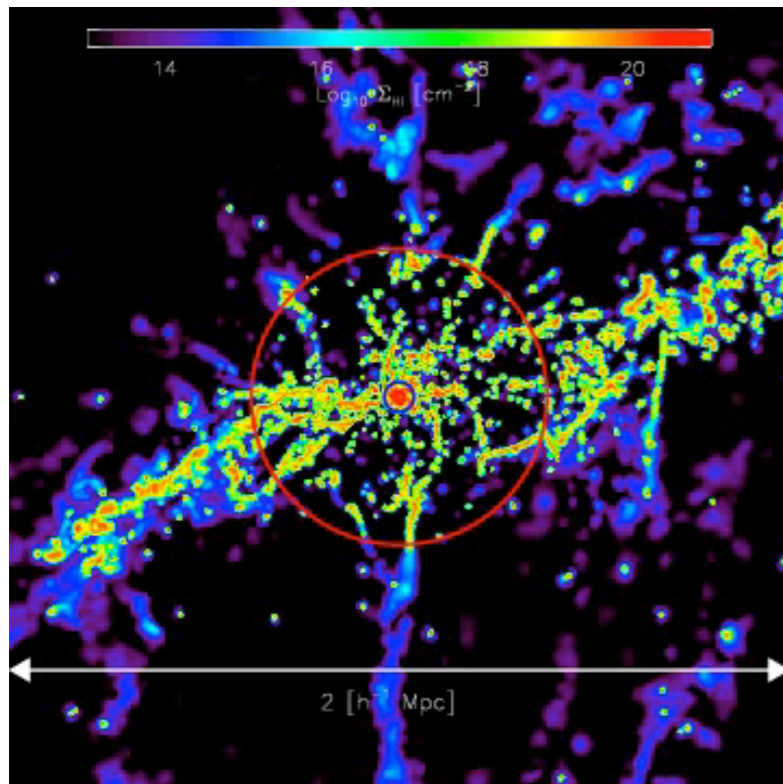


Future Neutral Hydrogen Surveys with ASKAP



Duffy et al (2012a) AD, Kay, Battye, Booth, Vecchia, Schaye

Duffy et al (2012b) AD, Moss, Staveley-Smith

Duffy et al (2012c) AD, Meyer, Staveley-Smith, Bernyk, Croton, Koribalski, Gerstmann, Westerlund



International
Centre for
Radio
Astronomy
Research



Alan Duffy
SURFs March 2013

ASKAP



ASKAP

36 dishes (30 within 2km; 30'' res, rest out to 6km; 10'')

Phased Array Feed enables 30 sq deg FoV

WALLABY (All Sky HI survey out to $z < 0.26$)

DINGO (Deep HI Survey to $z < 0.43$)

i) DEEP - 150 sq deg to $z < 0.26$

ii) UDEEP - 60 sq deg out to $z < 0.43$



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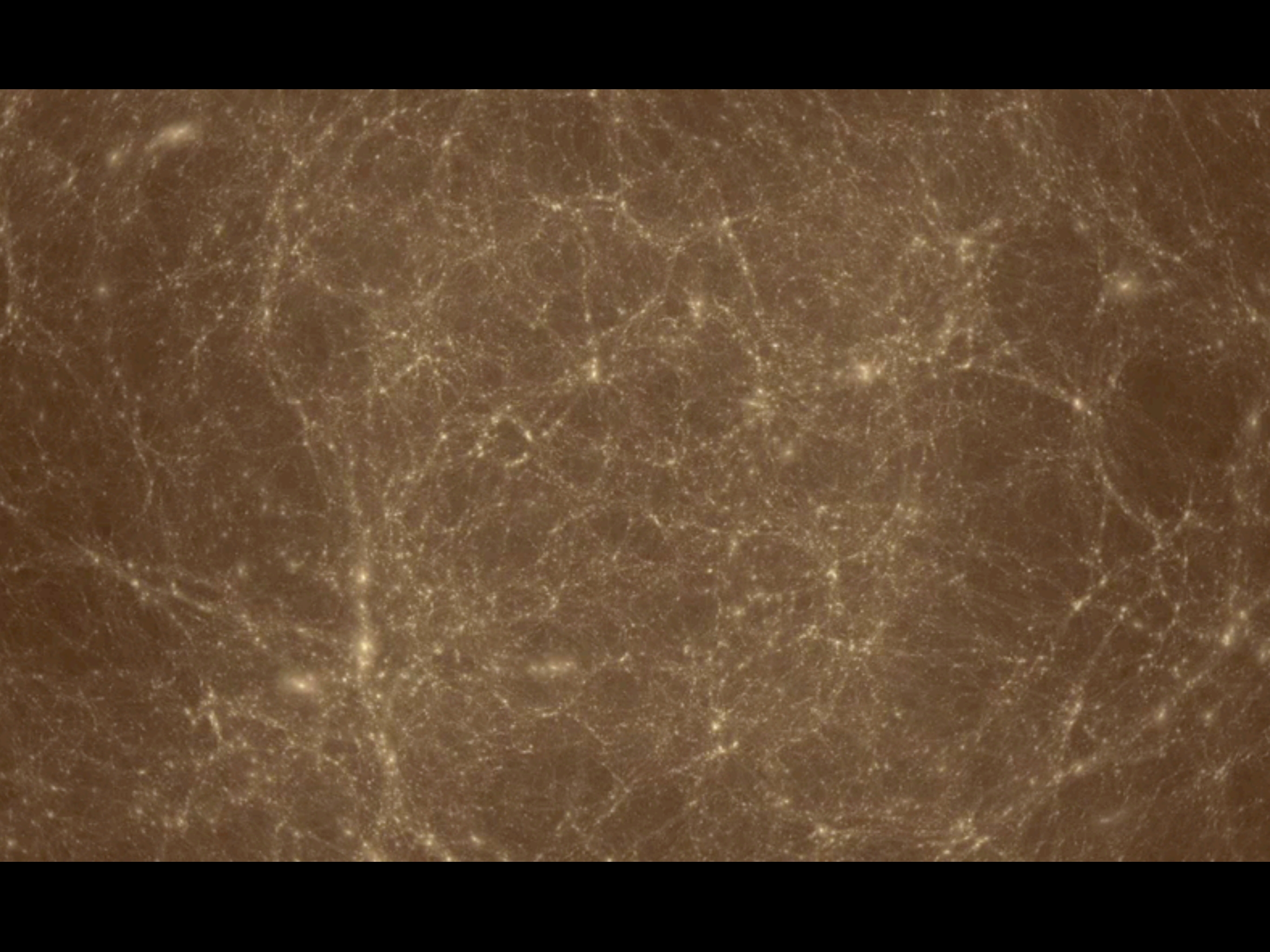
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Difficult to simulate this volume at the resolution needed!



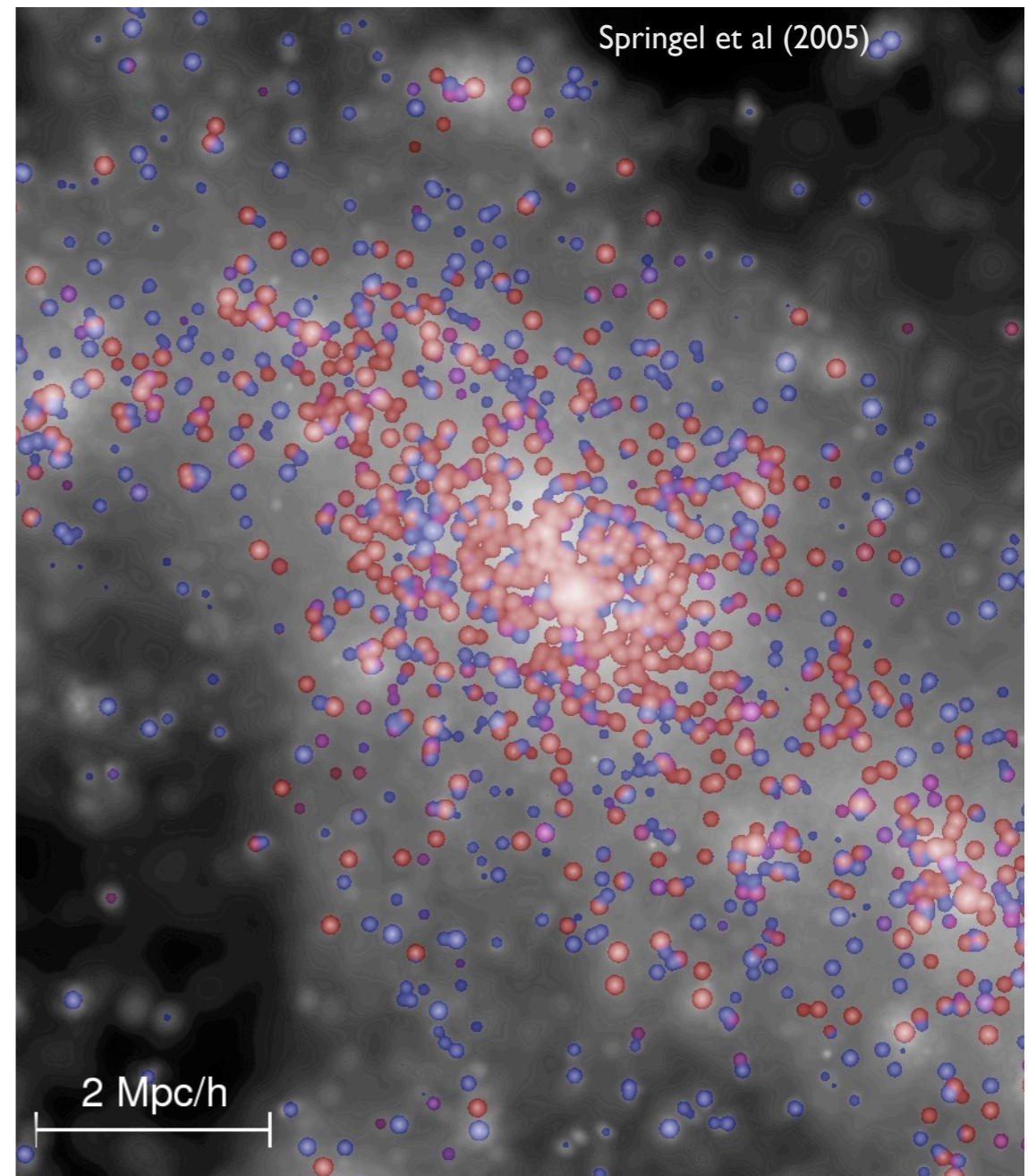


Cold Gas From Millennium Simulation

Dark Matter is tracked in simulation

Galaxy properties are 'painted on'

Can get accurate Cold Gas mass, Stellar mass and SFR amongst many other properties...



