Galaxy Stellar Mass Assembly from *Spitzer* to *JWST*

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Outline

- **Galaxy stellar mass assembly at z>3**

  The crucial role of Spitzer

  Achievements and limitations

- **A complete picture of galaxy buildup in the early Universe with *JWST***

  The building blocks of today's galaxies

  The first steps of galaxy stellar mass assembly

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With thanks to the UltraVISTA core team

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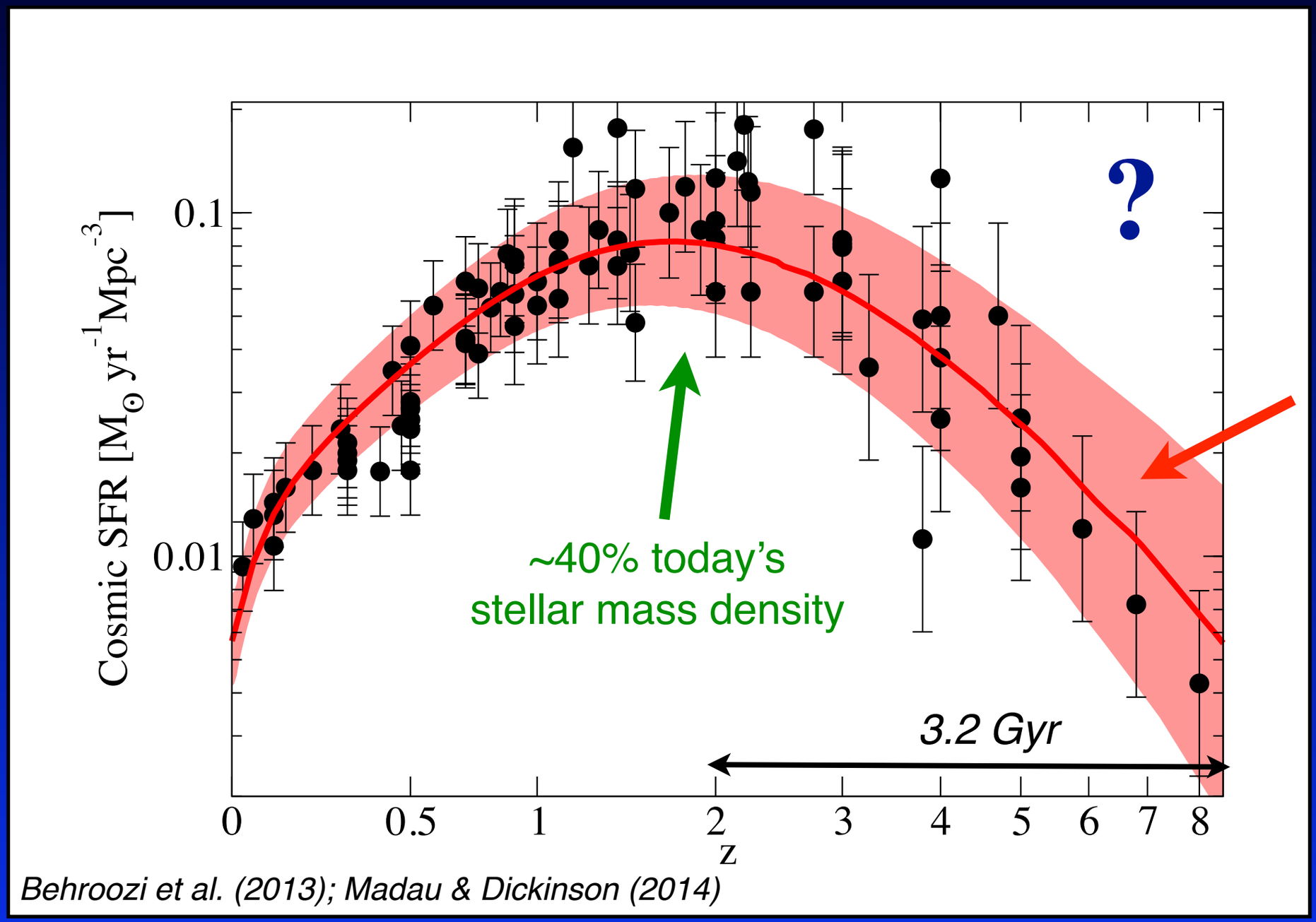
Stellar mass assembled by z~3

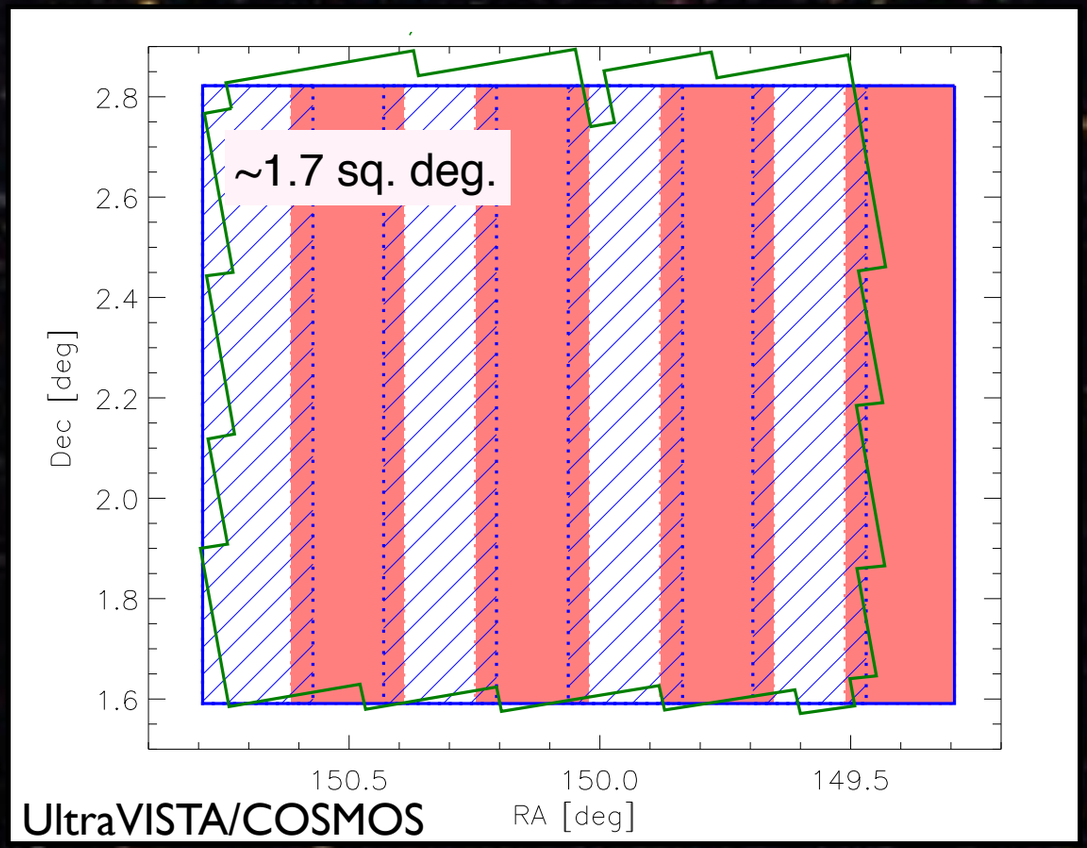


Behroozi et al. (2013); Madau & Dickinson (2014)

very efficient period of galaxy stellar mass assembly

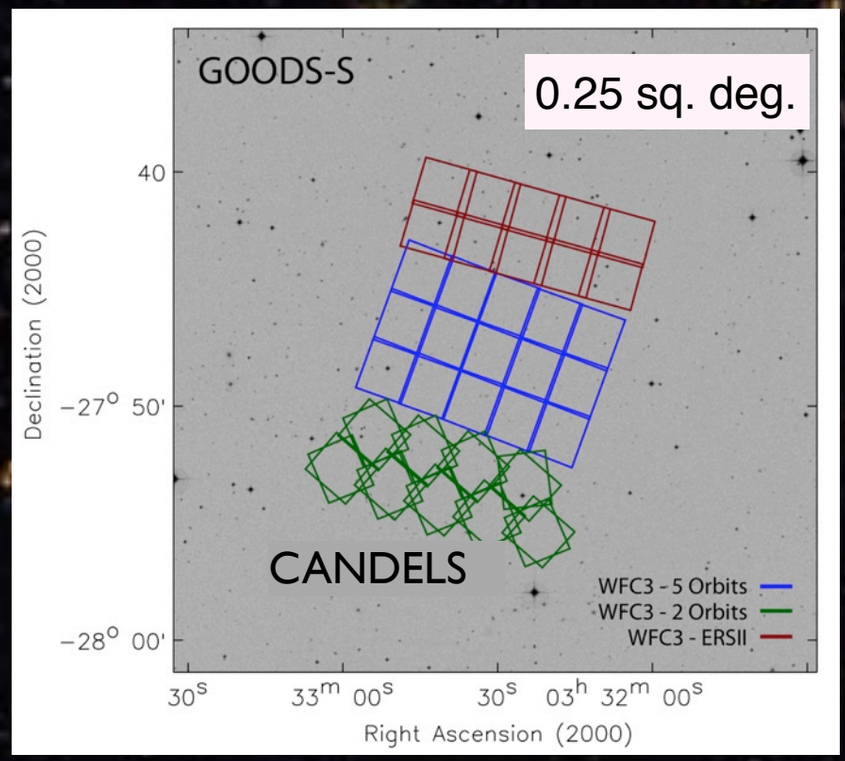
Deep blank galaxy surveys: a tool to probe the high z Universe

