The Stellar Mass Growth of Galaxies at $z \geq 4$

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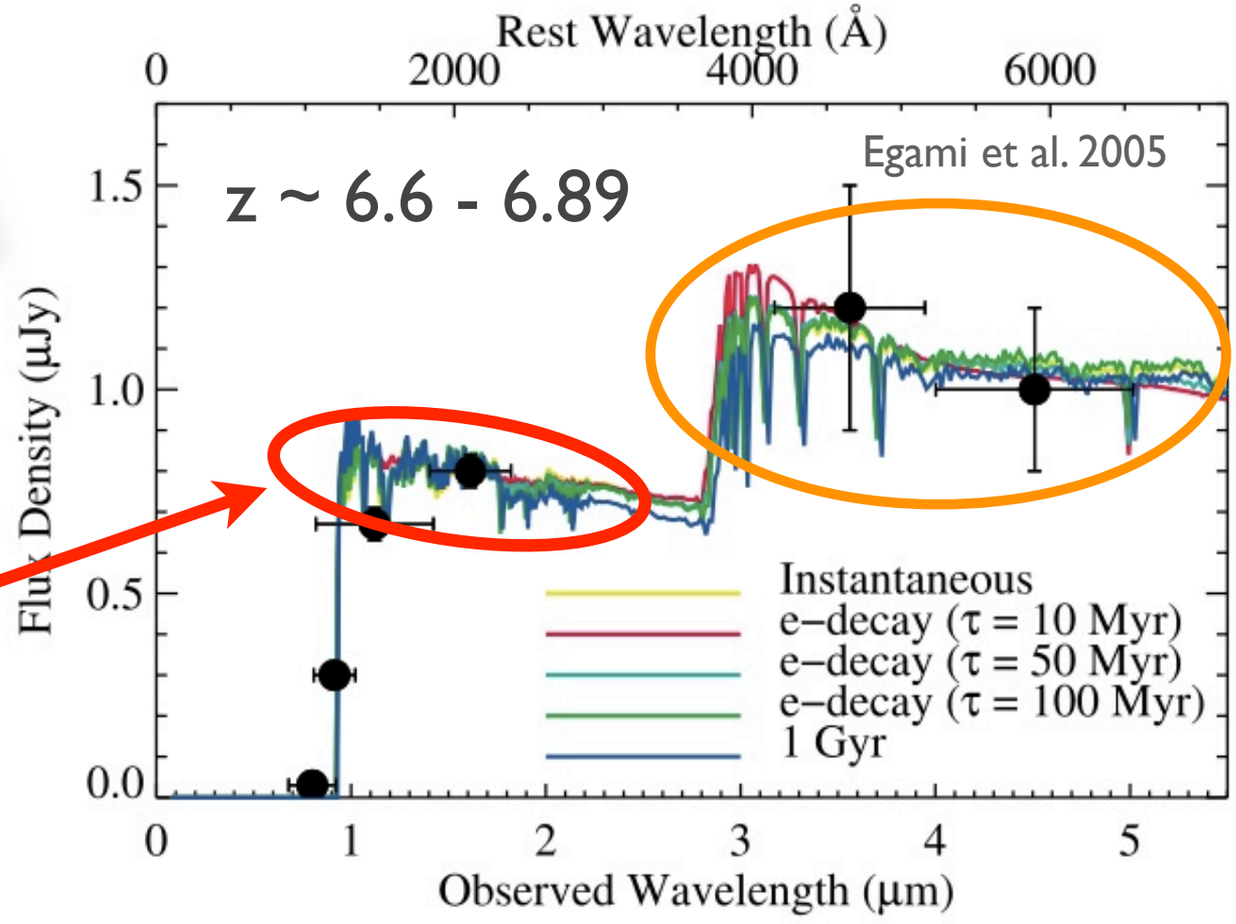
HST & Spitzer/IRAC

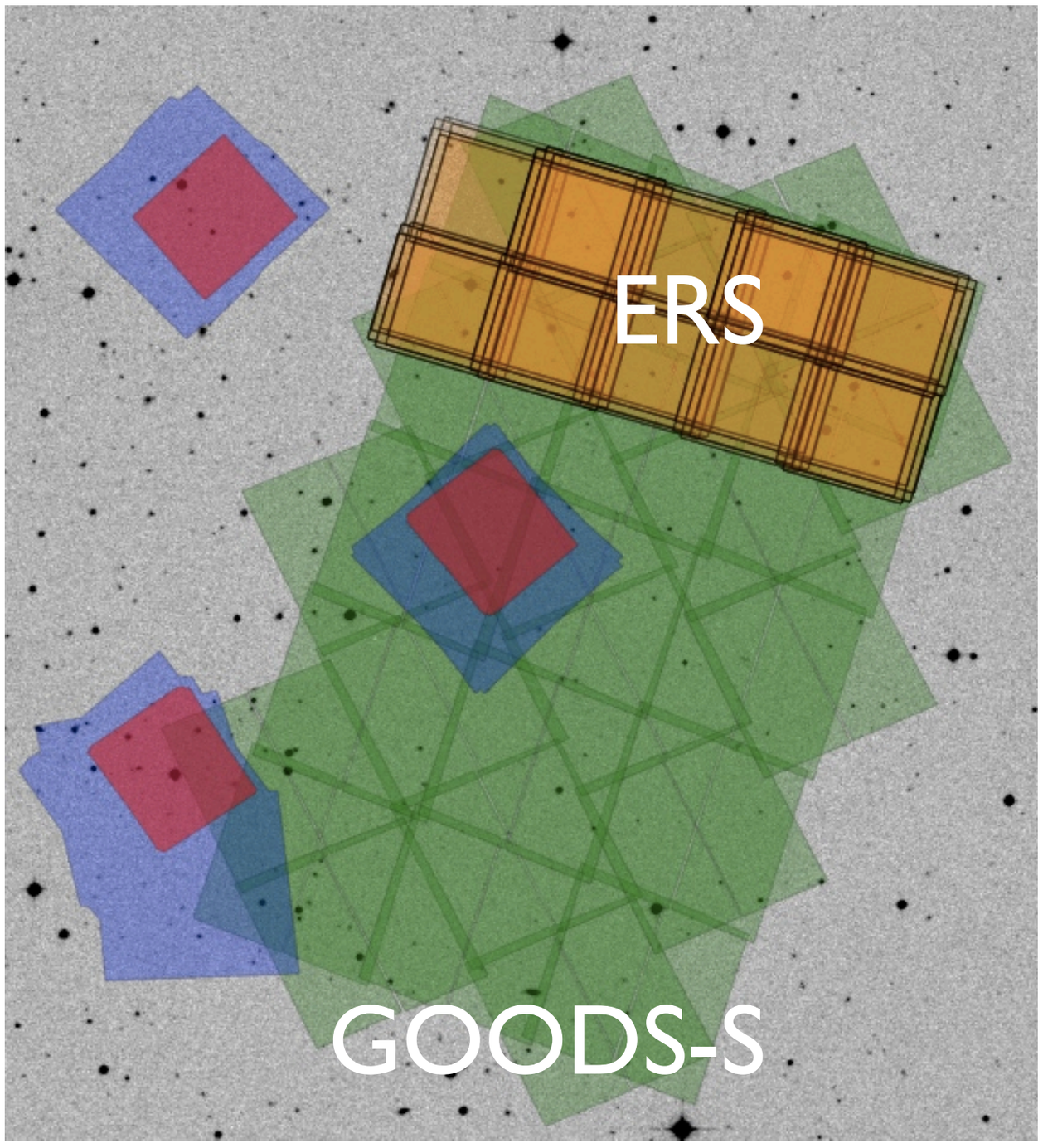
Stellar masses, ages, Av can (in principle) be determined from stellar population models using the combined HST and Spitzer/IRAC photometric information.

