Star formation in massive galaxies at z > 3

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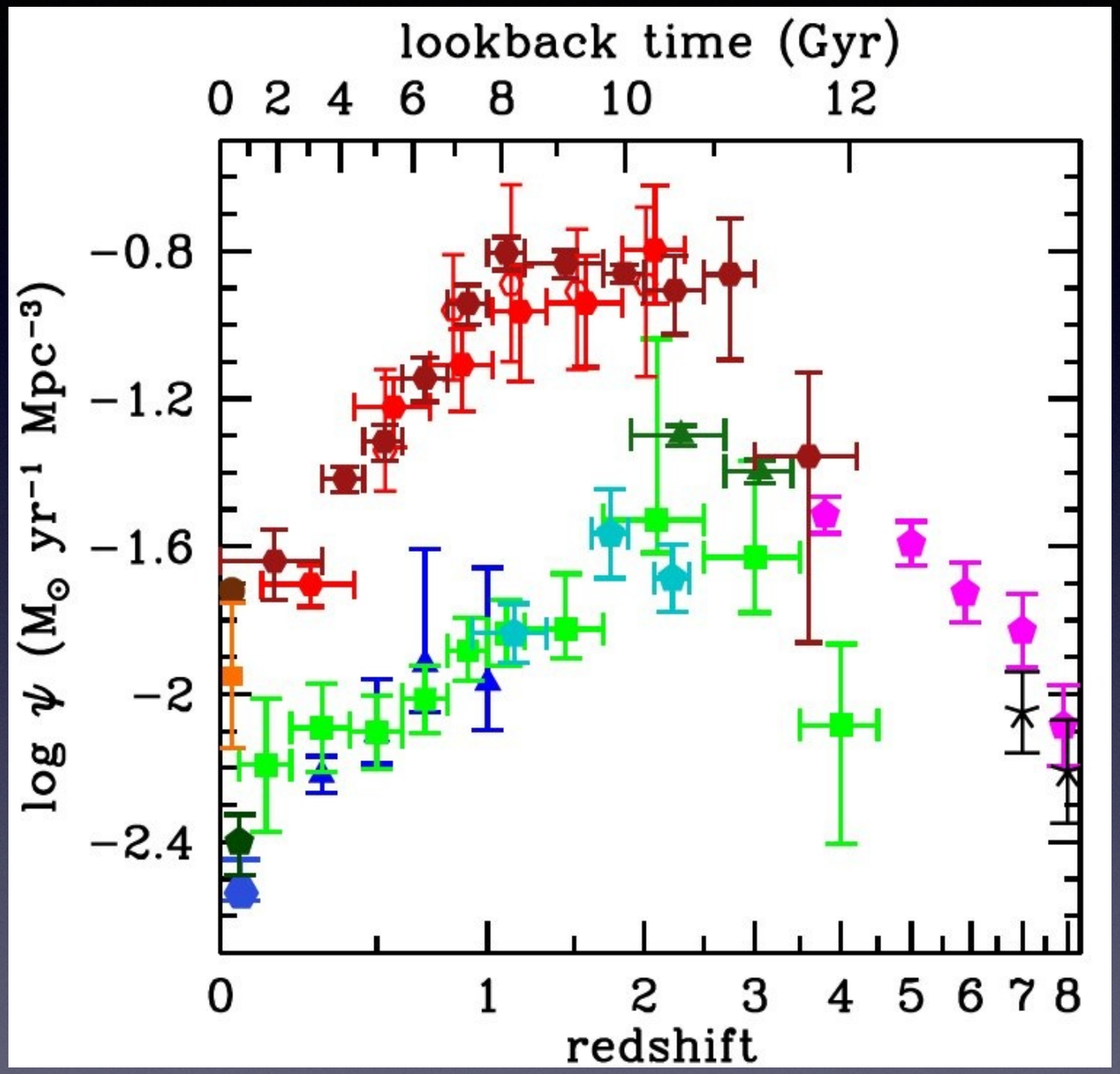
and other members in the ASTRODEEP and CANDELS consortium

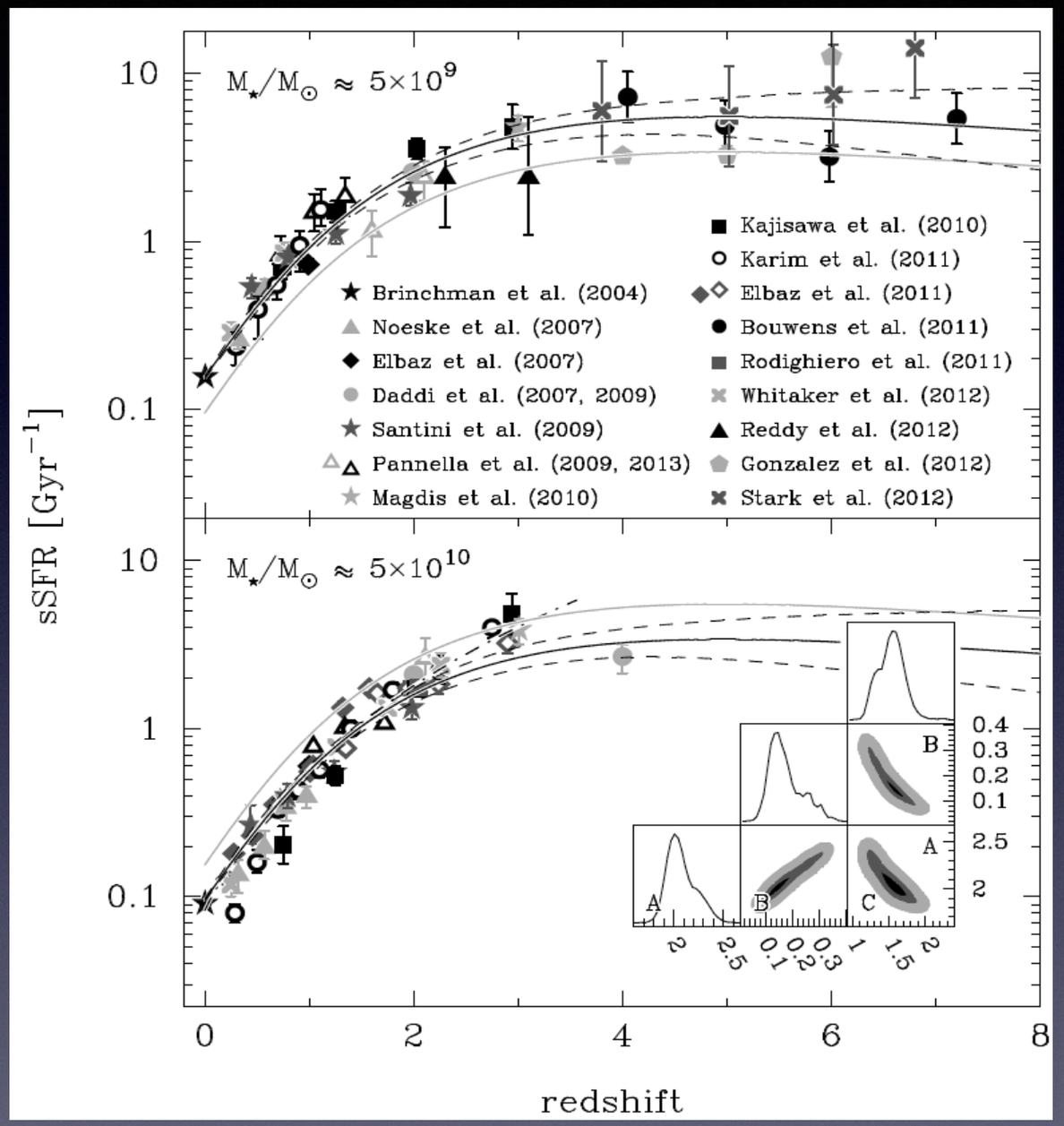
Outline

- Star formation in massive galaxies at z > 3
  Why study them? How to select them? What are their physical properties?