Select galaxies on near- / mid-IR images to trace old stellar populations
best proxy for stellar mass selection



Ks~24.0; 25.3 (3σ; AB)

McCracken et al. (2012)

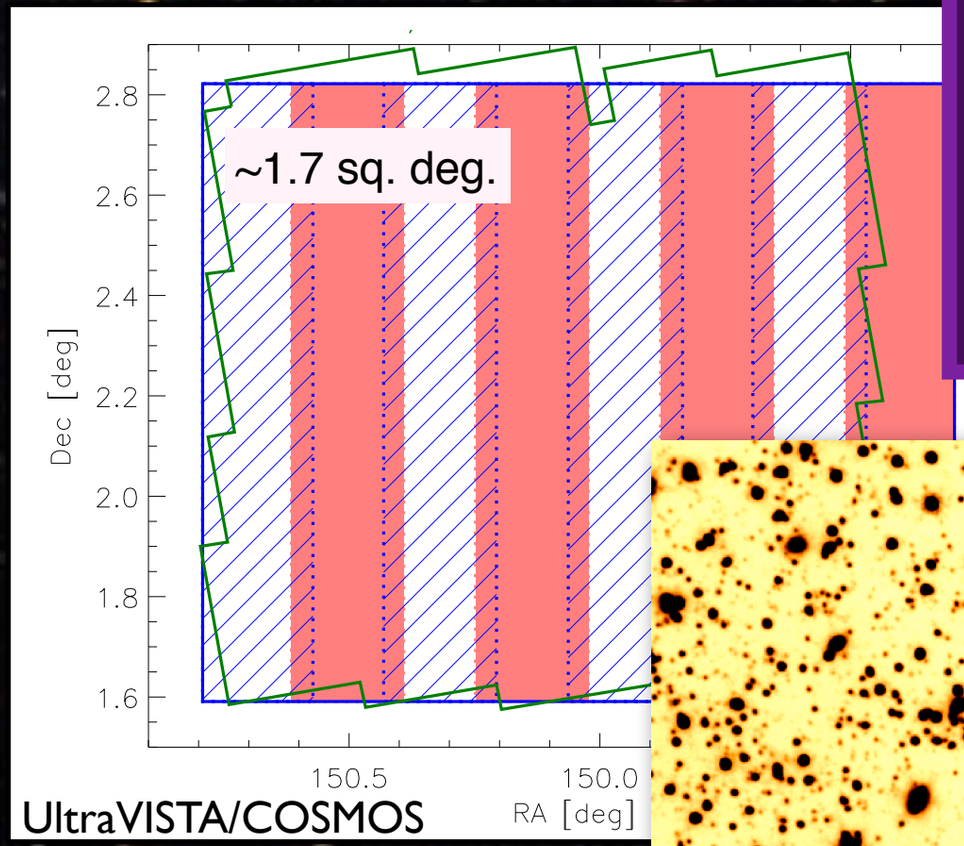


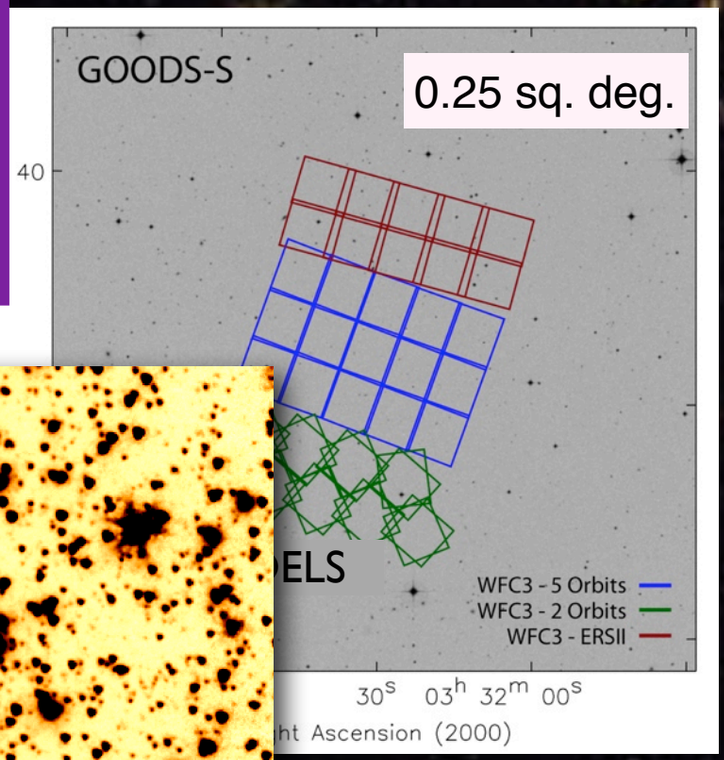
F160W~27 (3σ; AB)

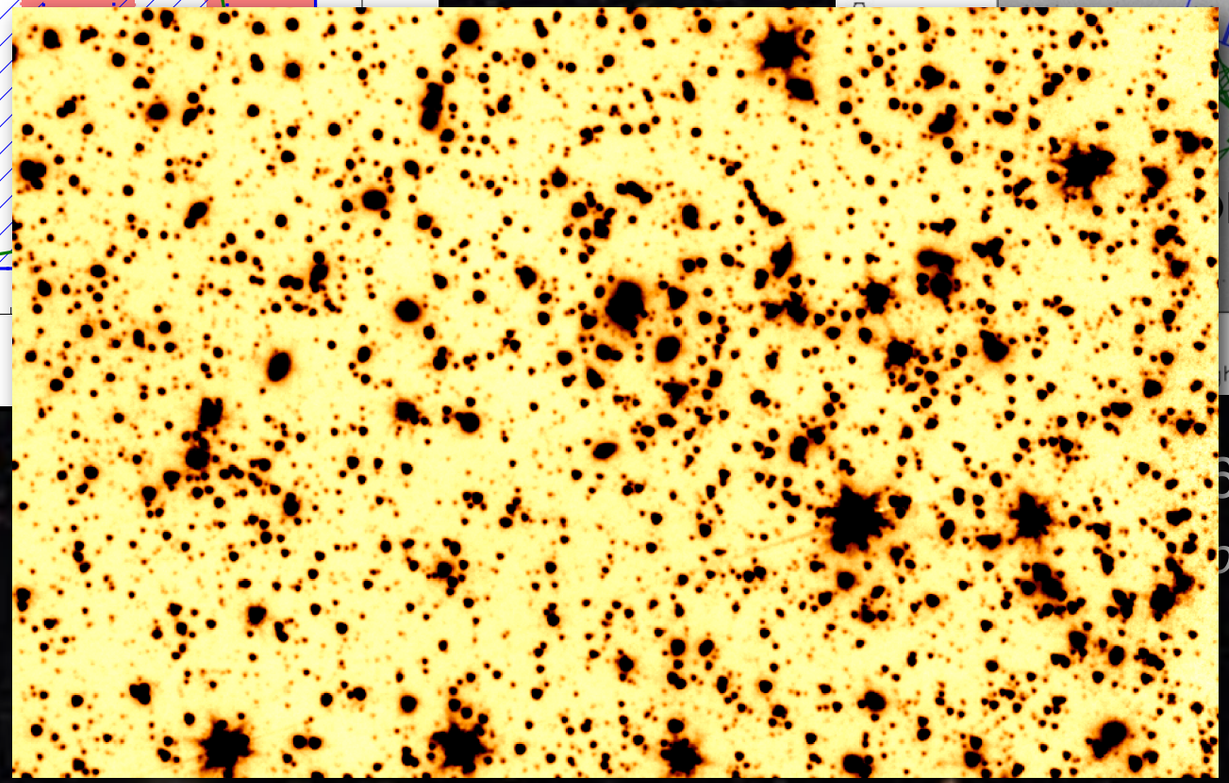
Grogin et al. (2011); Koekemoer et al. (2011)

