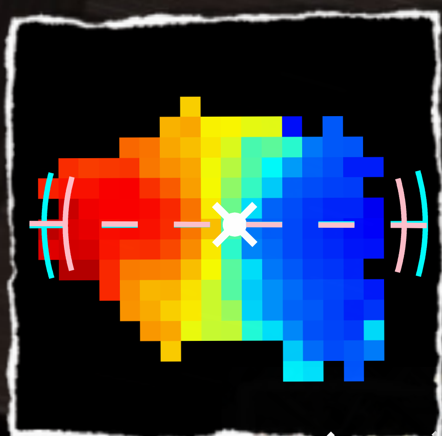
The growth of star forming galaxies at z = 1-2.5
A KMOS perspective

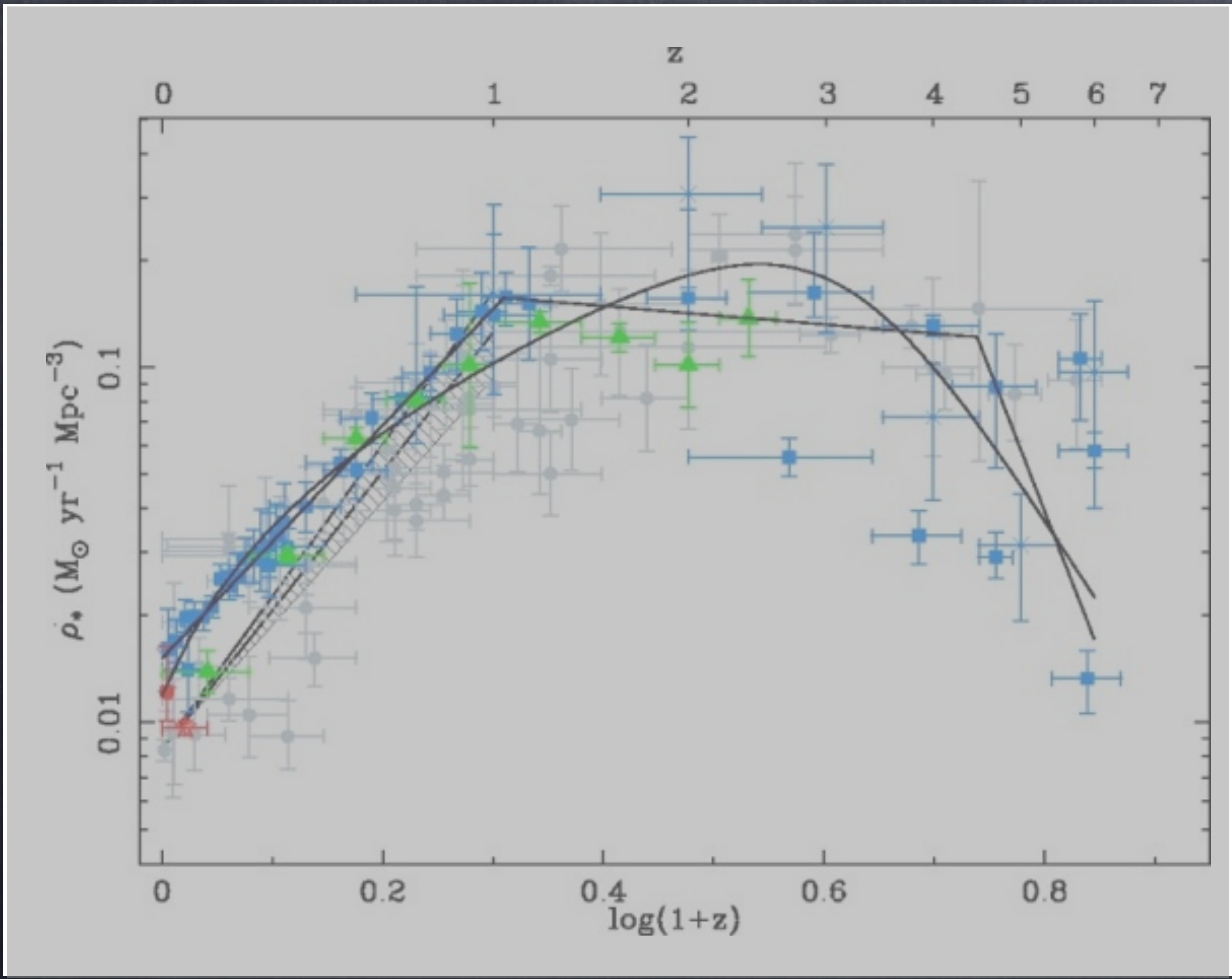


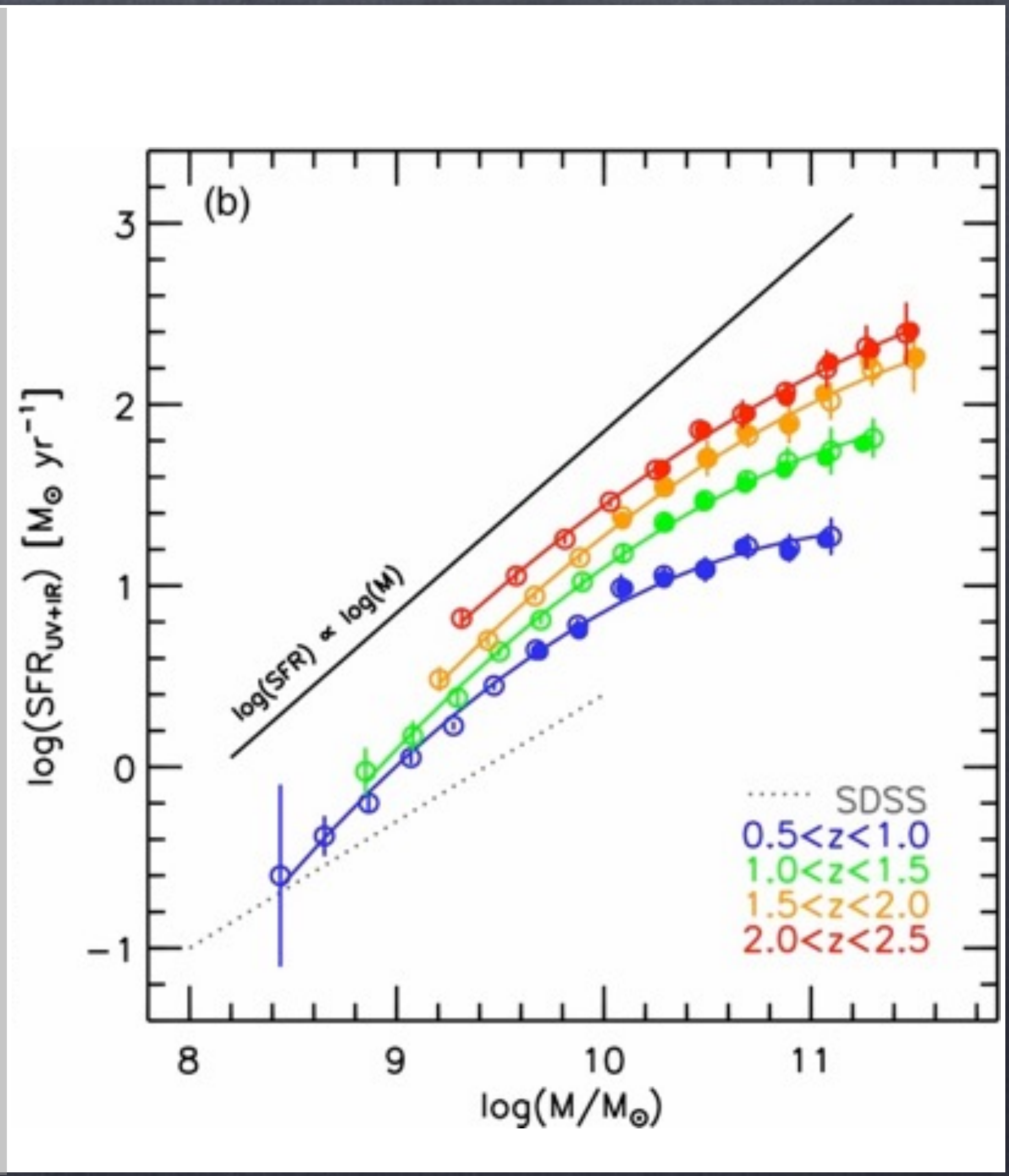
Matteo Fossati (USM/MPE)