Recent WFC3/IR data over the GOODS-S provide much improved constraints in the UV



A typical galaxy at z~7 has $[3.6]_{mag,\,AB} \gtrsim 25$

Selection of z~4, 5, and 6 sources over the ERS field

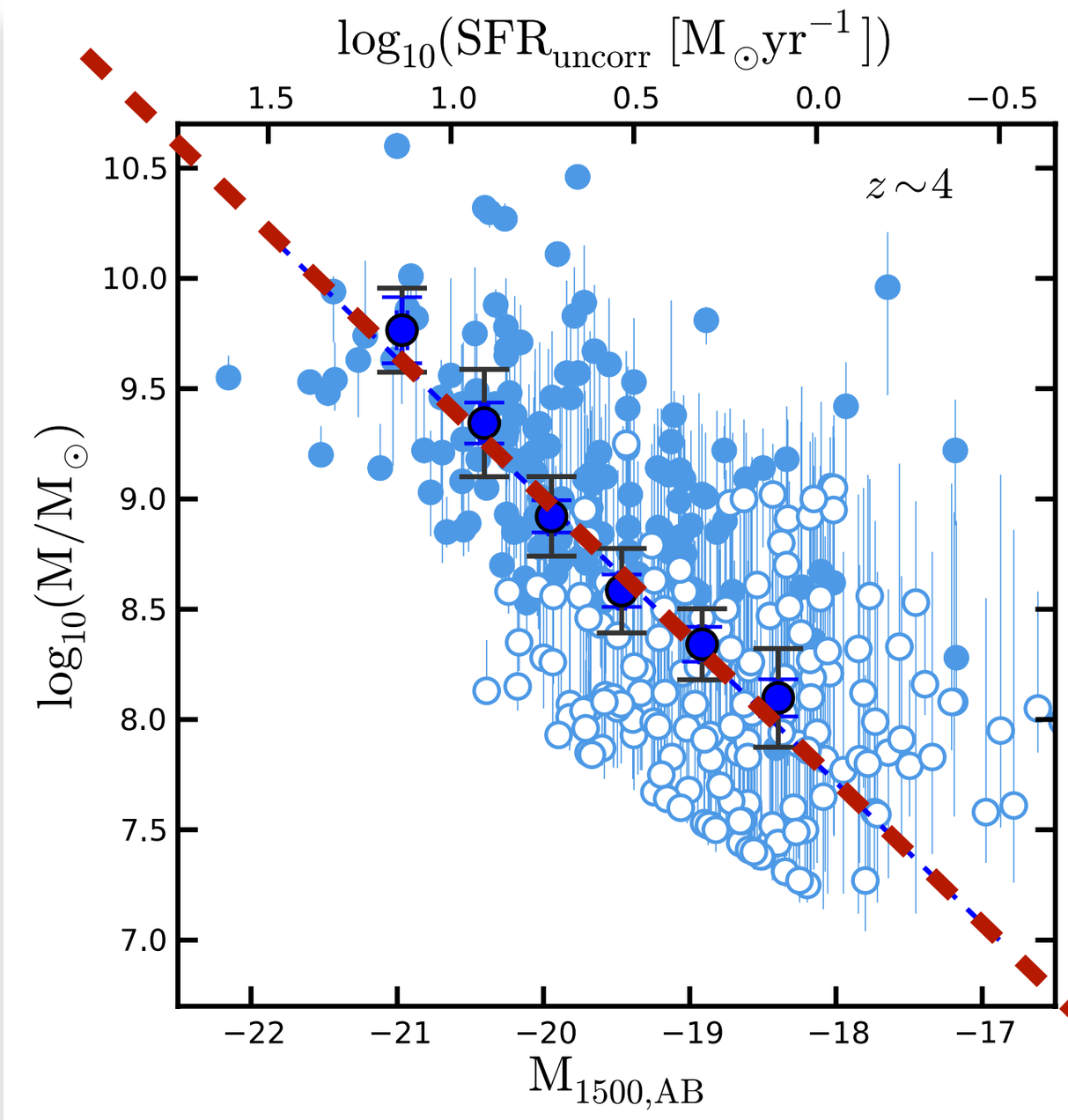


- Improved WFC/IR
+
- 23 hr of Spitzer/IRAC

- Stellar Mass determinations for:
  - ~300 z~4
  - ~100 z~5
  - ~30 z~6

- *BC03*
- *Metallicity: 0.2 $Z_\odot$*
- *SFH: constant SFR*
- *Salpeter IMF (0.1-100 $M_\odot$)*
- *Models do not include emission lines.*