Deep blank galaxy surveys: a tool to probe the high z Universe

Select galaxies on near- / mid-IR images to trace old stellar populations
best proxy for stellar mass selection





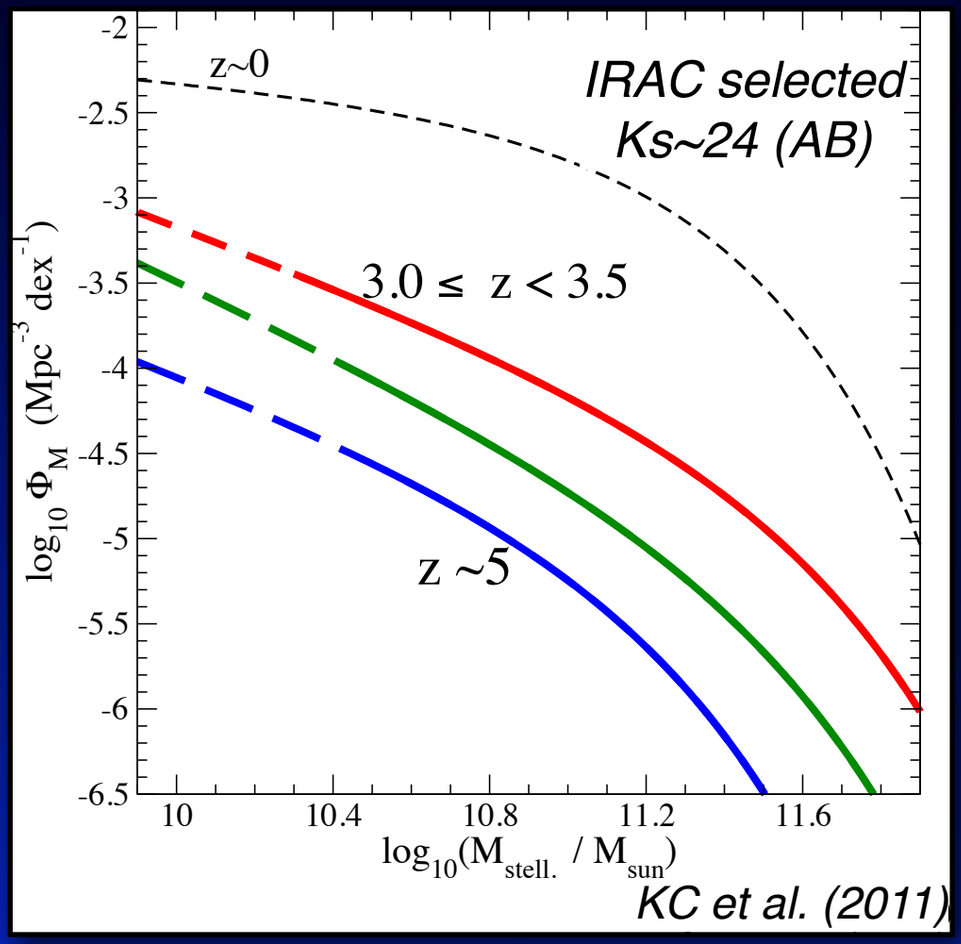


Ks~24.0; 25.3 (3σ; AB)
McCracken et al. (2012)

60W~27 (3σ; AB)
bekemoer et al. (2011)

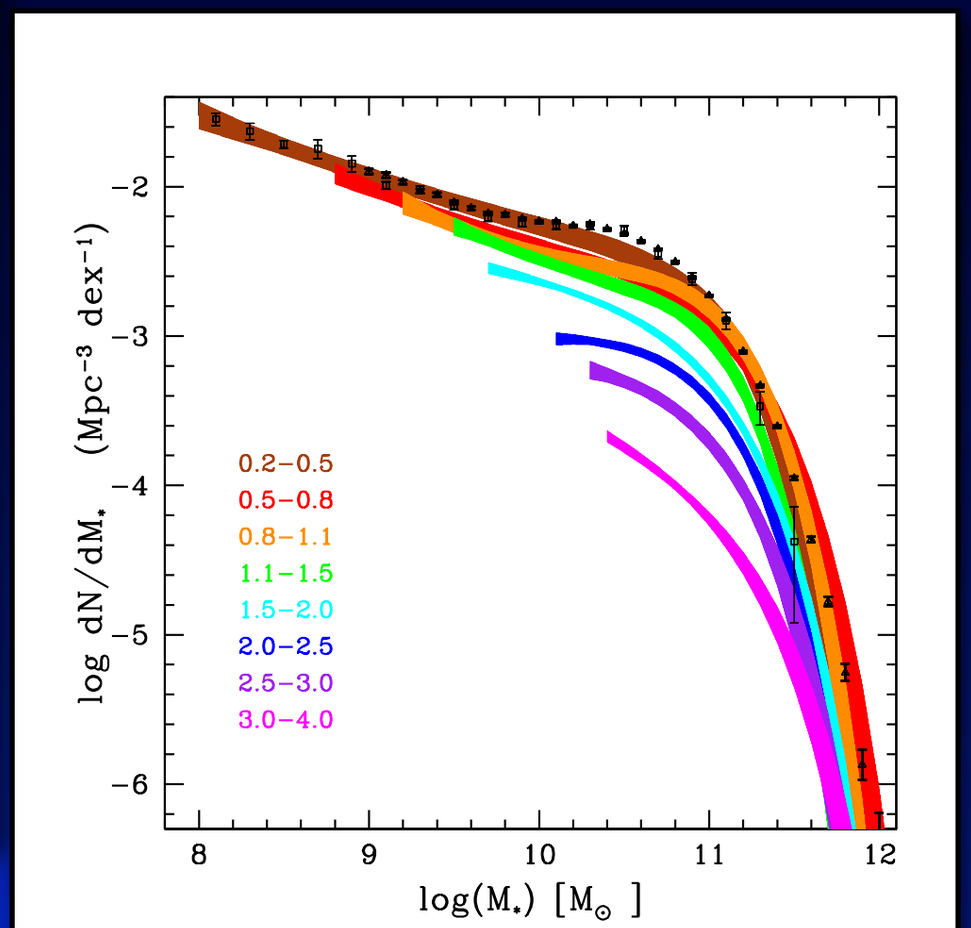
extend baseline to ~5 μm to trace light of old stars at z>3

The GSMF up to z=4-5 from large-area surveys



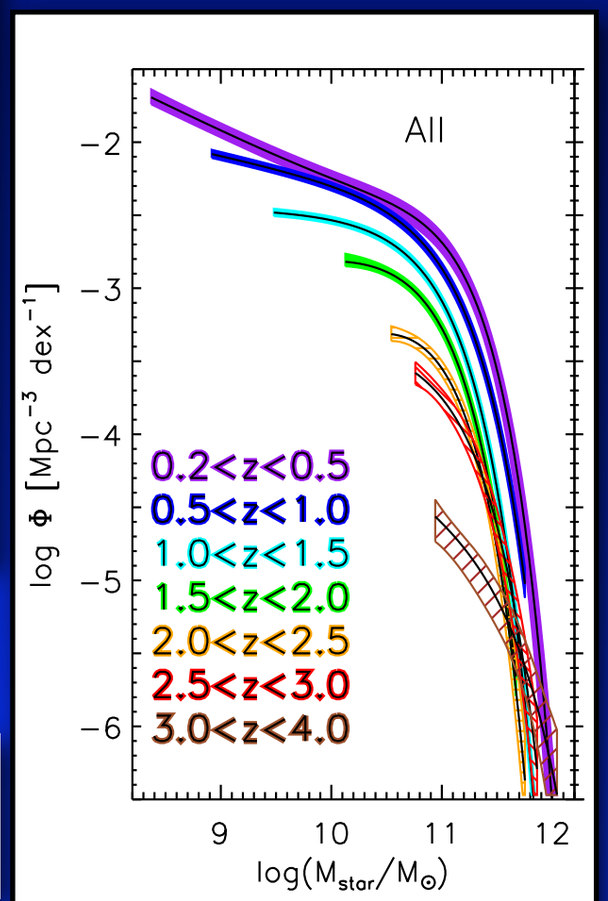
KC et al. (2011)

UKIDSS / UDS
0.6 sq. deg



Ilbert et al. (2013)

