LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

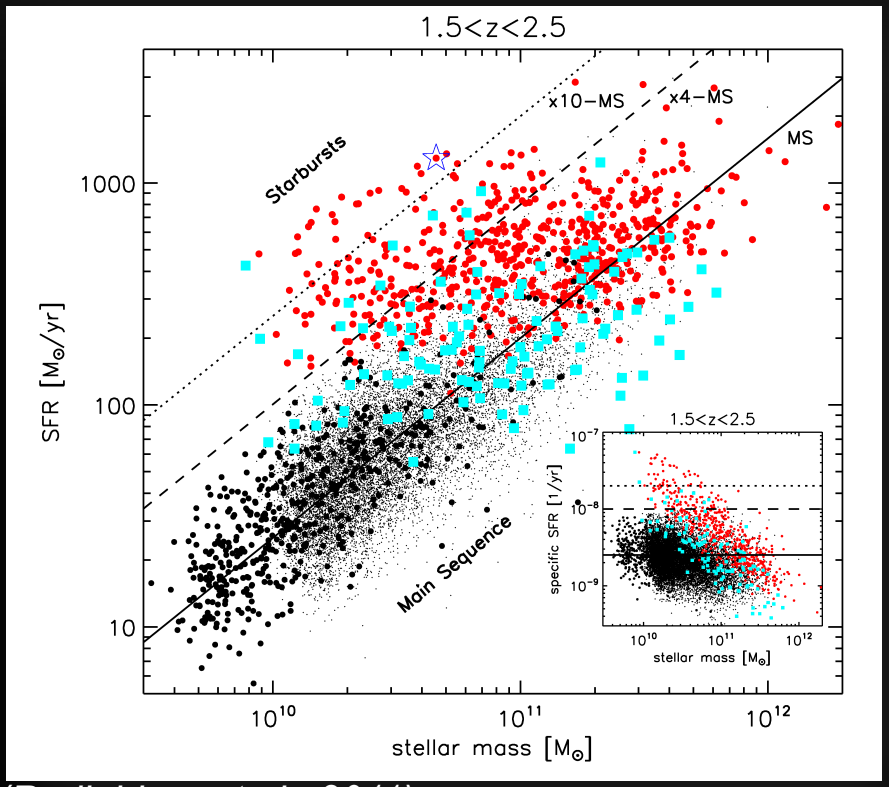
PROPERTIES OF MAIN SEQUENCE GALAXIES BEFORE AND AFTER MIGHTEE

Maurilio Pannella, Corentin Schreiber, David Elbaz, Frazer Owen

and the CANDELS+GOODS+Herschel folks

THE MAIN SEQUENCE PROPAGANDA

- log M_* ~ log SFR



(Rodighiero et al., 2011)

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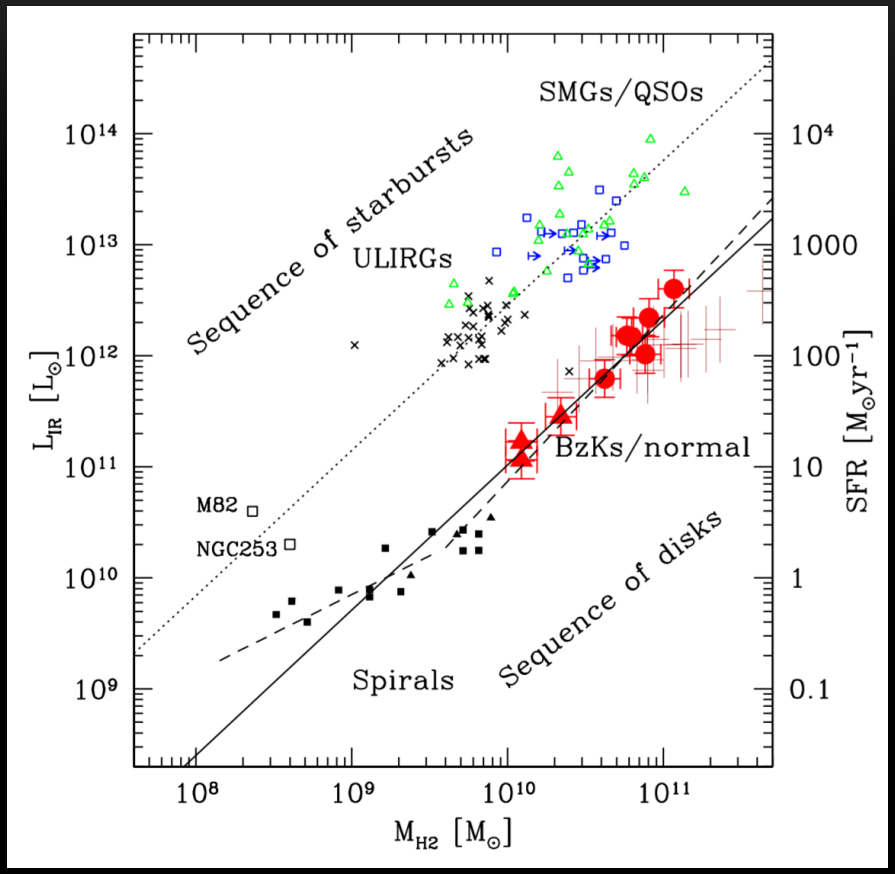

(Daddi et al., 2010)

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- Inefficient and long lasting conversion of gas in stars (1/SFE = M_{gas}/SFR ~ 1Gyr)