The Stellar Mass – UV Luminosity Relation

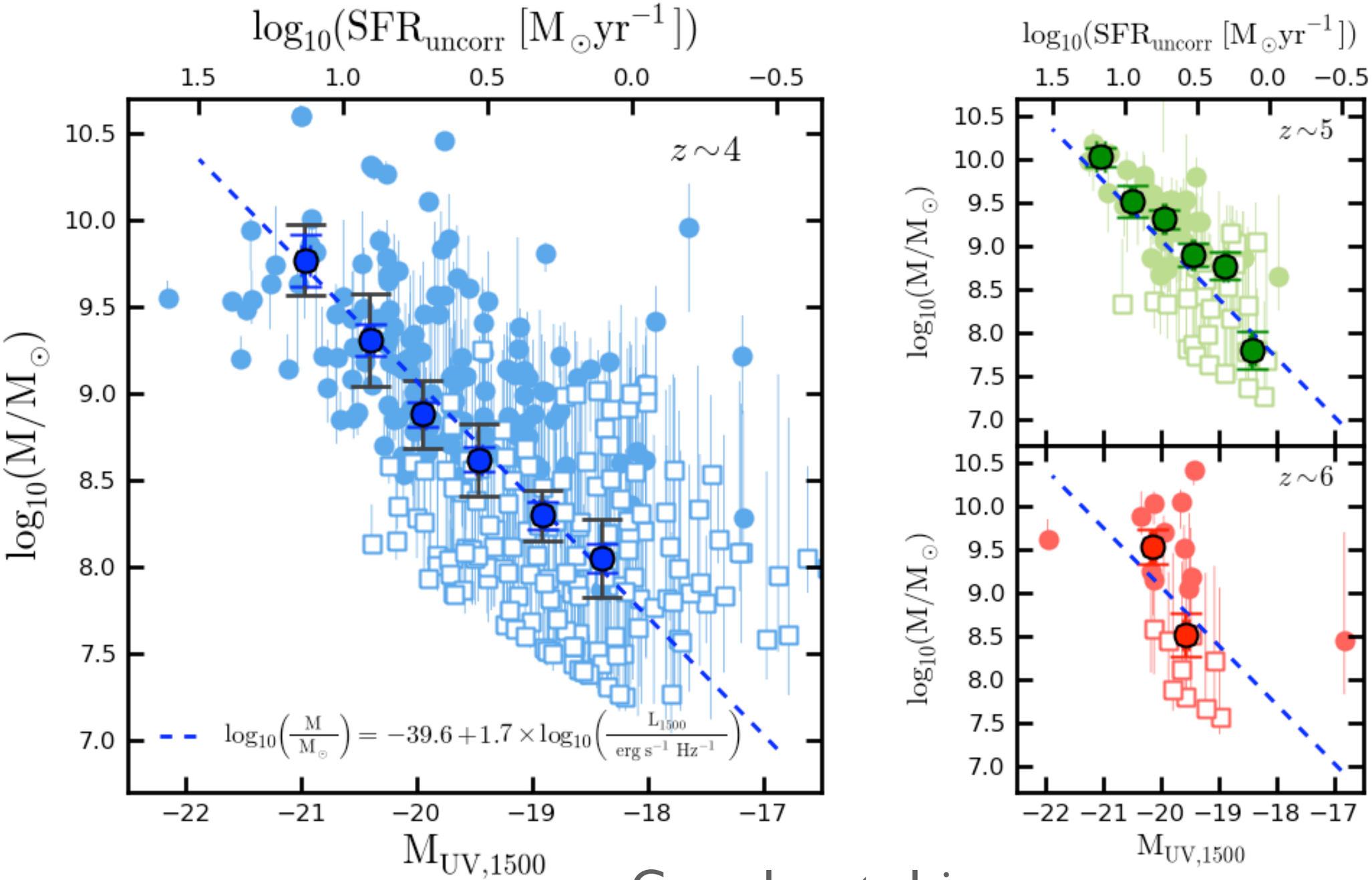


Stark et al. 2009 find a shallower slope of -1.2

-1.7 slope

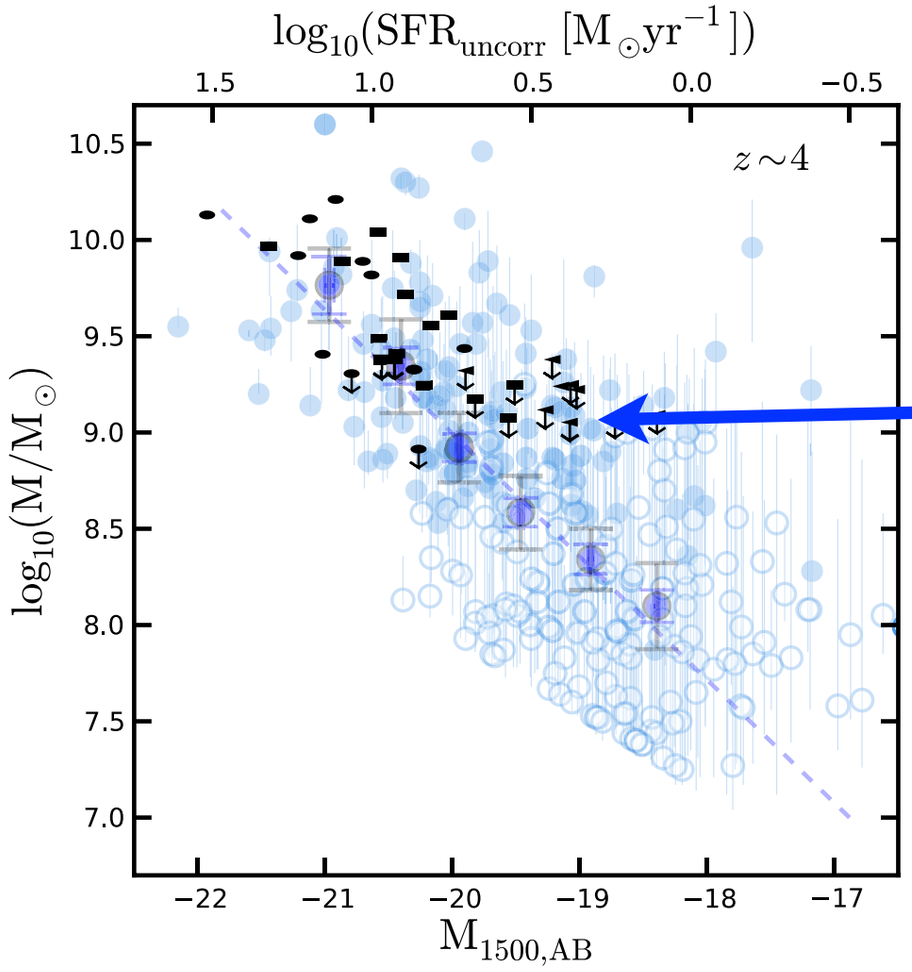
Gonzalez et al. in prep.