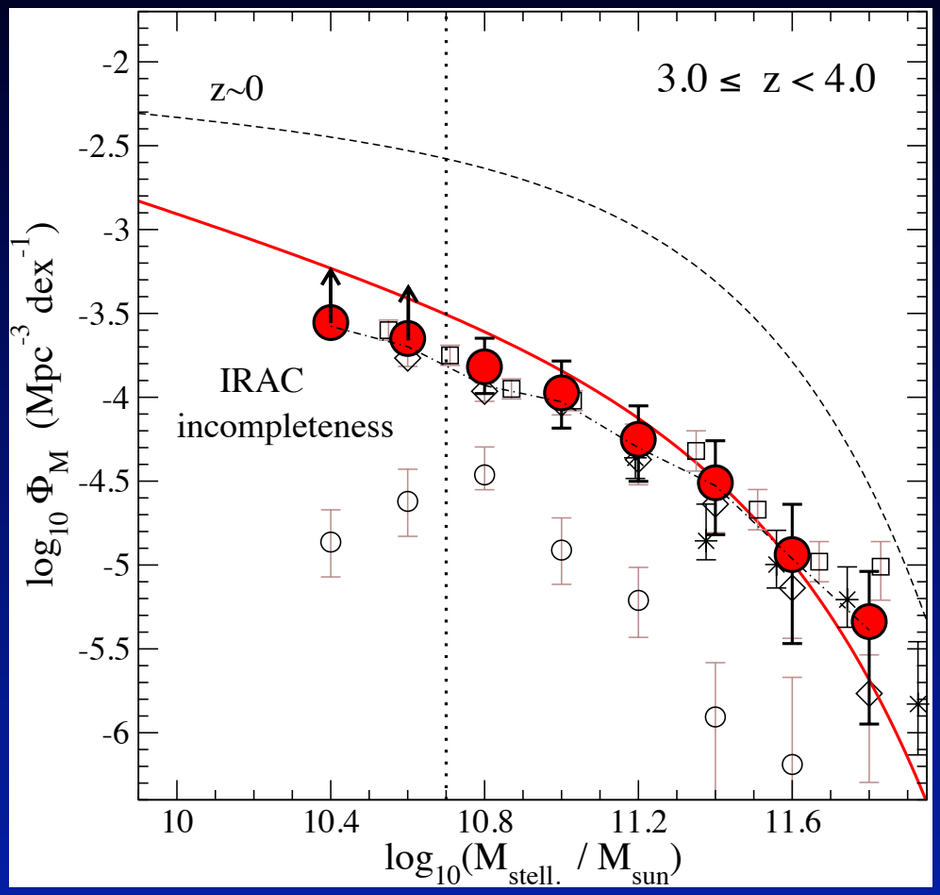
COSMOS
UltraVISTA
1.5 sq. deg
Ks~24 (AB)

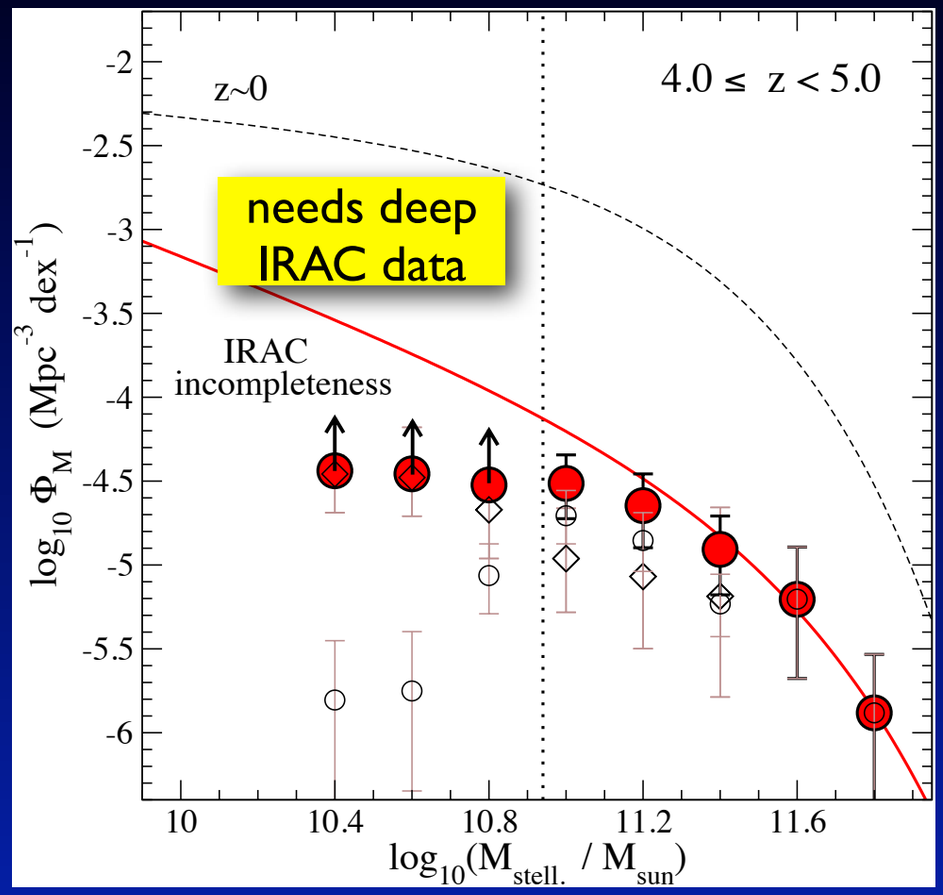


Muzzin et al. (2013)

GSMF high-mass end well constrained to z~4
(incomplete at higher z)

The updated GSMF at 3<z<5

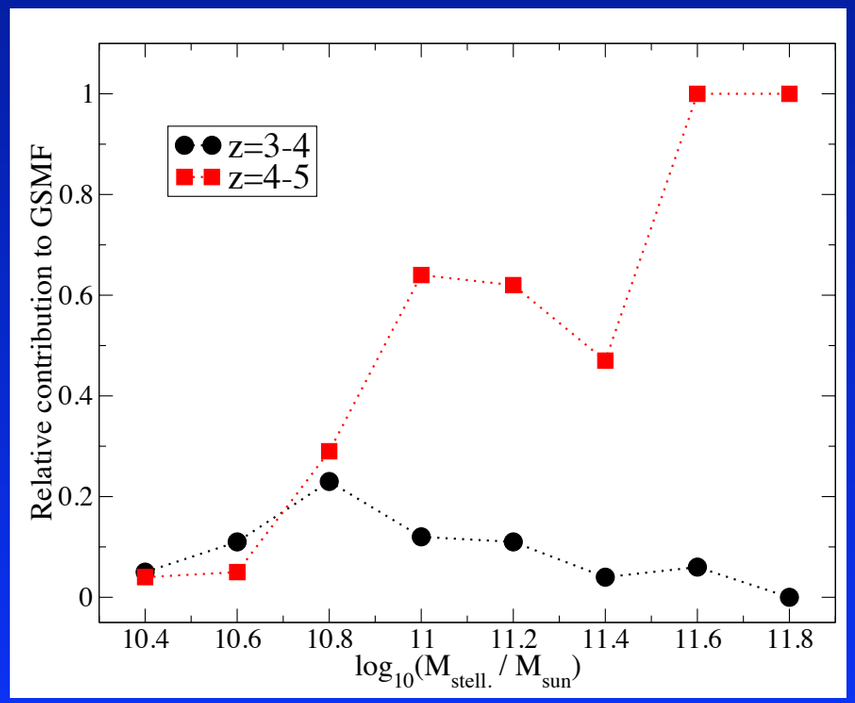




KC et al. (2015)