Why study massive galaxies at z > 3

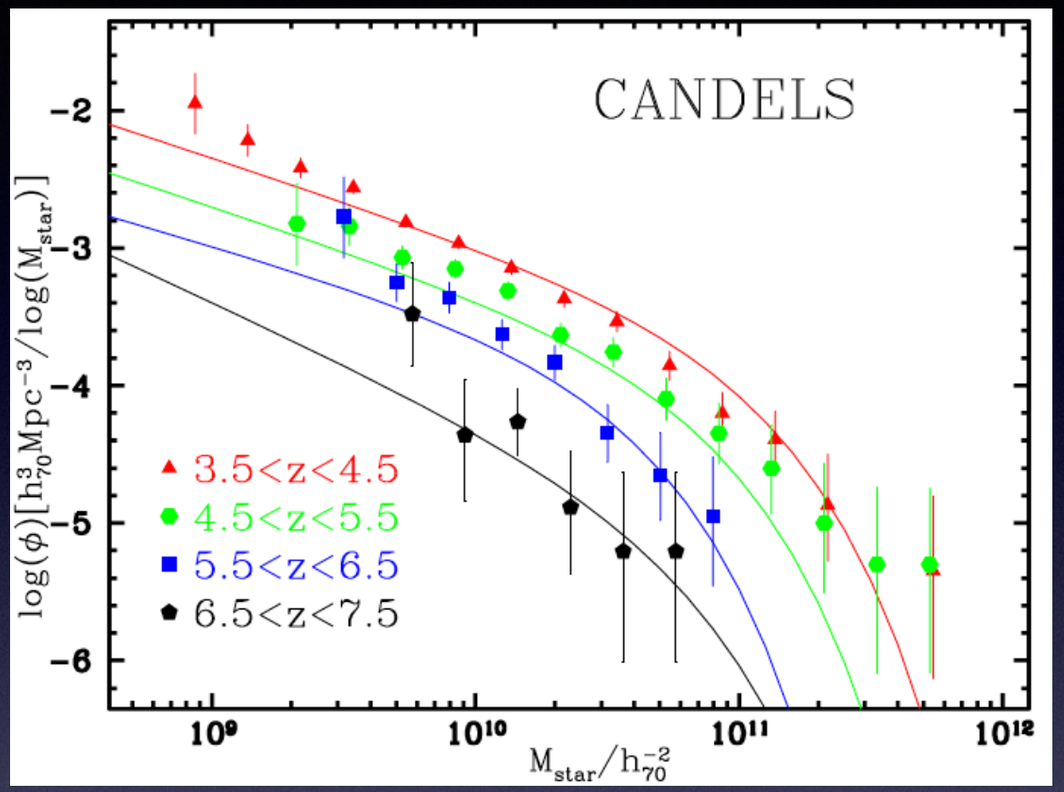


Madau & Dickinson 2014

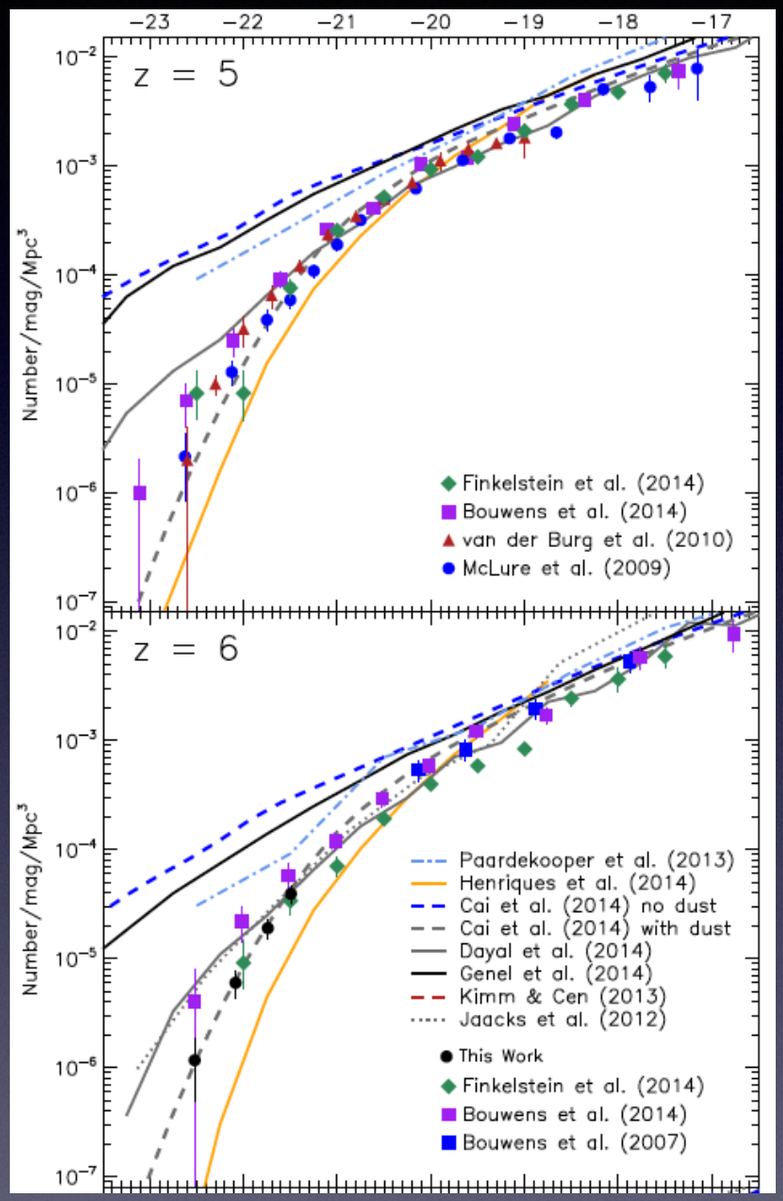


Sargent et al. 2014

What I learned here



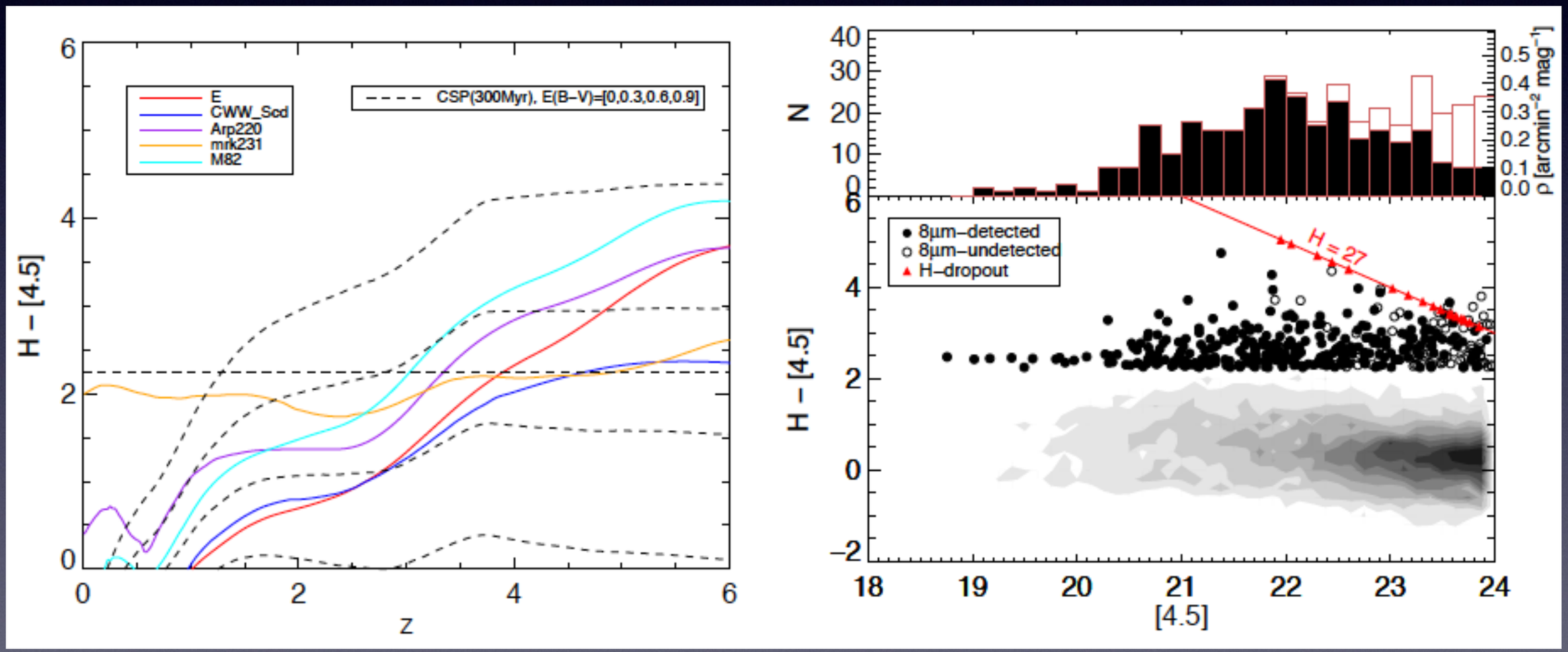
Grazian et al. 2014

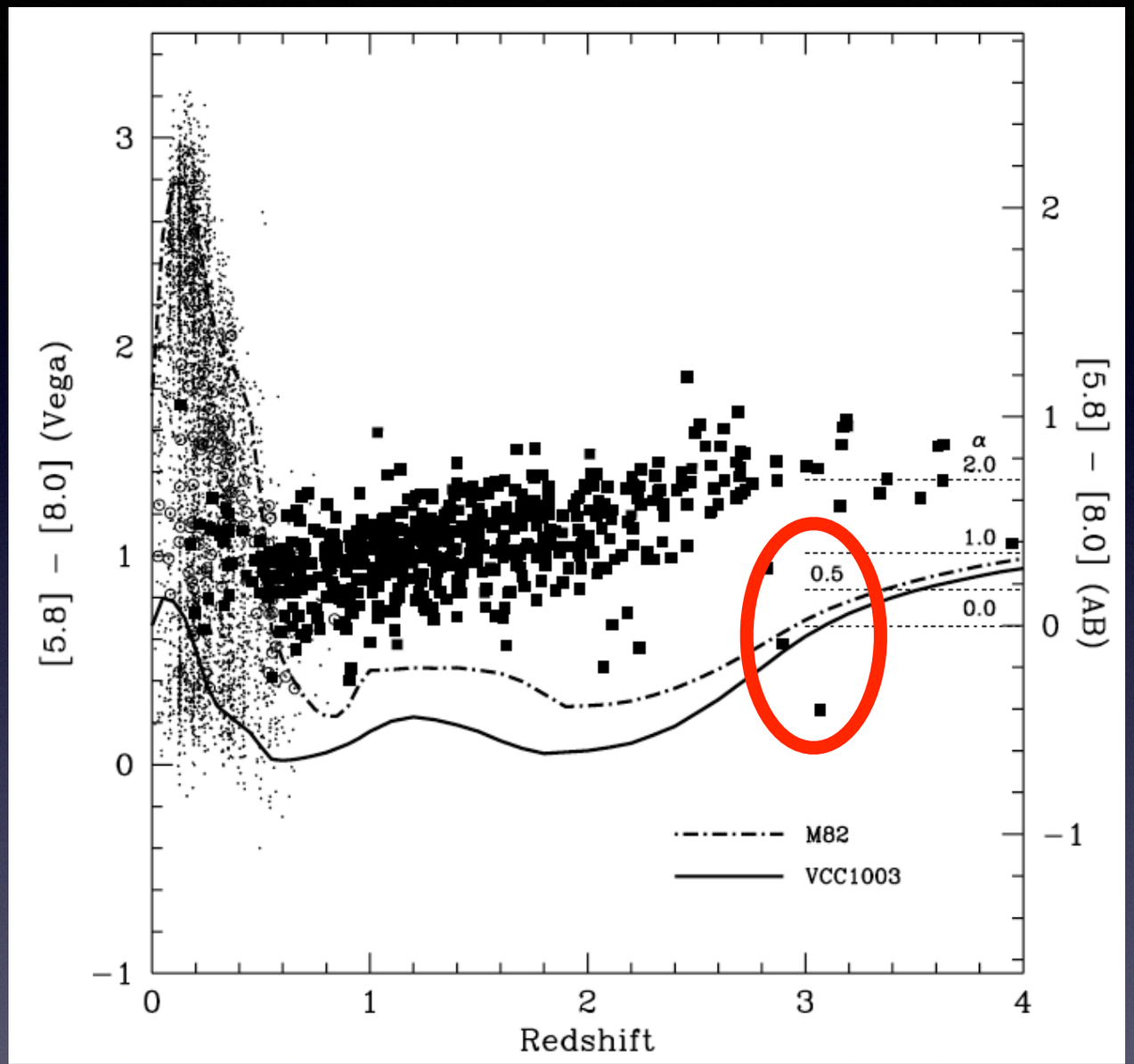


