<sup>2</sup>
- Detects galaxies at  $0 < z < 0.06$  with  $10^6 < M_{\text{HI}} < 10^{11} M_{\odot}$





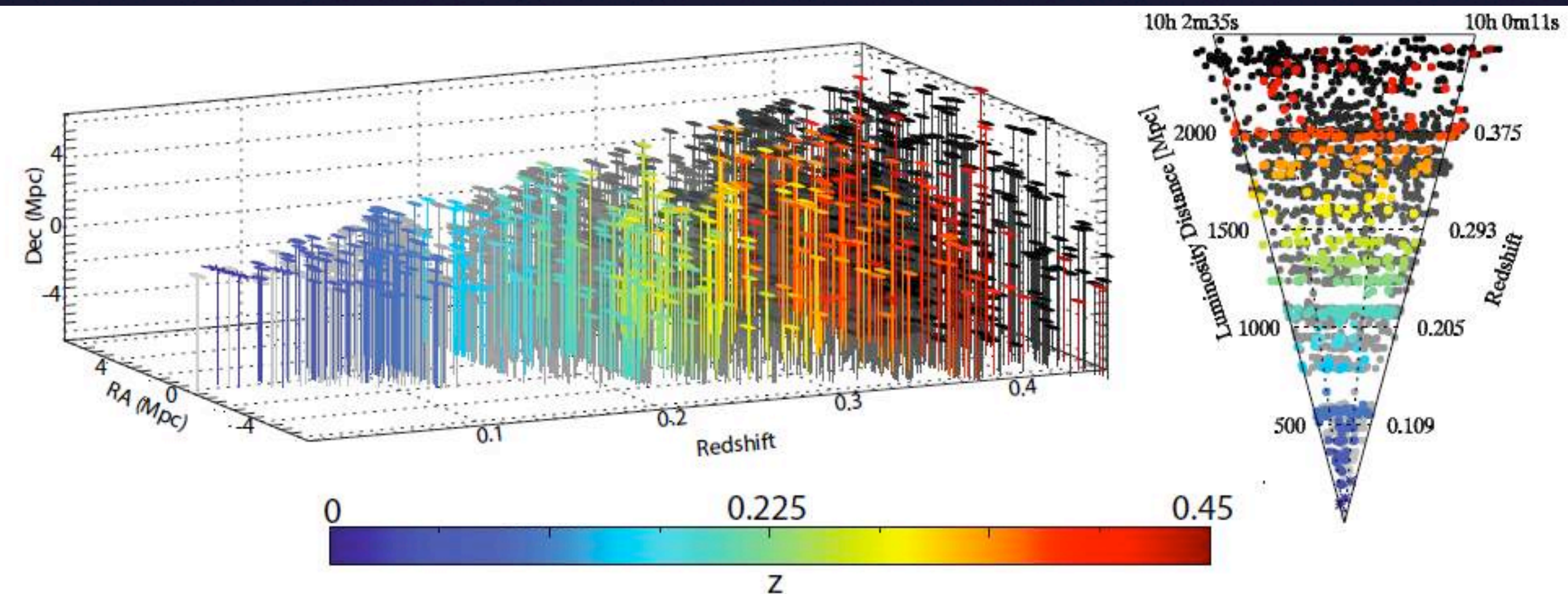






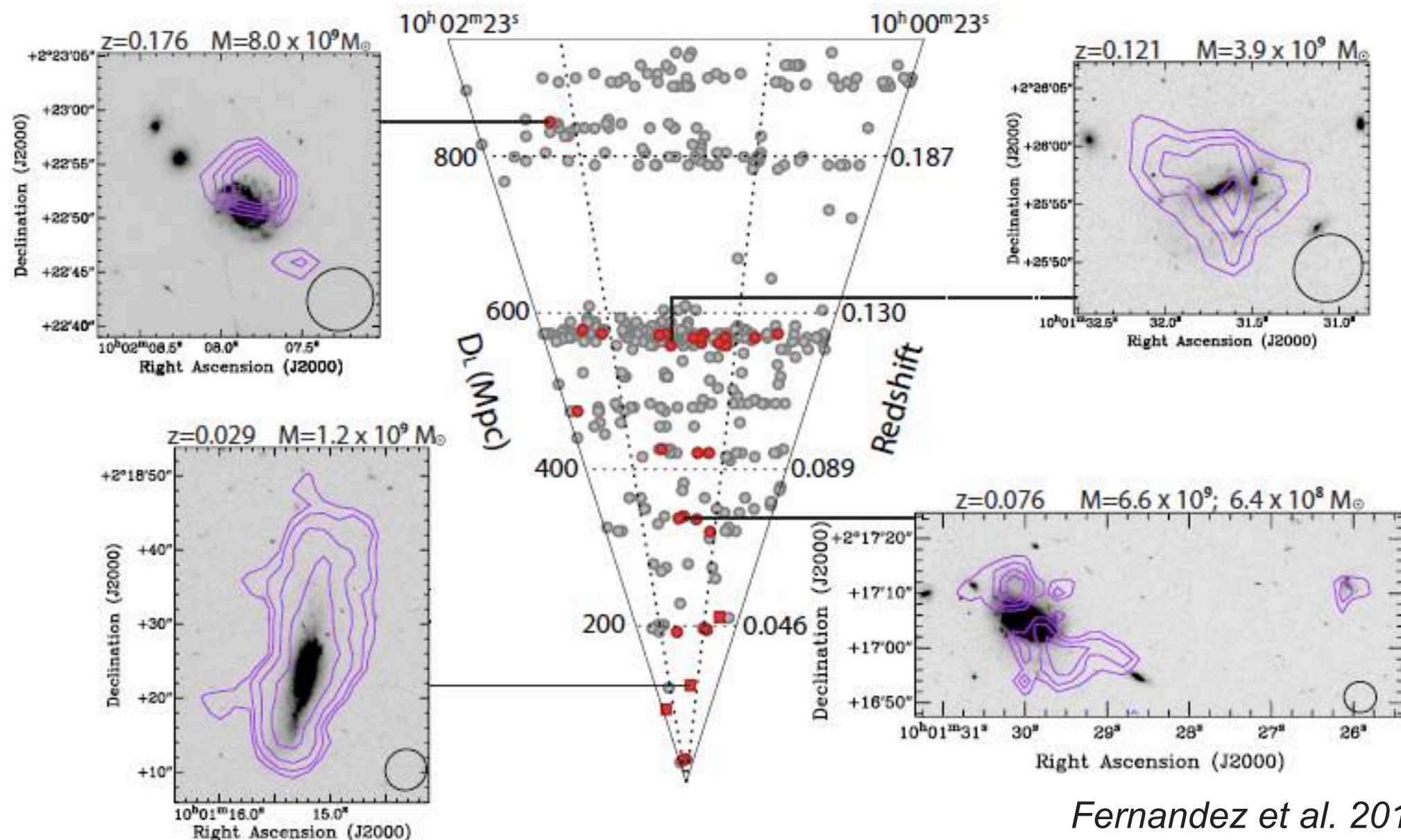
# COSMOS HI Large Extragalactic Survey

- 1000 hours integration of a single 0.25 deg<sup>2</sup> field
- Upgraded JVLA can observe HI at  $0 < z < 0.5$  (970--1420 MHz)
- Already underway, will detect ~300 galaxies to  $z < 0.5$





✓ Already have detections at unprecedented redshifts



*Fernandez et al. 2013*



# MeerKAT

- SKA Precursor facility
- 64 13.5m dishes in the Karoo region of South Africa
- First dishes in place and testing underway
- Survey operations begin 2016

## LADUMA

- Looking At the Distant Universe with the MeerKAT Array
- Deep HI survey with MeerKAT
- 5000 hours of a single pointing
- HI detections to  $z \leq 0.6$ , stacked detections to  $z > 1$