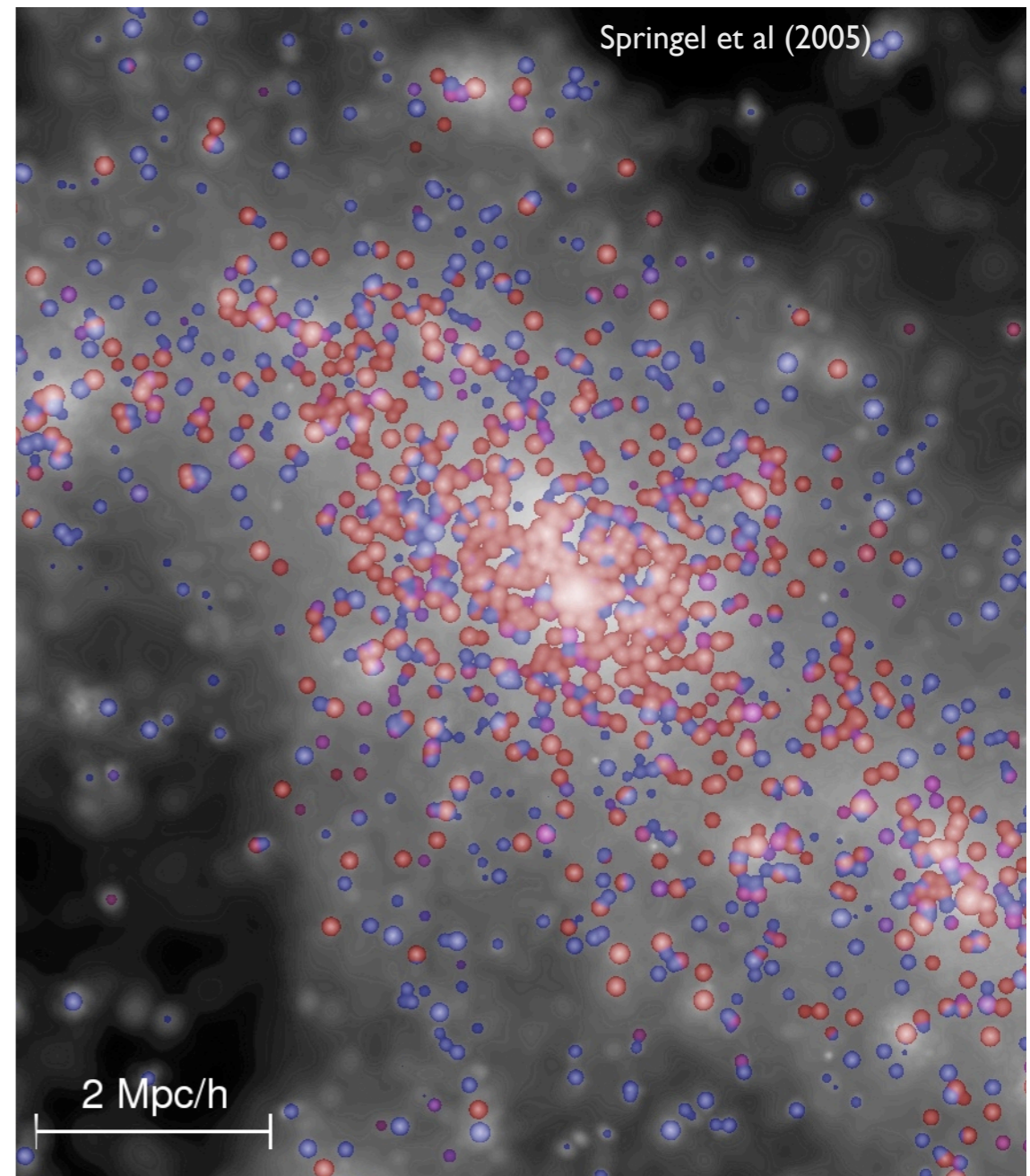
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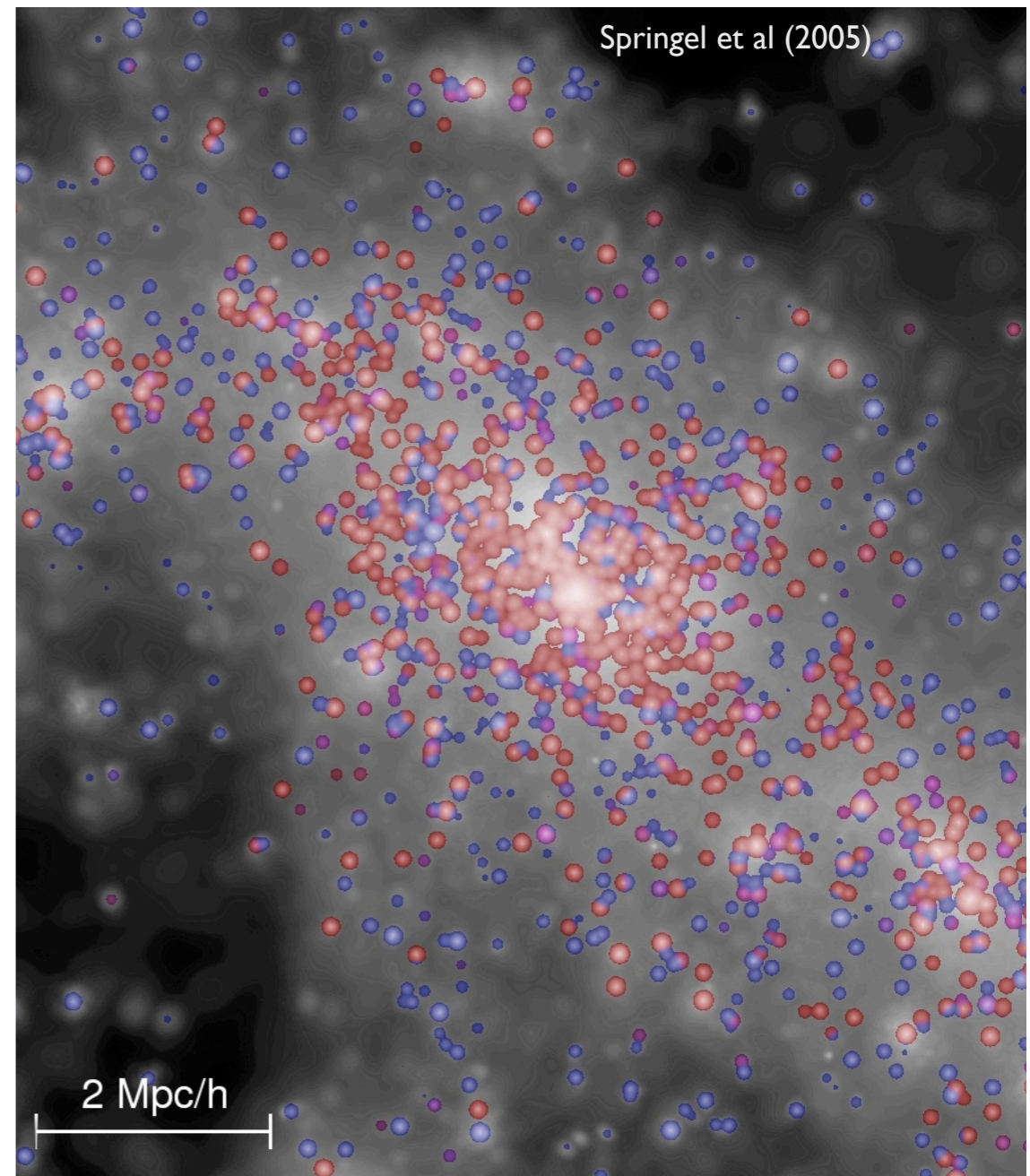
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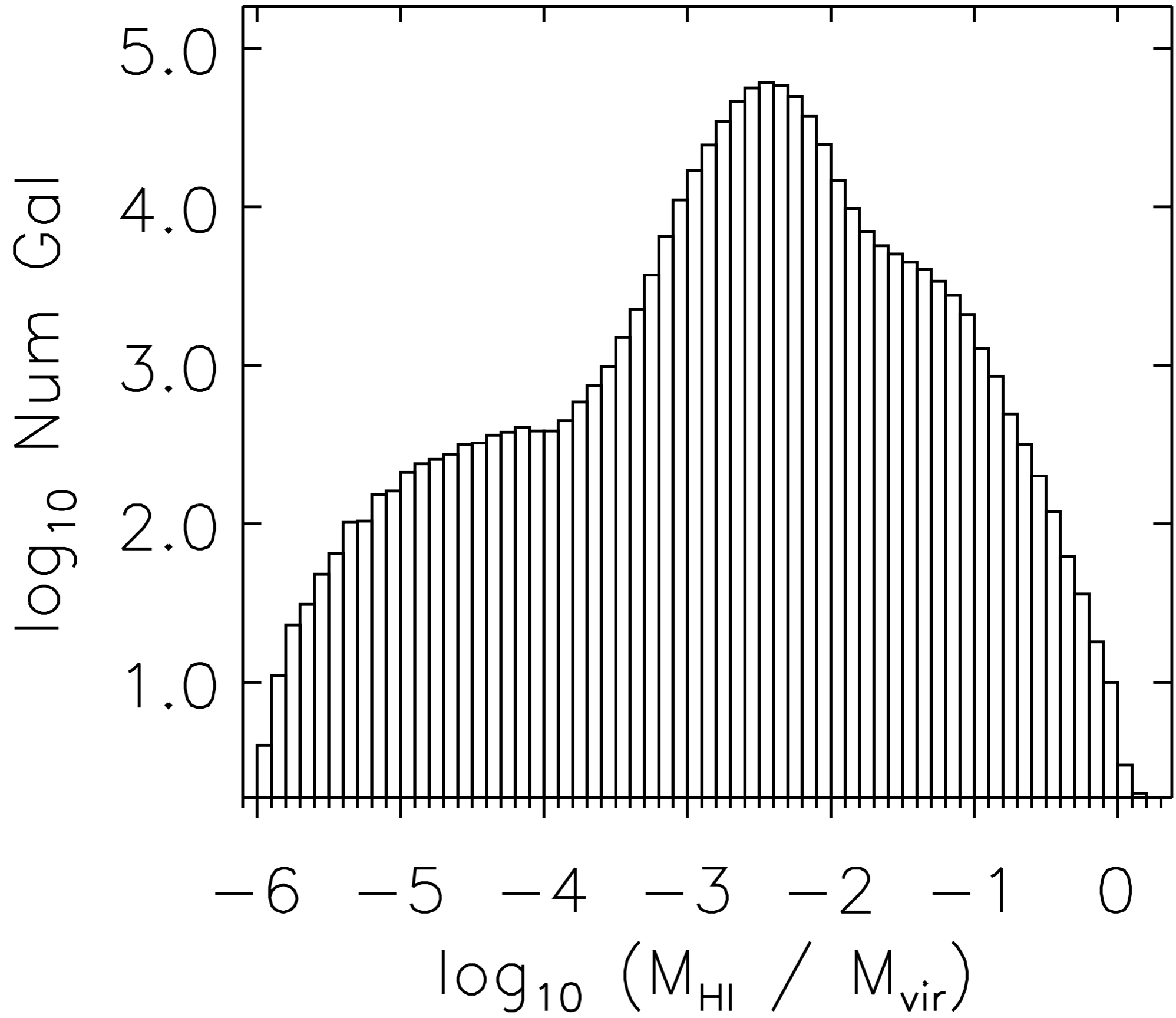
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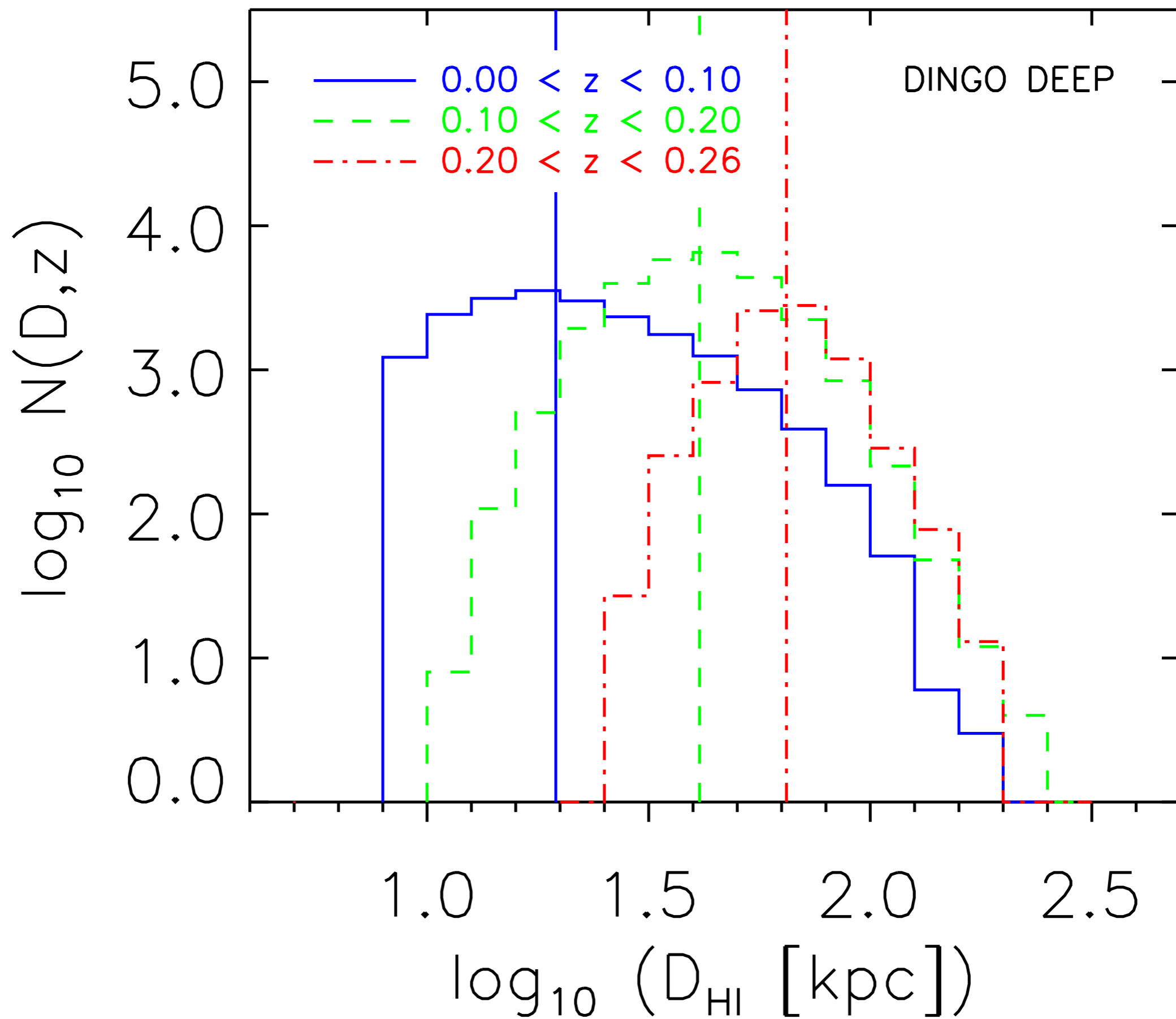
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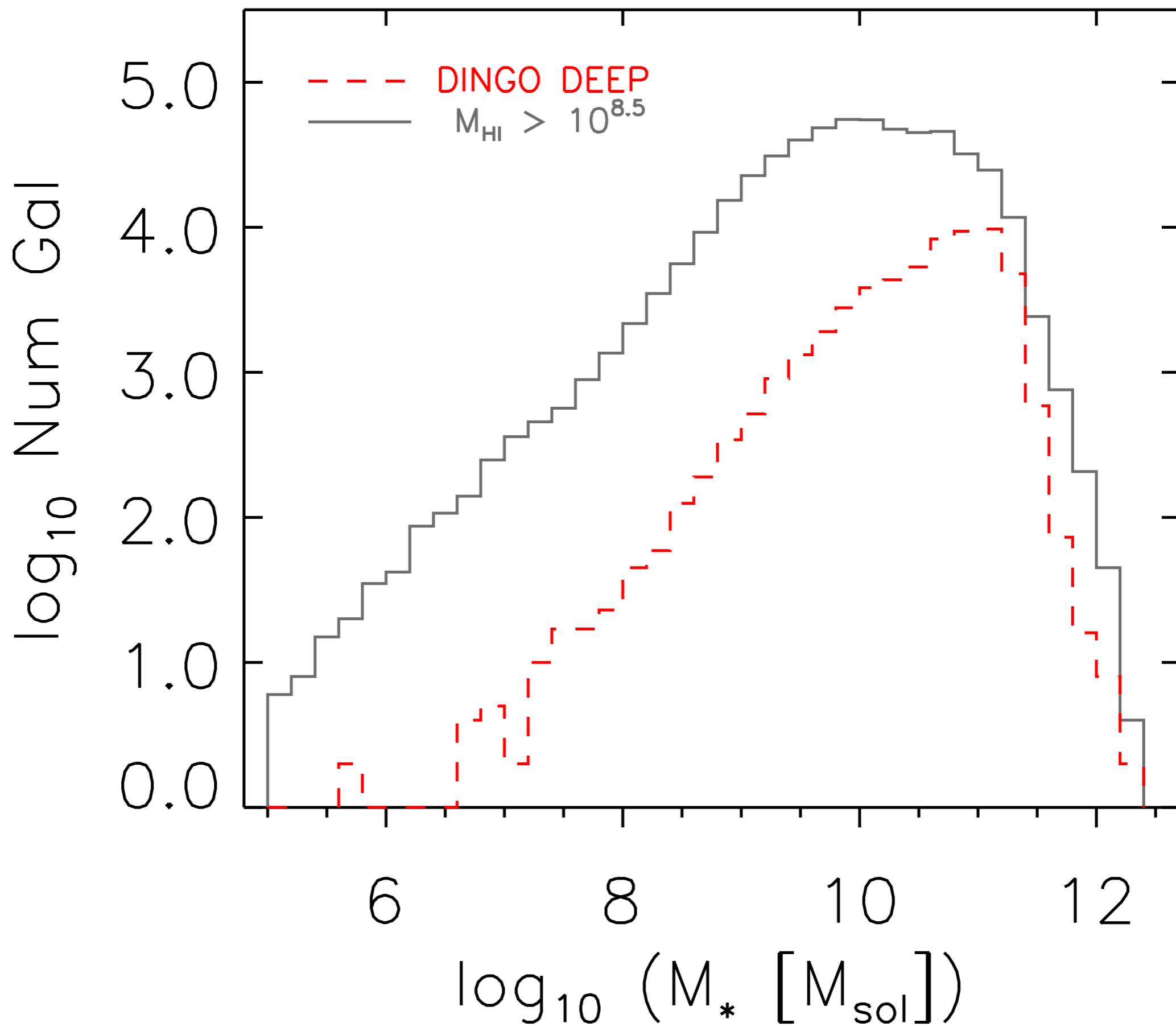
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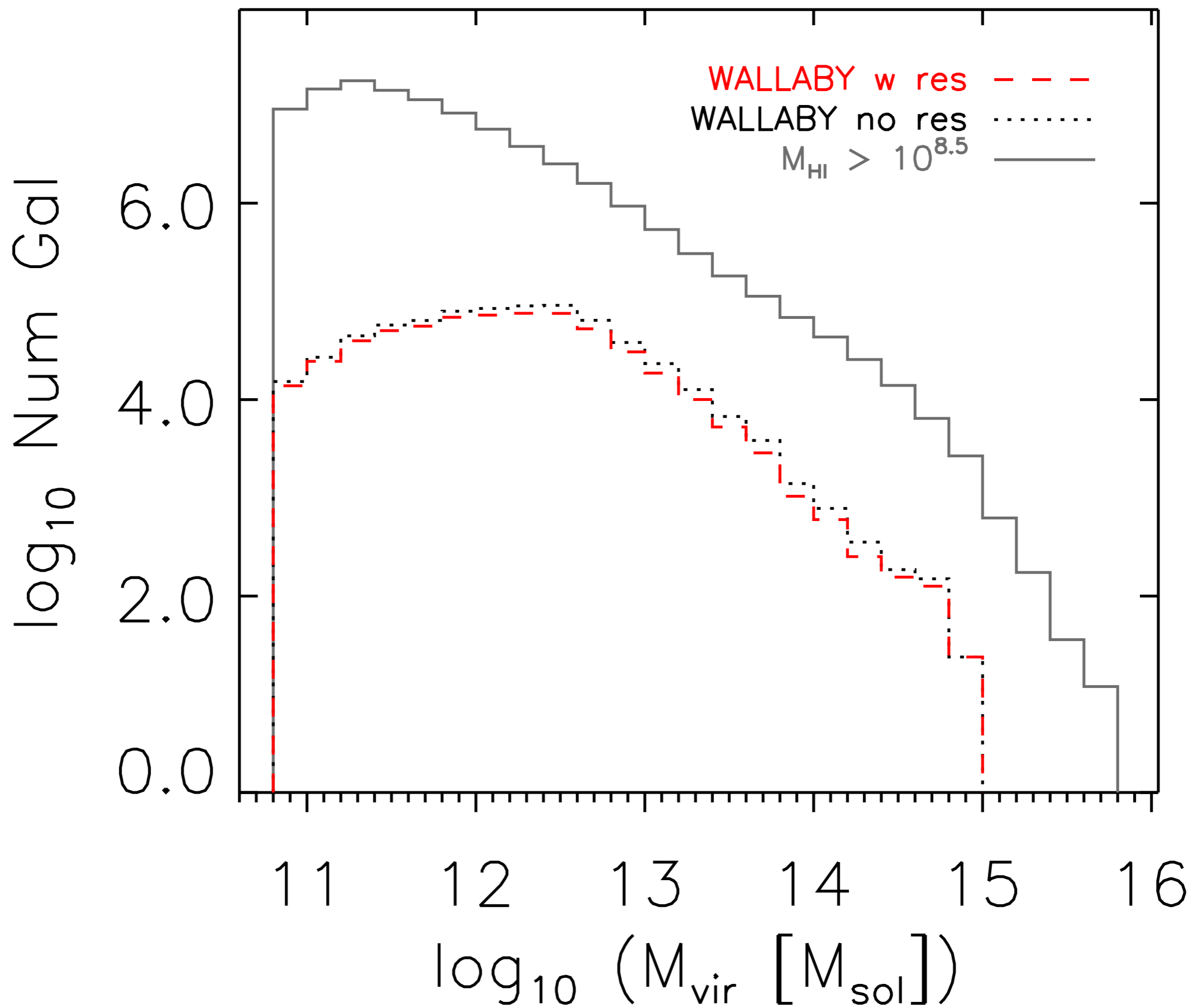
Set HI fraction of cold gas to match HIMF