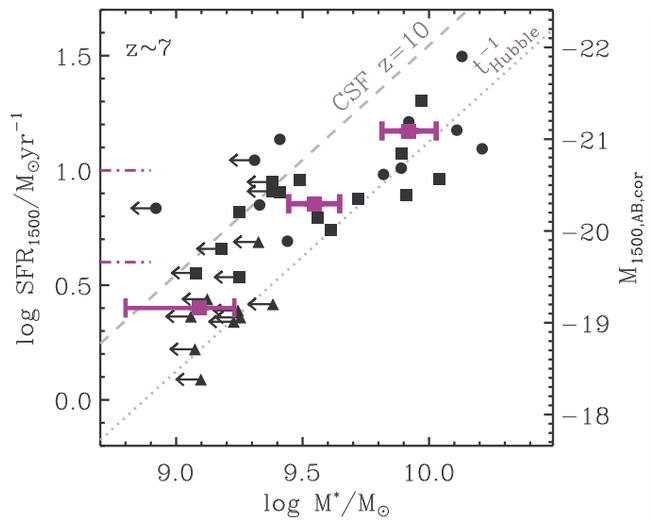
The evidence does not suggest strong evolution of the relation from z~6 to z~4



Gonzalez et al. in prep.

And at Higher redshifts?