SKA South Africa





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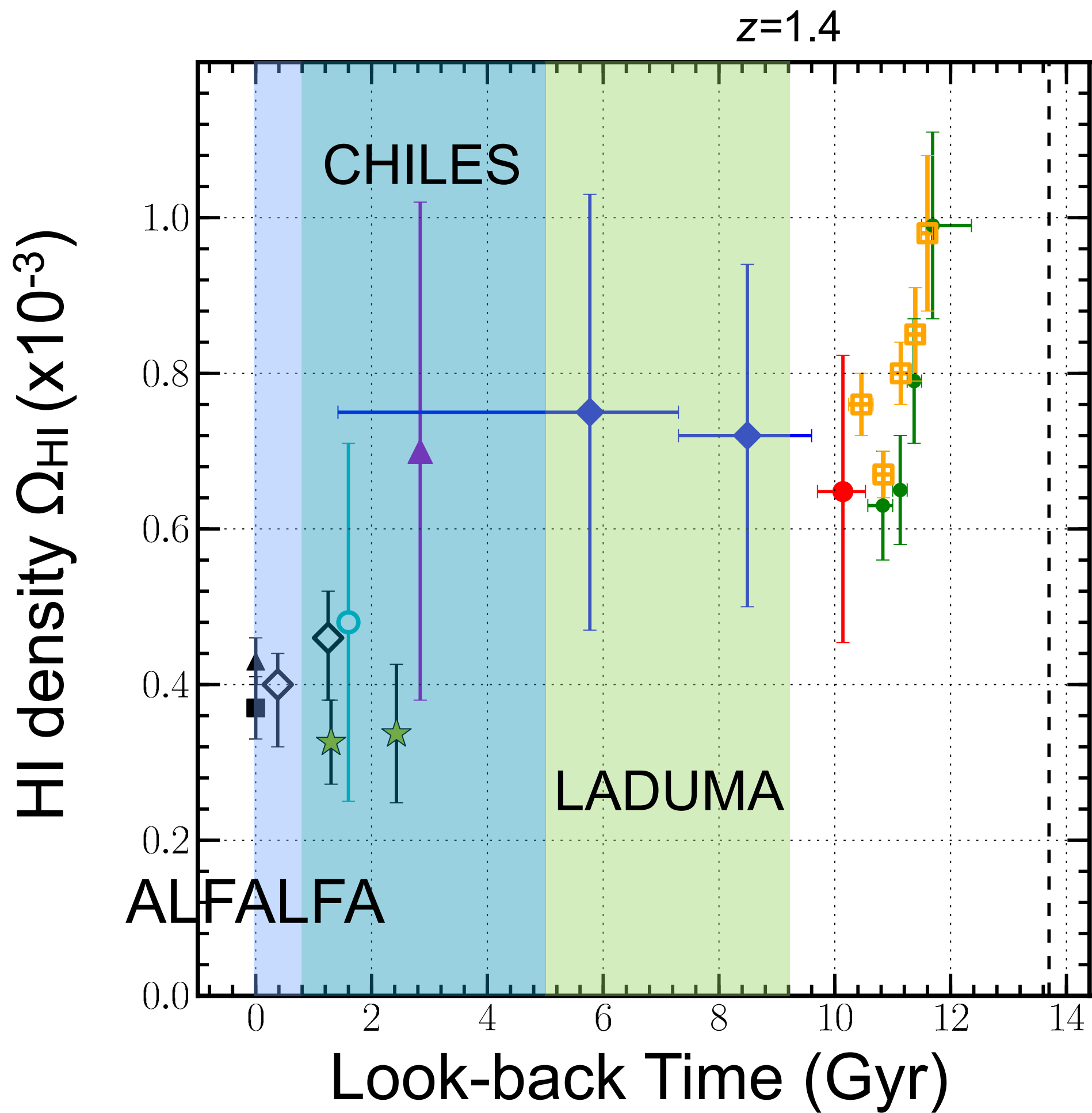