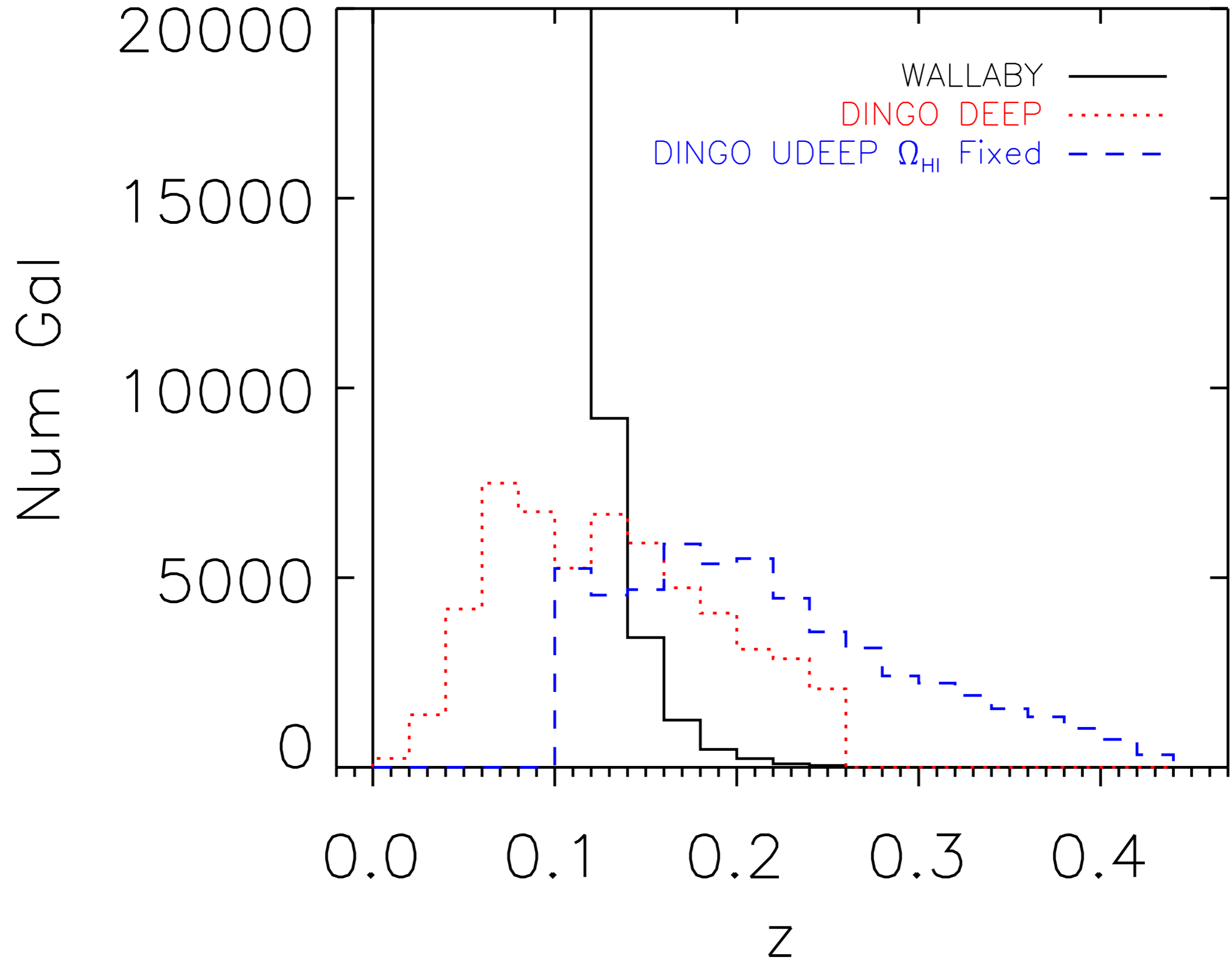


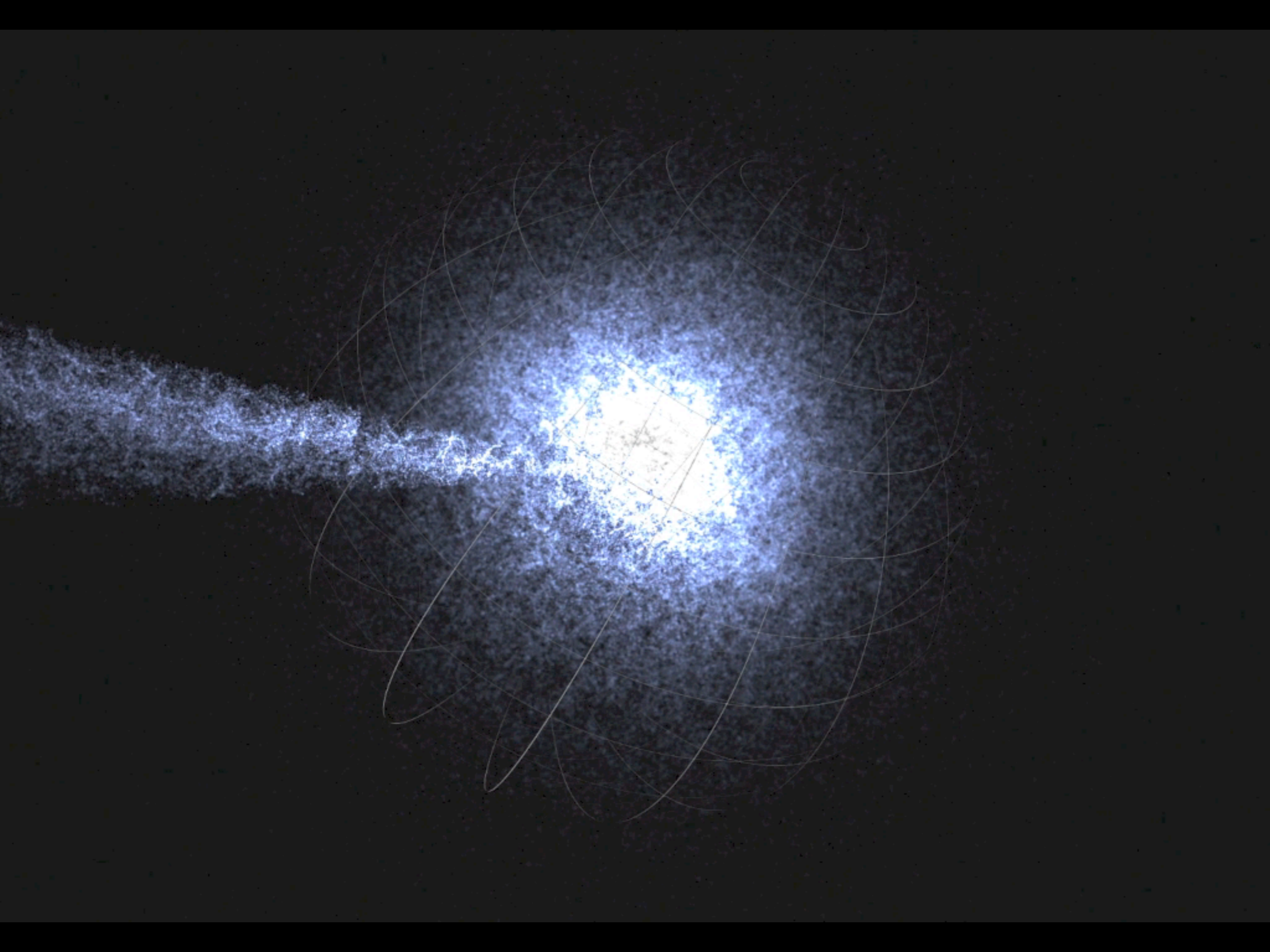






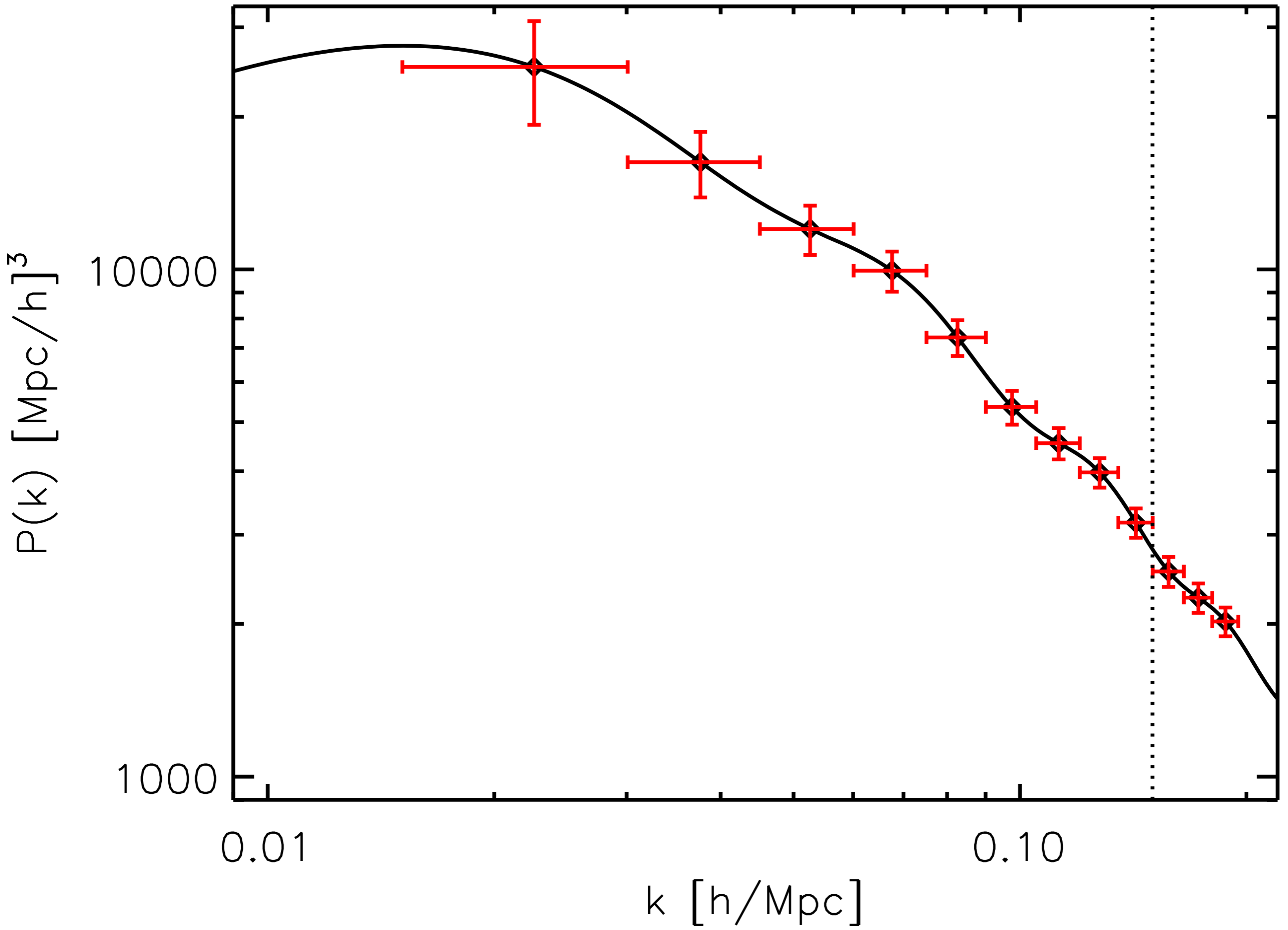






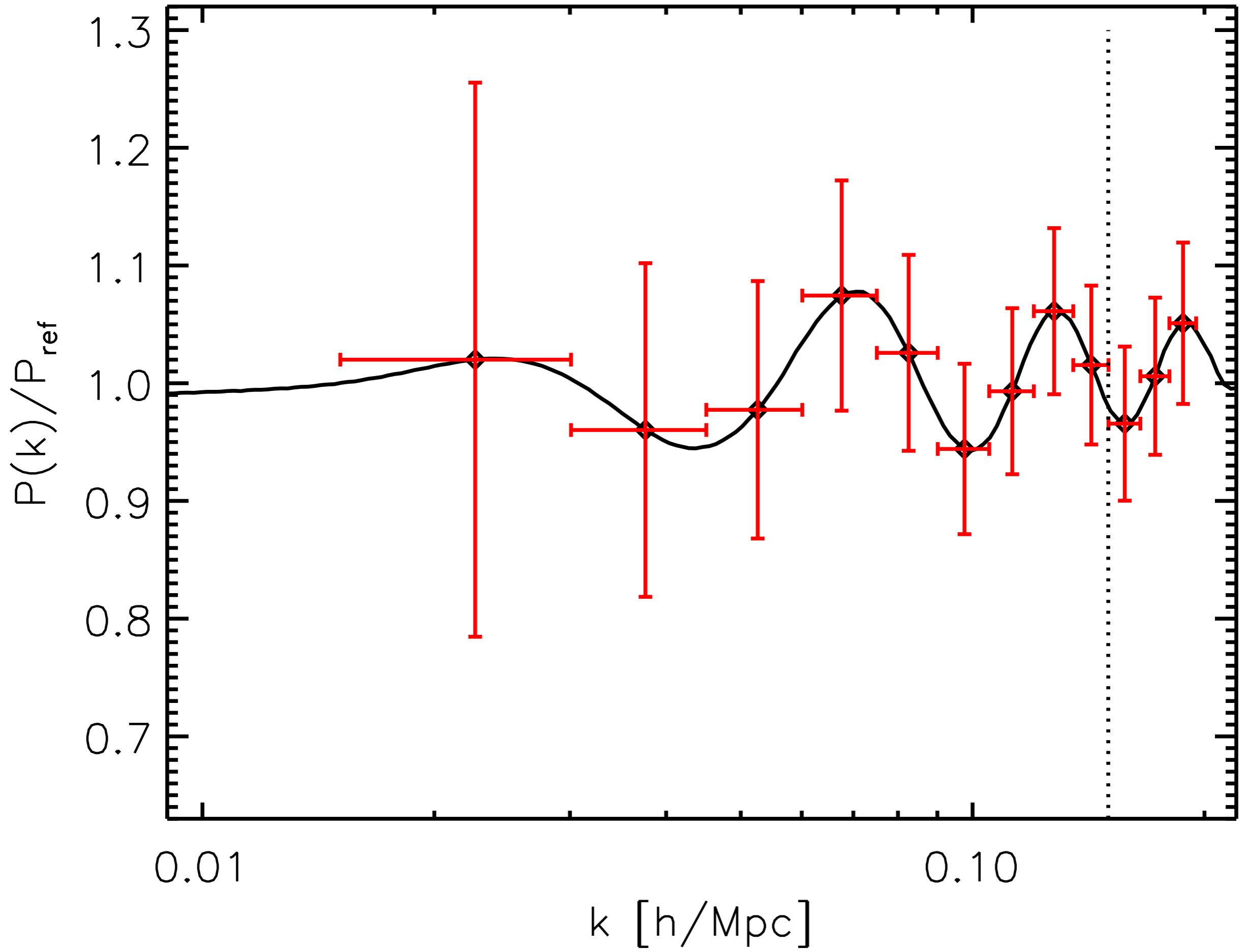
Constrain Matter Power Spectrum

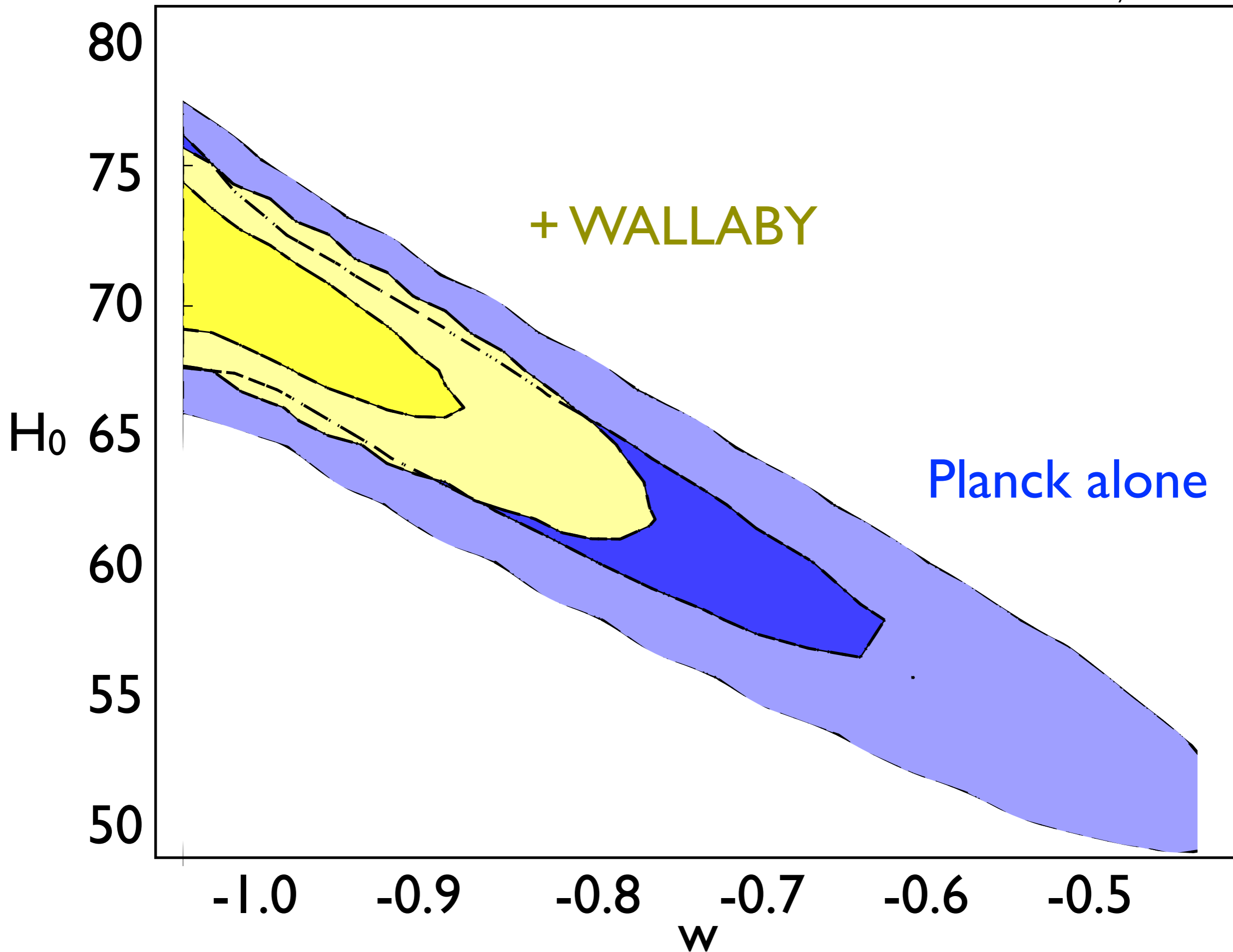
Duffy et al 2012b
see also:
Beutler et al 2011