N.M. Förster Schreiber, D. Wilman, K. Bandara, A. Beifiori, R. Bender, G. Brammer, J. Chan, R. Davies, A. Galametz, R. Genzel, S. Kulkarni, J. Kurk, P. Lang, D. Lutz, J.T. Mendel, I. Momcheva, E. Nelson , D.Rosario, R. Saglia, S. Seitz, L.J. Tacconi, P. van Dokkum, E. Wisnioski, E. Wuyts, S. Wuyts, et al.

GDSF Chania - 28th May 2015

Cosmic Star Formation History (When)

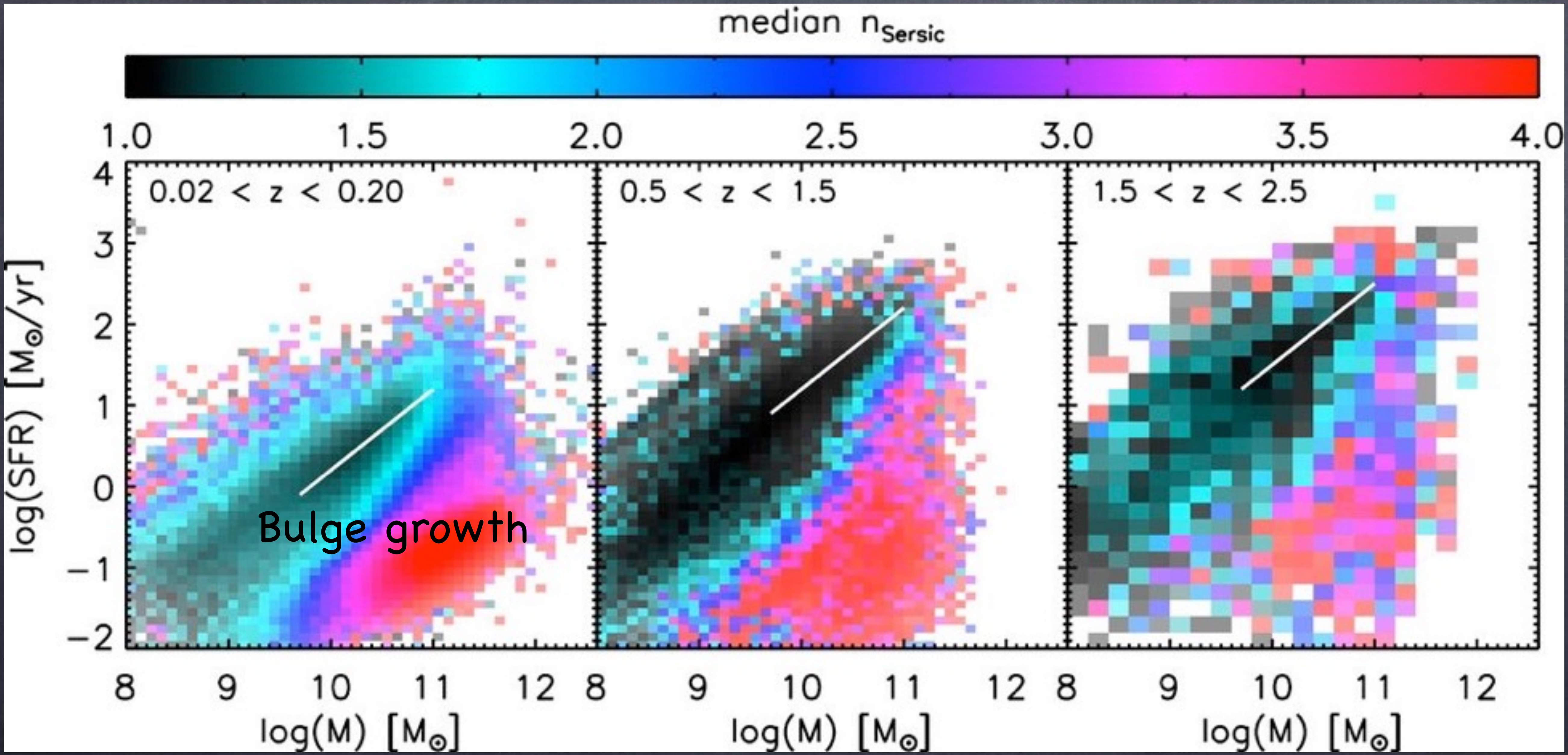