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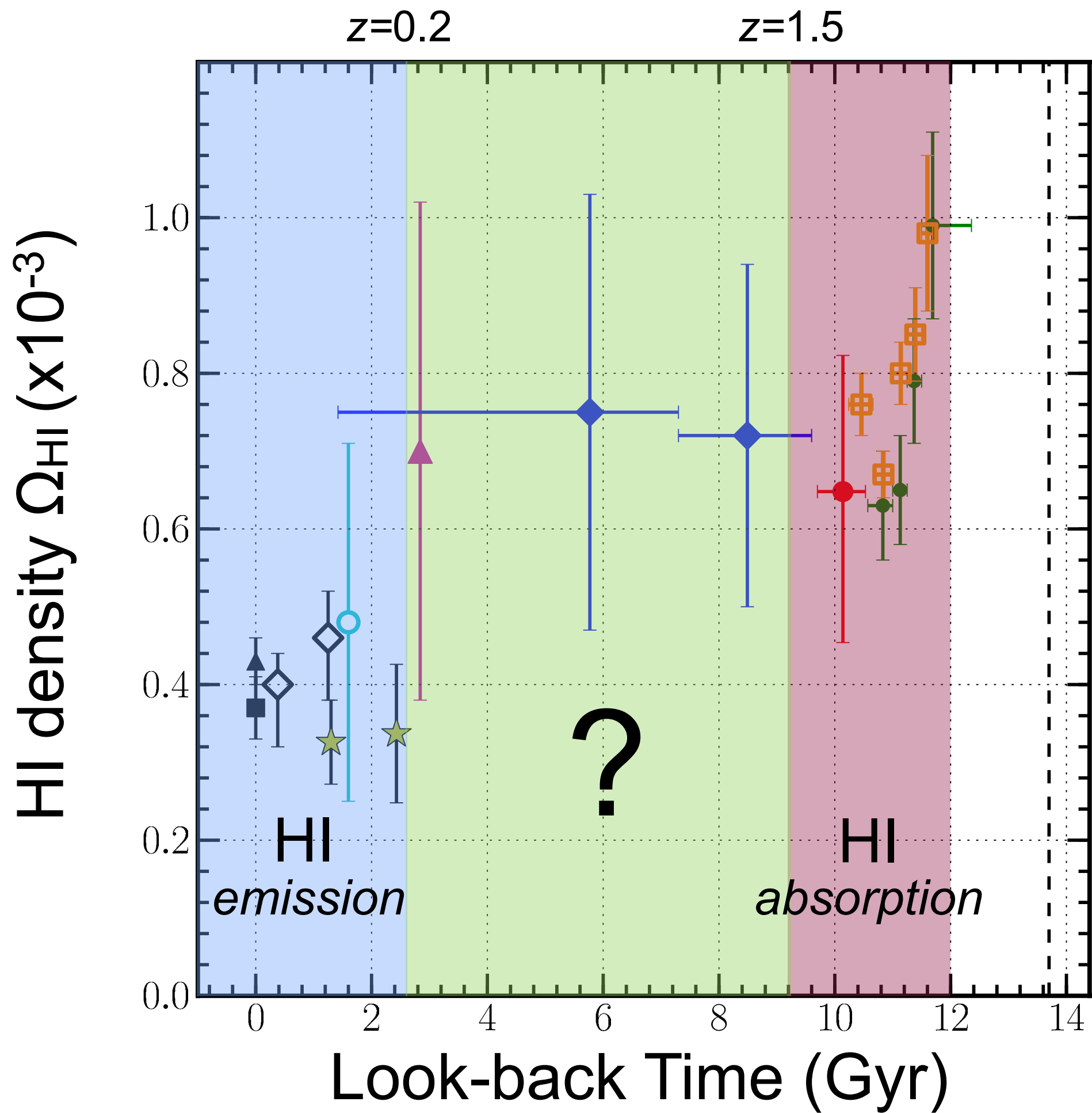