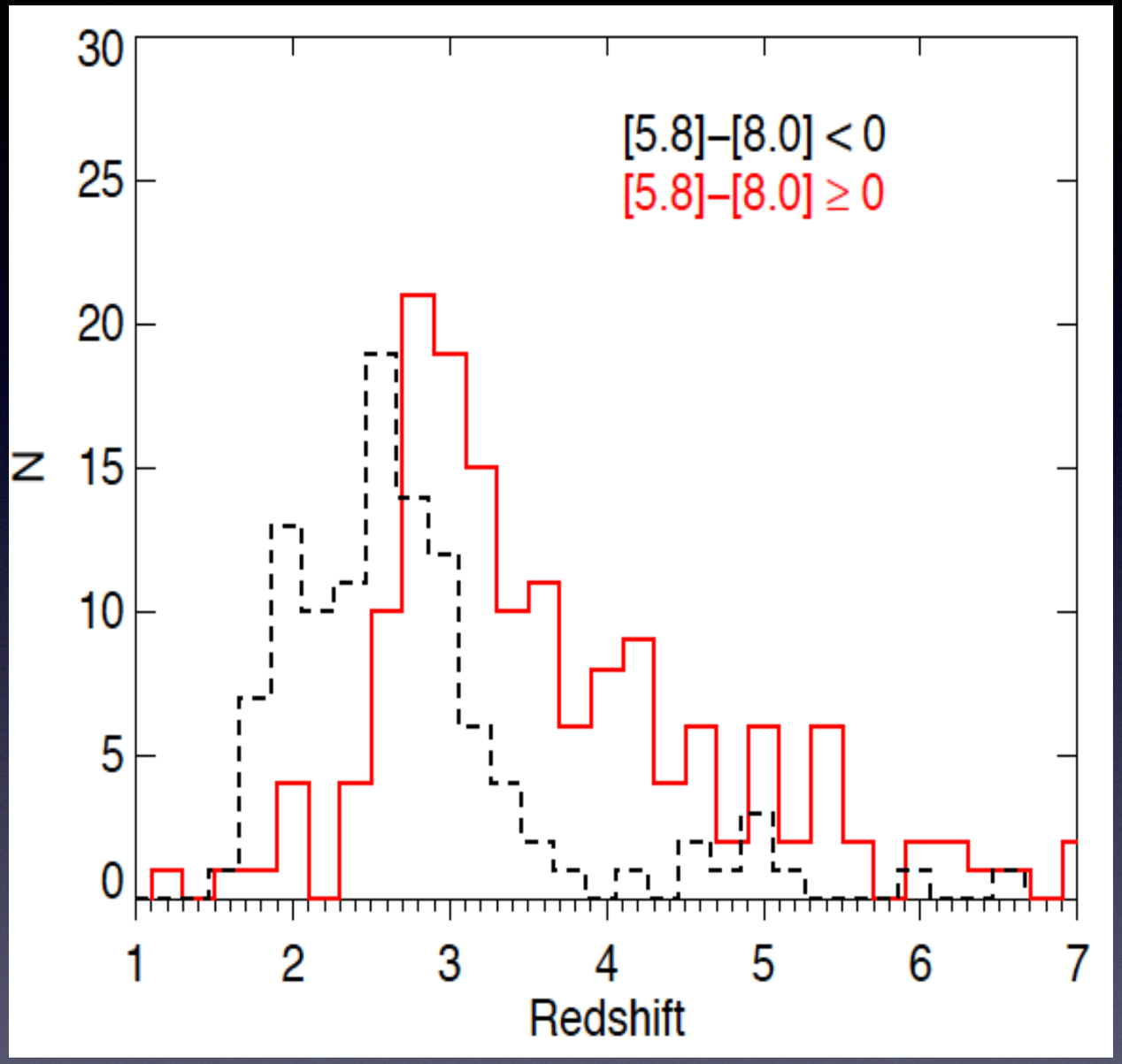
Bowler et al. 2014

The lack of massive galaxies in CANDELS at z~4.
The tension at the bright end of the UV luminosity function at z>4 between models and observations.

How to select massive galaxies at z>3:





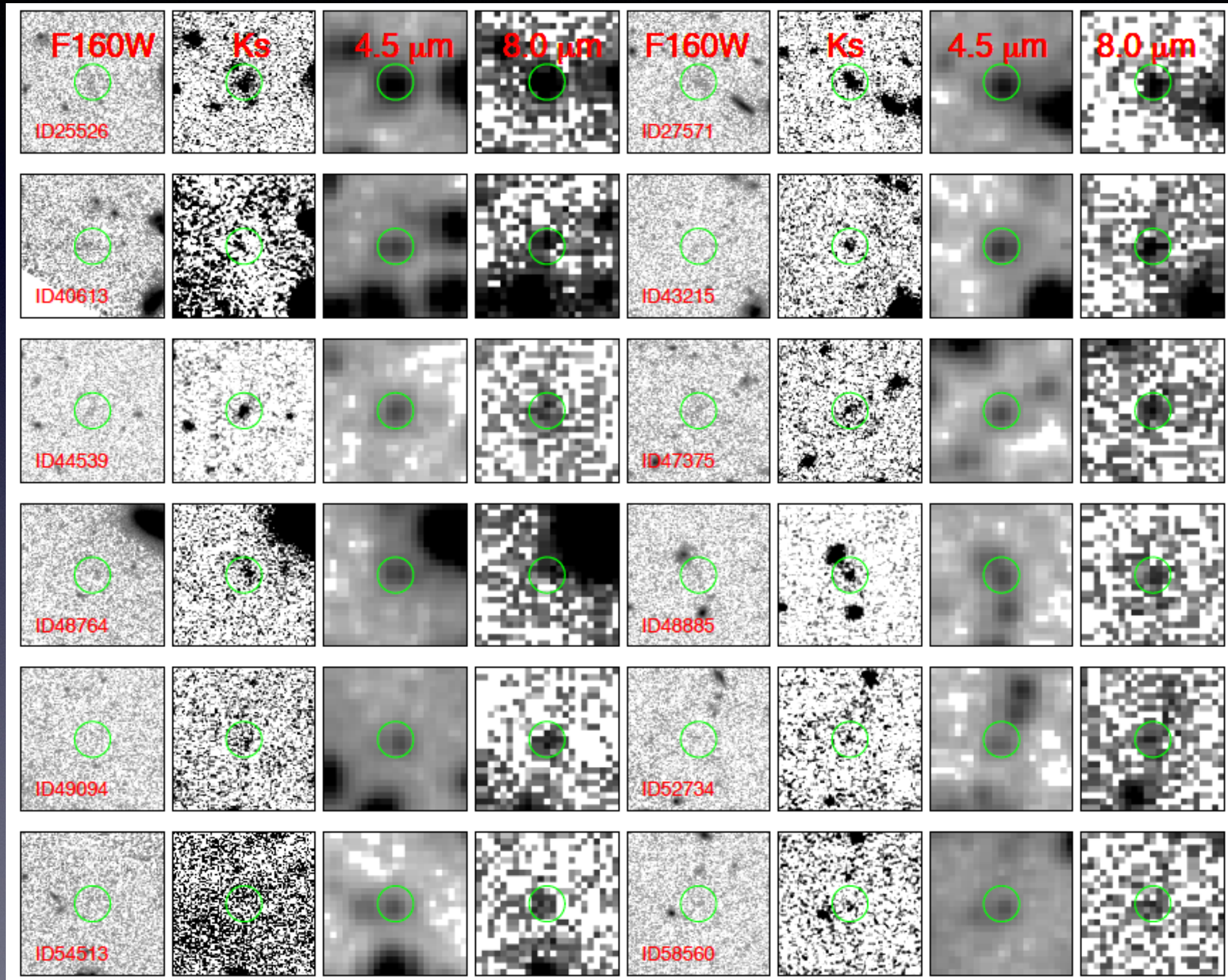


Stern et al. 2005

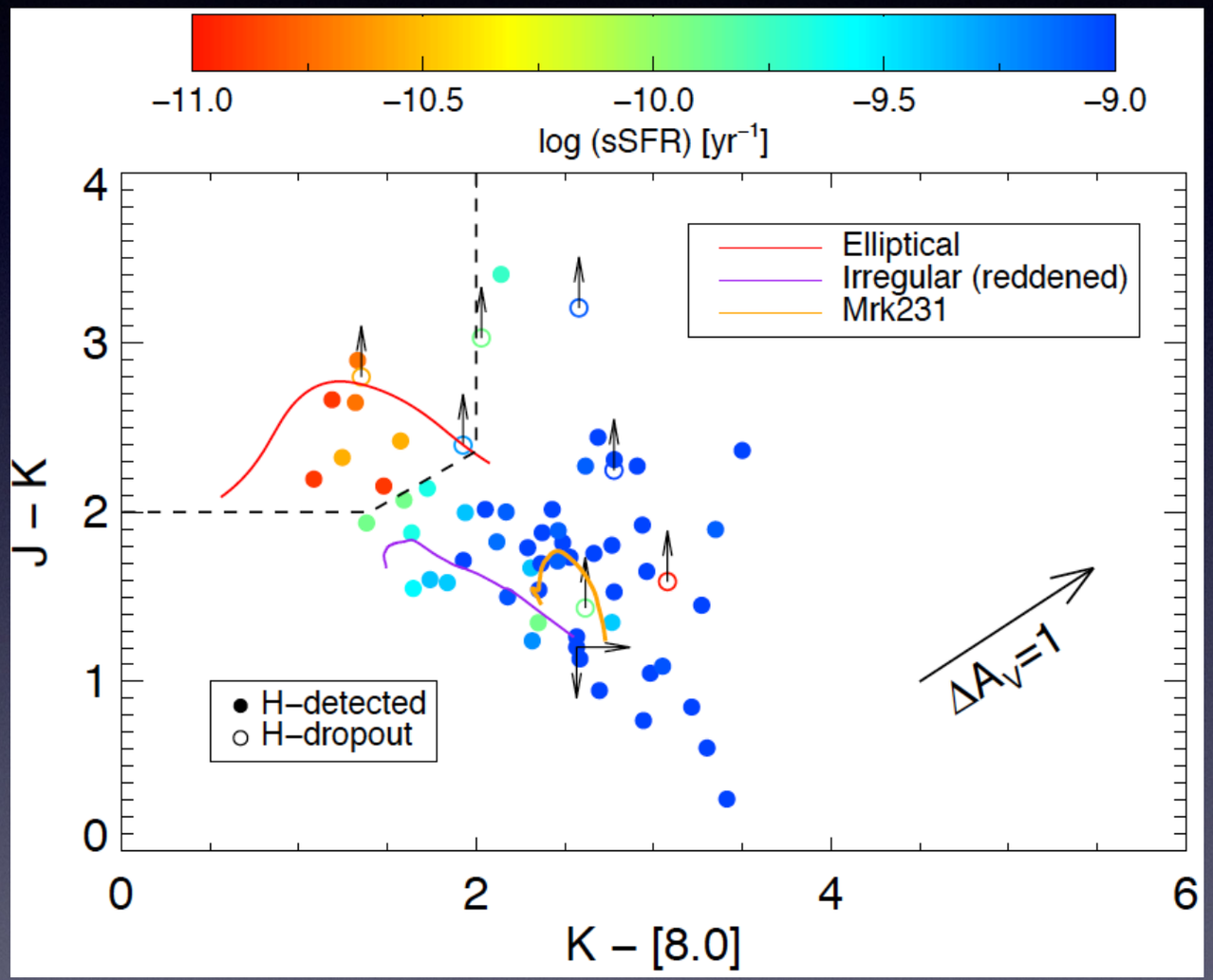
180 HIEROs in GOODS-N and GOODS-S

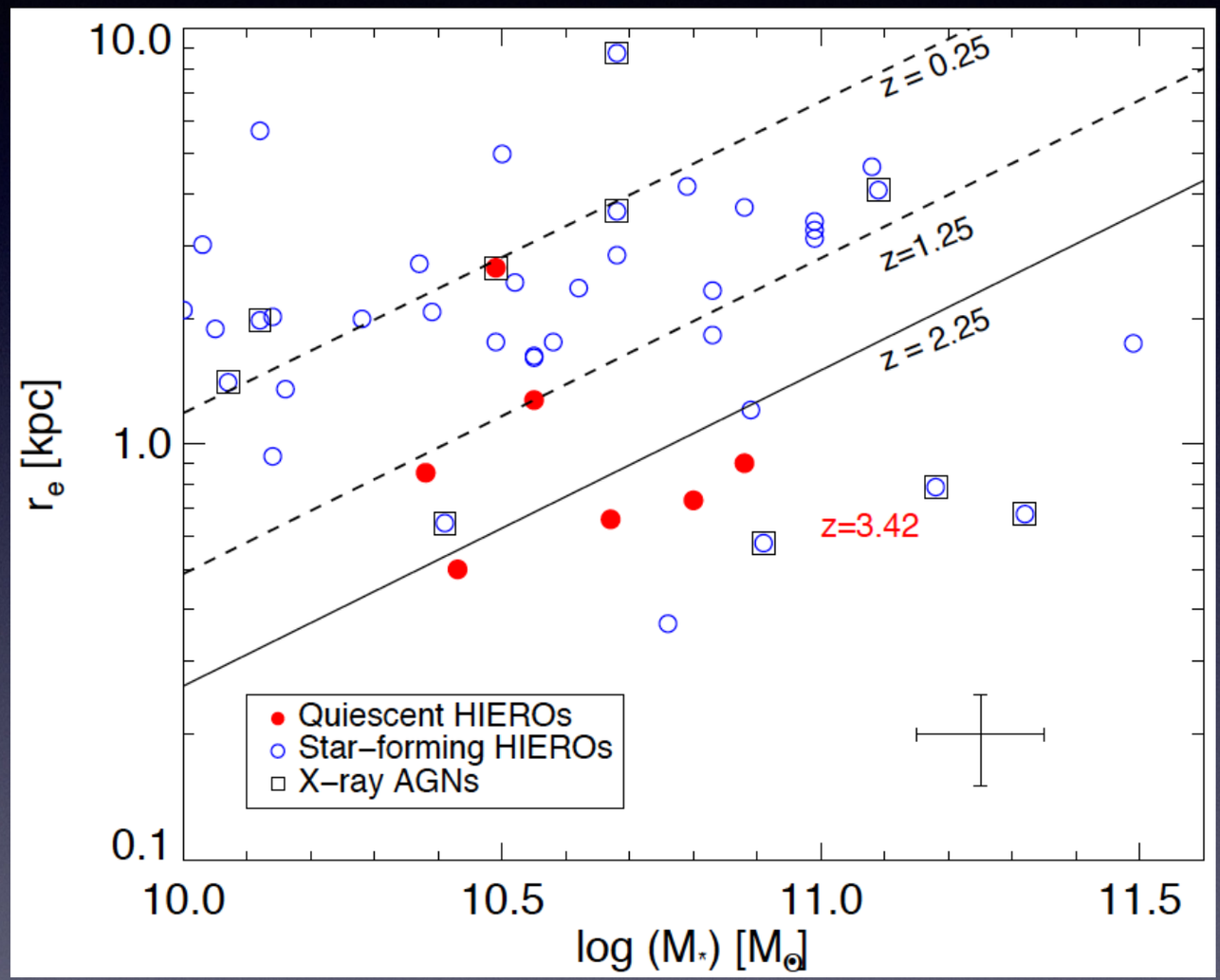
H-band and IRAC selected extremely red objects (HIEROs): H - [4.5] >2.25 and [5.8] - [8.0] > 0