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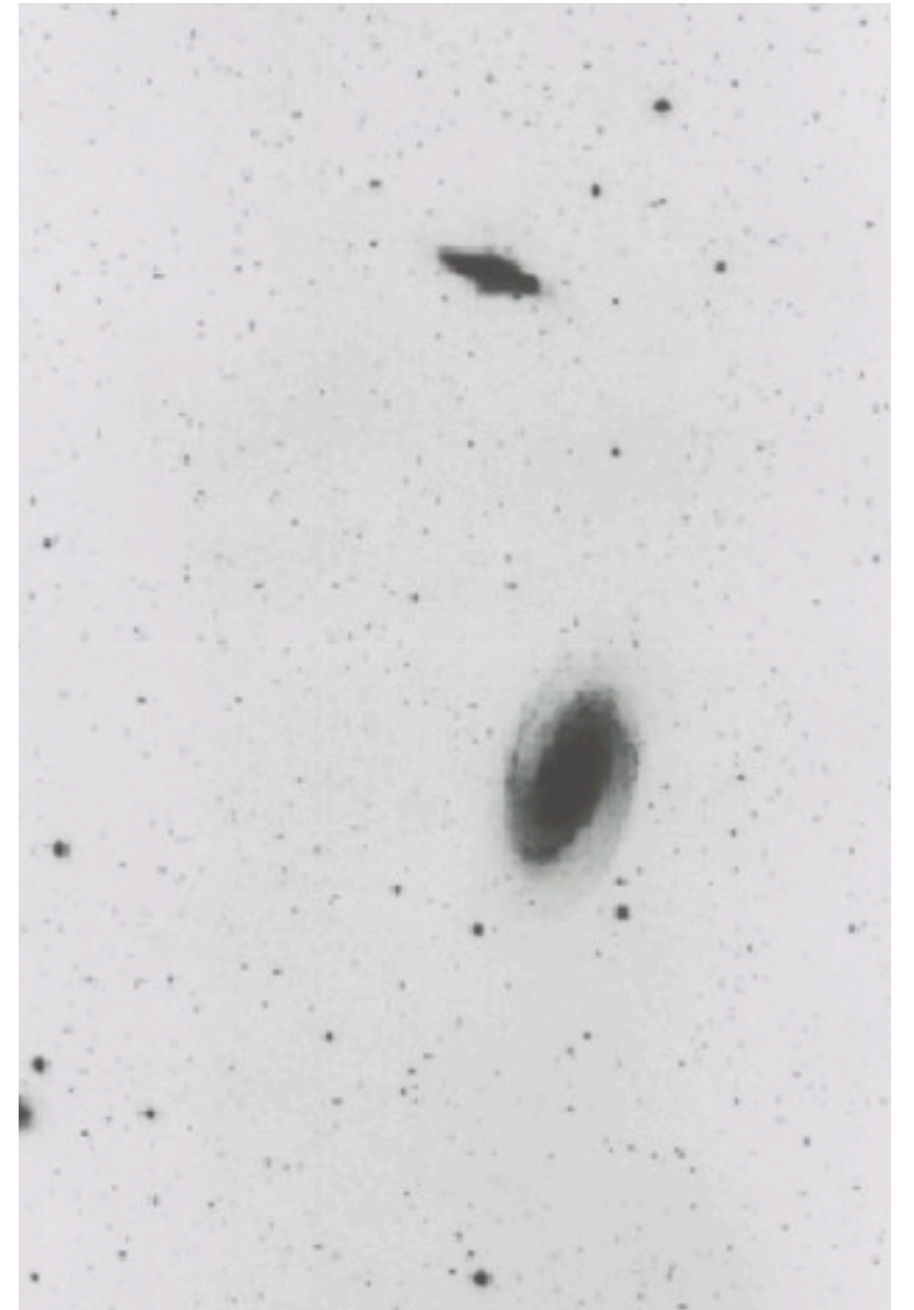
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SKA and Theory

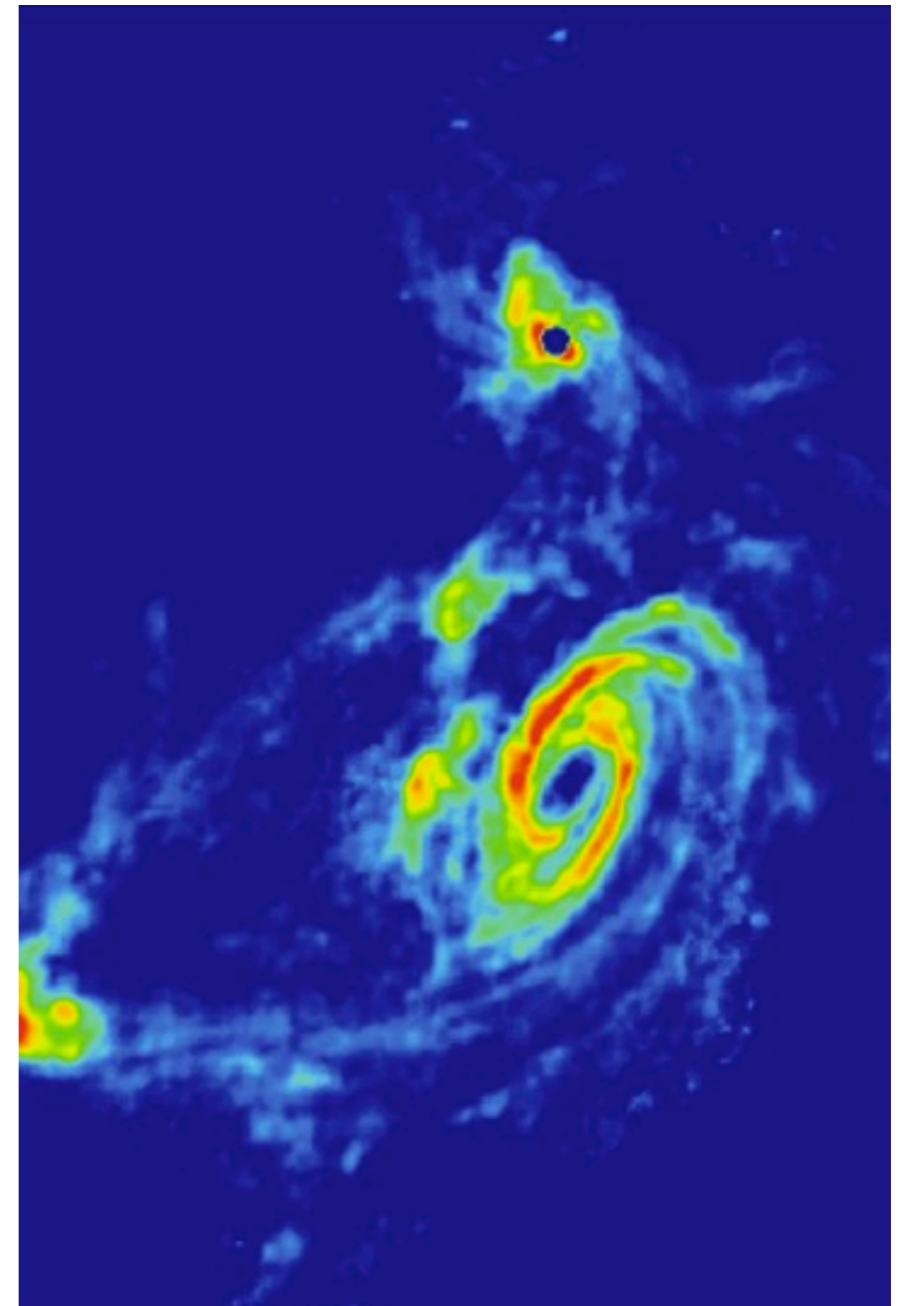
So far this work is DM only (collisional approx ok for stars?)



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But if observing HI, ideally we would like to simulate the gas..!