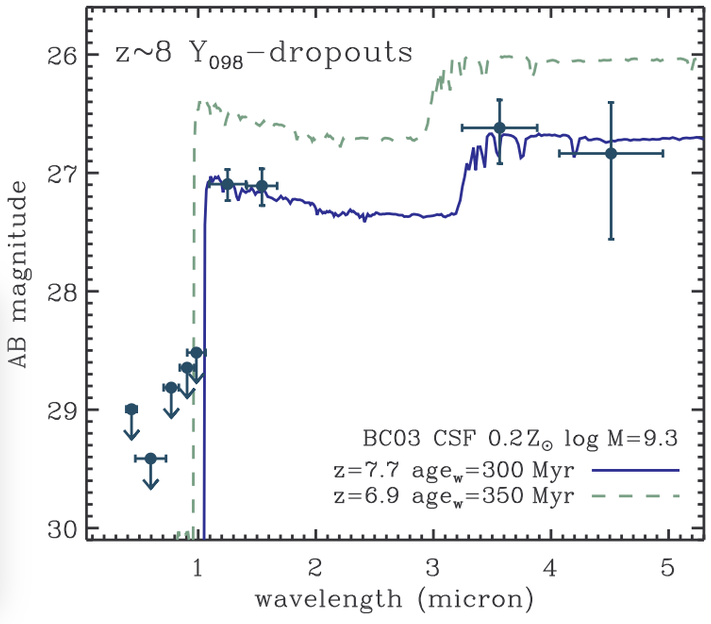


This relation is very similar to what has been observed at z~7

Labbé/González et al. 2010b

Only 2 sources have been detected in IRAC at z~8

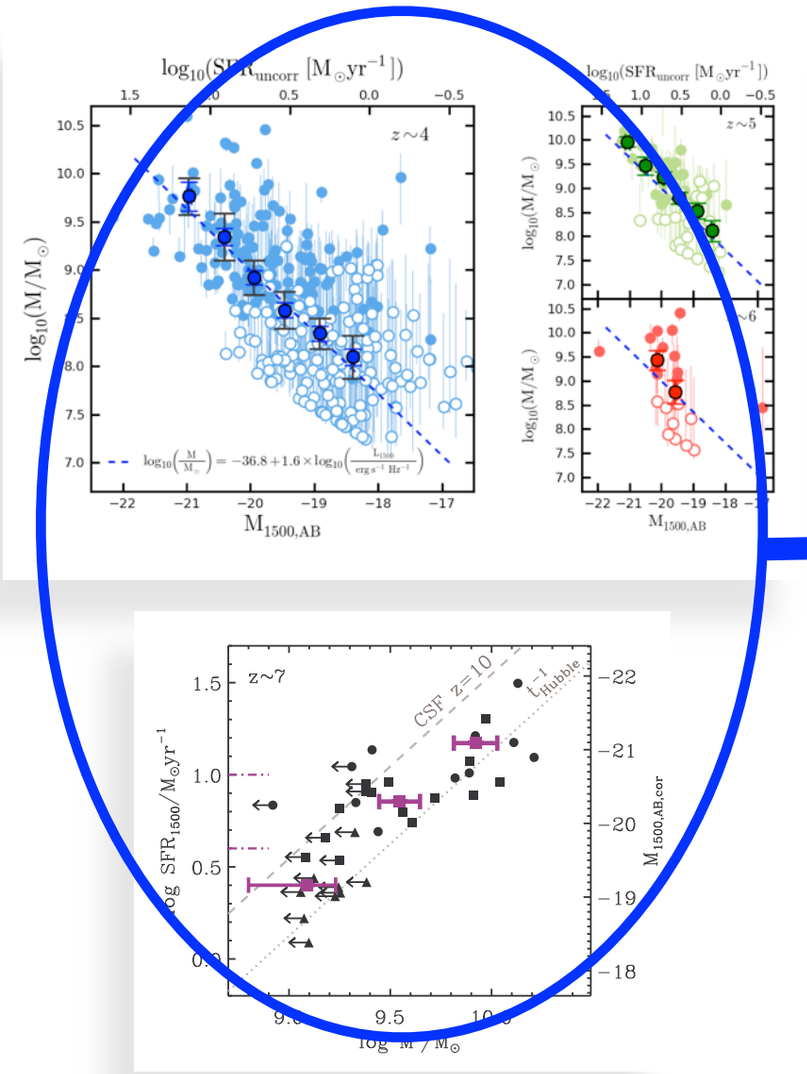
z~8

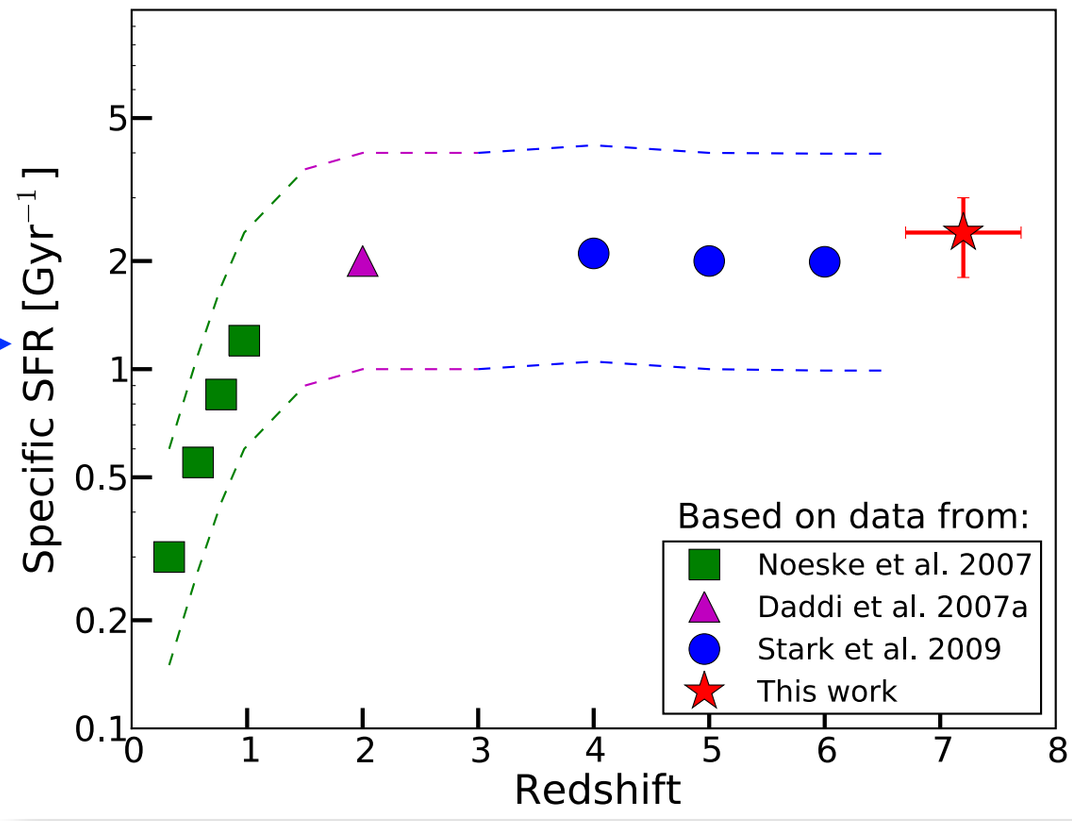


Labbé/González et al. 2010b

At a given Luminosity or Mass

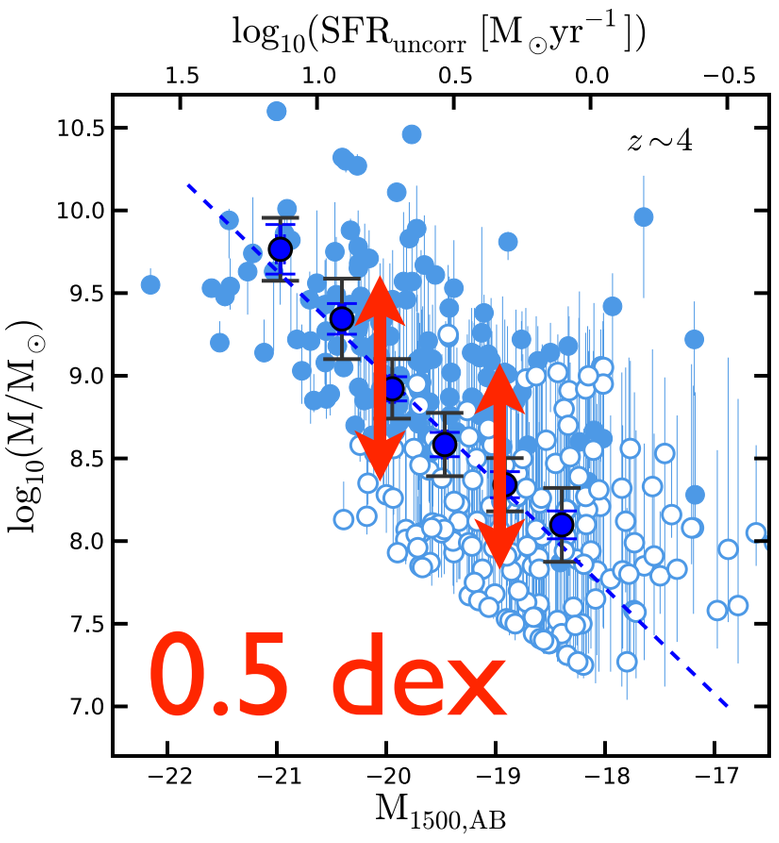
The specific SFR remains constant in time.