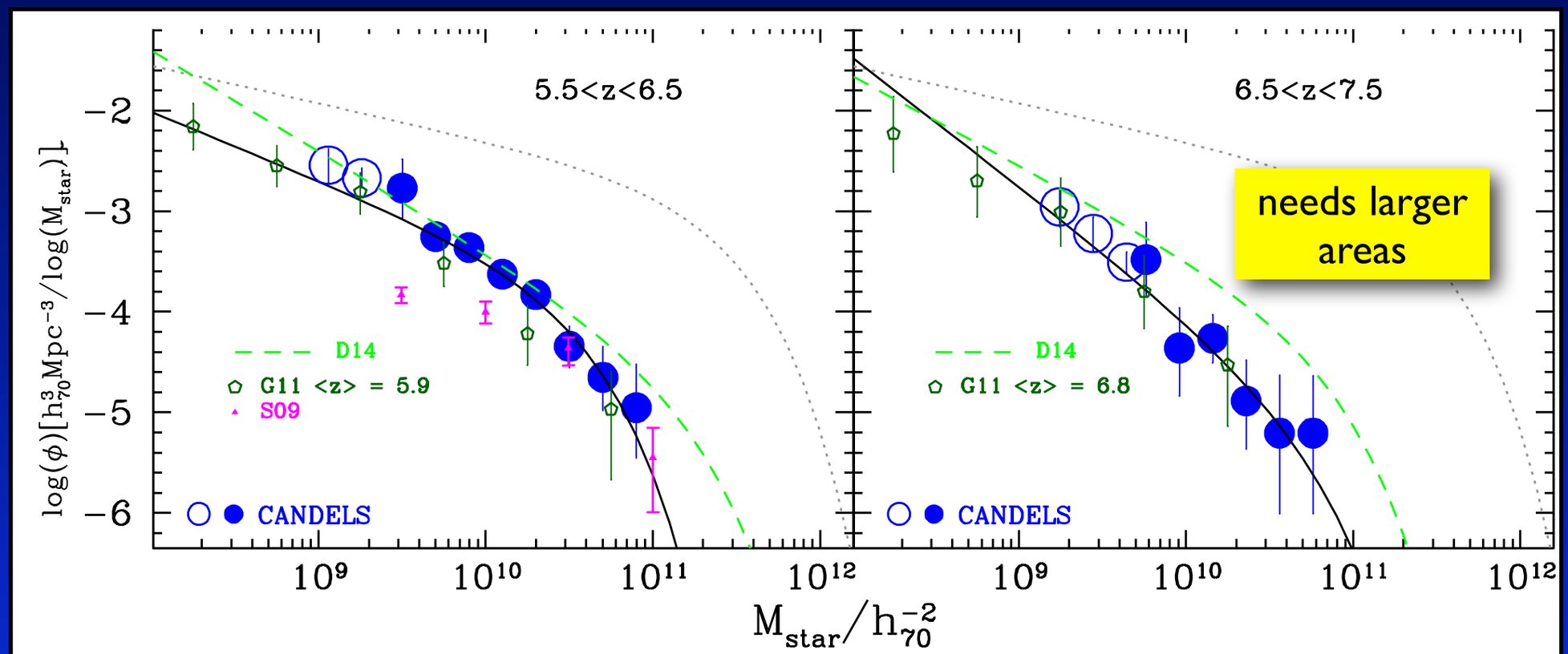
[4.5]<23, Ks>24 galaxies have an ***important contribution*** *to the high-mass end at 4<z<5*

Wide-area, ultra-deep near-IR surveys are necessary for complete census of massive galaxies at z>4



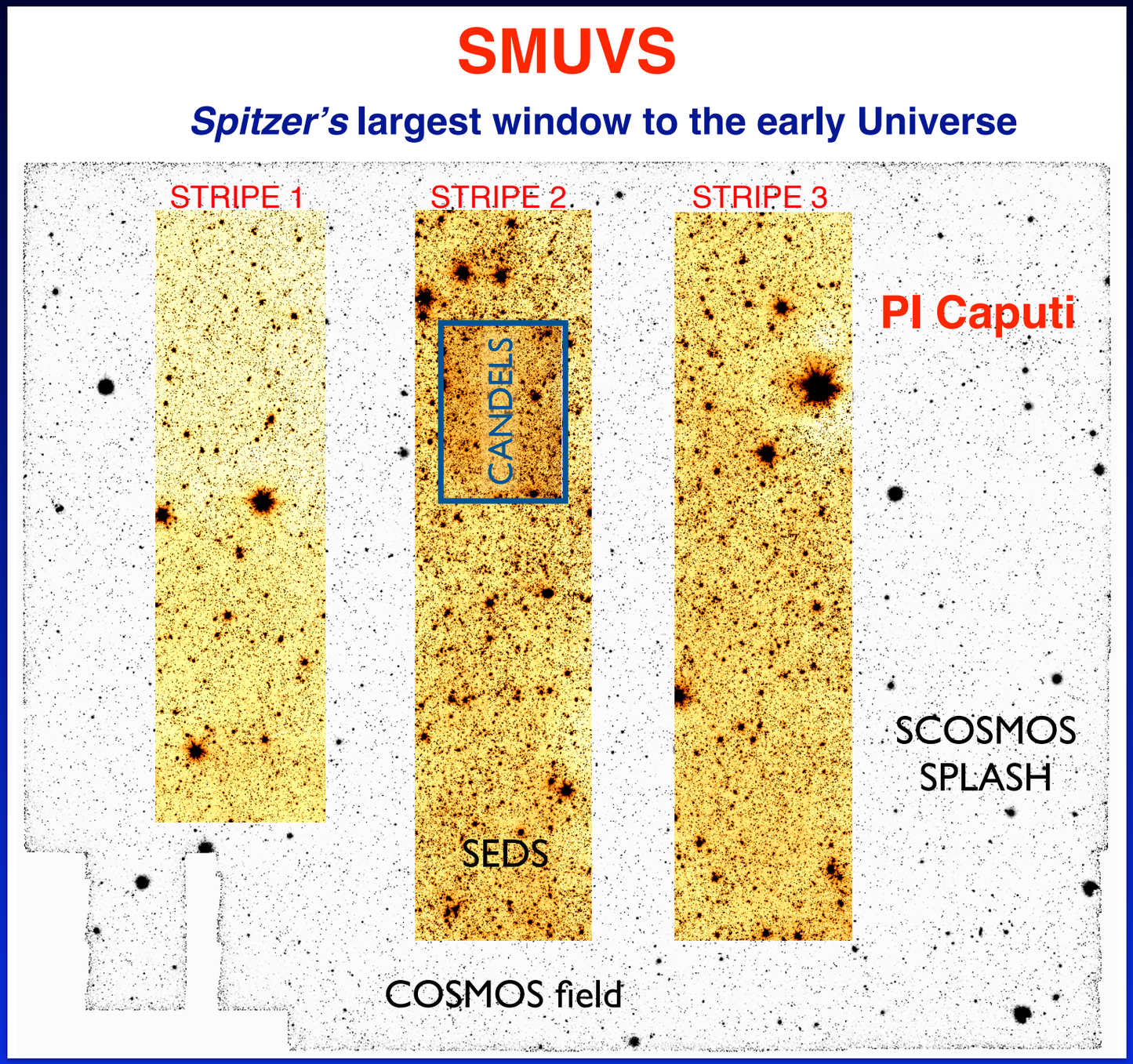
The GSMF at z~6-7

CANDELS



Grazian et al. (2015)