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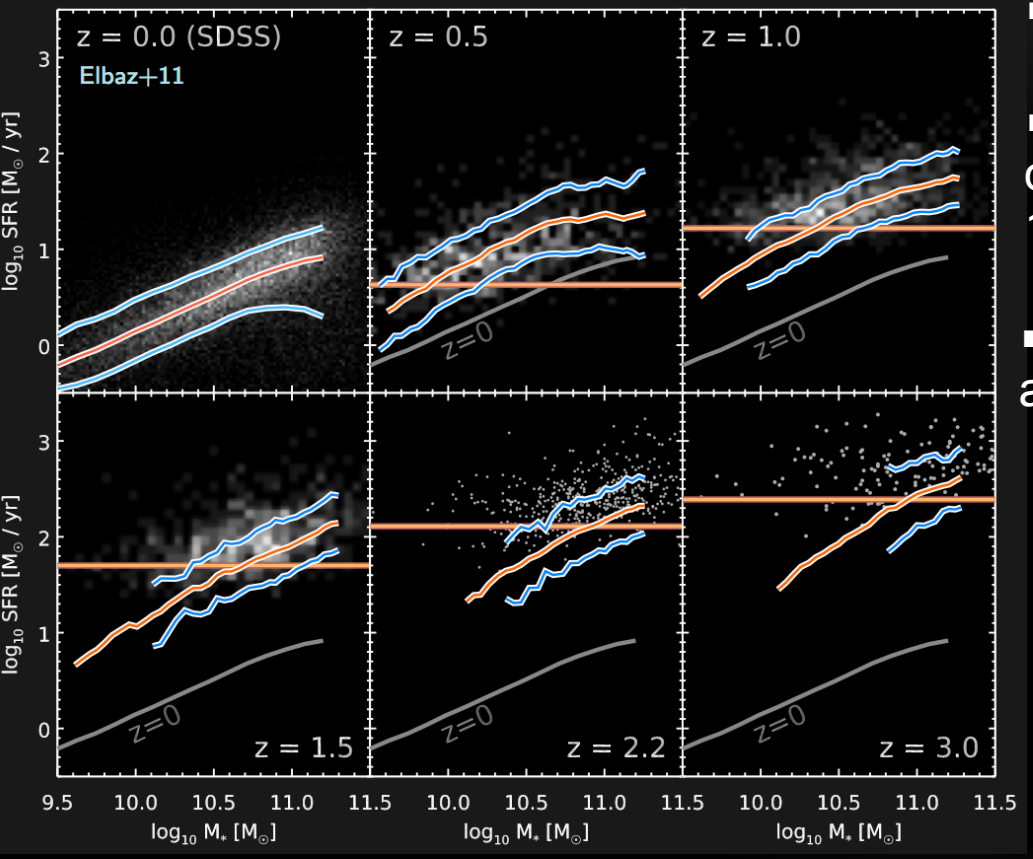

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- Scatter is ~0.3 dex at all stellar masses and all redshifts up to z~3

(Schreiber, MP et al., 2015)

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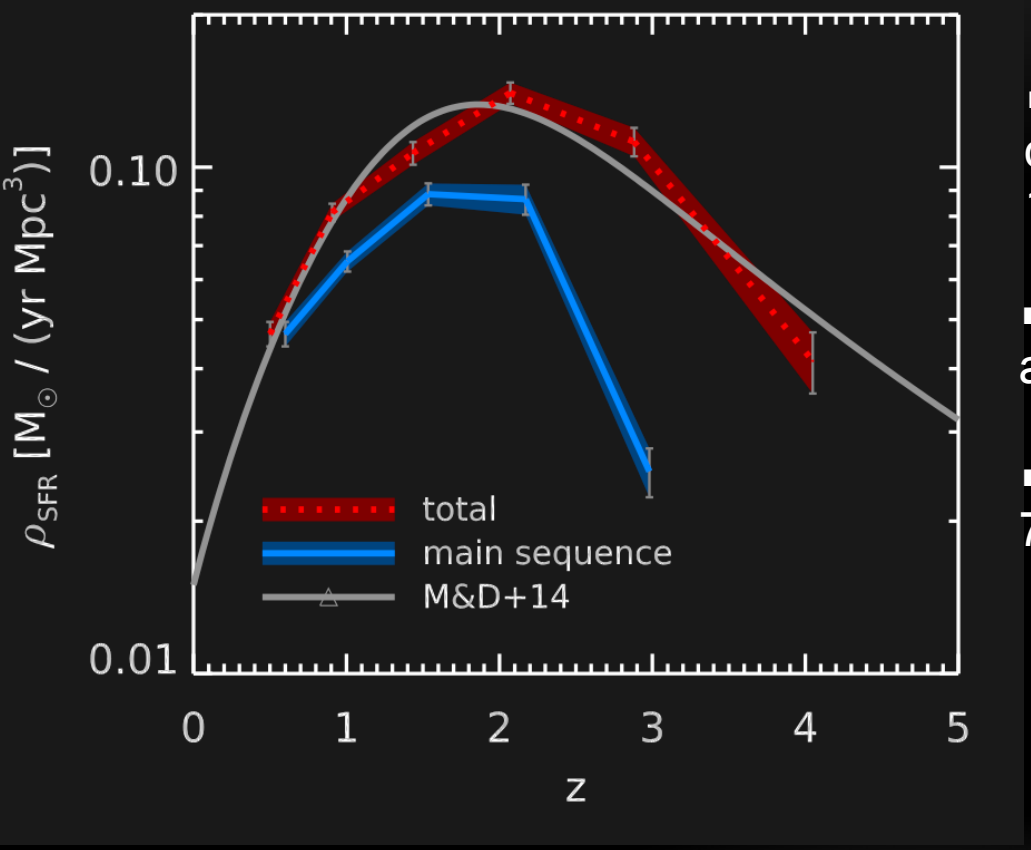

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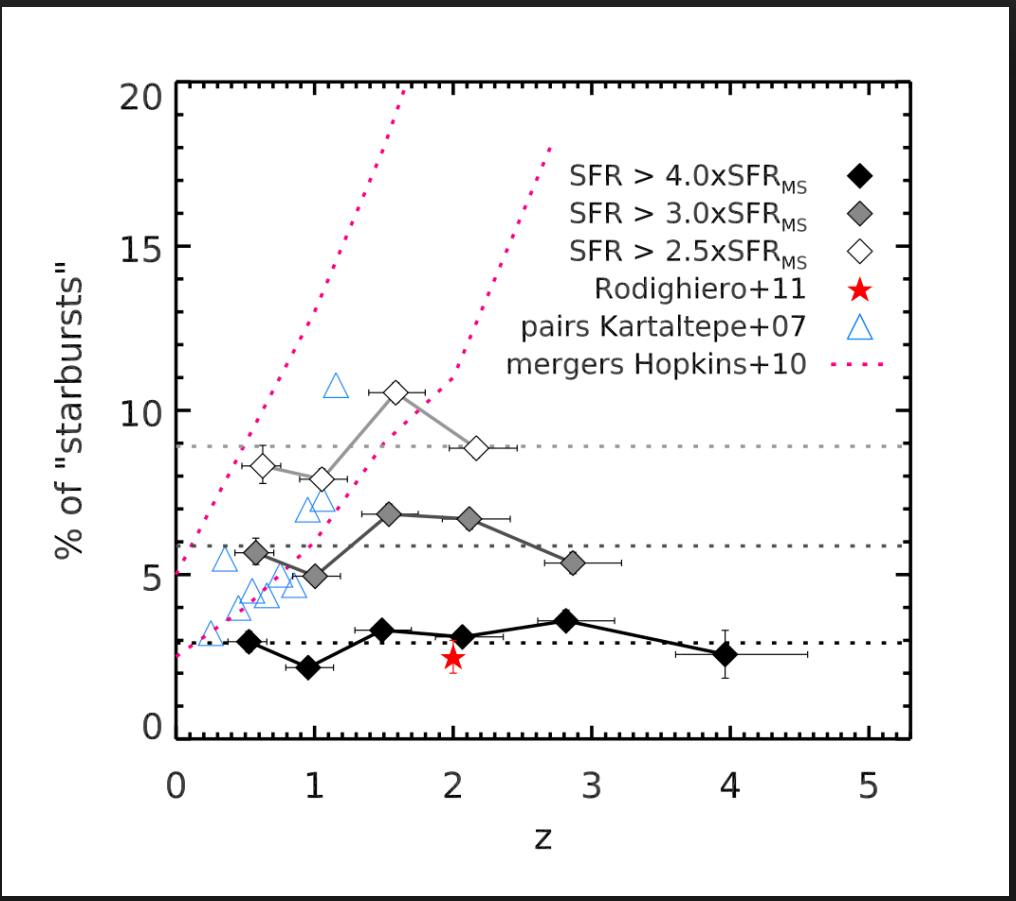