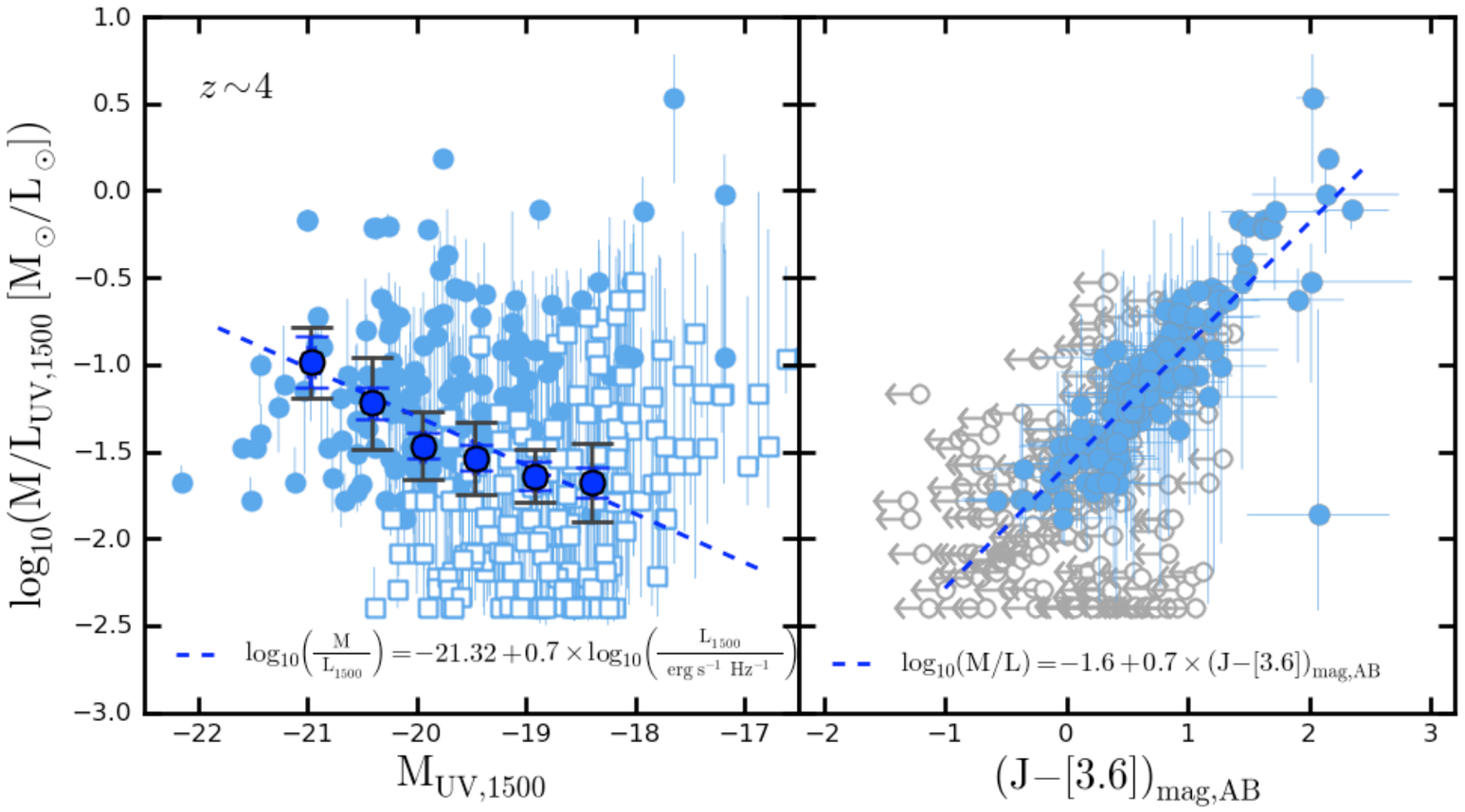




González et al. 2009

Spread in the M – L_{UV} relation

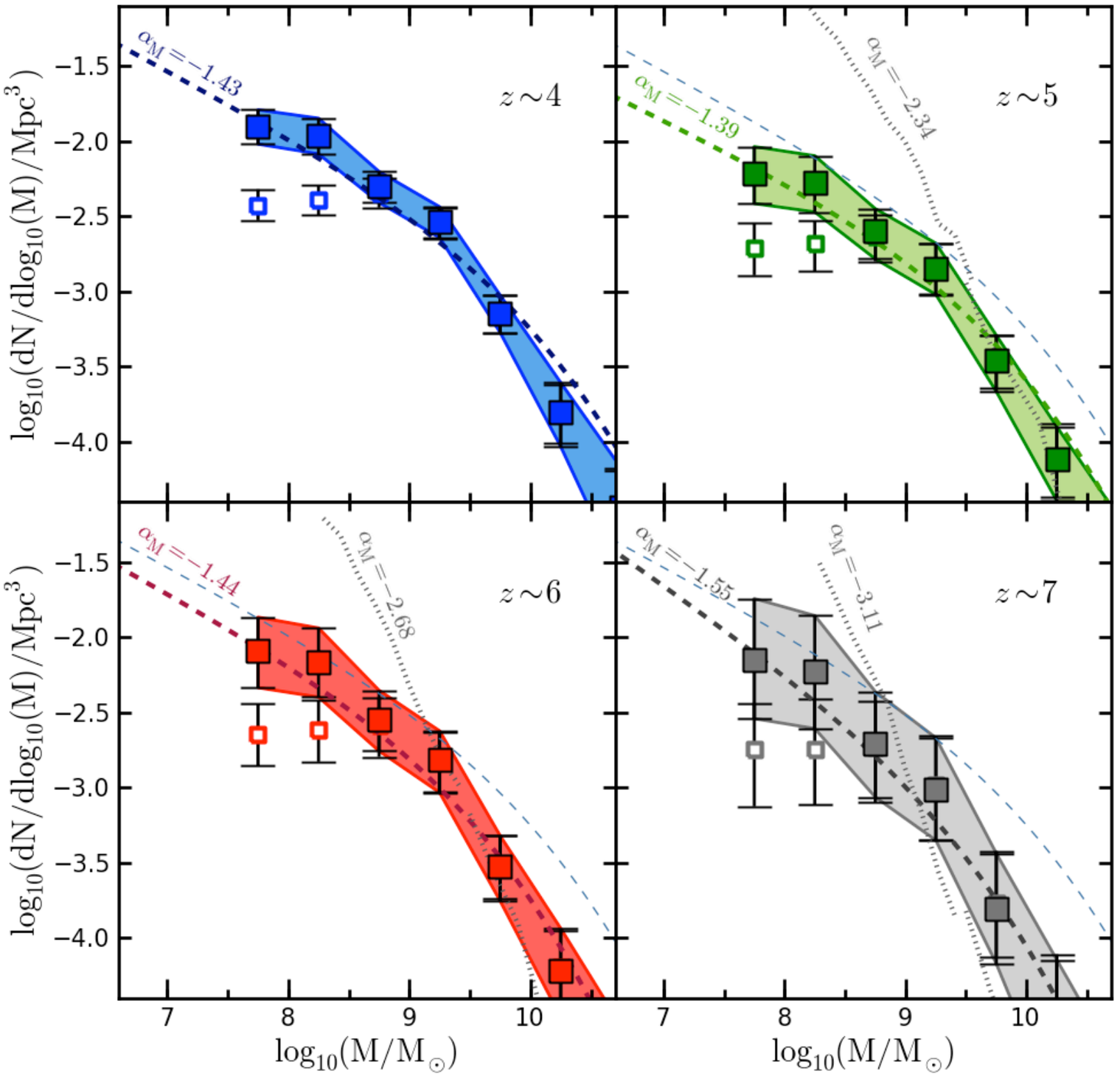




Gonzalez et al. in prep.