A. Hopkins & Beacom, 2006

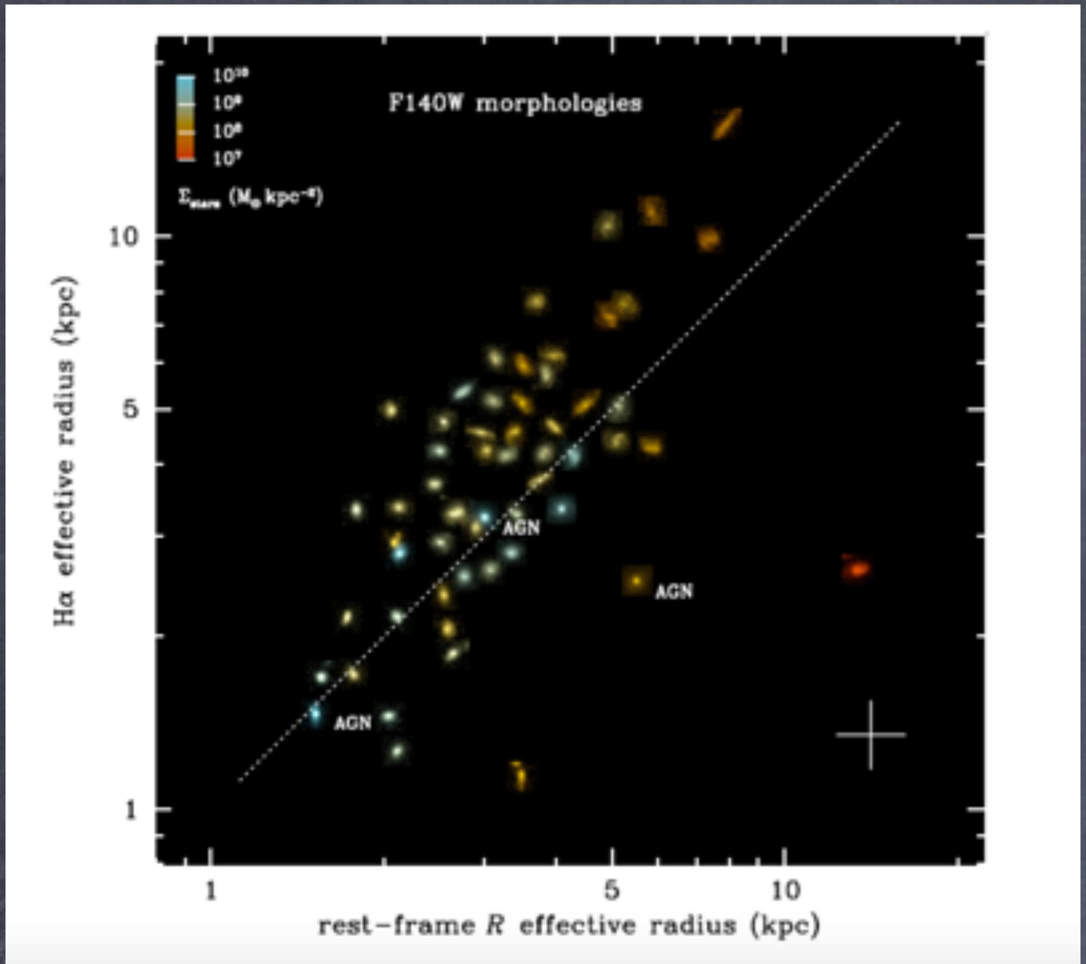
Whitaker et al. 2014

SFR and galaxy structure (Which)



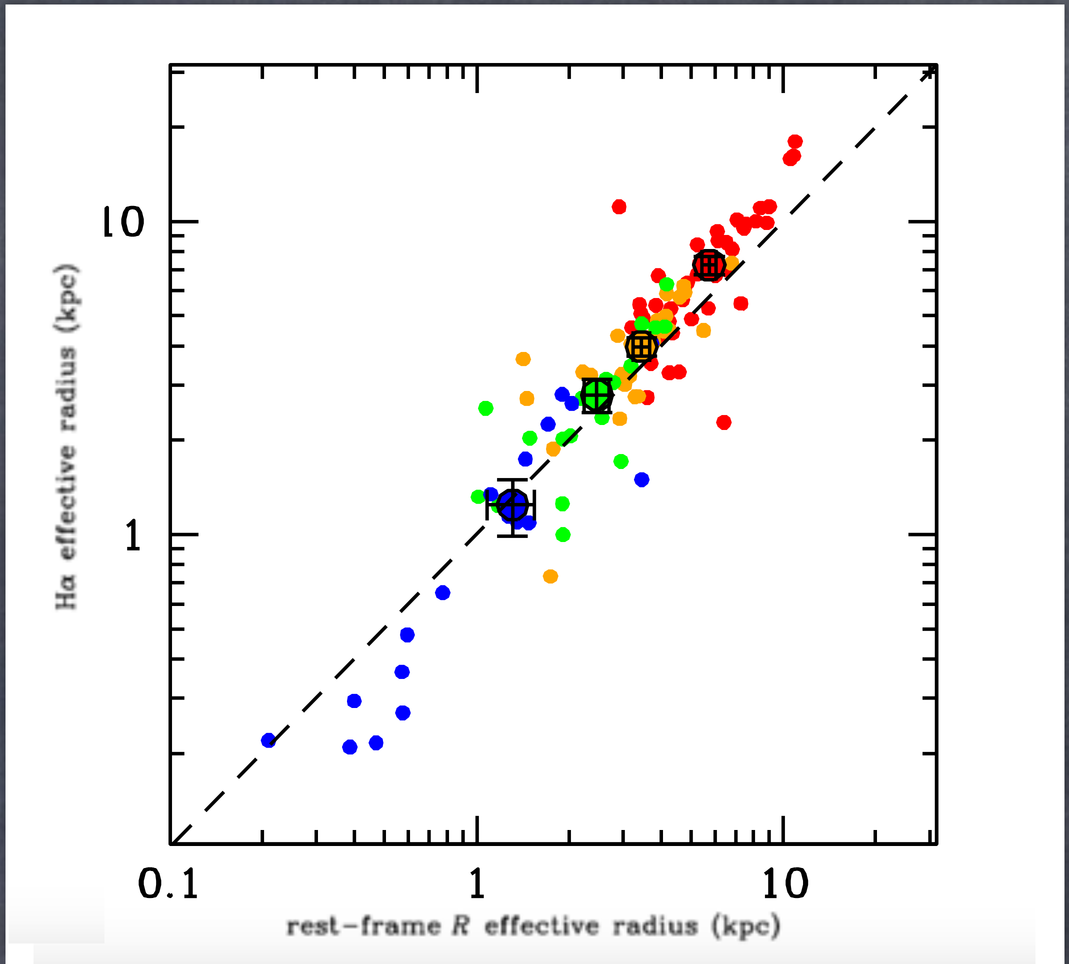
Wuyts et al., 2011 based on CANDELS, Herschel + SED fit