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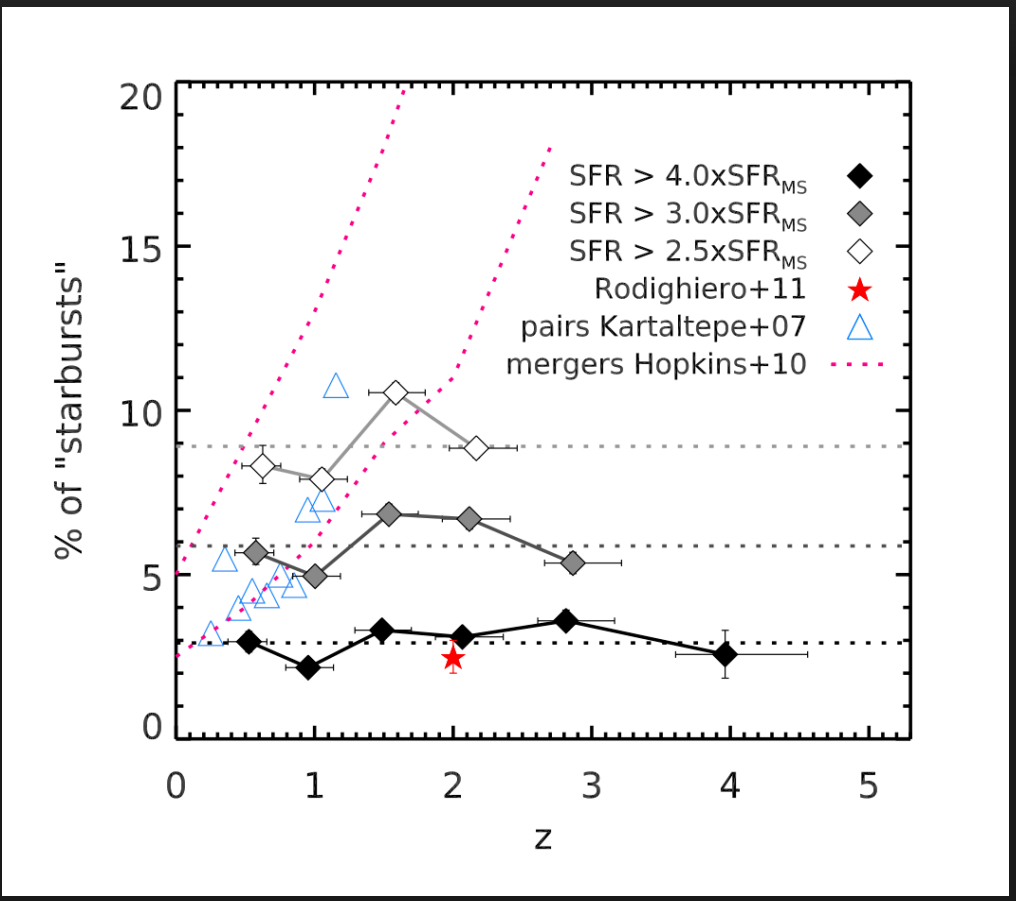

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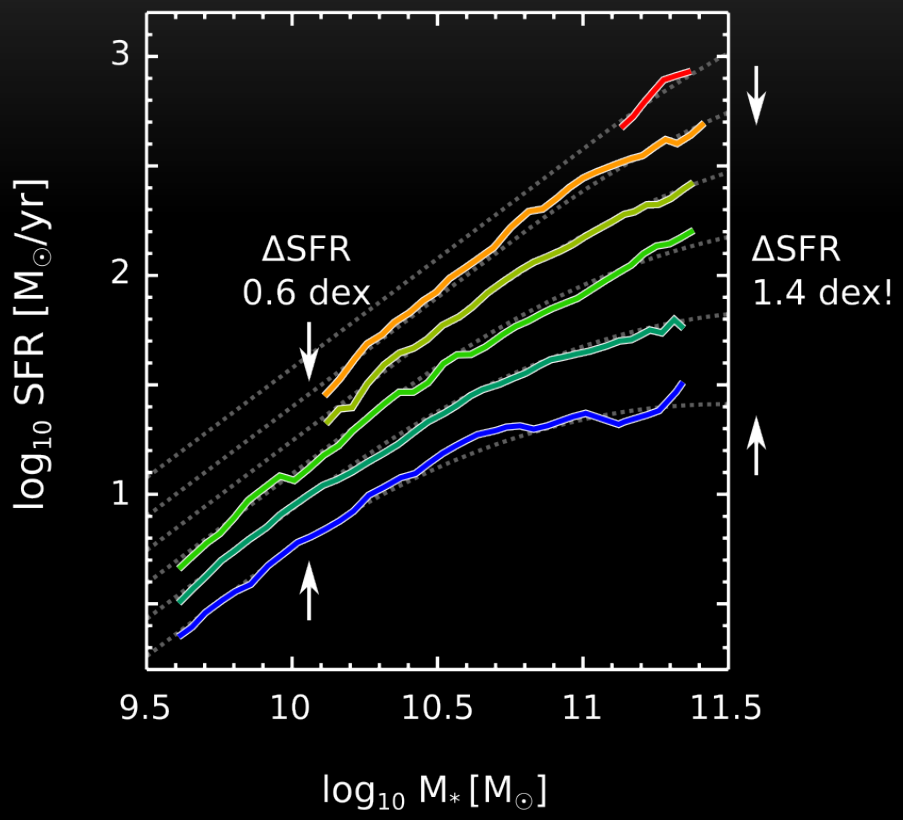
- **The Main Sequence is the dominant mode of star formation up to z ~ 3**