New *Spitzer* data in COSMOS



Spitzer
Exploration
Science Program

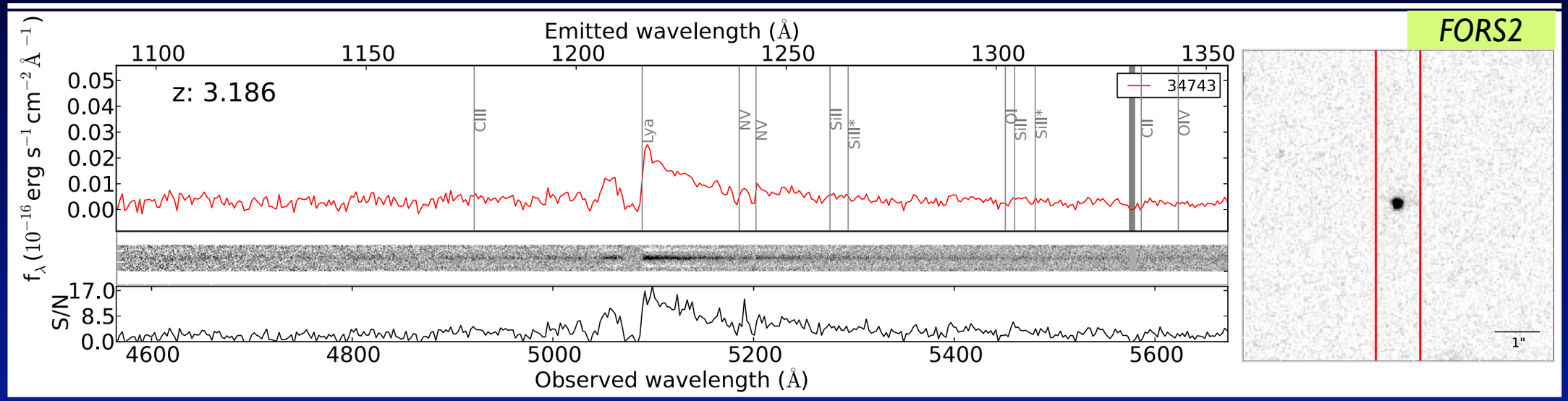
~1800 h total

~35 h / pointing

will be (almost) completed in Sep 2016 -- ***stay tuned!***

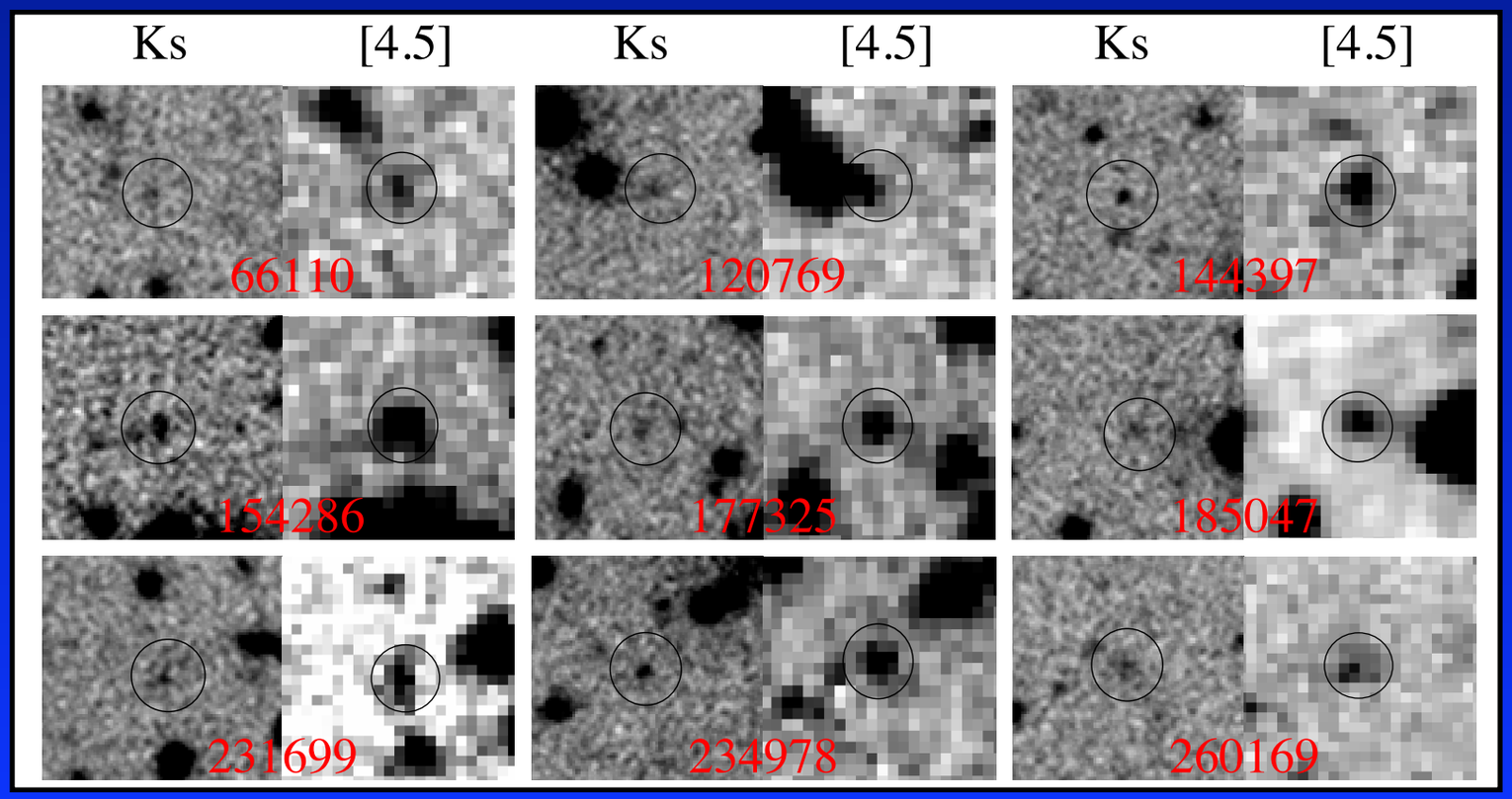
Outstanding Problem

Limited spectroscopic confirmation for massive galaxies at z>3



Karman, KC et al. (2014) -- see also VUDS survey

biased to optically bright galaxies



too faint for current spectrographs!

KC et al. (2015)

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  The building blocks of today's galaxies

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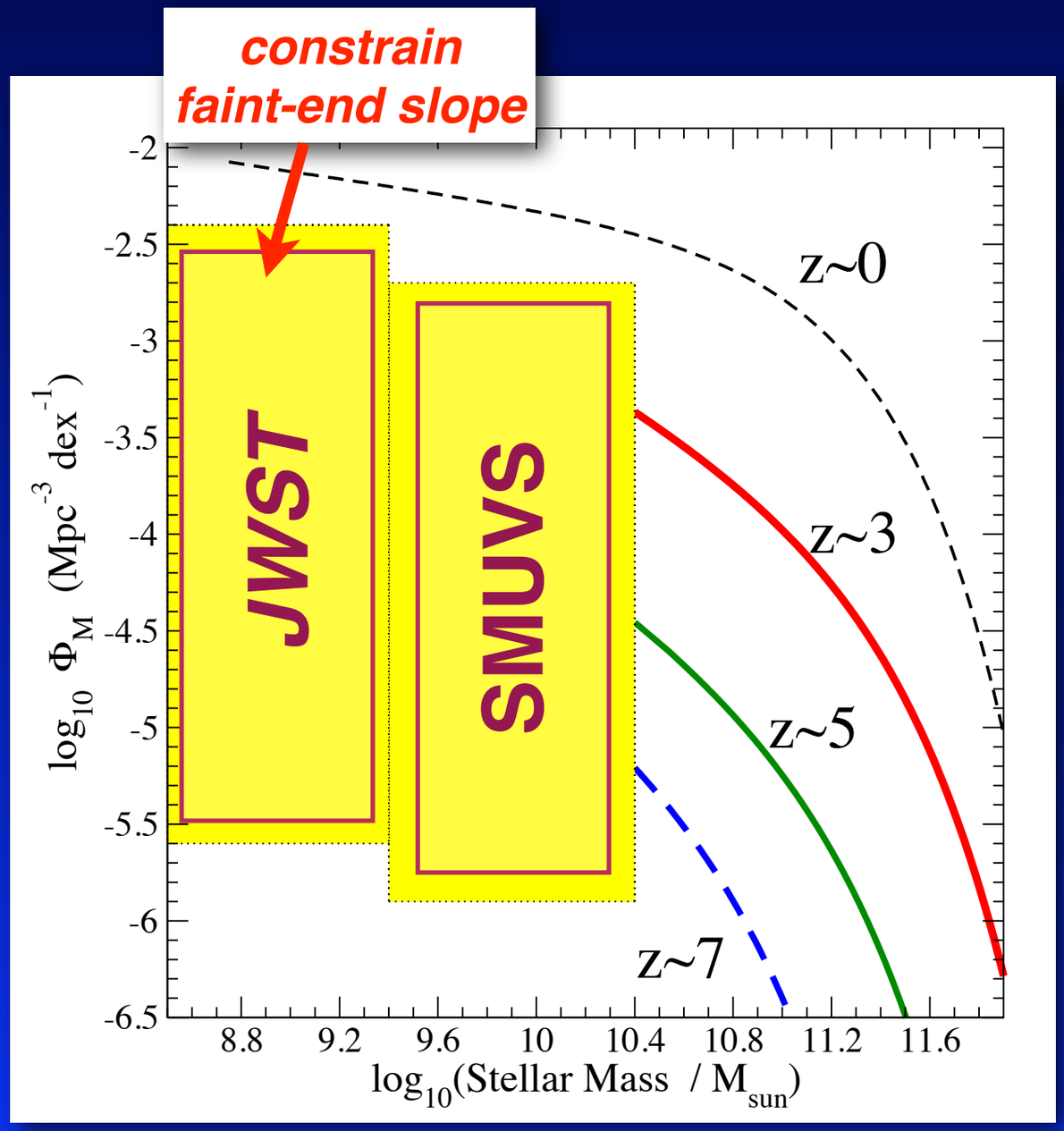
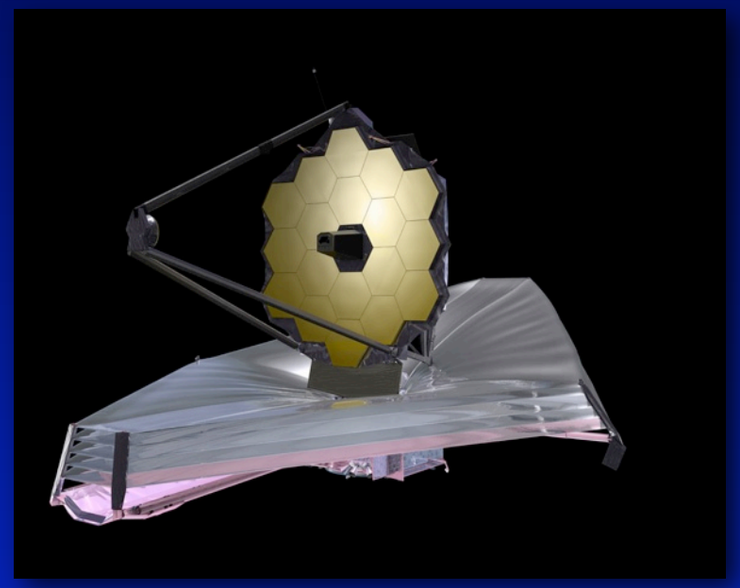
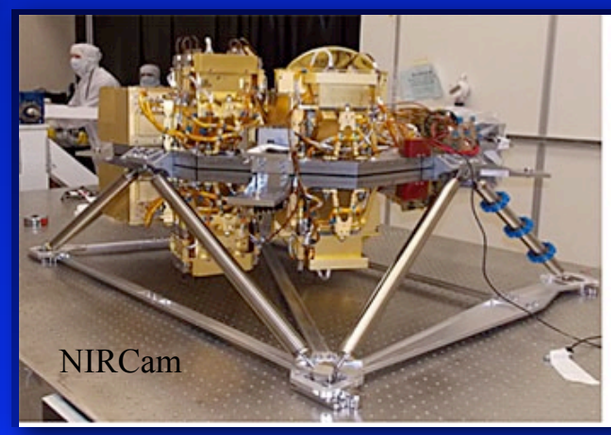
With thanks to the high-z MIRI team