Size growth (Where)



Nelson et al. 2012

- 57 massive galaxies
- $0.8 < z < 1.3$
- From 3D-HST grism



Fossati et al. 2013

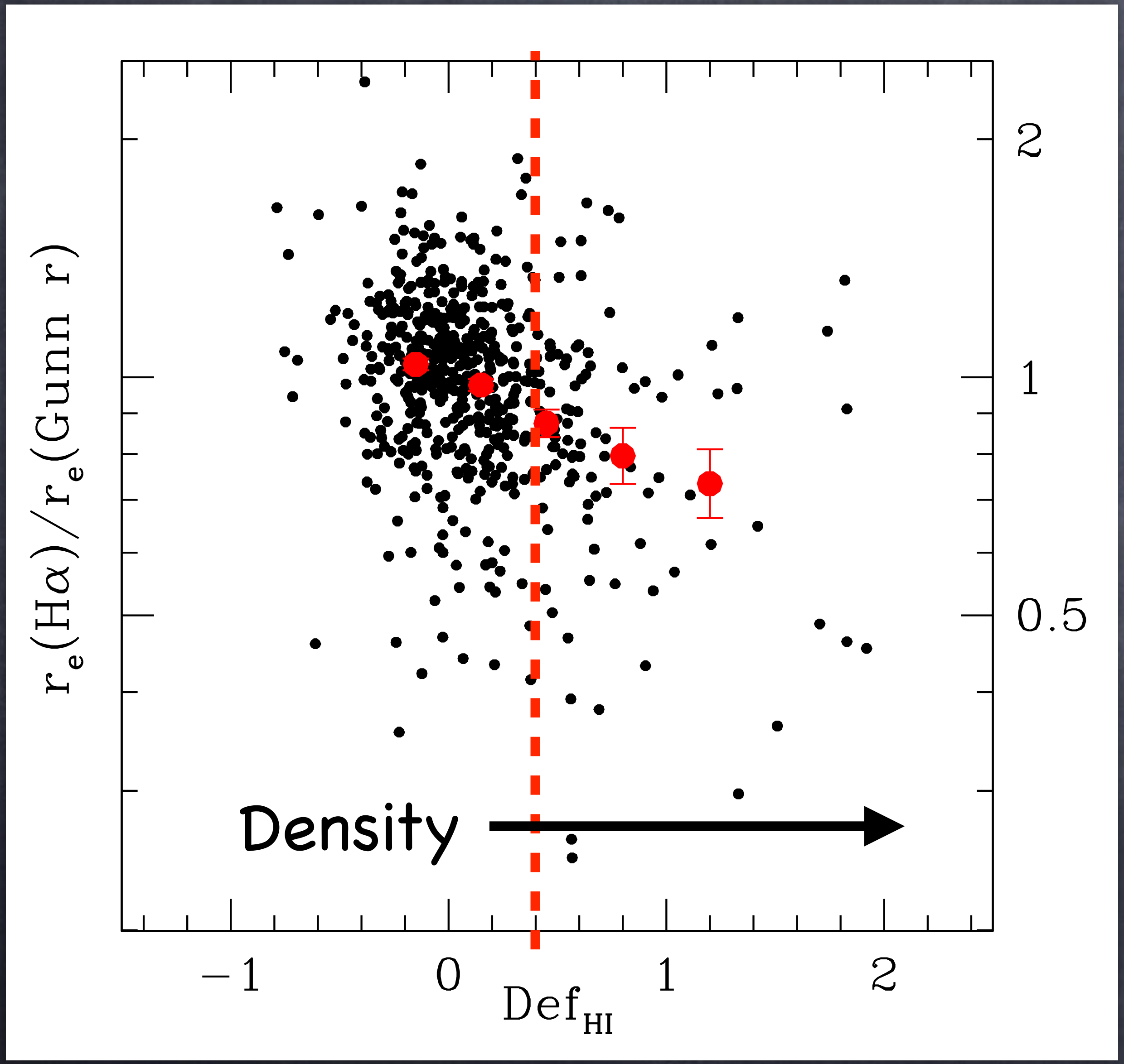
- Local Universe (z=0)
- From Ha + [NII] imaging