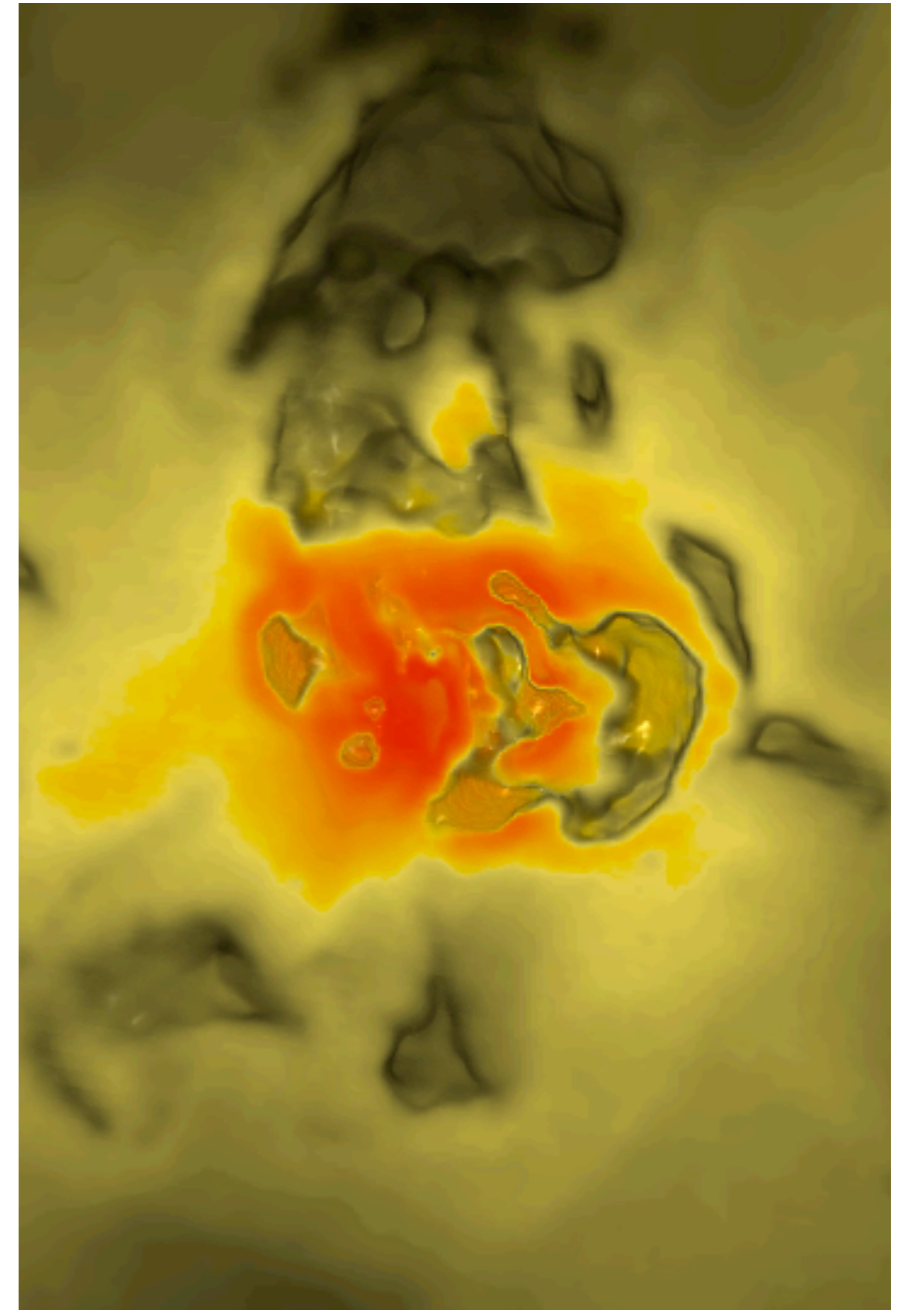


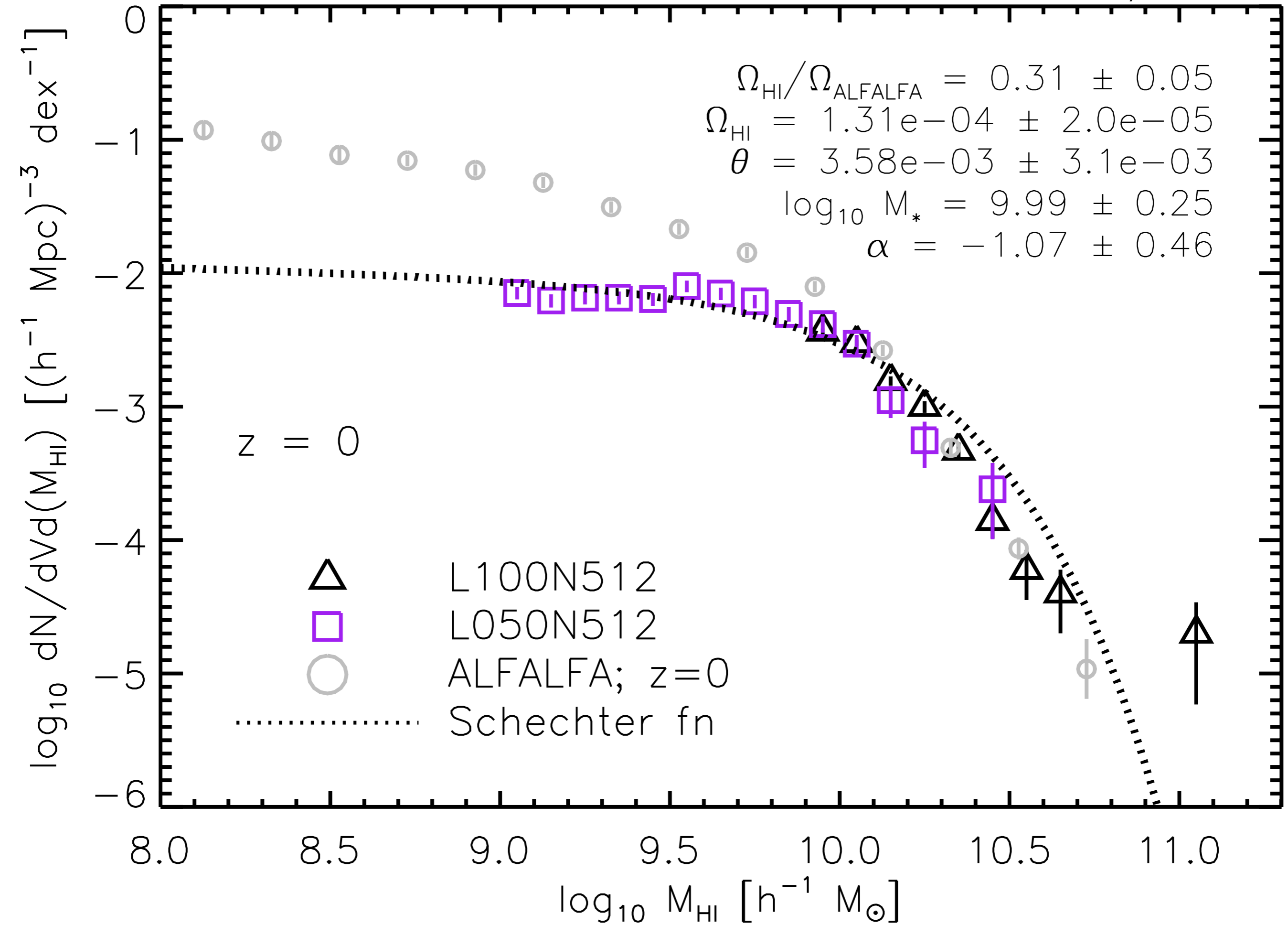
SKA and Theory

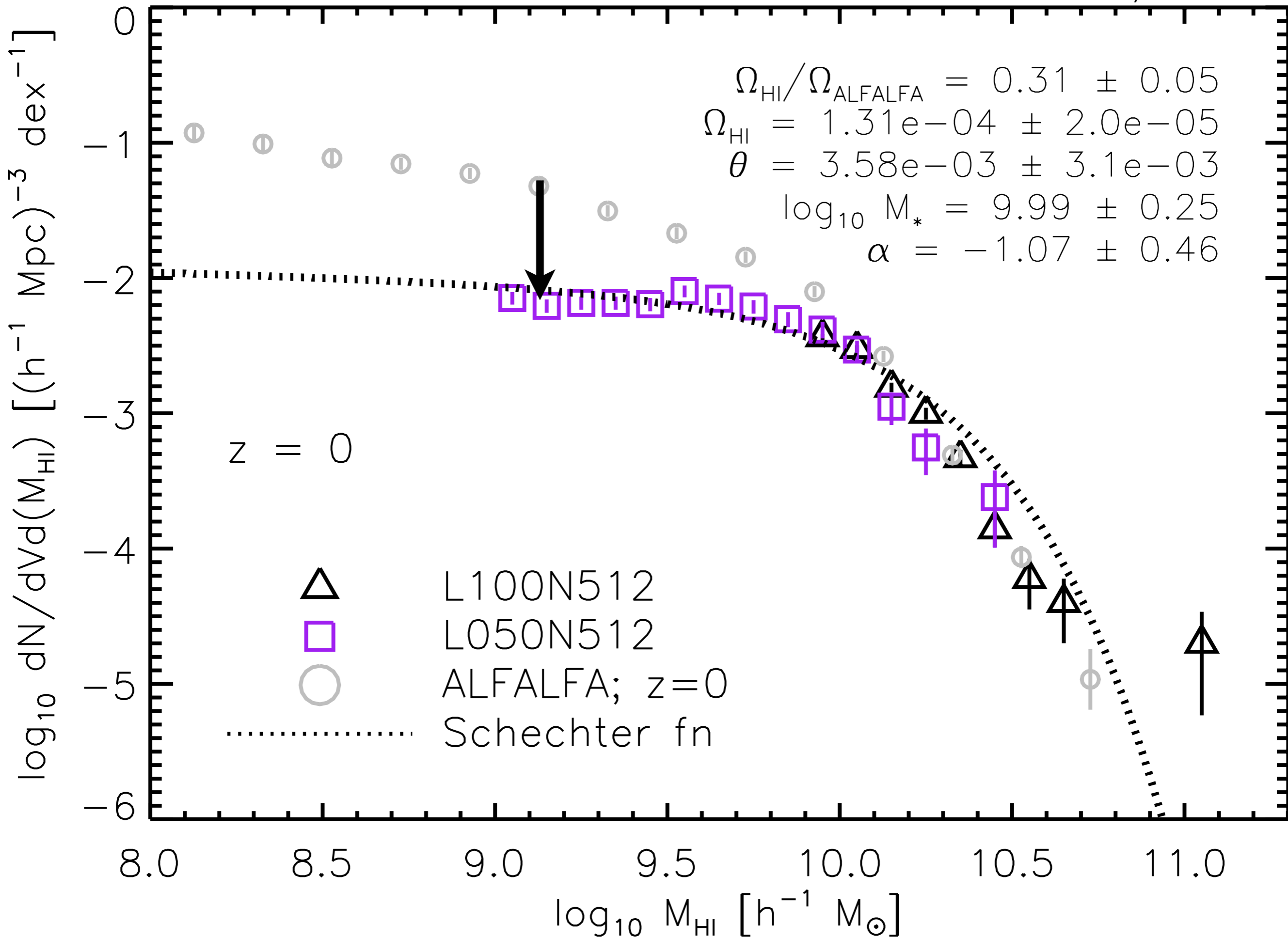
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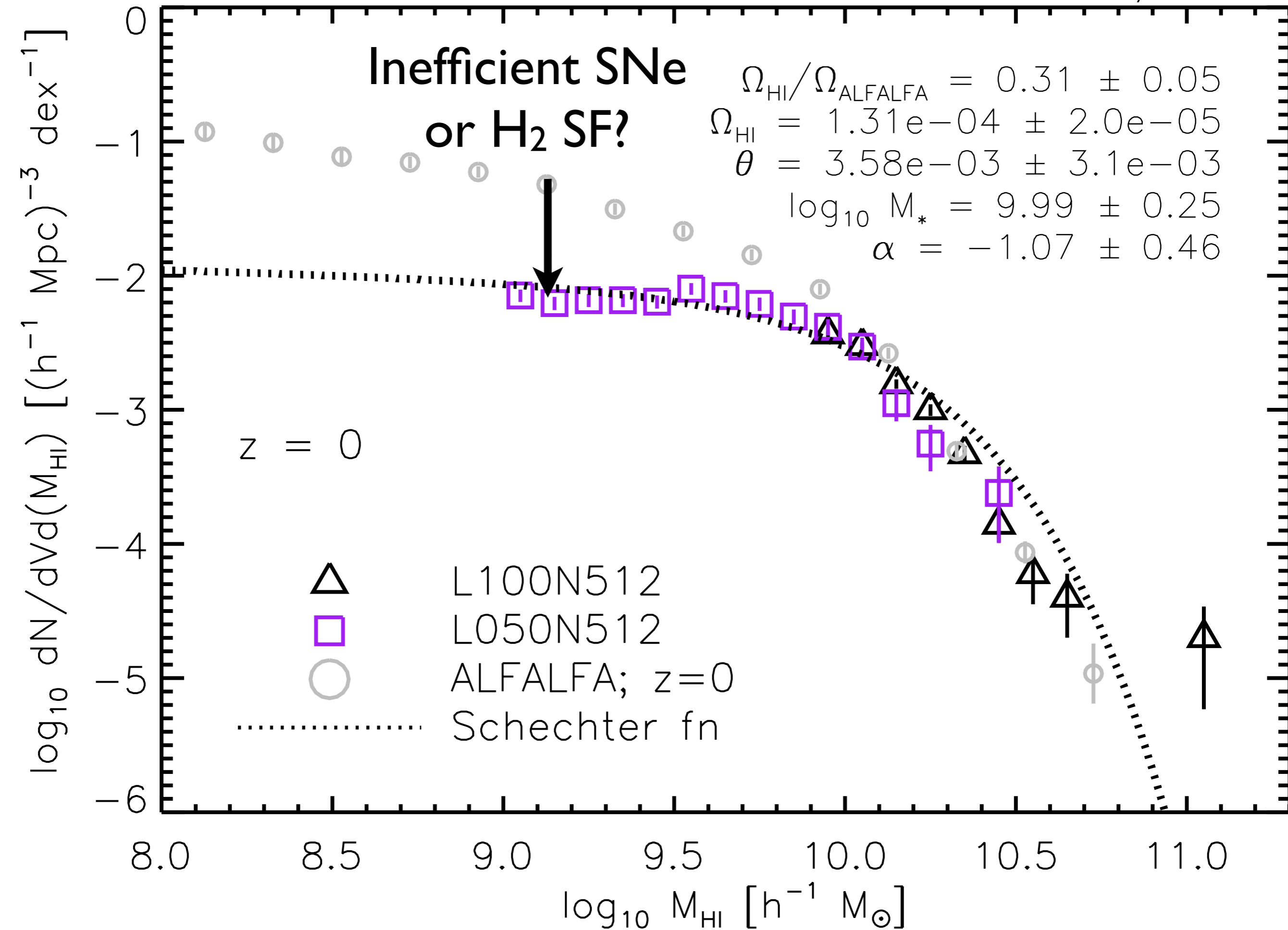
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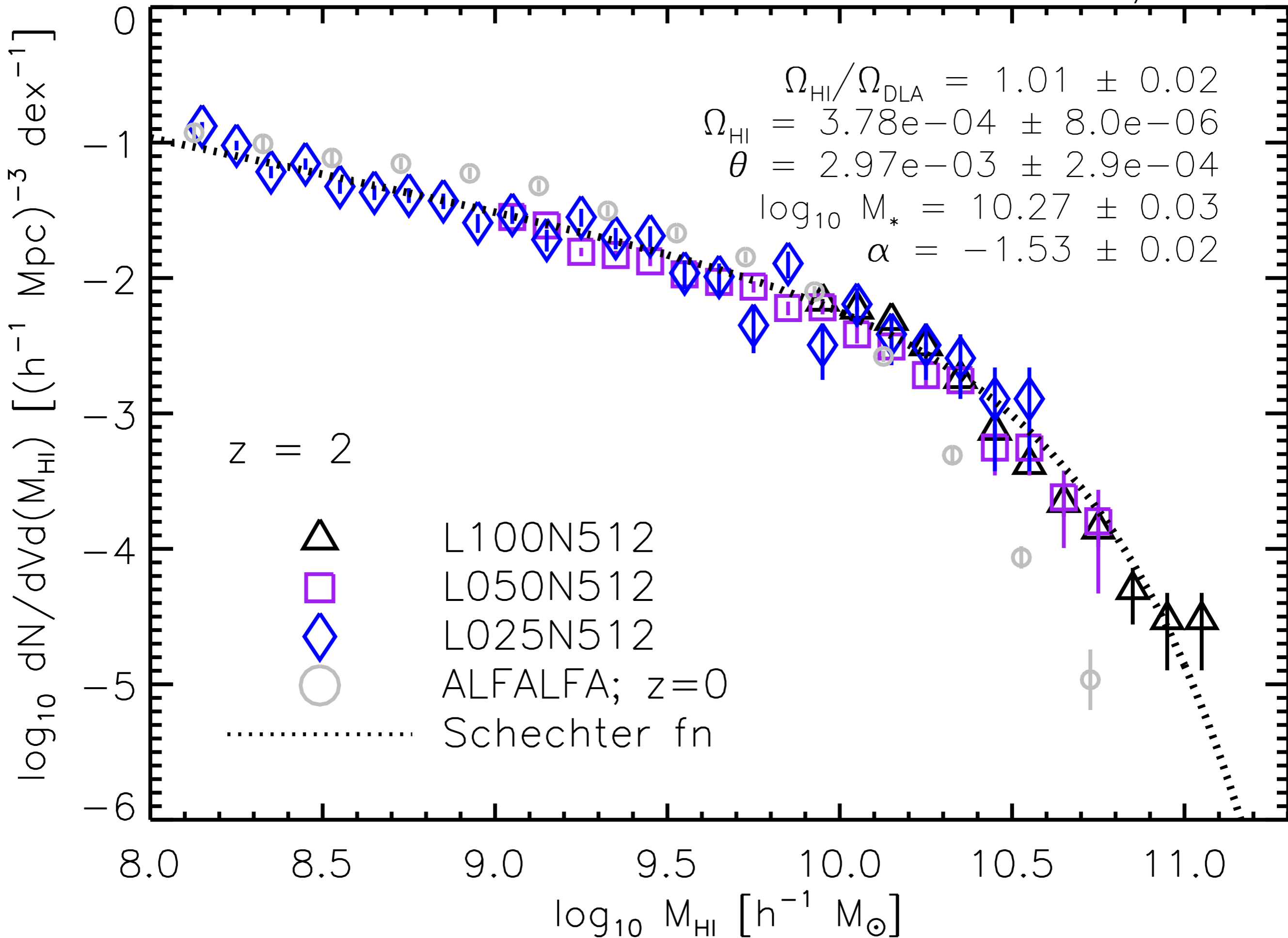
OWLS (Schaye +10) still the best available hydrosim until Eagle.