Photometric scatter could only account for 0.14 (0.34) dex at M_{1500} = -20 (-19)

The Stellar Mass Functions at z≳4



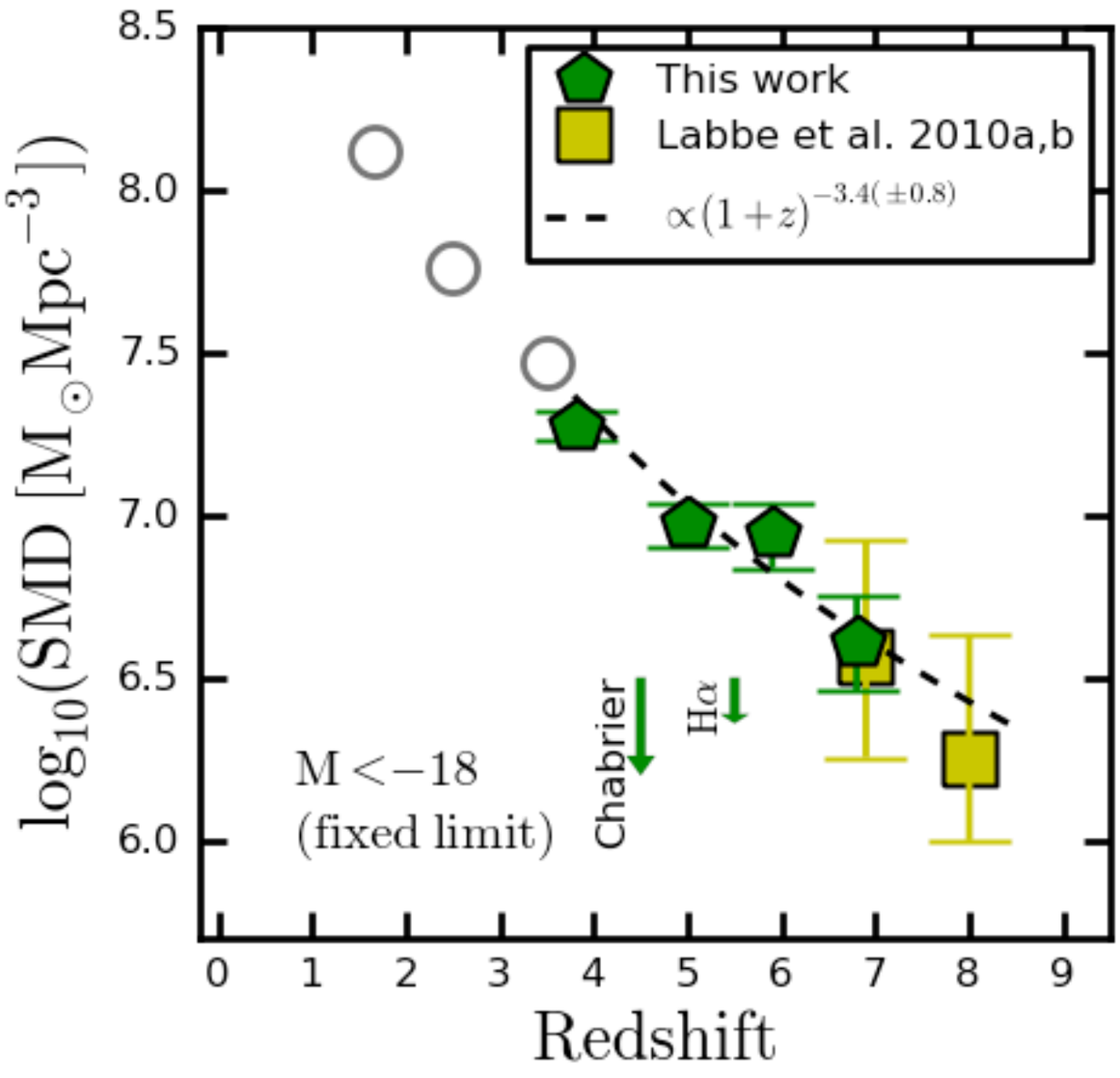
Gonzalez et al. in prep.

Completeness corrected low mass slopes:
$\alpha_{MF} \sim -1.4 - -1.55$

Luminosity Function slopes:
$\alpha_{LF} \sim -1.7 - -1.9$

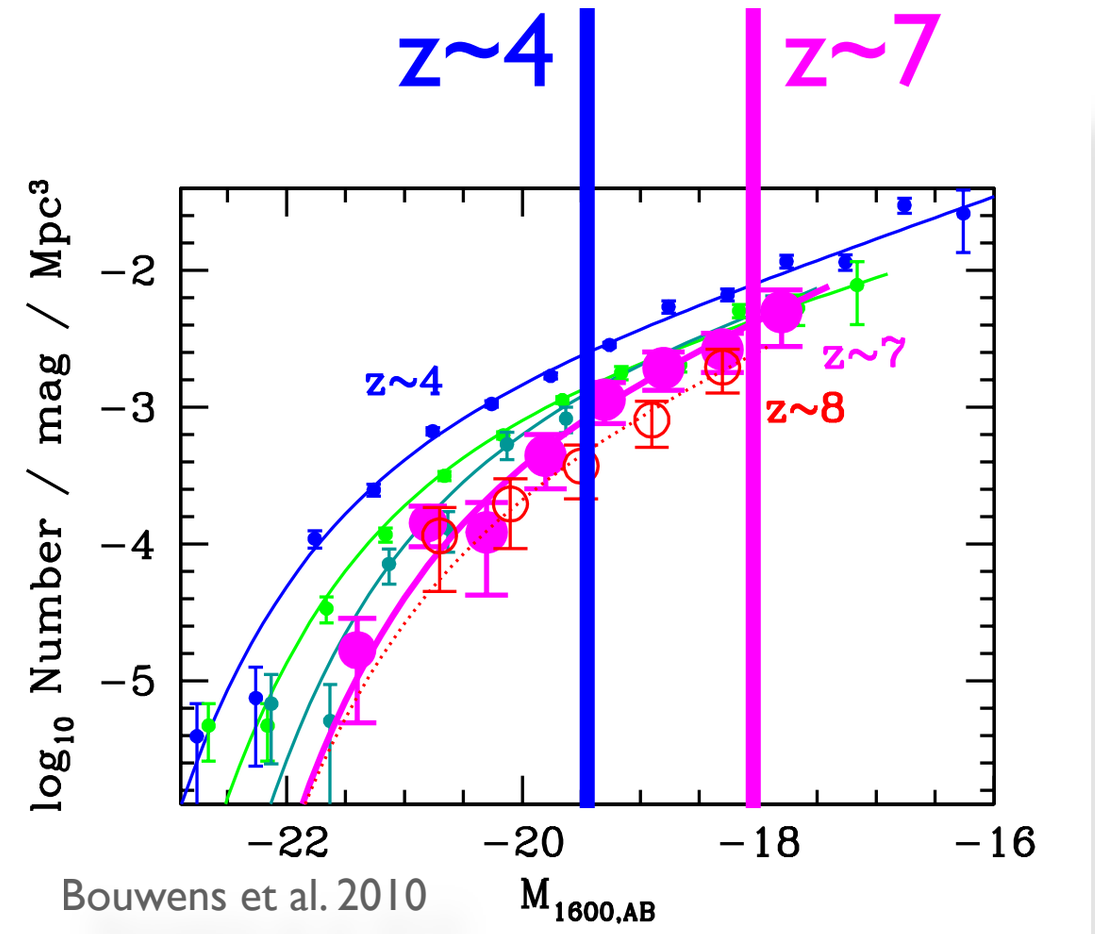
Choi & Nagamine 2010 simulations:
$\alpha_{MF} < -2.0$