Hα + [NII] effective radius ~ 30% larger than R-band effective radius.

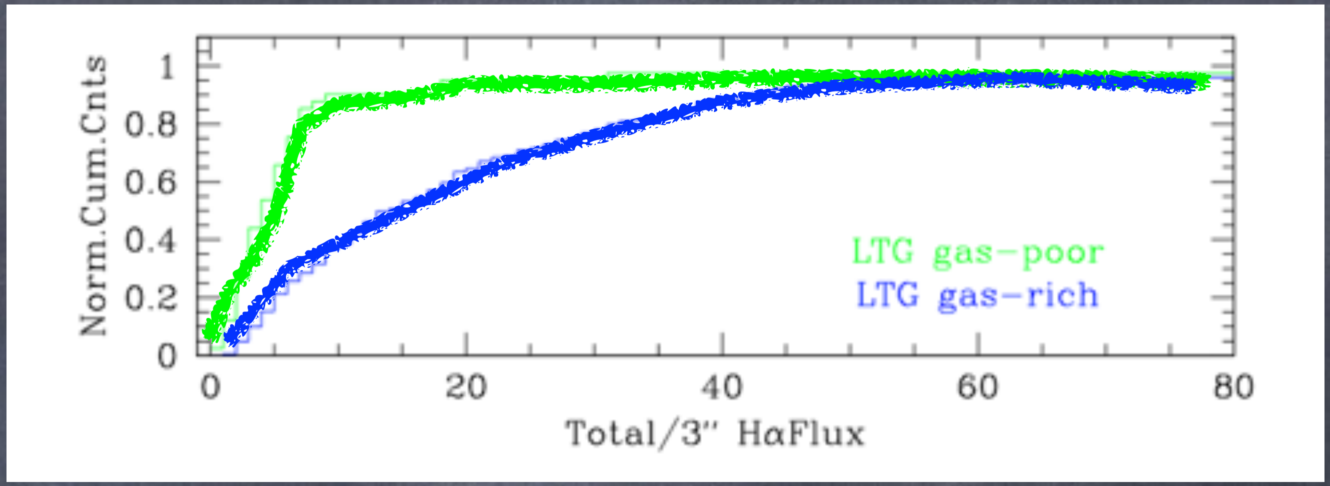
Ongoing growth of disks

The role of environment

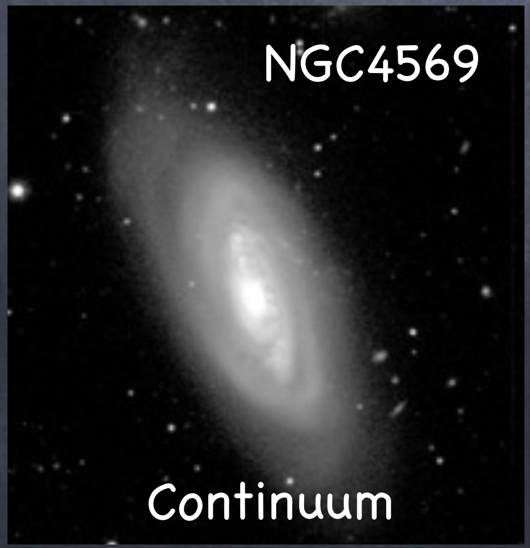
- Is the large scale environment playing a role on the growth efficiency and quenching of the star formation?