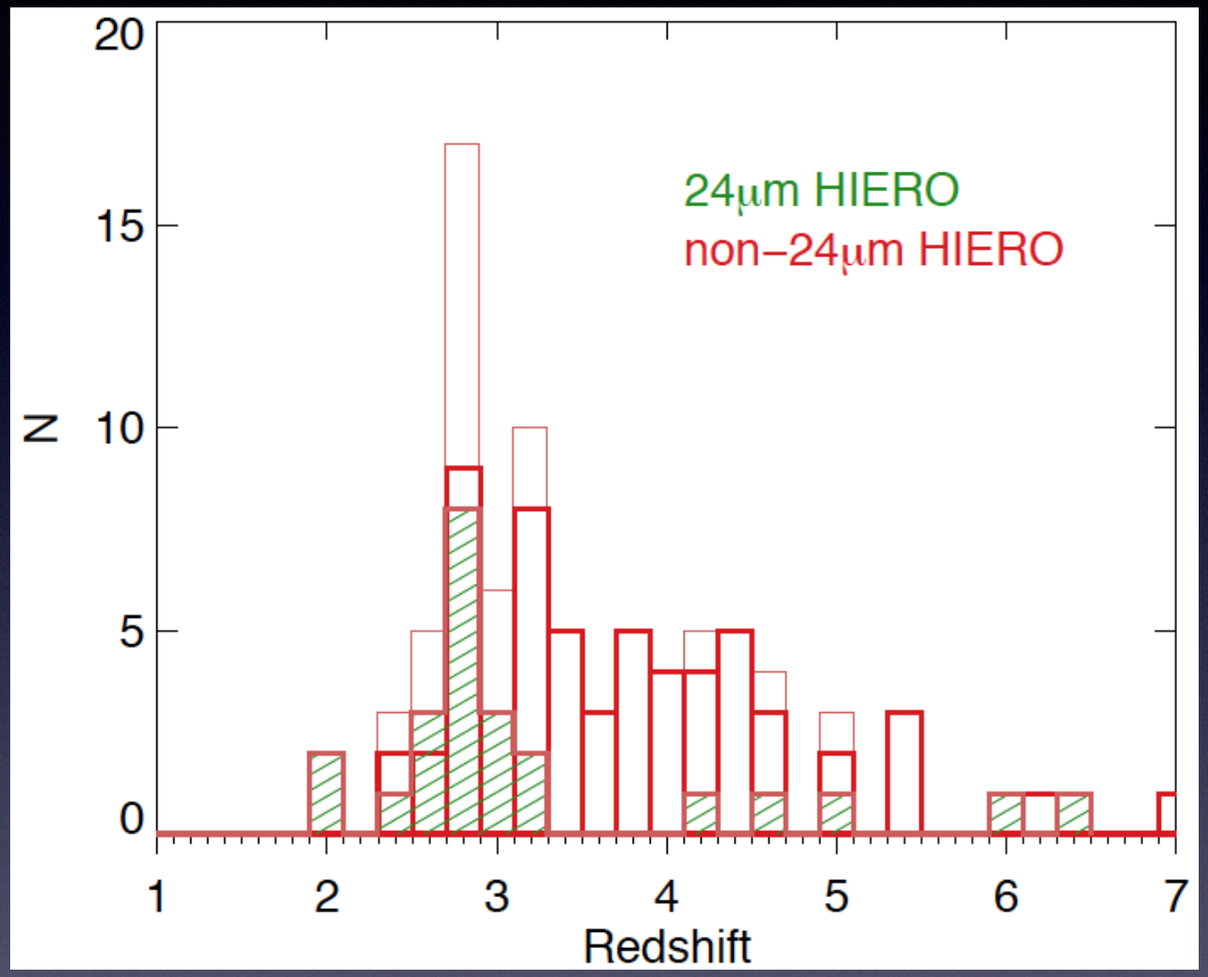
Stamp images of HIEROs in GOODS-South

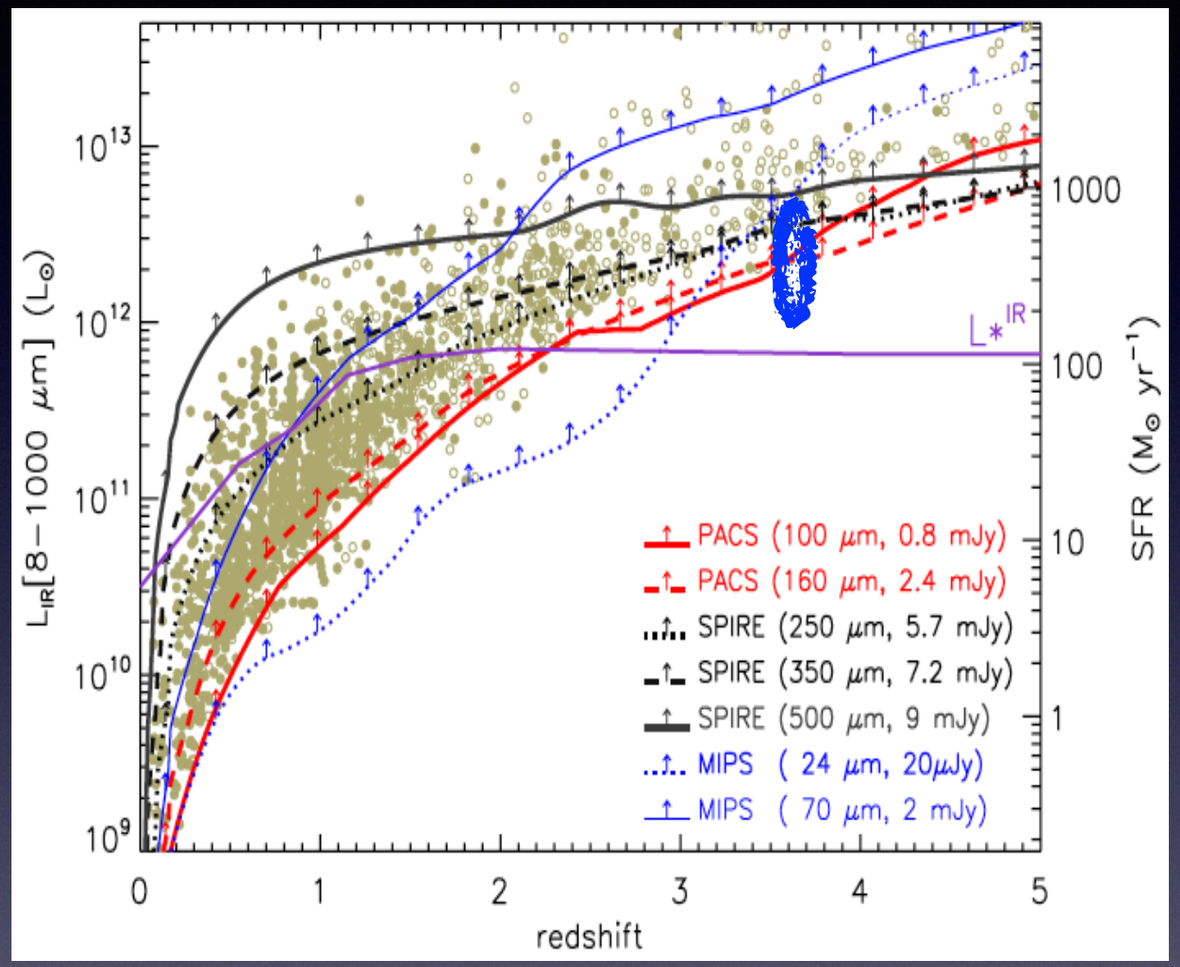


Quiescent vs. star-forming





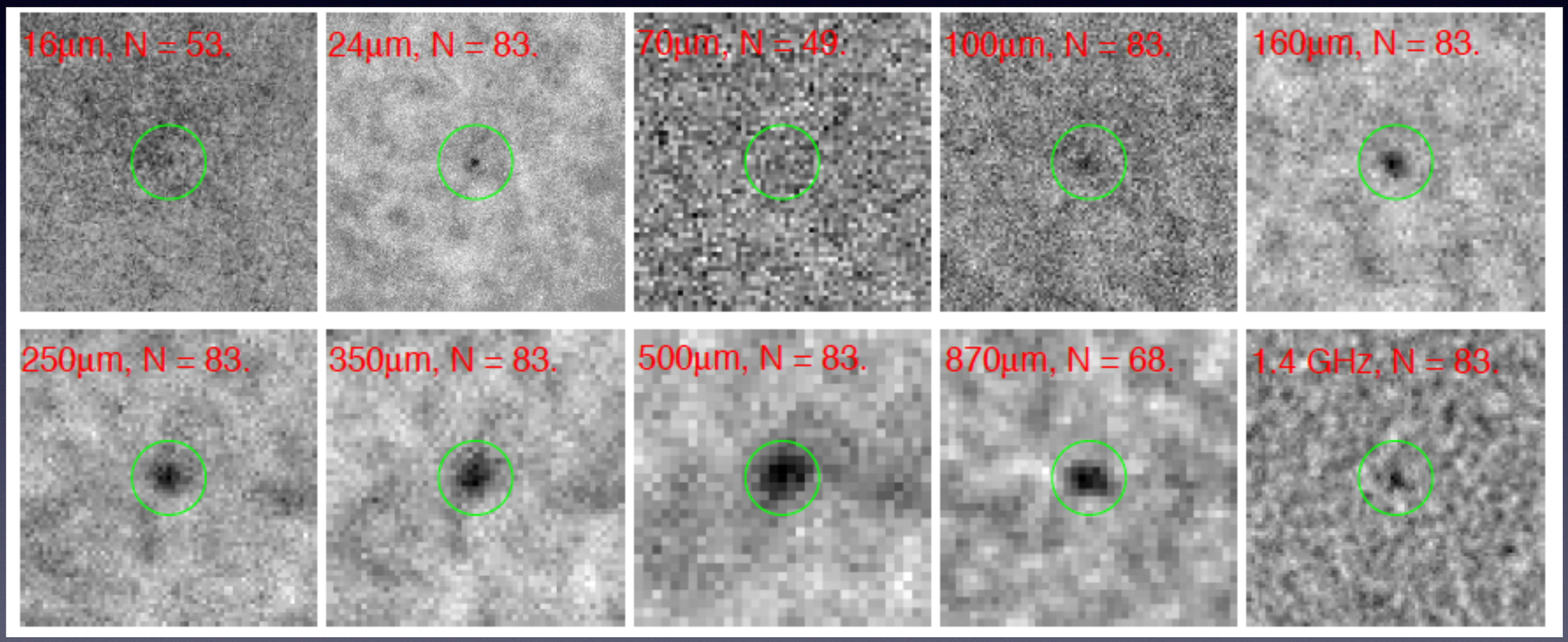




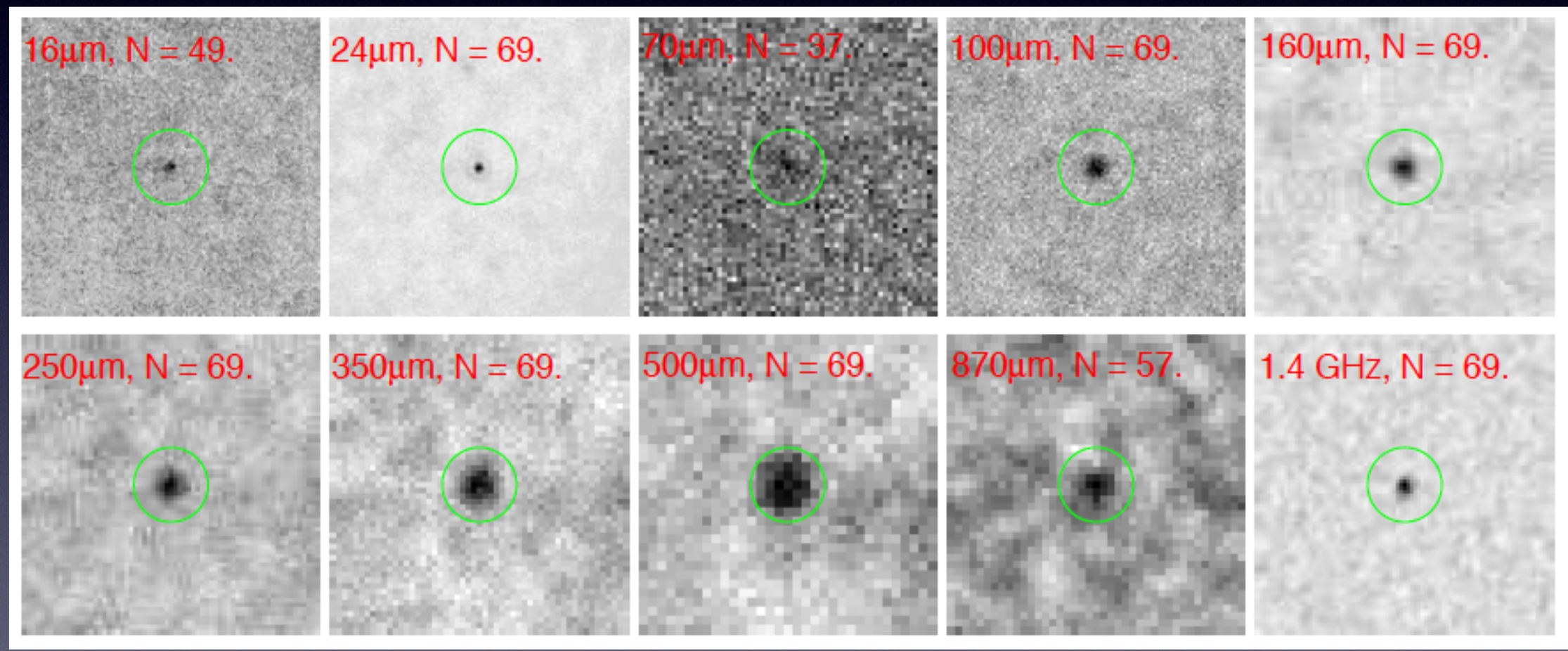
Elbaz et al. 2011

HIEROs with 24um detections are likely to be either high-redshift AGNs or low-redshift dusty galaxies (with or without an AGN)