The Stellar Mass Growth since z~8 (for galaxies brighter than M_{UV}=-18)



Gonzalez et al. in prep. + Marchesini et al. 2009

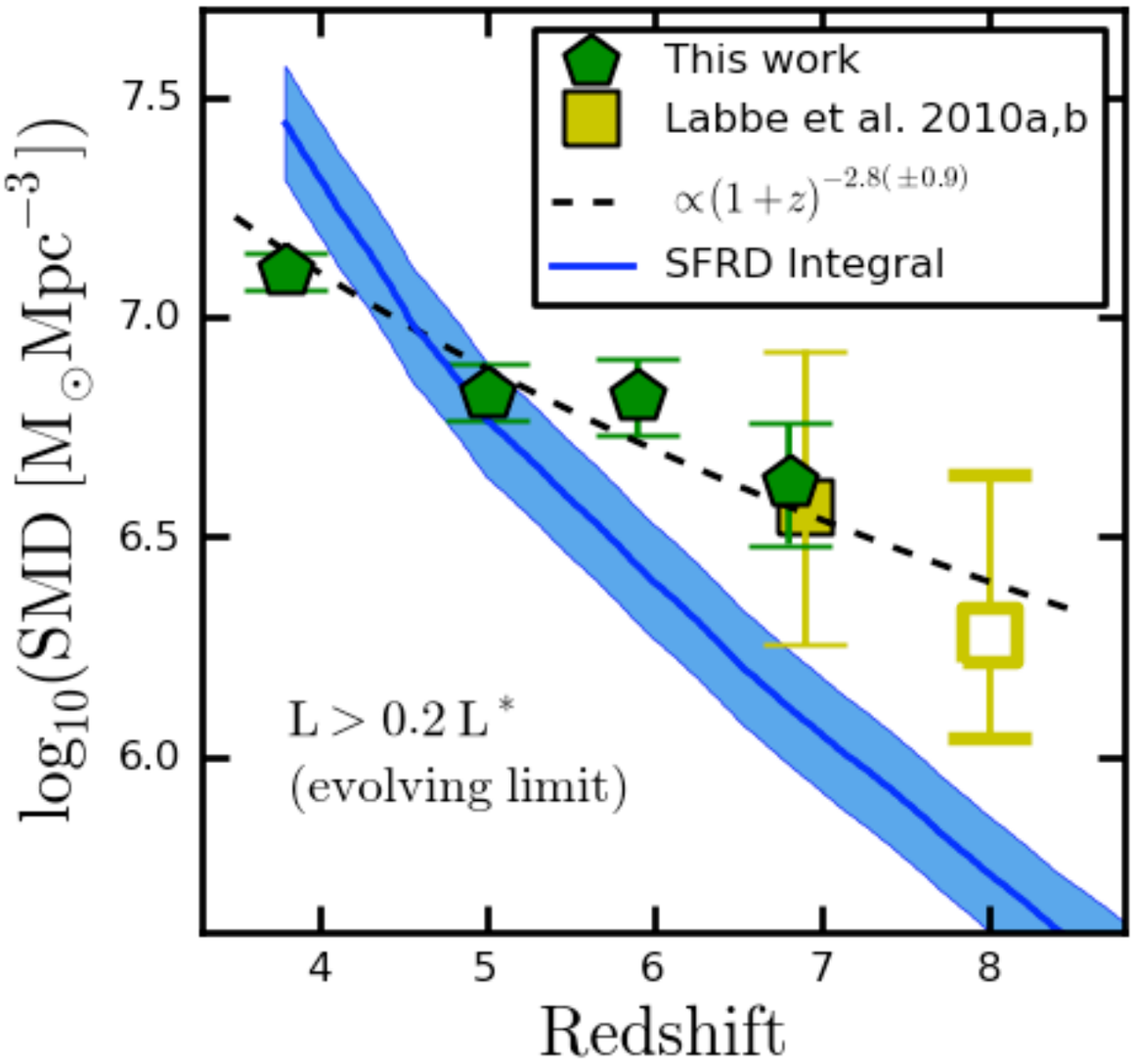
Track the evolution of *the same population from z~7 to z~4* and compare the predicted mass growth from the SFR density and the Stellar Mass growth determined from SED fits.



Bouwens et al. 2010

Follow the population to a relative limit of 0.2L*

Stellar Mass Growth from the MFs
vs.
Integral of the SFR density from the LFs



Gonzalez et al. in prep.

Summary

- Stellar Masses provide very important information to understand the way galaxies built up at early epochs
- The existence and apparent constancy of a Stellar Mass - L_{UV} relation suggests that galaxies used to grow up in a similar way
- The M-L_{UV} relation has a sizable intrinsic scatter.
- The slope of the relation suggests fairly steep MFs.
- The Stellar Mass Density derived from the MFs roughly agrees with expectations based on the estimated SFR of approximately the same population. Important differences remain.