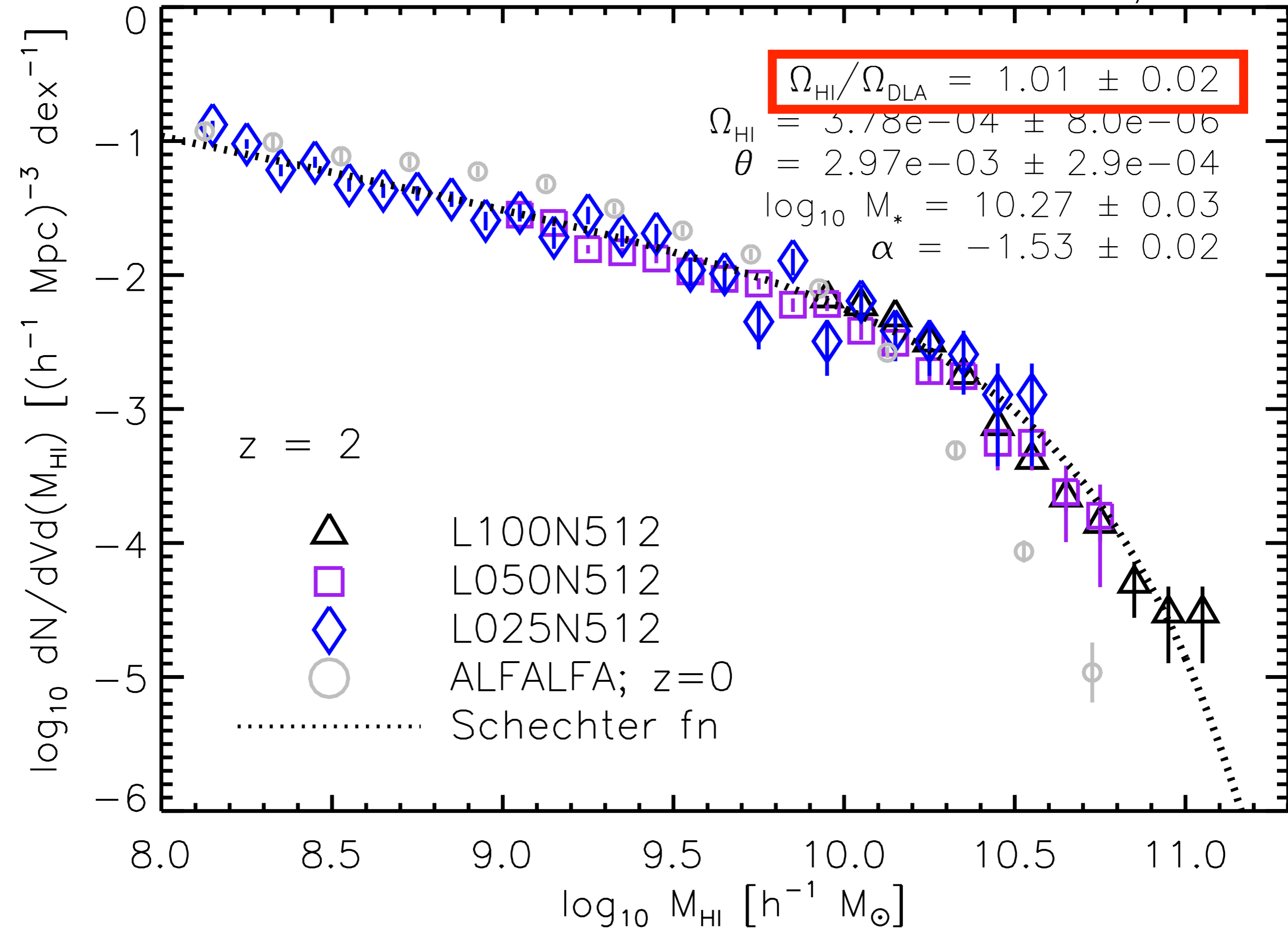


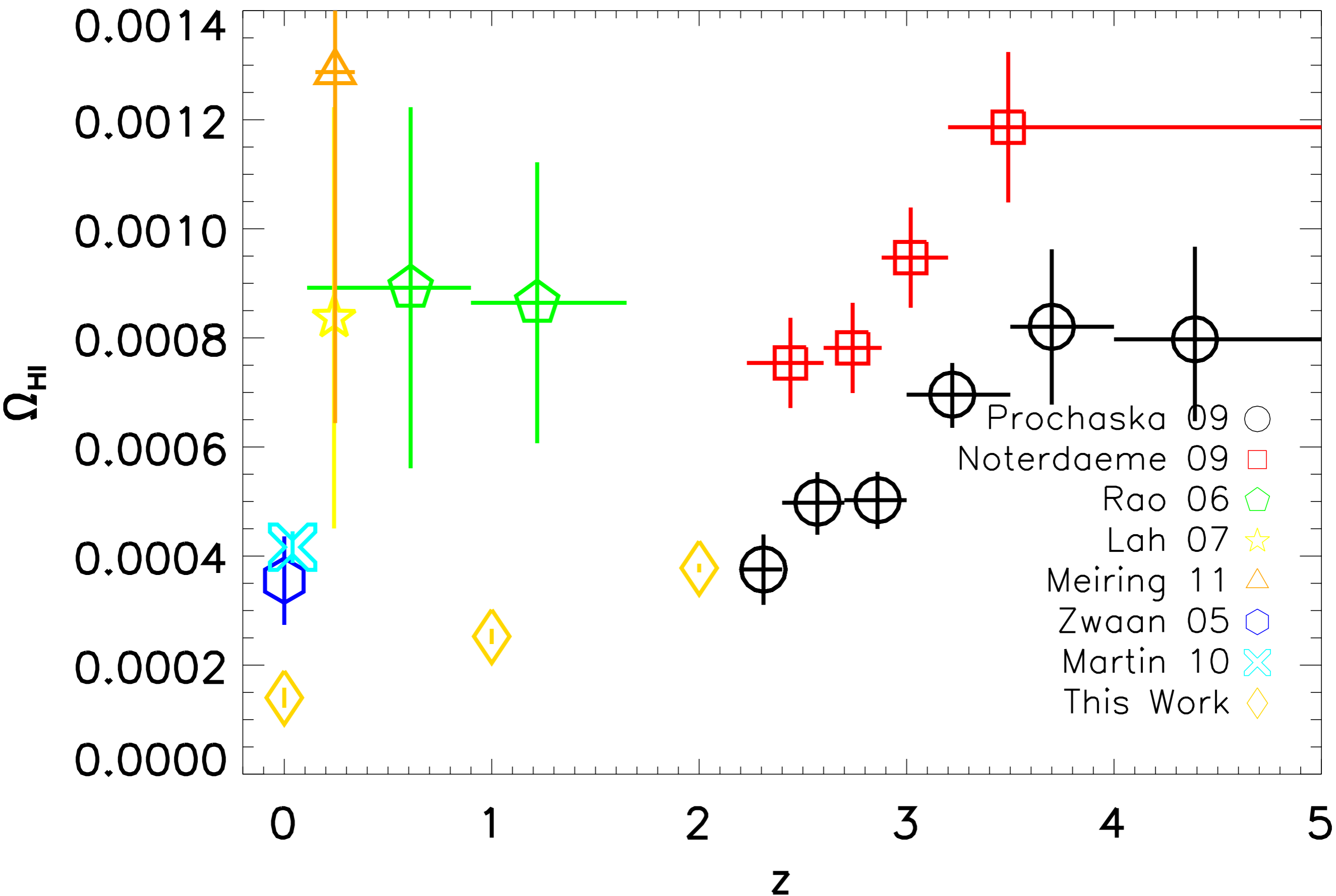


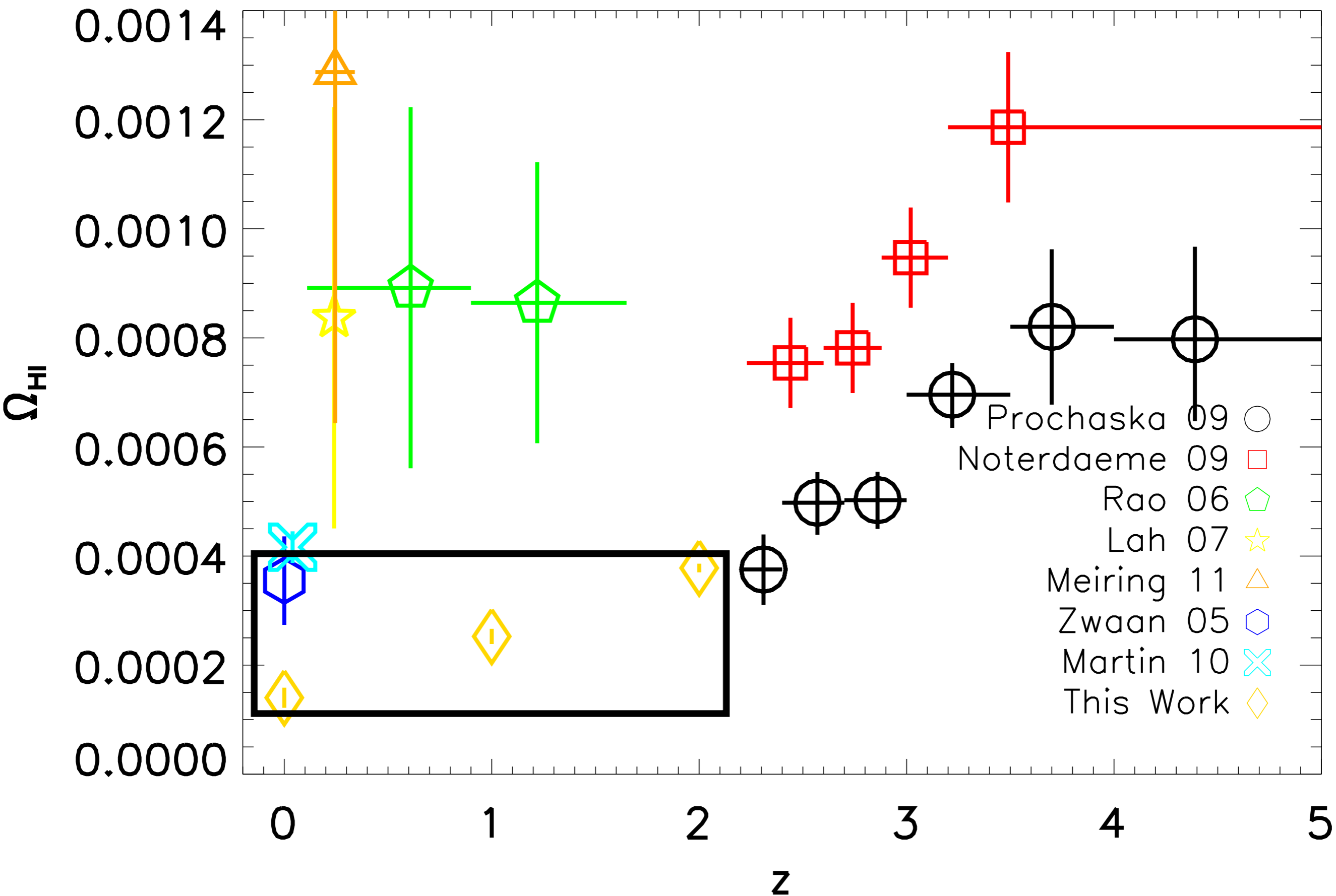


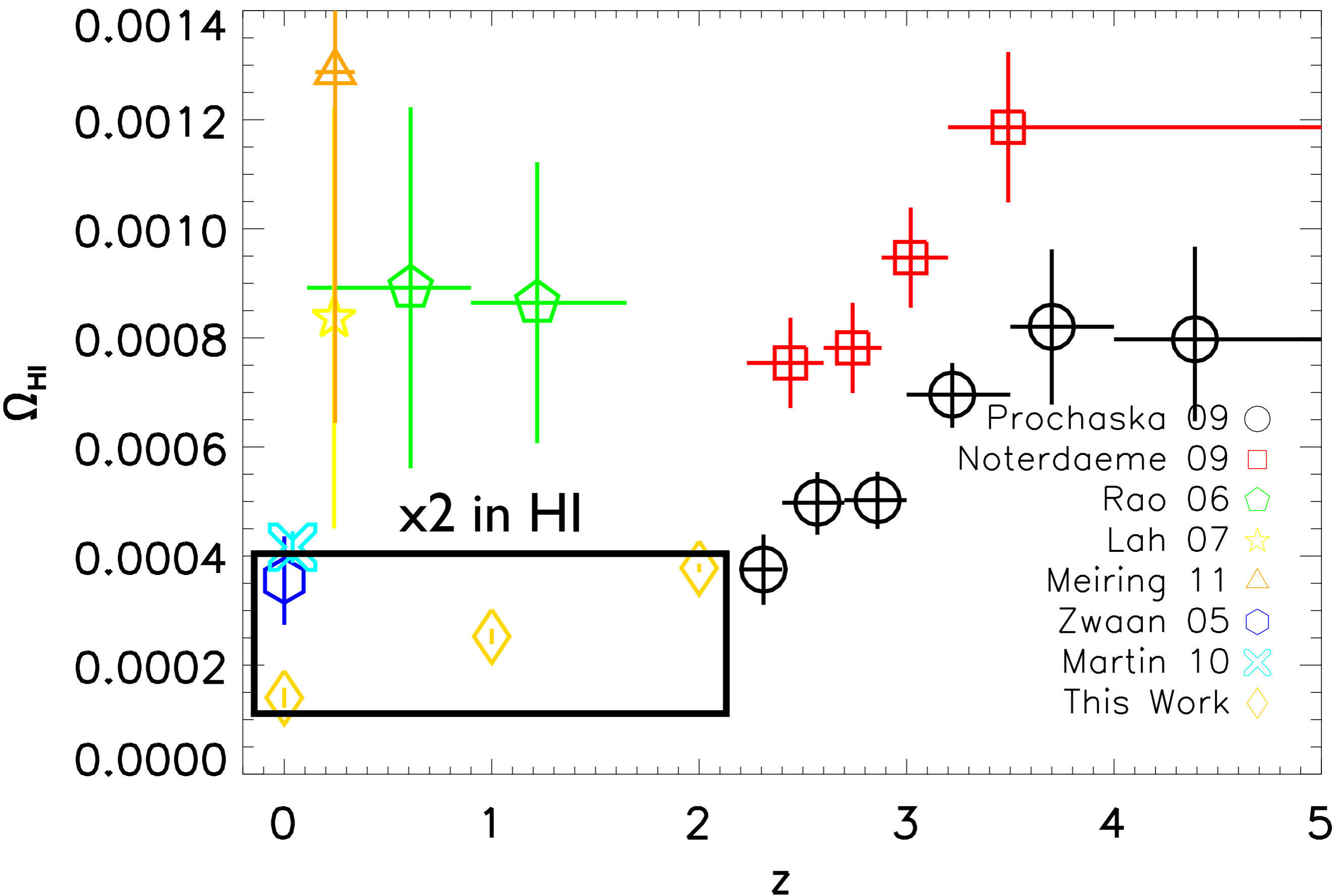










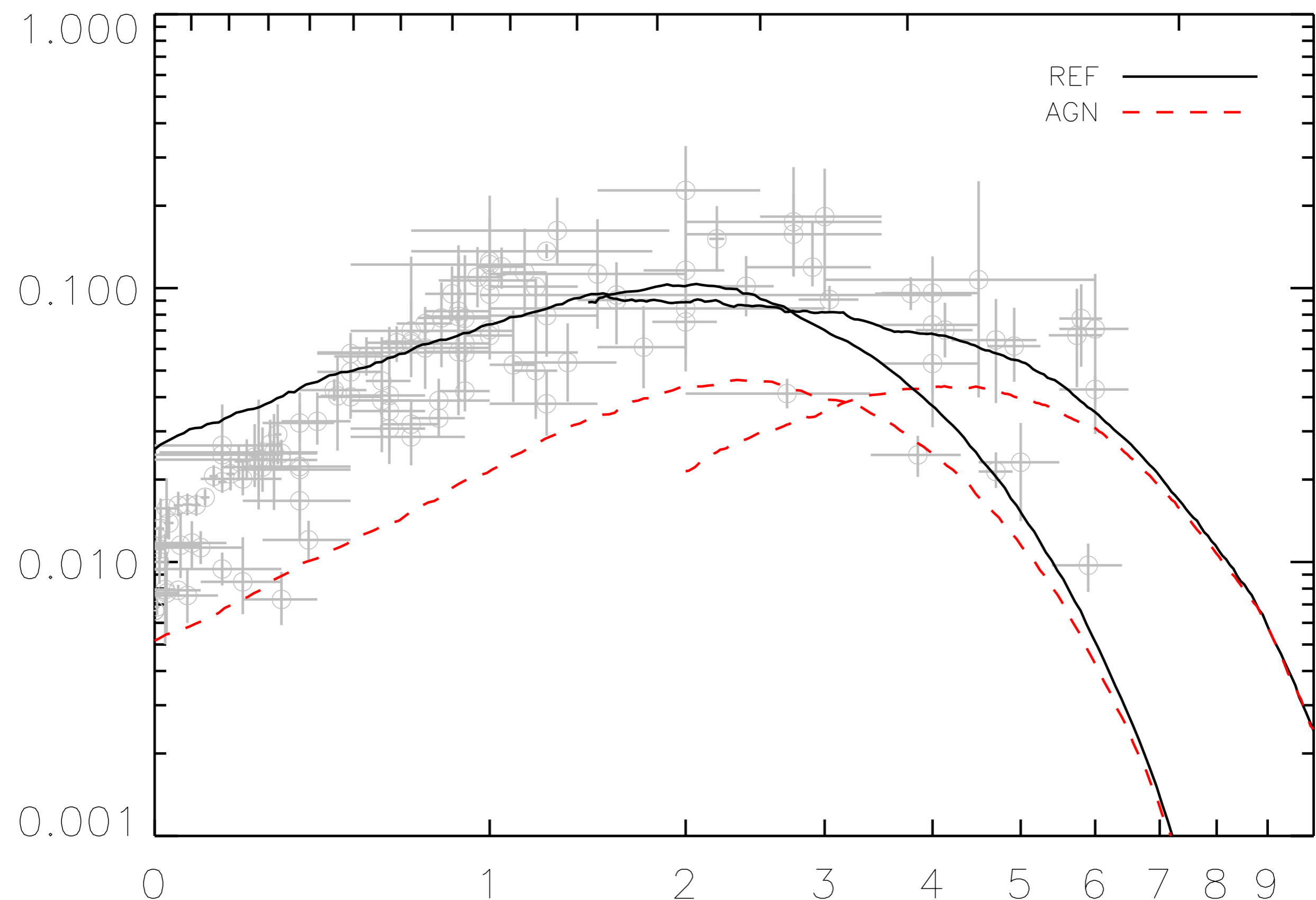


Lookback time (Gyr)