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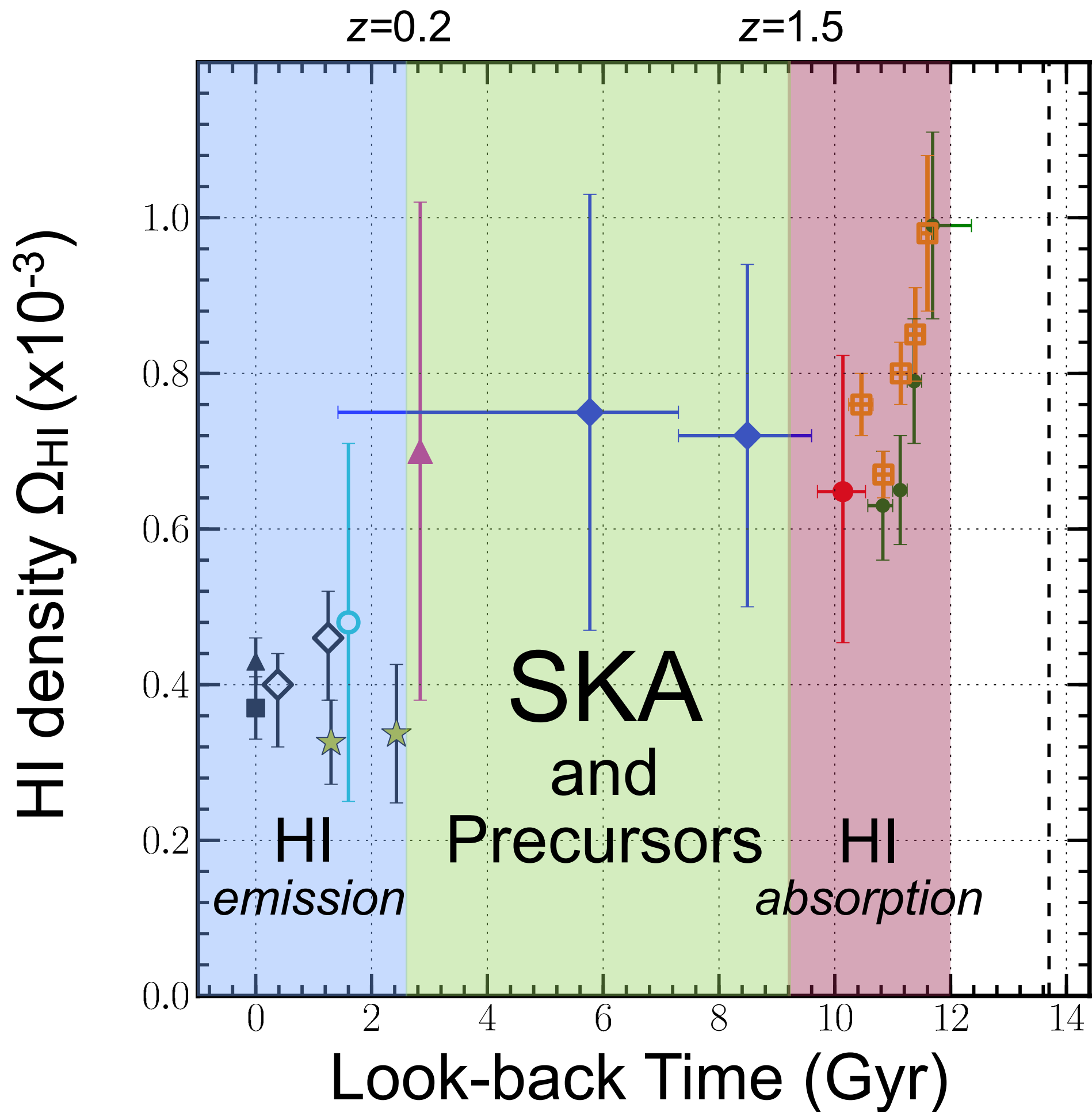












- To understand star formation, we need to understand HI
- The new generation of radio telescopes will enable HI observations over cosmological redshift ranges
  - The SKA will truly be *transformational* for HI science