Stellar mass assembly with *JWST*

When and how have the building blocks of today's (massive) galaxies formed?



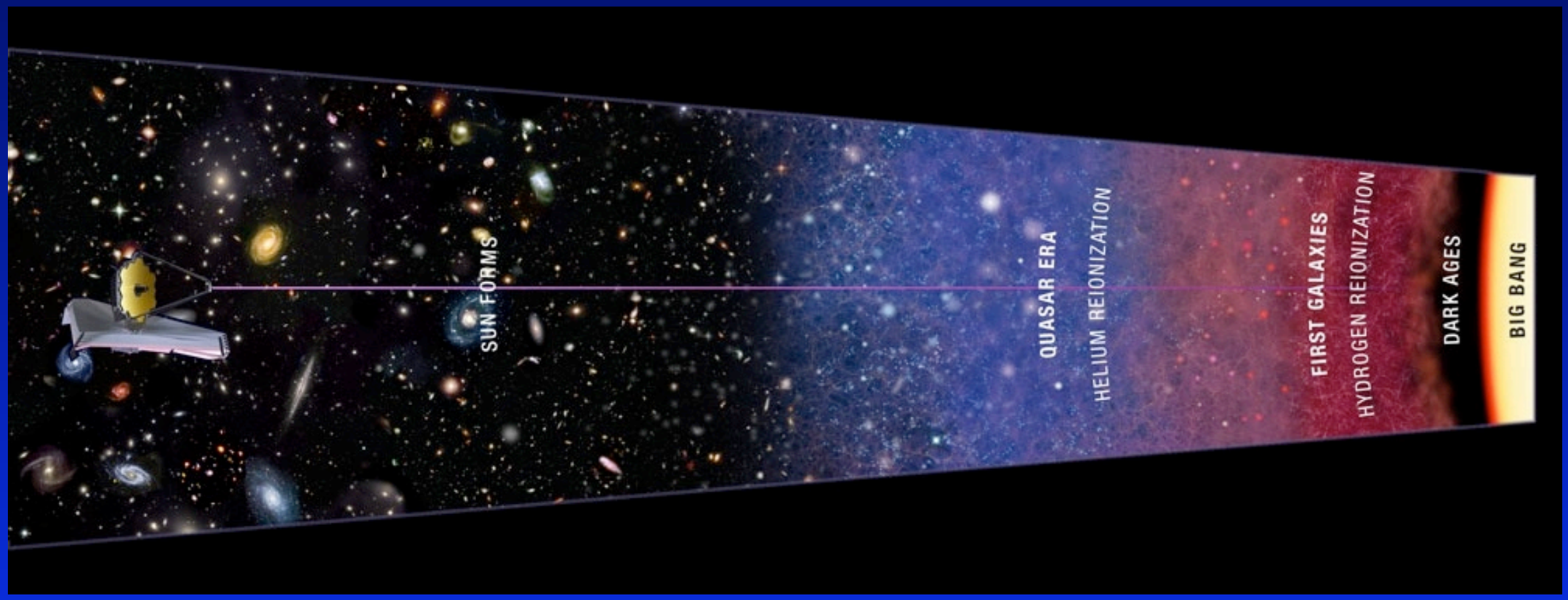




The first steps of stellar mass assembly

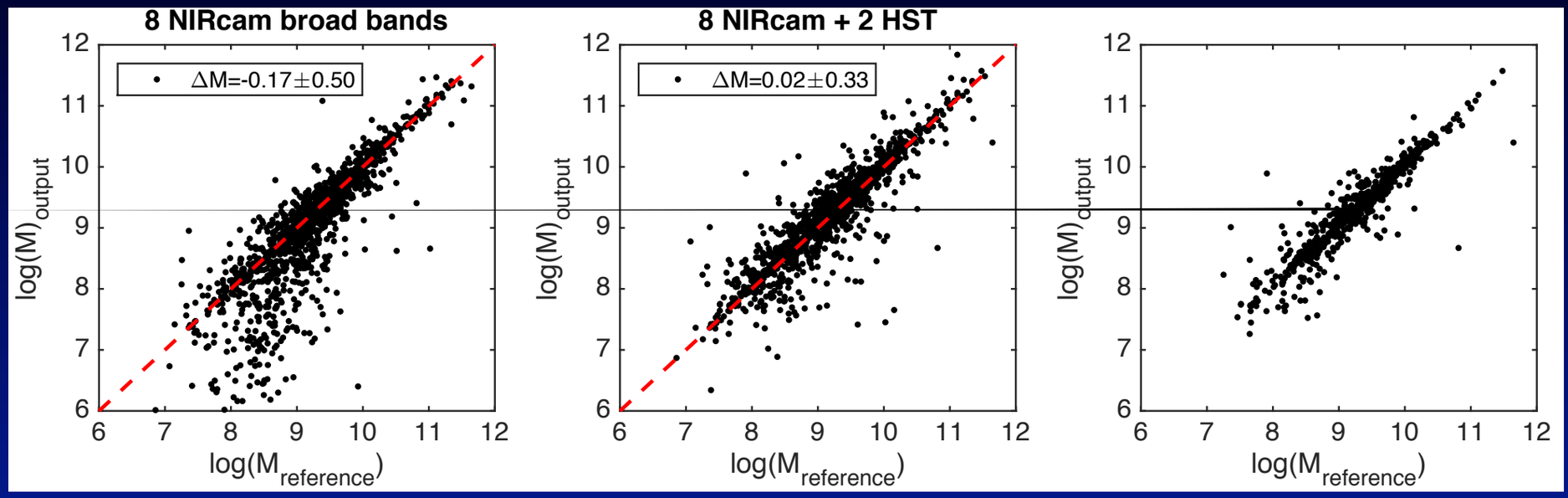
How much stellar mass was formed in the first billion years?

What is the maximal stellar mass in a single galaxy?