BEYOND THE PROPAGANDA: THE MAIN SEQUENCE BENDING



(Schreiber, MP et al., 2015)

- A varying slope with redshift/mass

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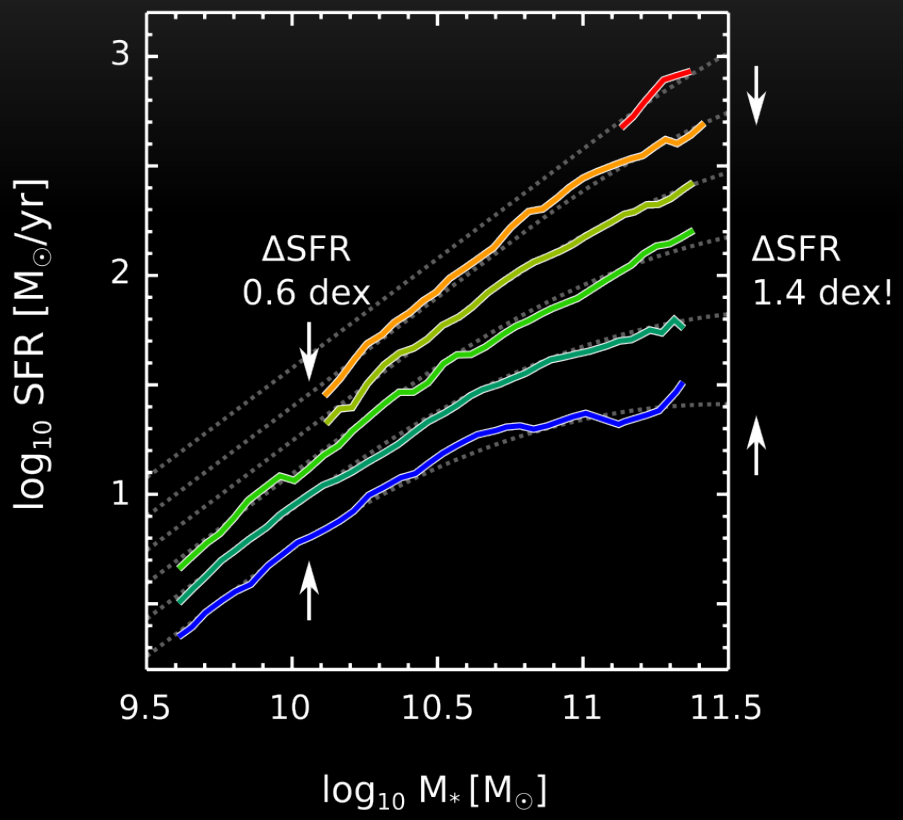

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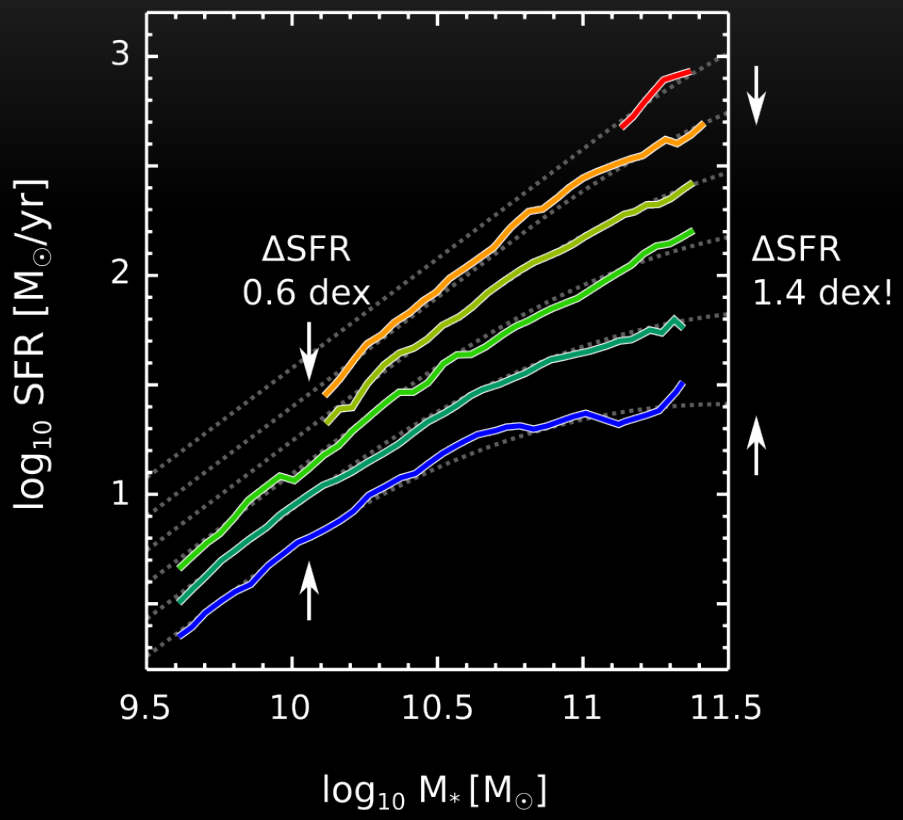