Stacking



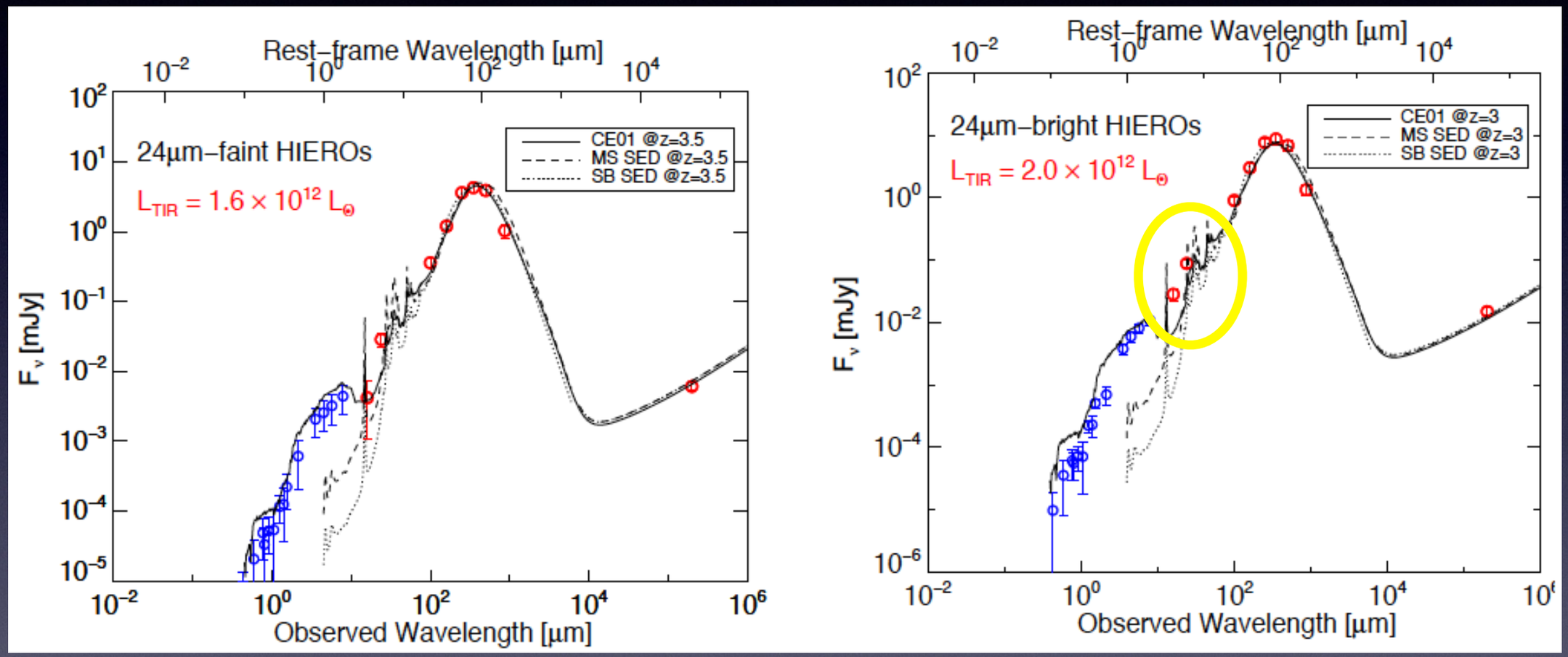
24um HIEROs



non-24um HIEROs

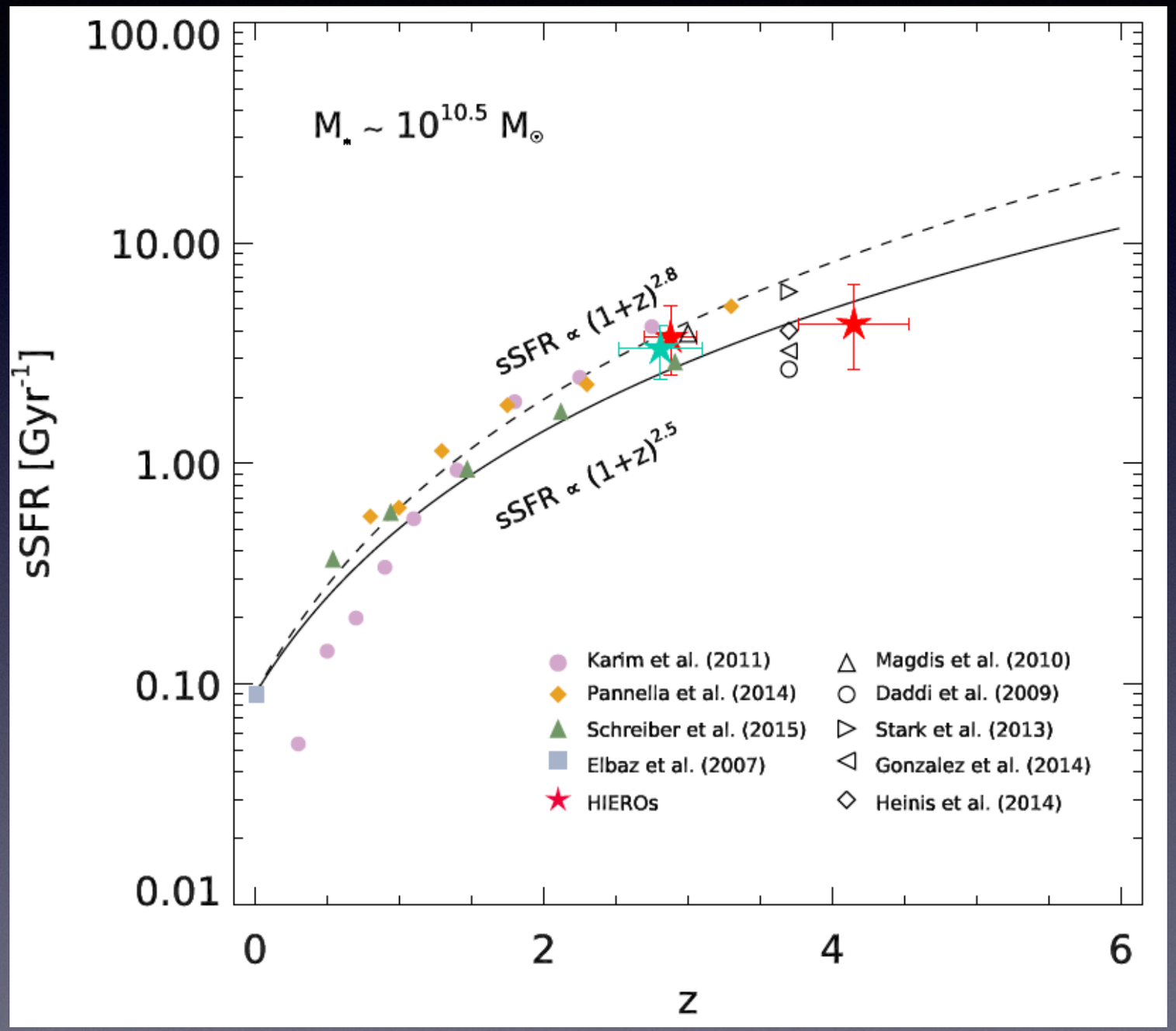
non-24um HIEROs, z~ 3.5

24um HIEROs, z~3



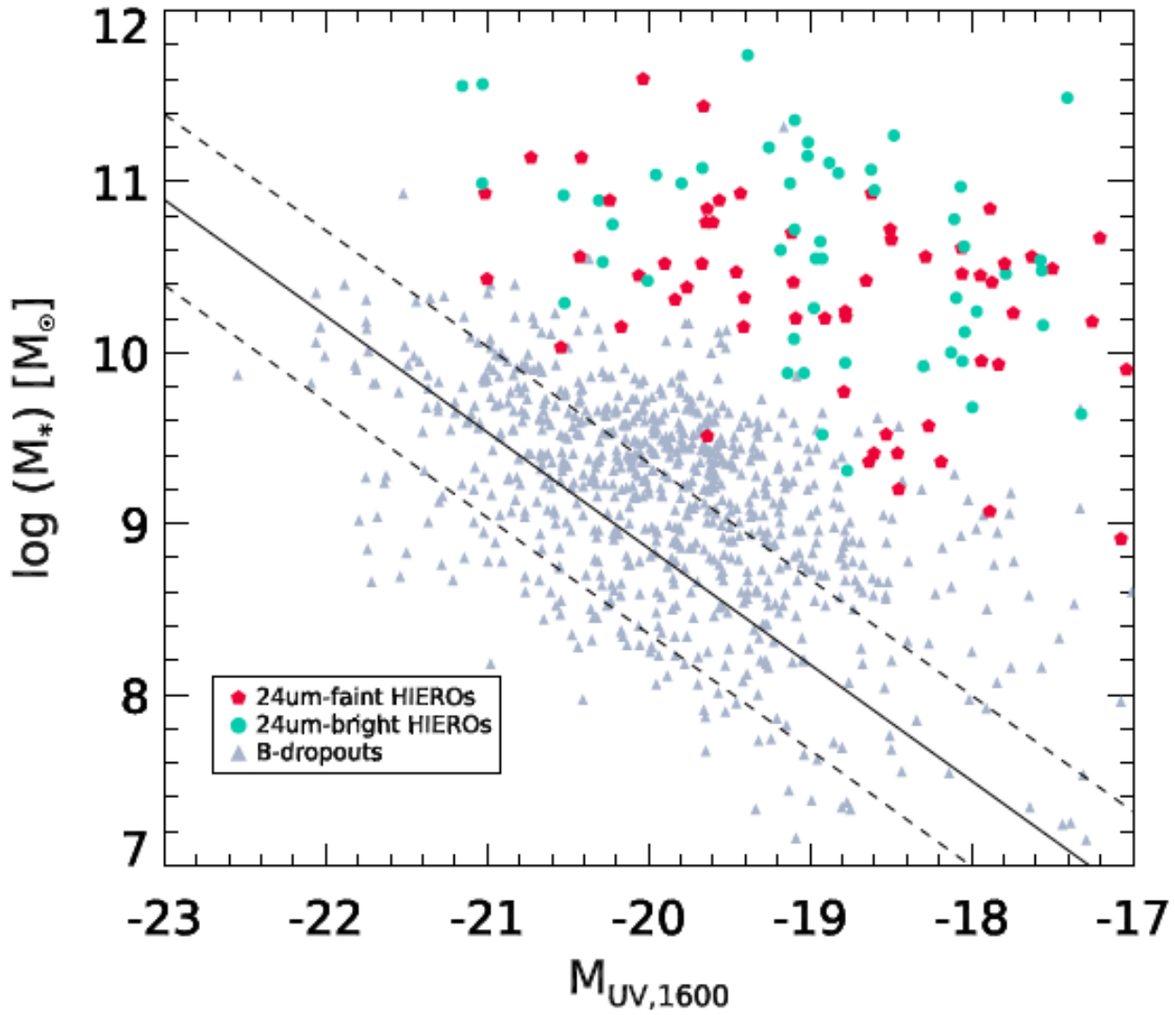
The stacked FIR SED peaks at 350-500 um, providing further evidence that most of the HIEROs are at z > 3