0 1 2 3 4 5 6 7 8 9 10 11 12 13

SFR ($M_{\text{sun}} \text{ yr}^{-1} \text{ Mpc}^{-3}$)

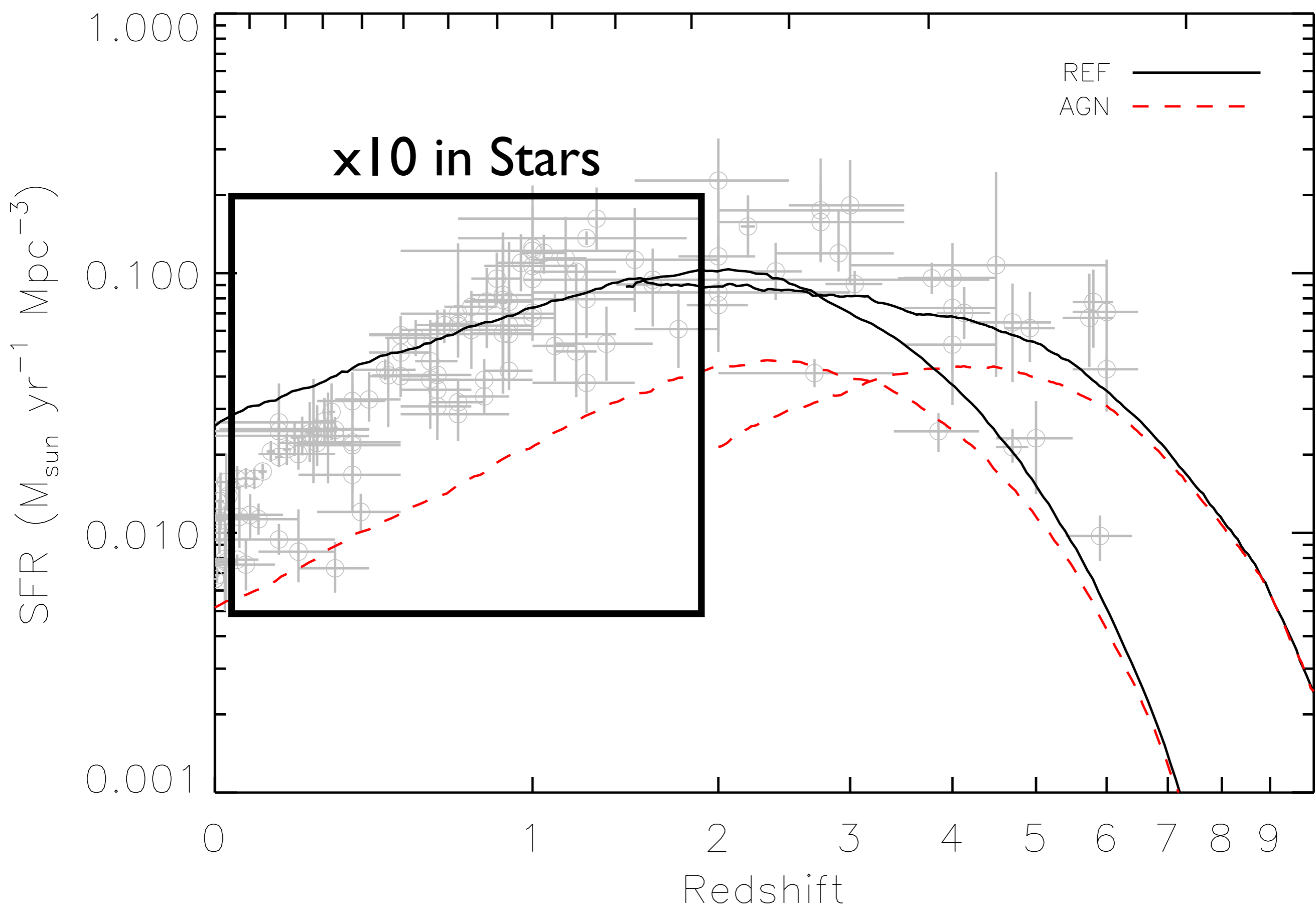
REF ———
AGN - - - -

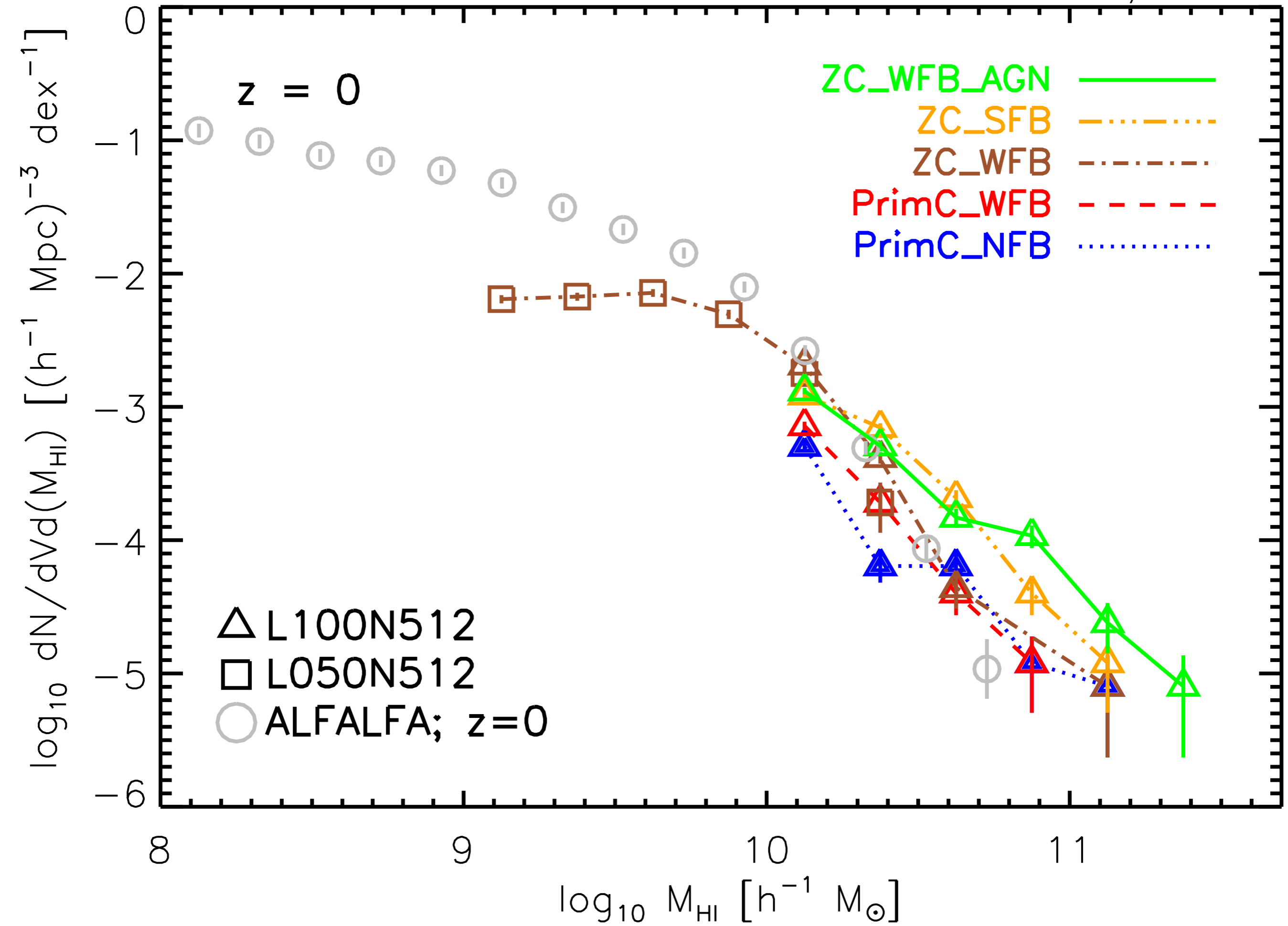


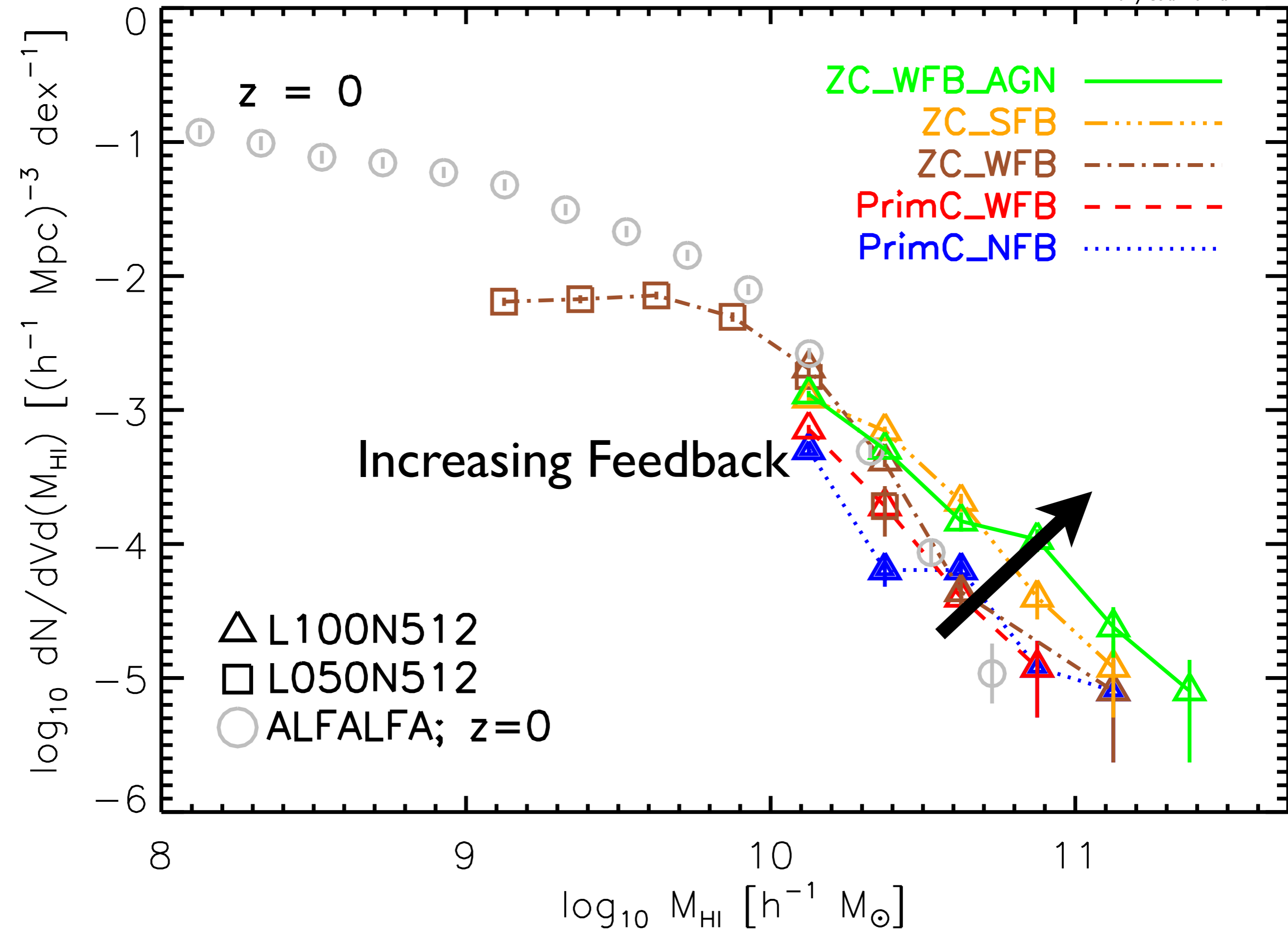
Redshift

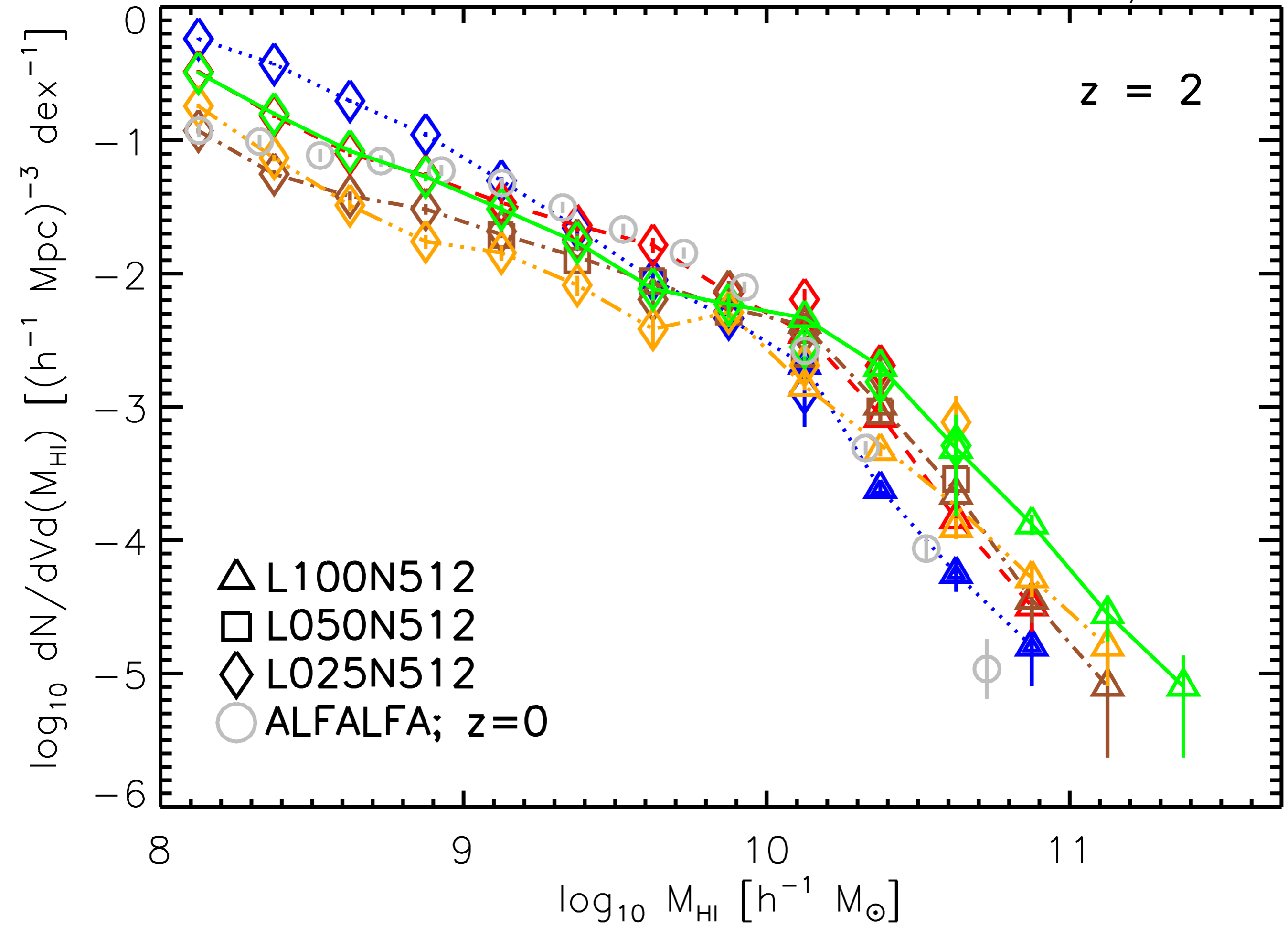
Lookback time (Gyr)