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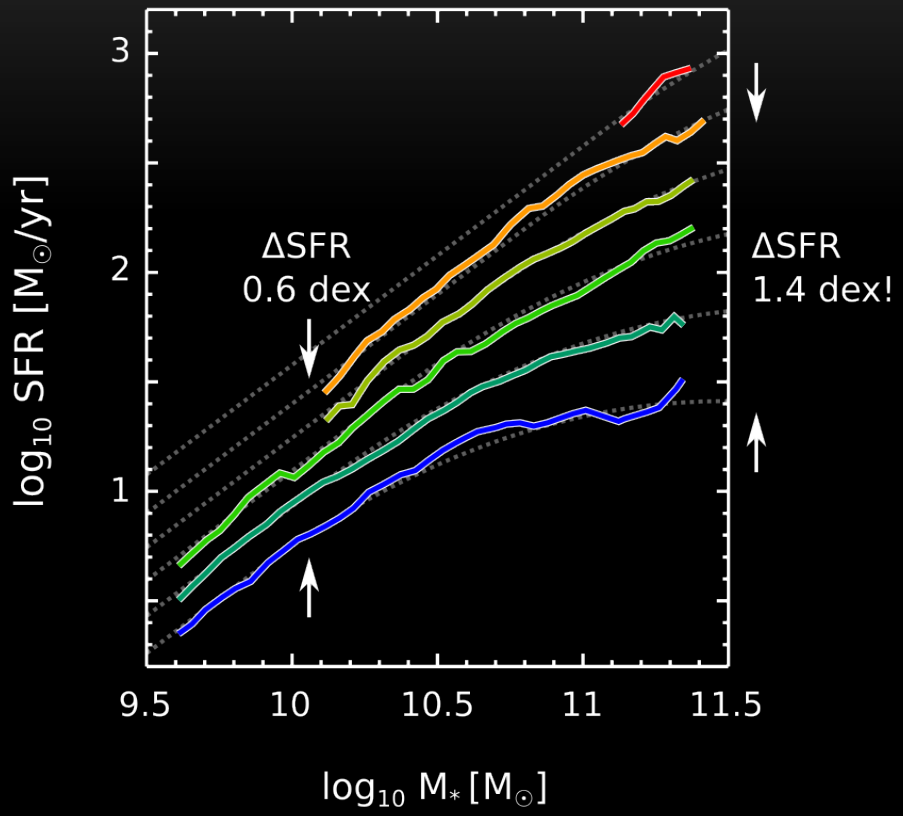
- Or a decreasing efficiency in converting gas to stars?

BULGES, DISKS AND GAS ON THE MAIN SEQUENCE



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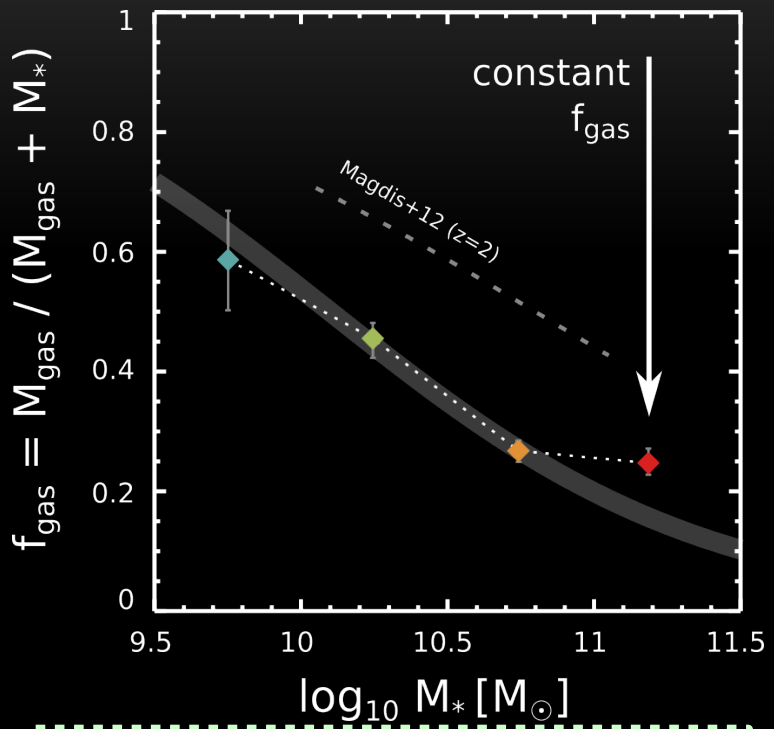

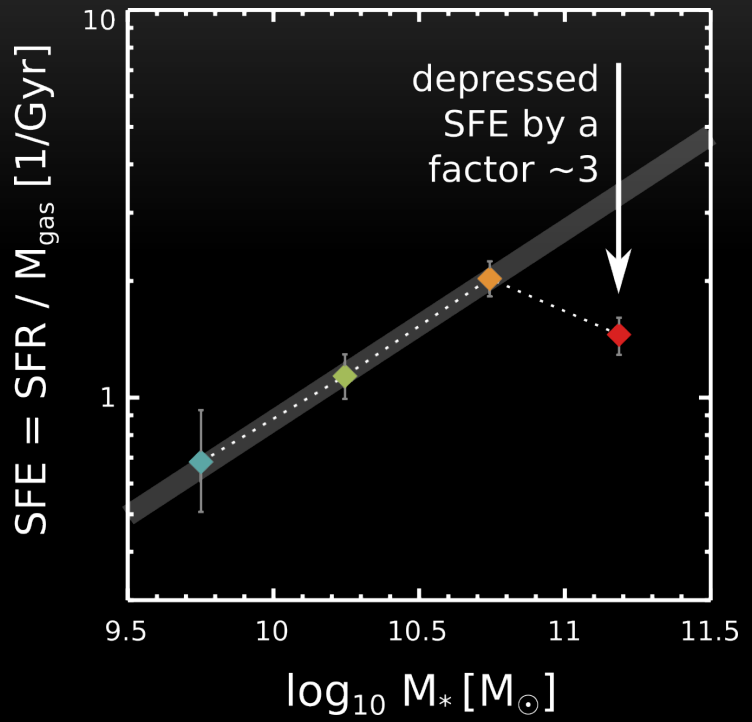

M_{gas} = (1/Z) x (1-f)/f x M_{dust}

Franco & Cox 86

Z: metallicity
FMR, Manucci+10

f: % of metals in dust
Leroy+08, Magdis+12

Assuming:

- single dust grain composition
- M* - SFR - Z relation
- fixed value of f

Cross-checked with HI+CO at z=0

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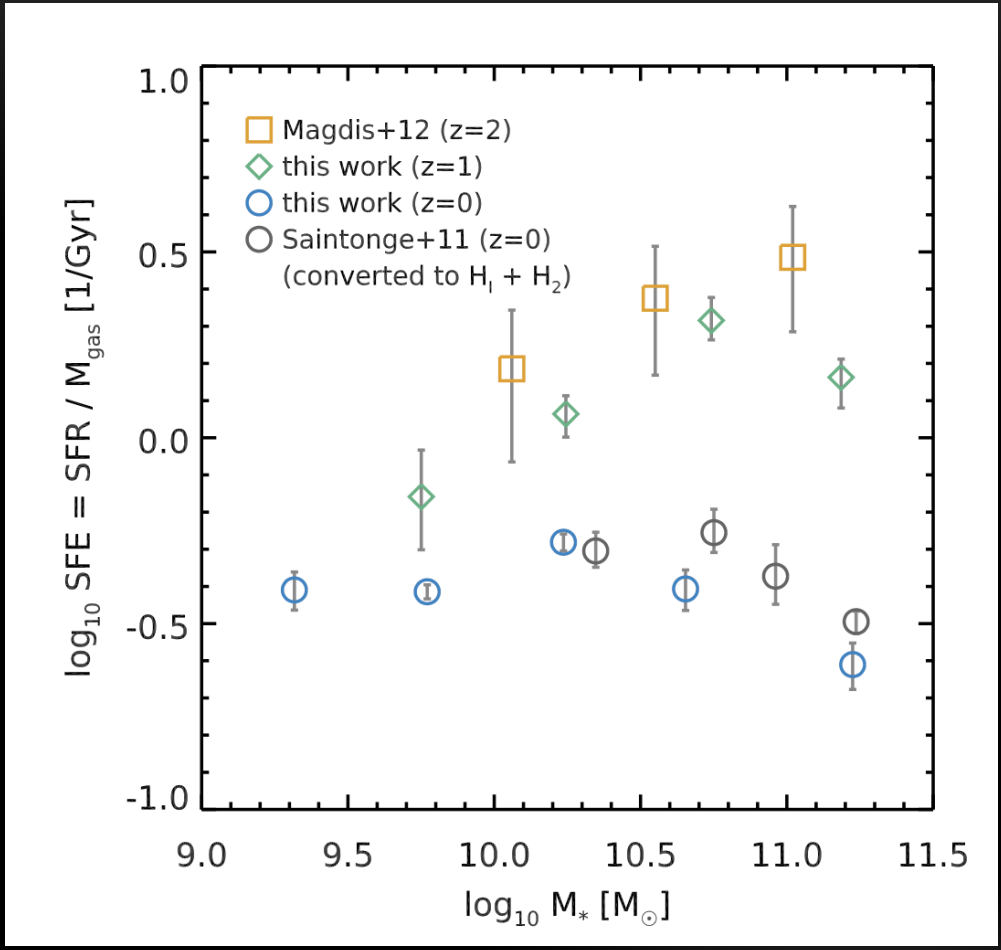
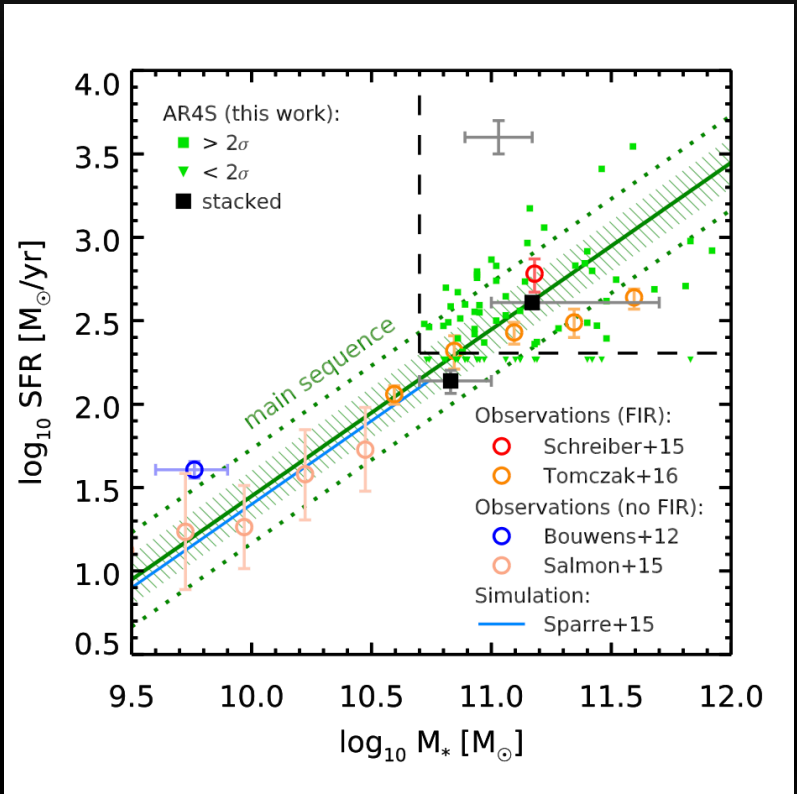


(Schreiber, Elbaz, MP et al., 2016)

slow downfall **of SFE in massive galaxies!**

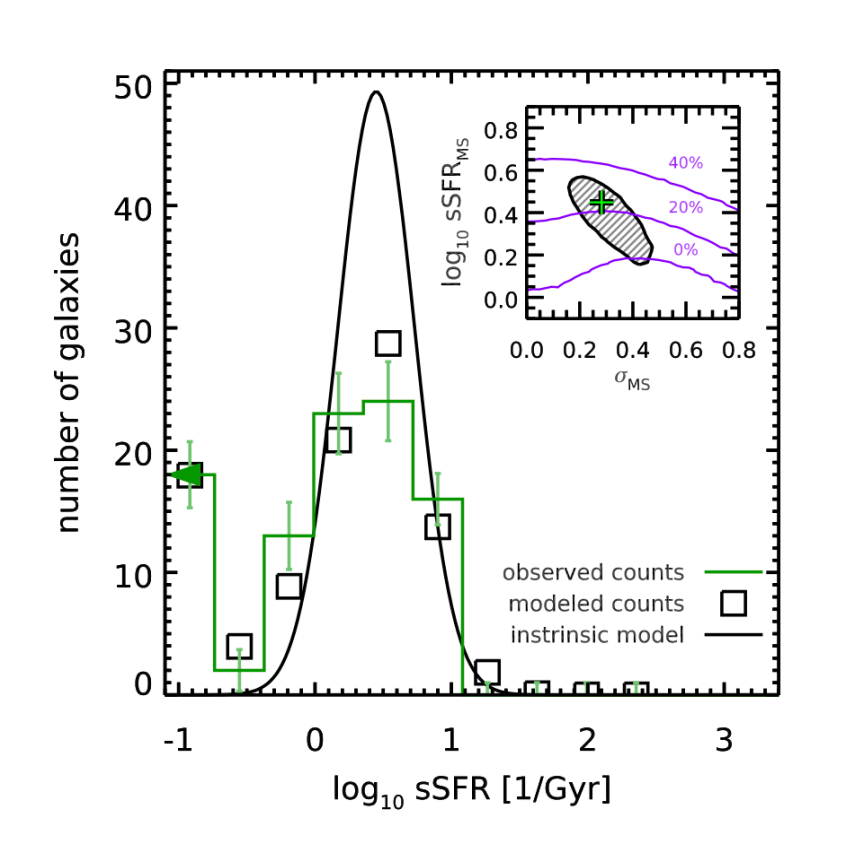
BEYOND THE PROGANDA: MOVING TO HIGHER REDSHIFT



- The high-mass end of MS in place !