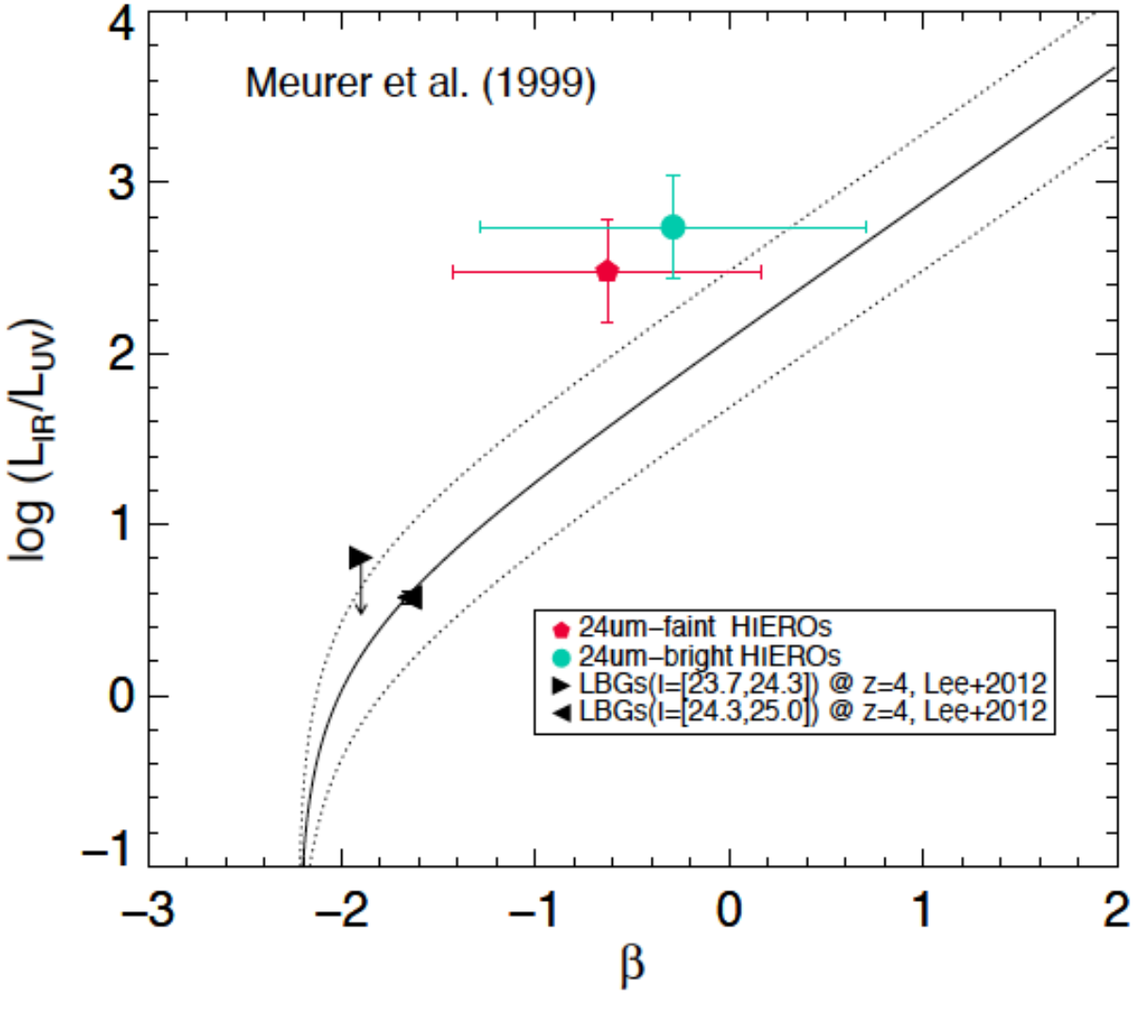
Specific SFRs of massive galaxies at z > 3



The scatter was derived by bootstrapping SEDs in our sample

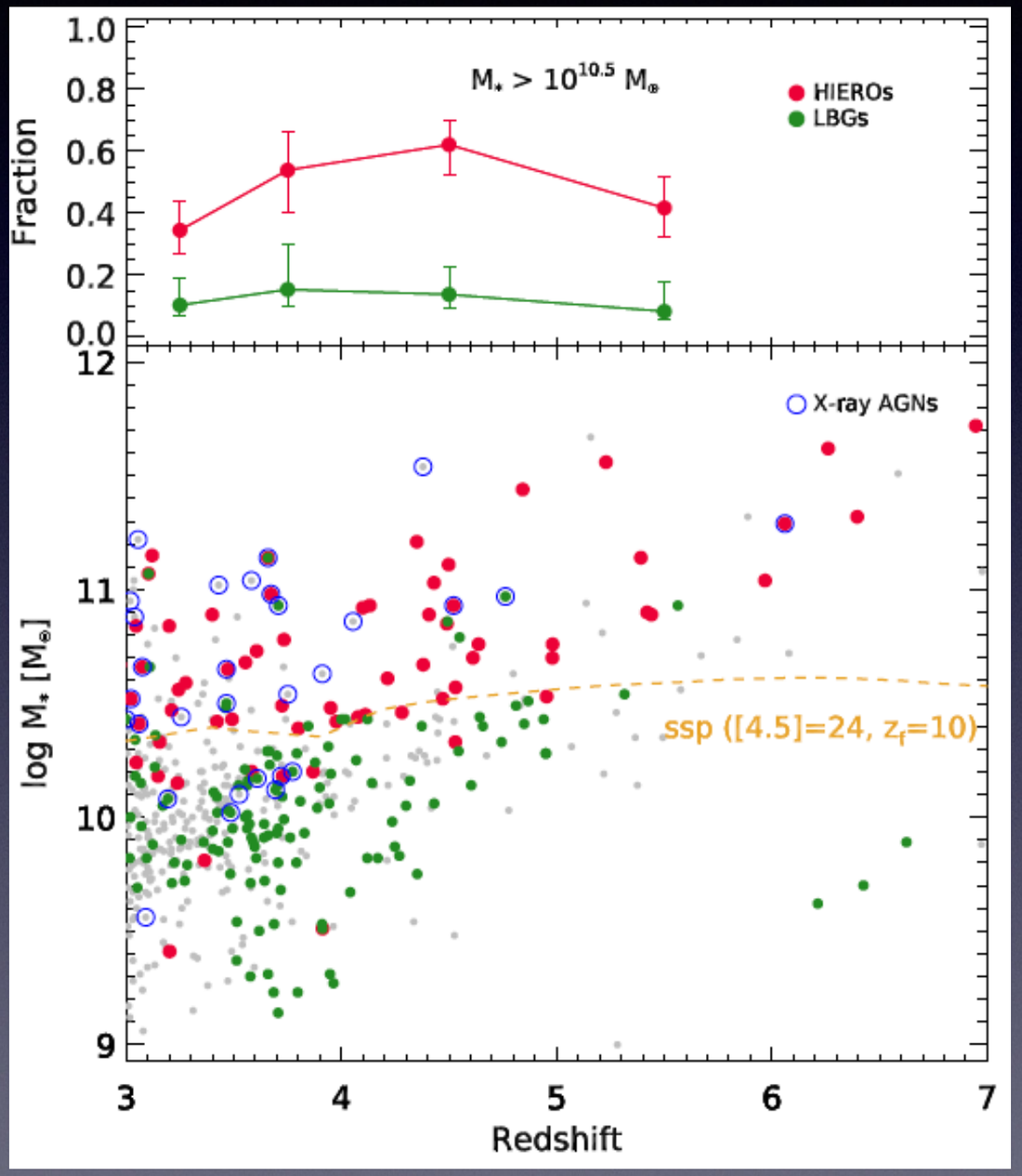
HIEROs vs. LBGs



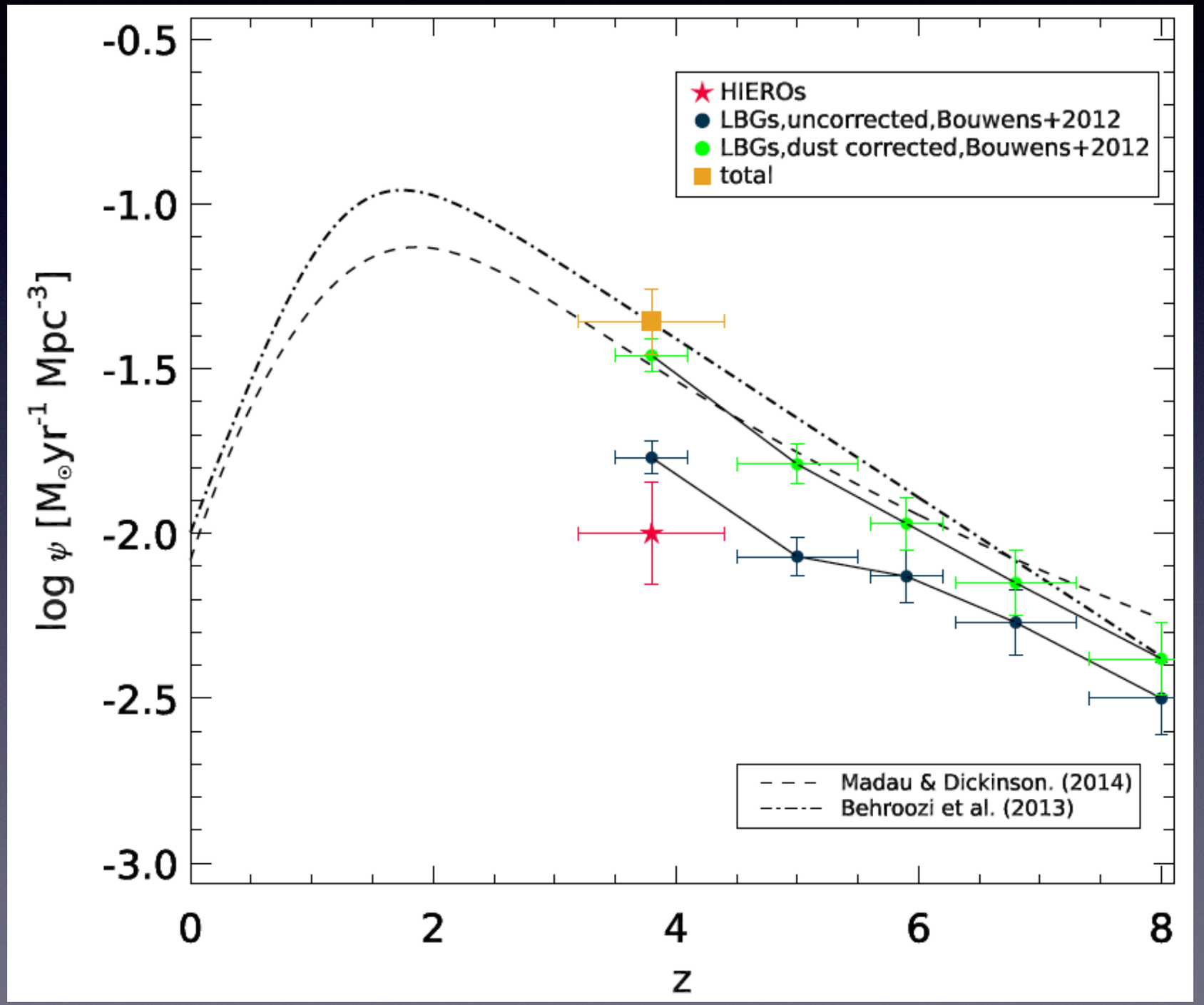


HIEROs are much fainter in the rest-frame UV at fixed stellar mass than LBGs.