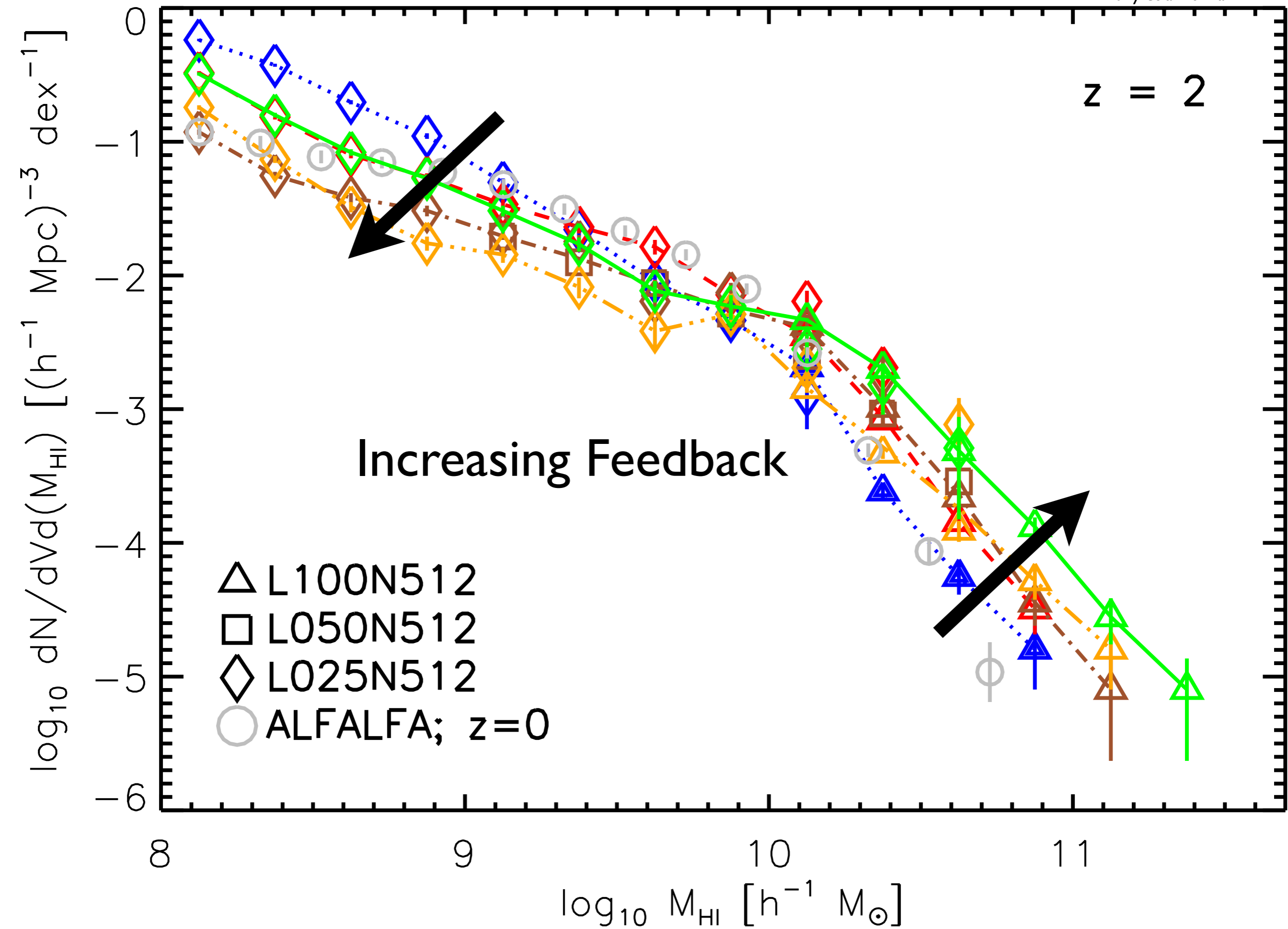
0 1 2 3 4 5 6 7 8 9 10 11 12 13



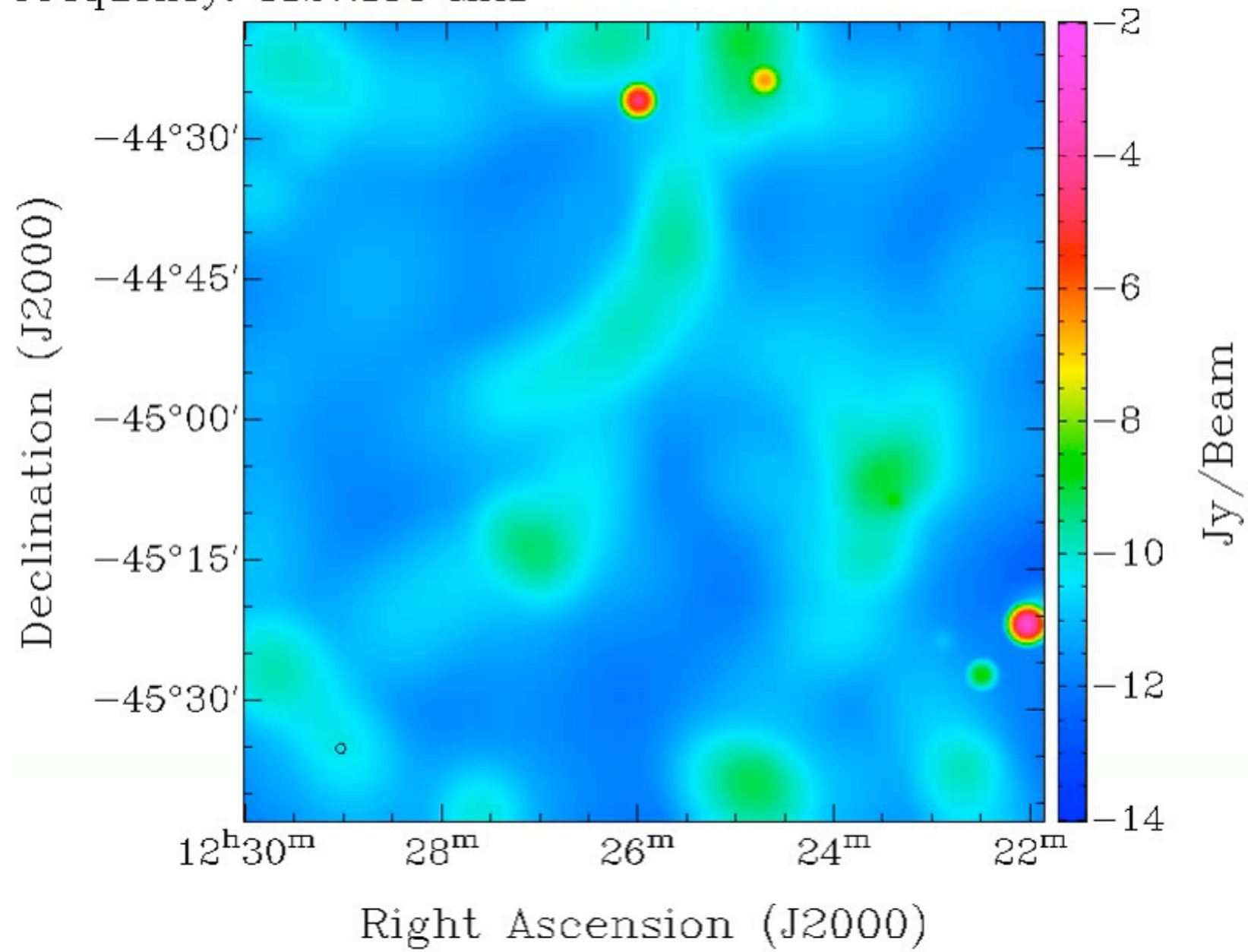


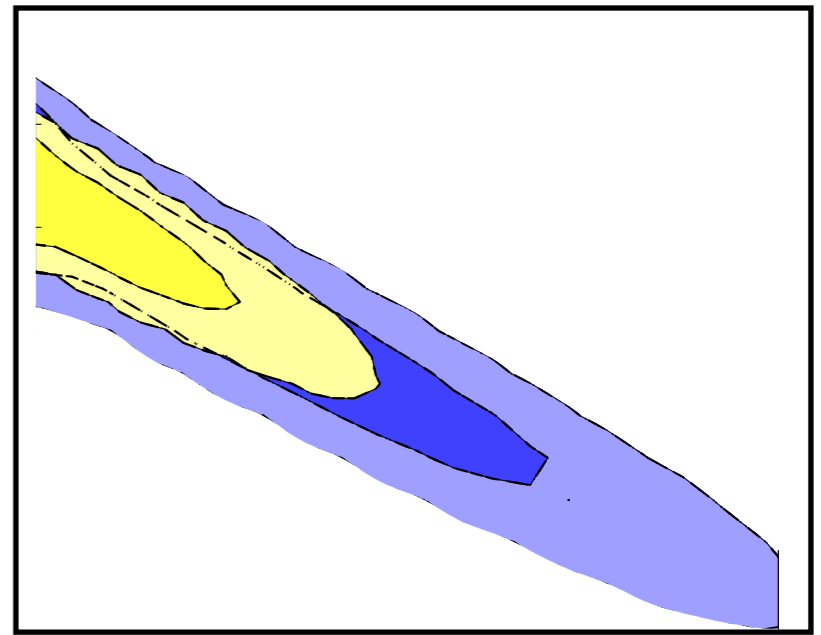
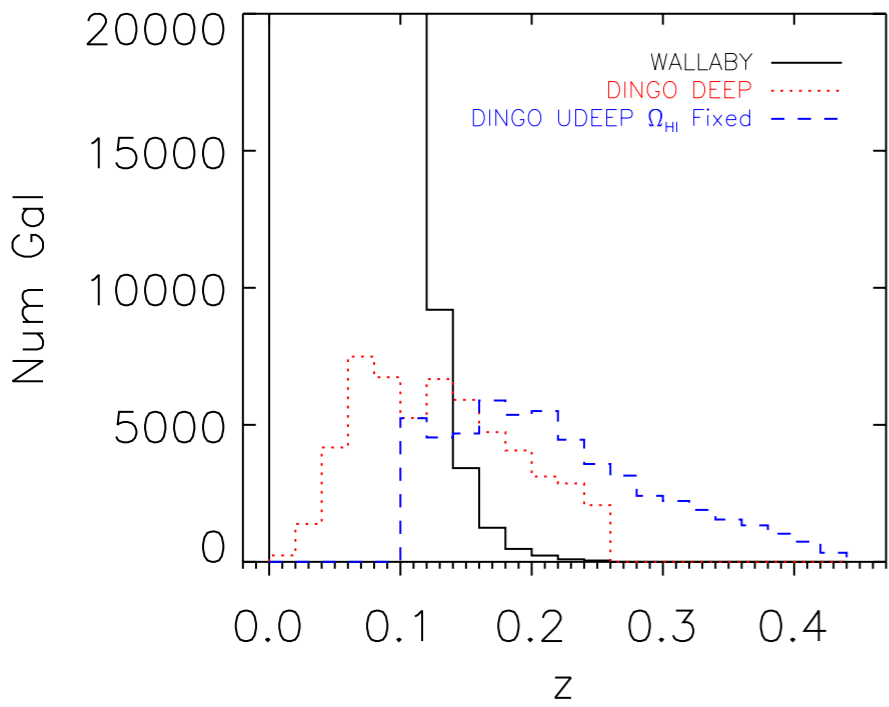




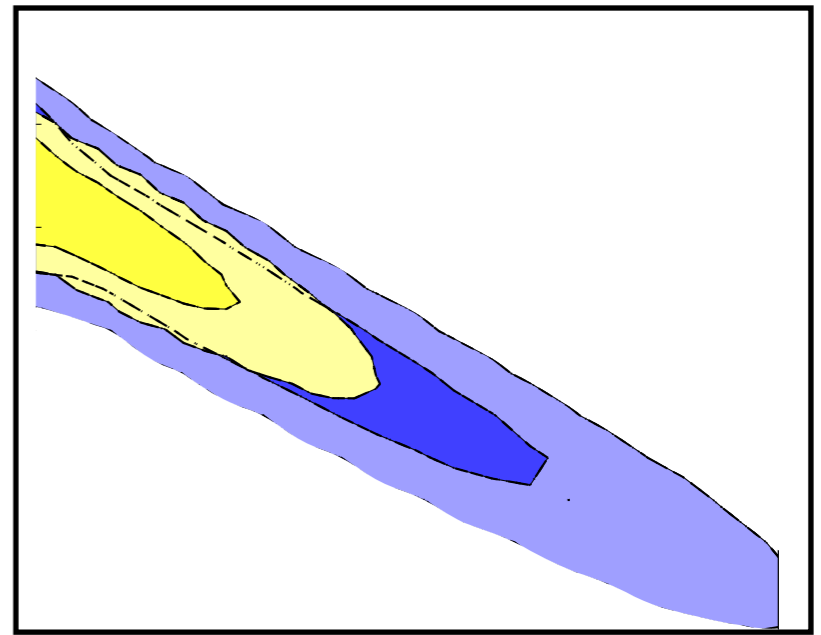
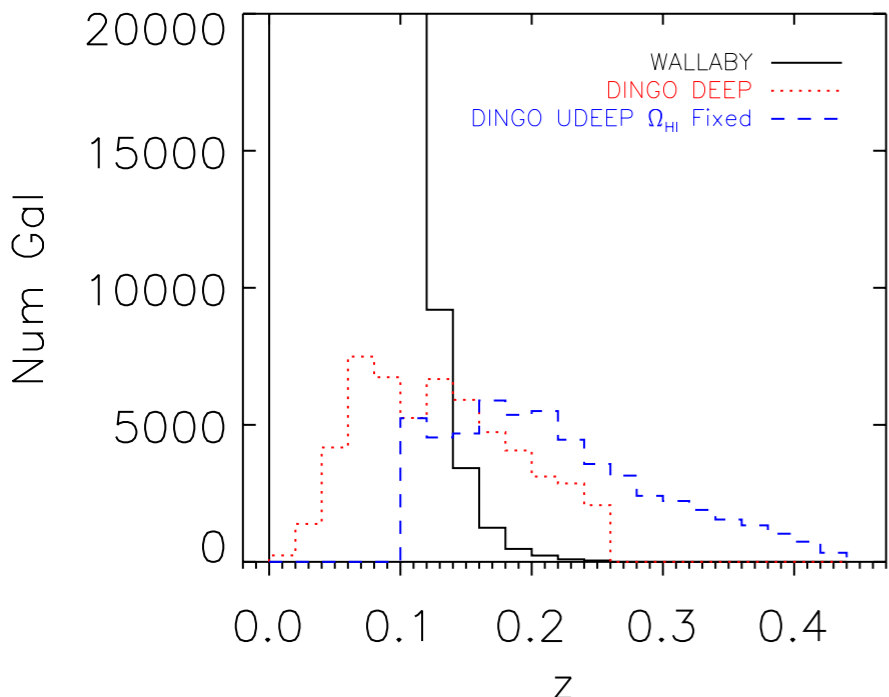


Frequency: 1327.390 MHz





HI with ASKAP is a coming of age.



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HI simulations will arrive in time for the 36 dishes...