(Schreiber, MP et al. 2017)

ALMA TO UNVEIL THE MS IN THE EARLY UNIVERSE

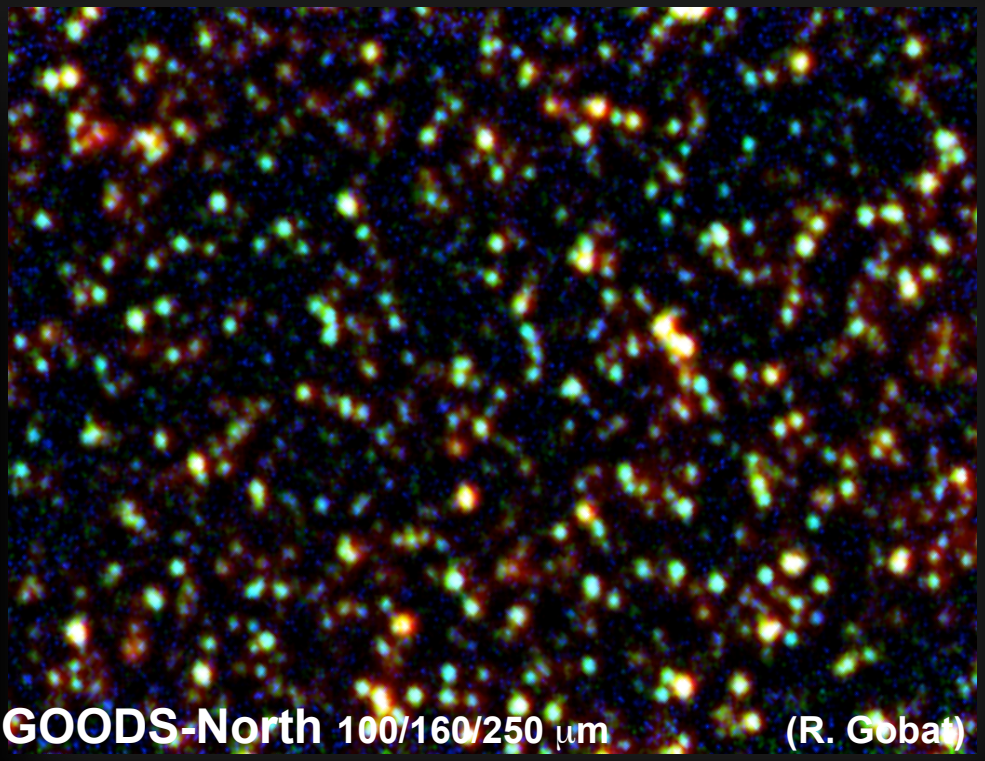


- The high-mass end of MS in place !
- Scatter is consistent with 0.3 dex

Most stars were forming in a MS "quiescent" mode already 1.5 Gyrs after the Big-Bang !

(Schreiber, MP et al. 2017)

RADIO CONTINUUM IN THE GOODS-NORTH SURVEY



An Open Time Key Program, P.I. D. Elbaz
The deepest IR images of the sky

GOODS-North 10'x15' – 154hrs
PACS 100/160 μm (1.1/2.6 mJy)
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1000 Herschel detections

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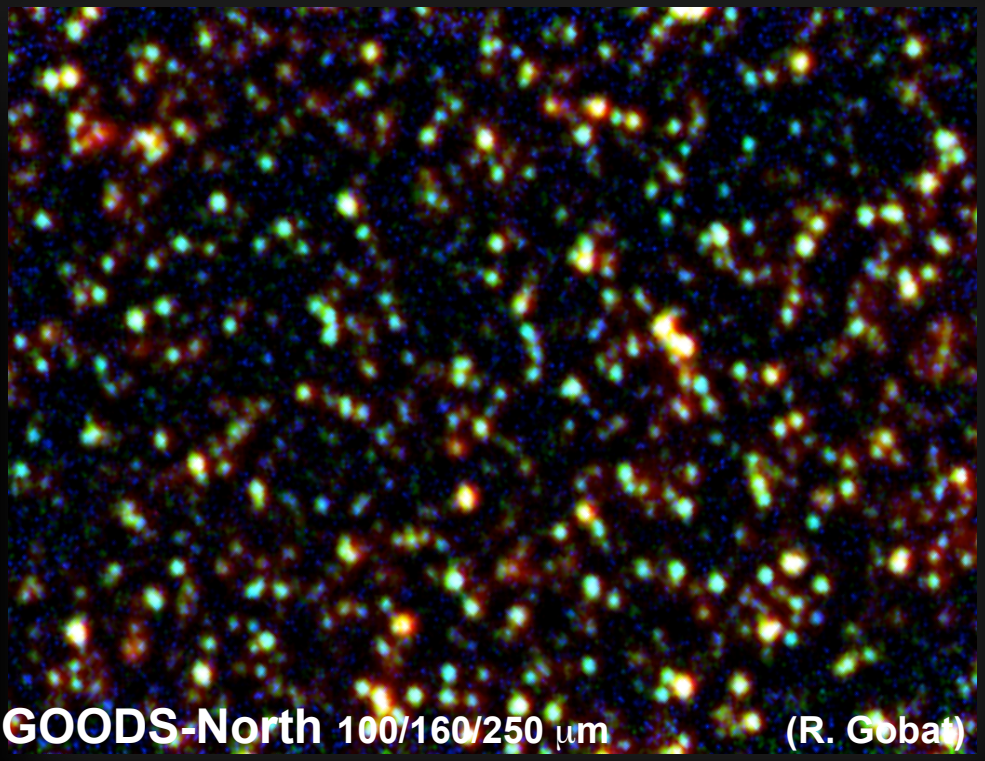