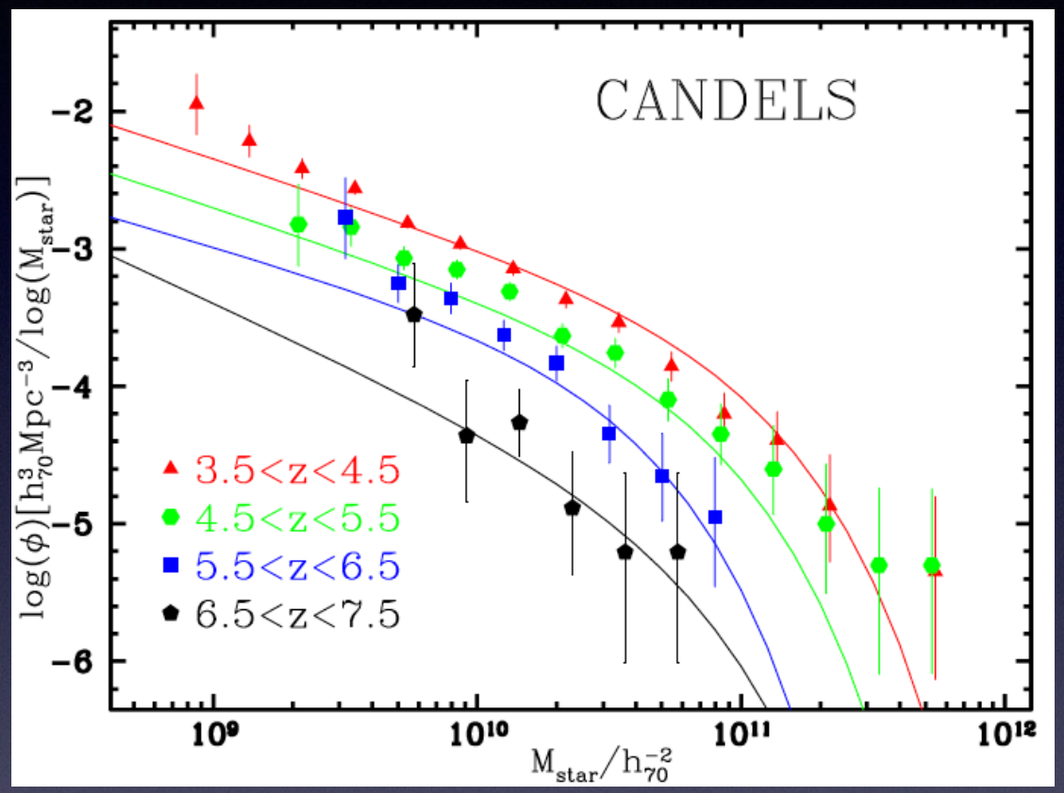
The relative contribution of HIEROs and LBGs to the massive end of the stellar mass function



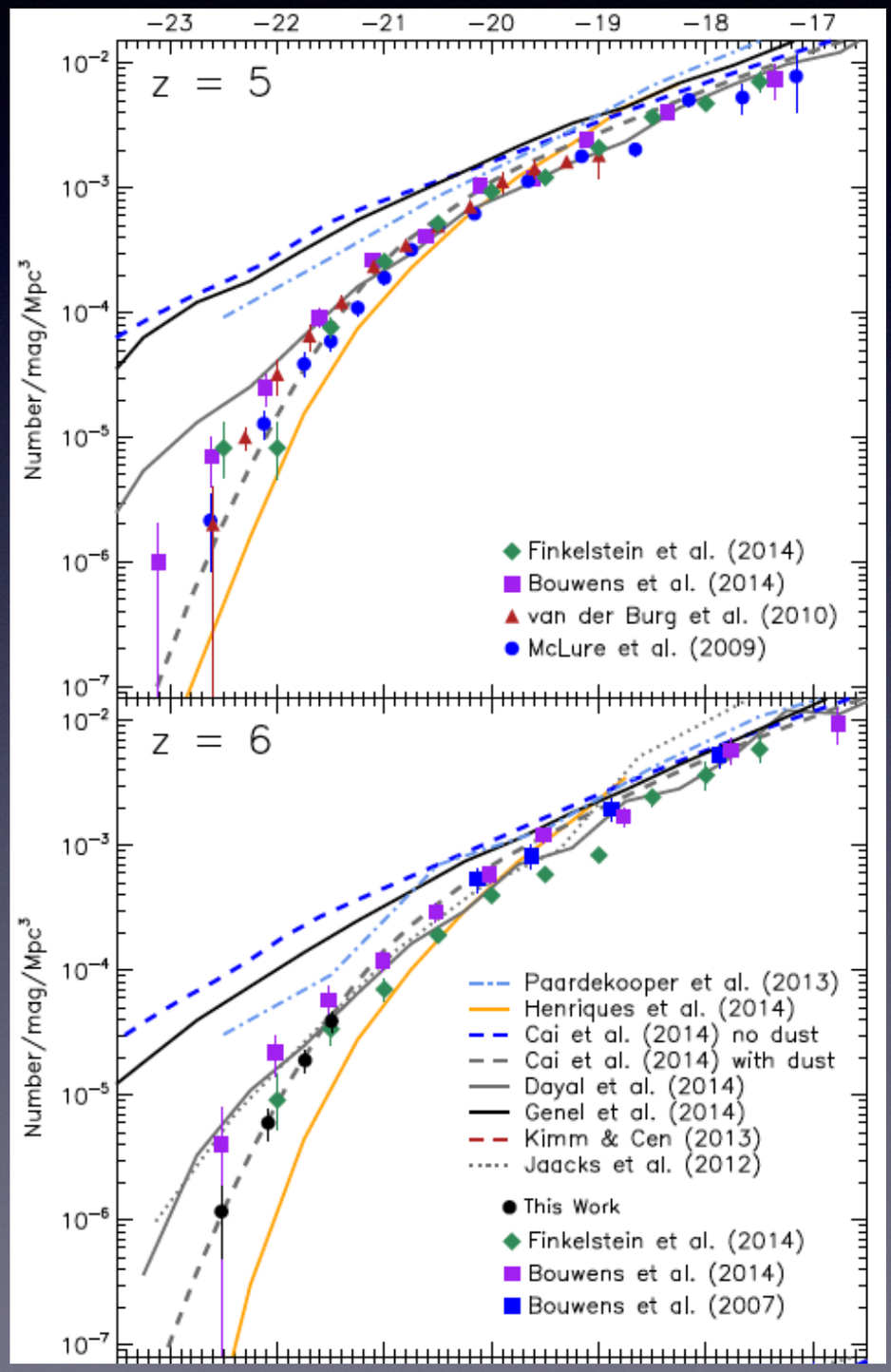
HIEROs contribute ~60% of galaxies with M > 10^10.5 M⊙ at z=4-5, while LBGs only contribute 15%.



0.01 $M_\odot$ yr^{-1} Mpc^{-3}

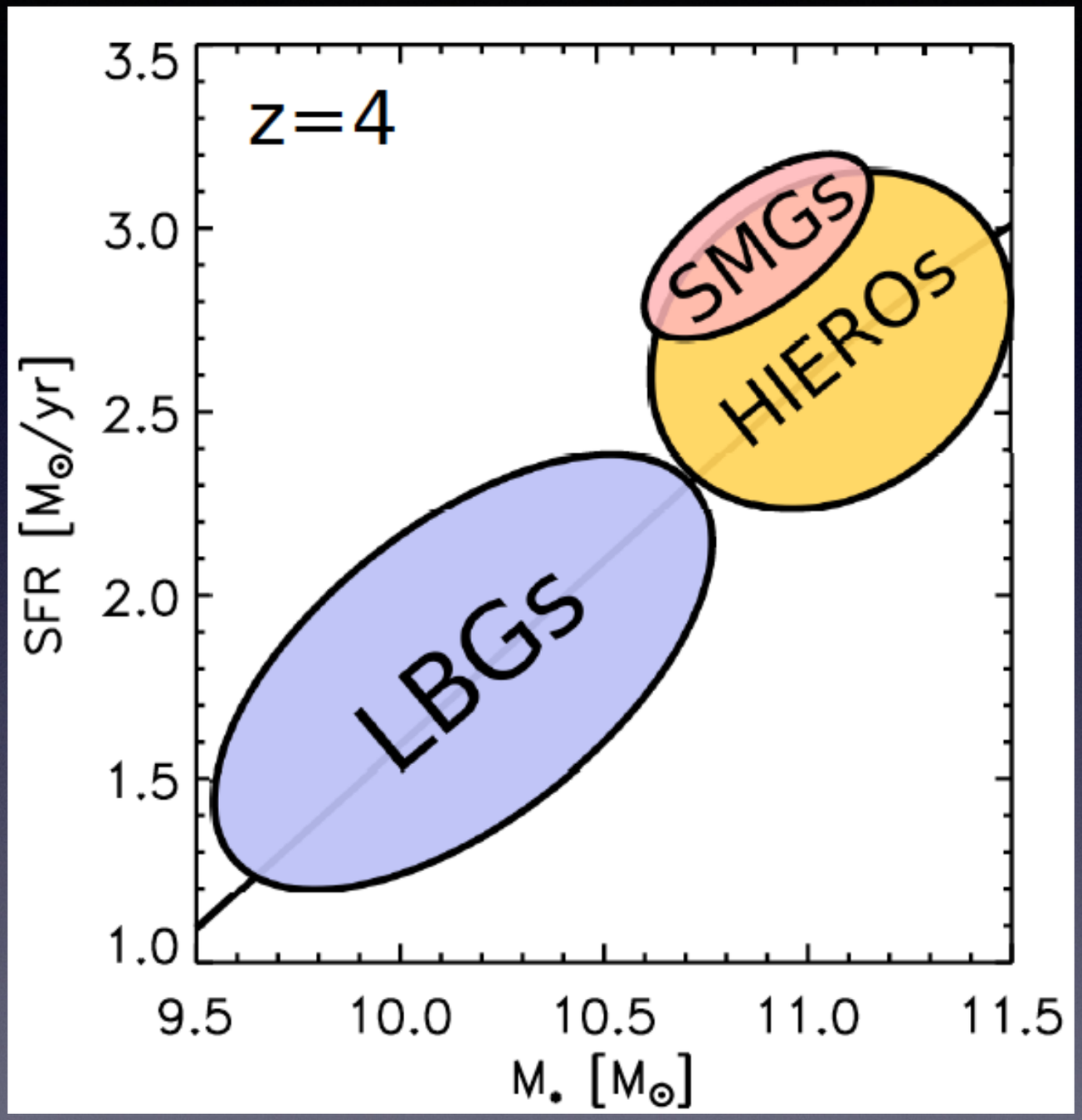


Grazian et al. 2014



Bowler et al. 2014

Summary


z=4
SMGs
HIEROs
LBGs
SFR [M⊙/yr]
M* [M⊙]
3.5
3.0
2.5
2.0
1.5
1.0
9.5
10.0
10.5
11.0
11.5