STScI

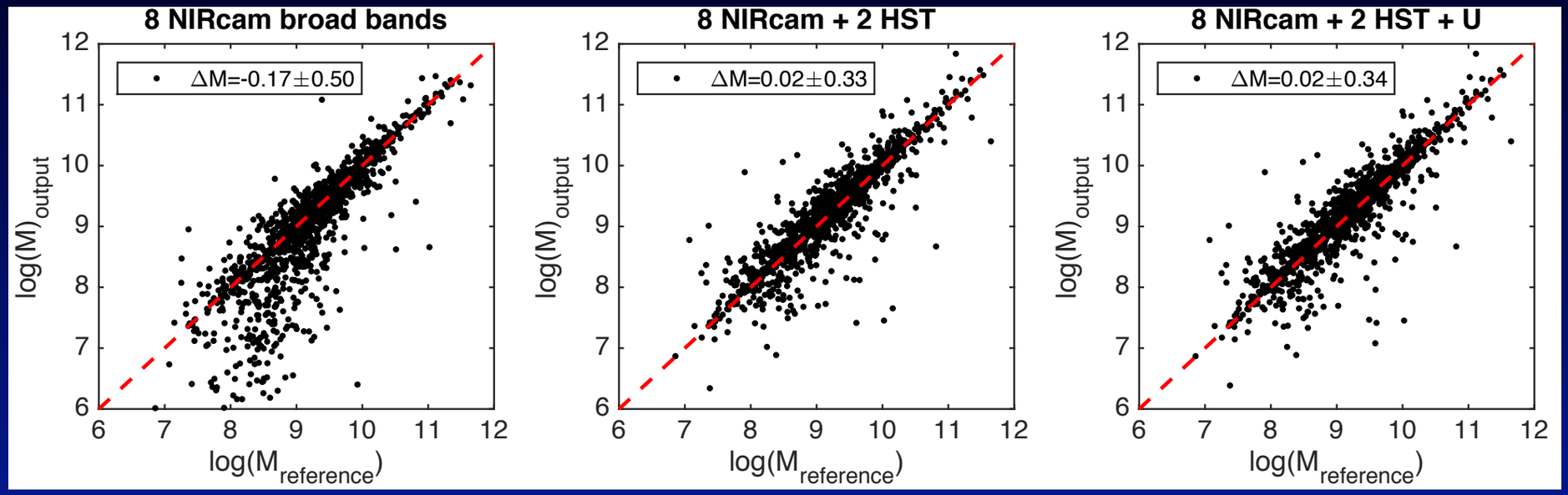
Stellar masses with *JWST*



CANDELS GOODS-S galaxies at $4<z<7$

For extensive zphot testing see *Bisigello, KC et al. (2016)*

Stellar masses with *JWST*



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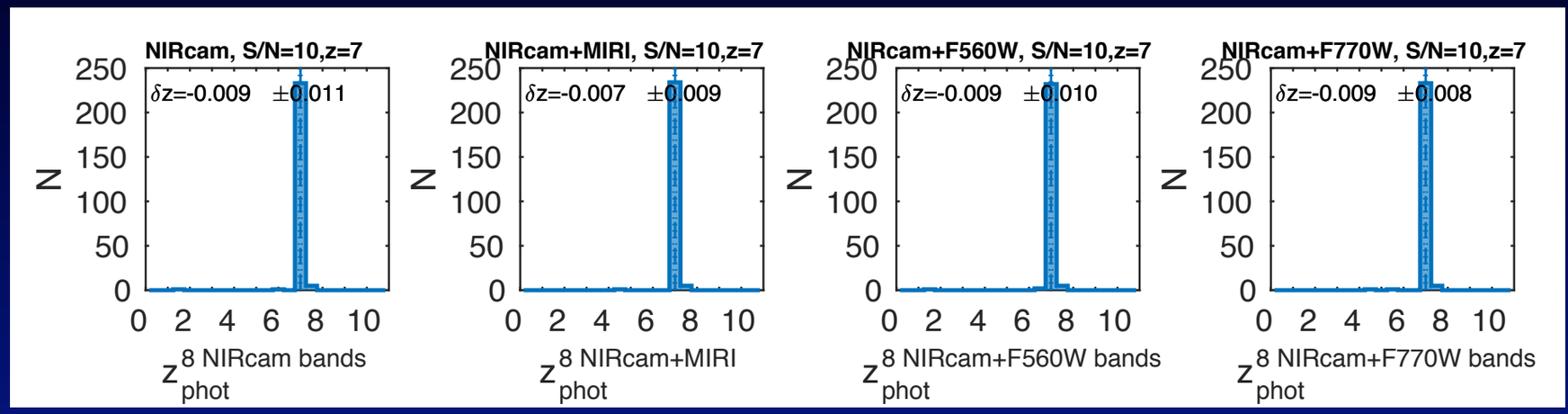
For stellar mass testing see *Bisigello, KC et al., in prep.*

Stellar mass recovery for *JWST* galaxies

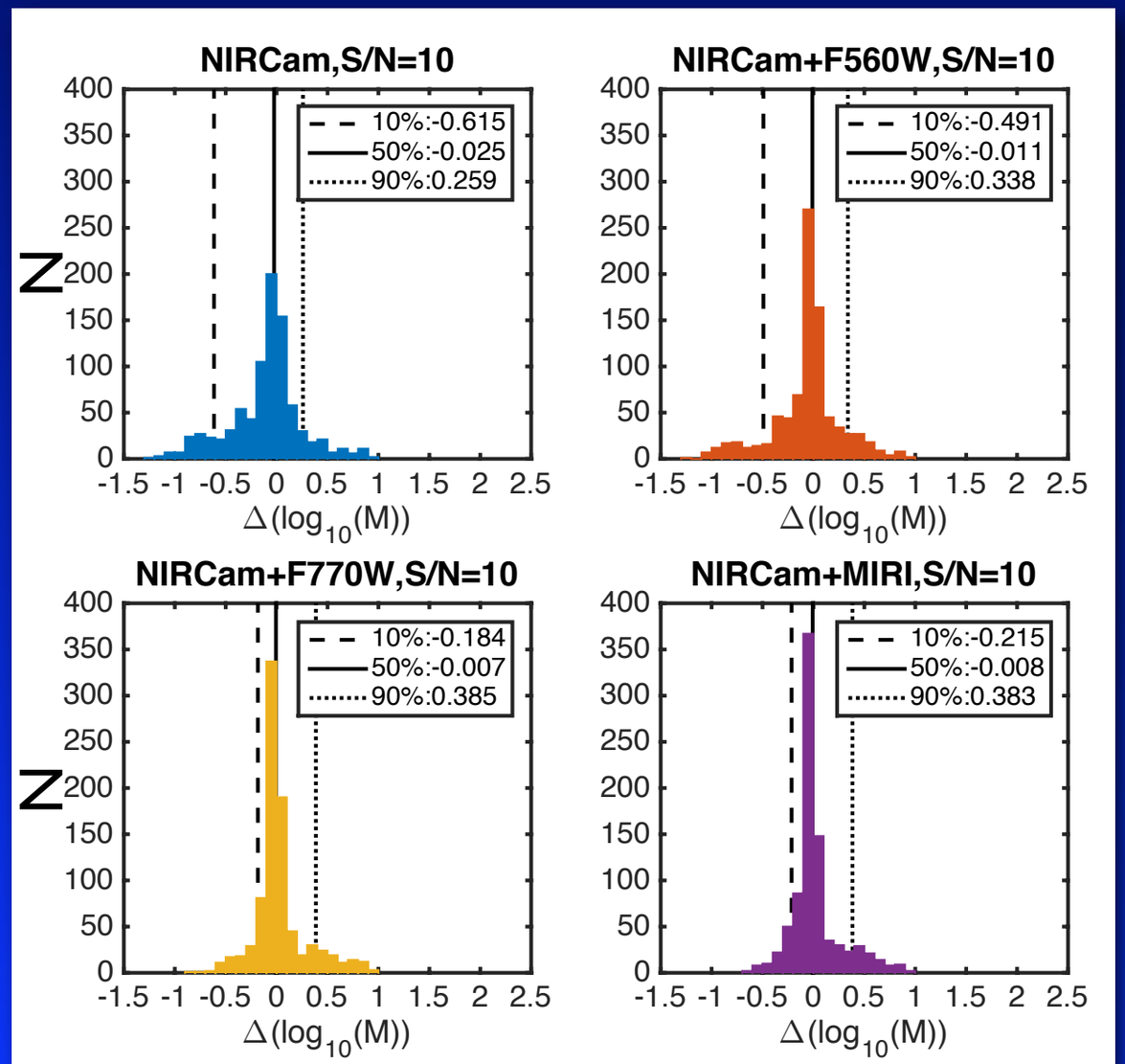
mock galaxies
at z=7,8,9,10

Bisigello, KC et al. (2016)



MIRI data very important to recover stellar masses at high z

Bisigello, KC et al., in prep.



Summary

- ***Spitzer*** images + deepest near-IR surveys allow us to constrain GSMF up to z~6-7

  but not consensus yet on low-mass end

- ***JWST*** will probe the GSMF low-mass end at high z

  building blocks of today's galaxies at early cosmic times

- ***JWST*** will open up stellar mass assembly studies at z>7

  investigate the very first steps of galaxy buildup

definitive constraints for galaxy formation theories

Thanks!