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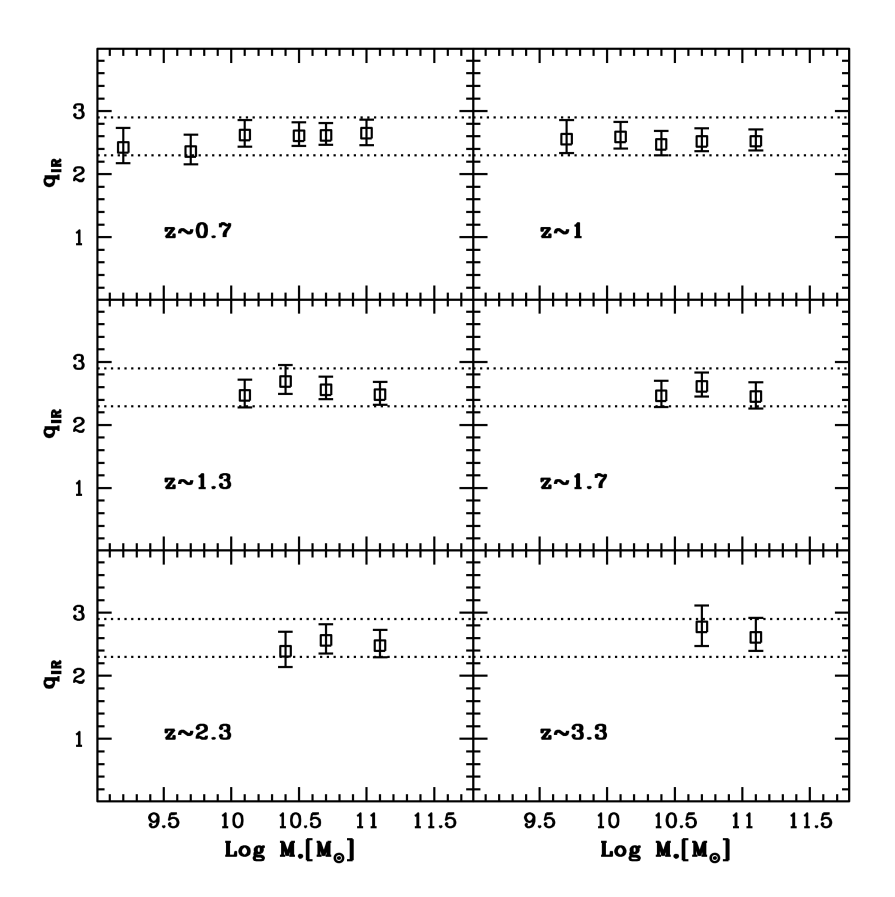
40 hours JVLA time, P.I. F. Owen
The deepest radio images of the sky

1.5 GHz single pointing
rms = 2.5 uJy/beam

900 JVLA detections

THE JVLA GOODS-NORTH SURVEY

THE RADIO-IR CORRELATION UP TO Z~4



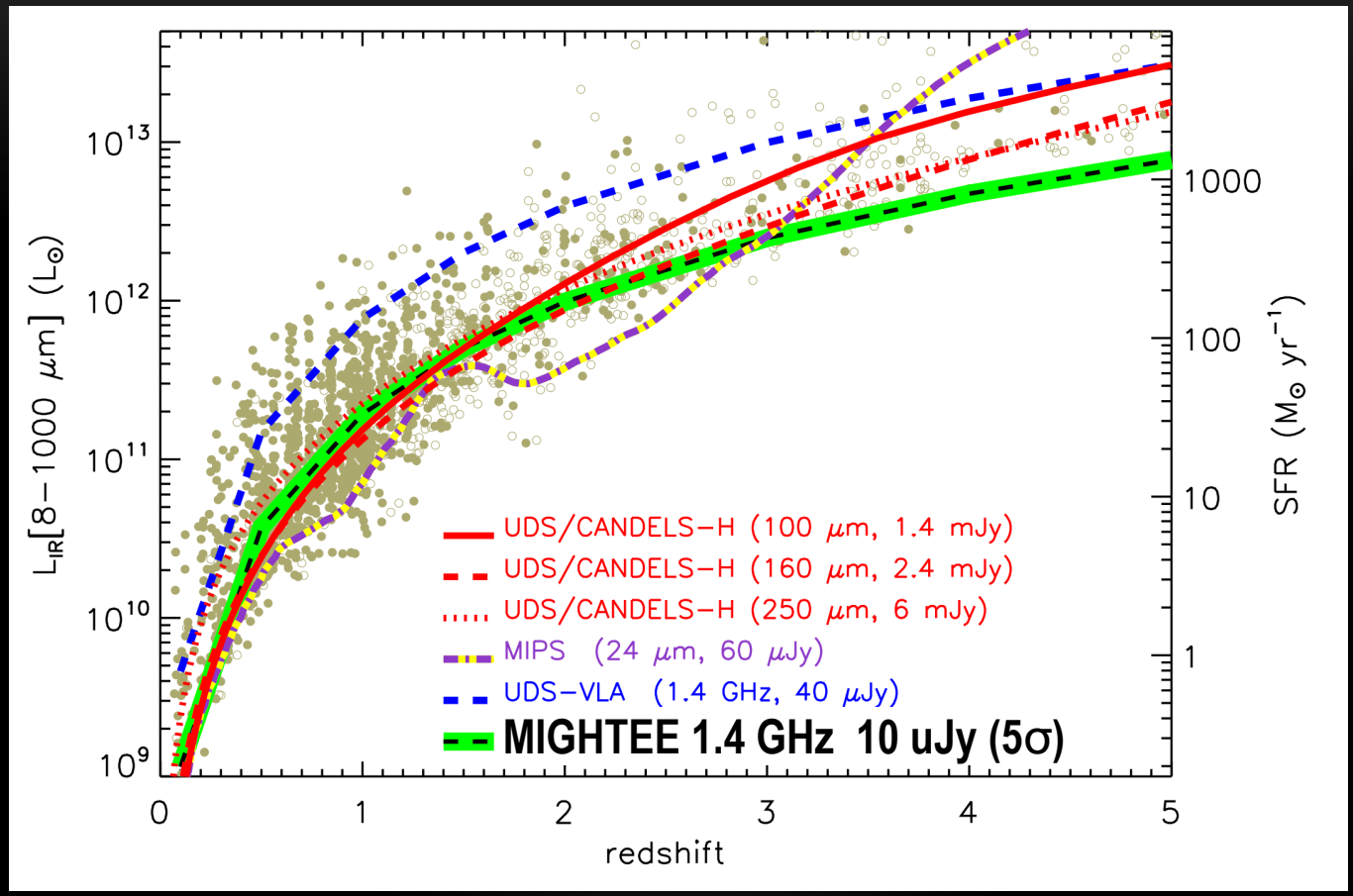
The correlation does not evolve !

B field increasing with redshift ?

Main Sequence galaxies keep their “similarity” but they are becoming more bursty with increasing redshift ?

(MP et al., 2015)

MIGHTEE: A CLEAN SHOT THROUGH THE DUSTY UNIVERSE



CONCLUSIONS AND OPEN QUESTIONS

We know many things about star-forming galaxies but

… the devil hides in the details !

Gaining a factor hundred in detections

Reach enough statistics on the high-mass end

Environmental effect on the MS

HI vs molecular gas content at different cosmic times

The radio-IR correlation and the evolution of magnetic field

The radio AGN population and the maintenance mode feedback