Fossati et al. 2013



Gavazzi et al. 2013



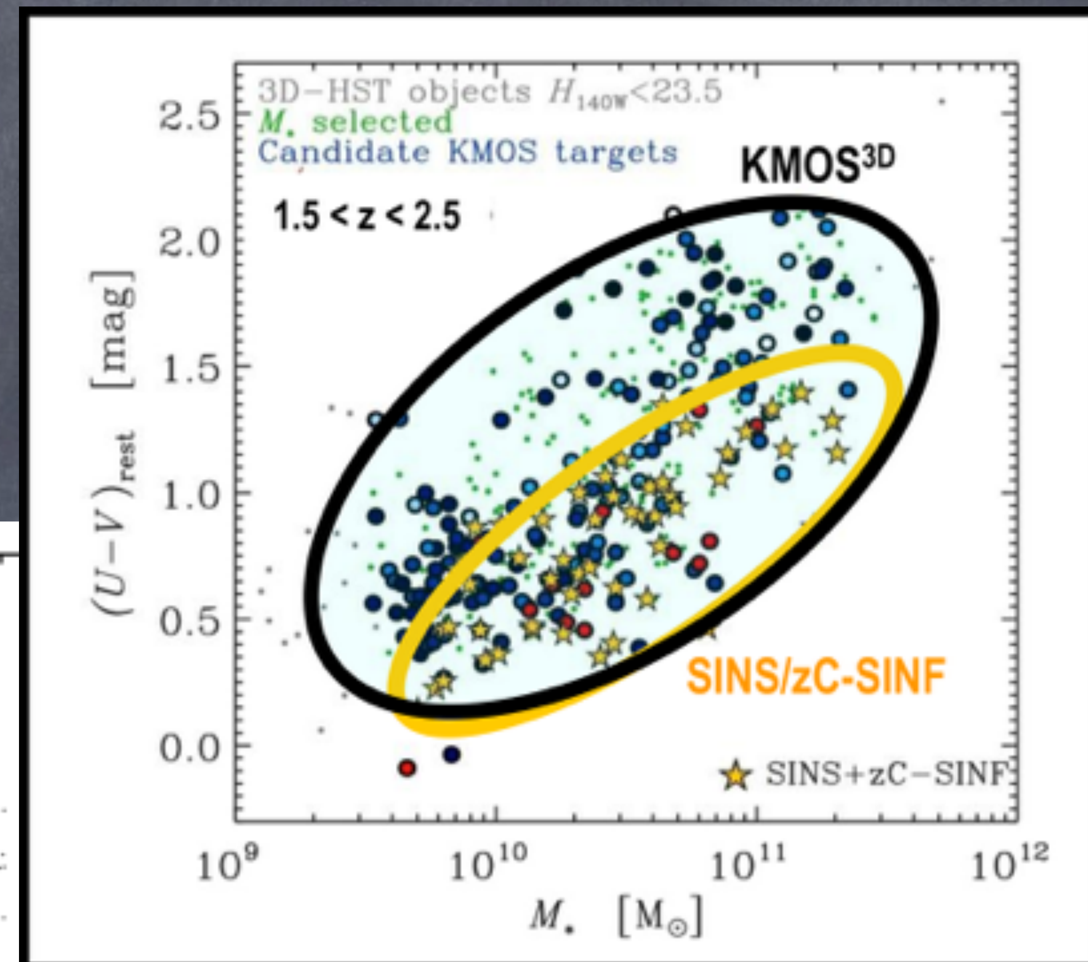
Disk truncation due to
Ram pressure stripping

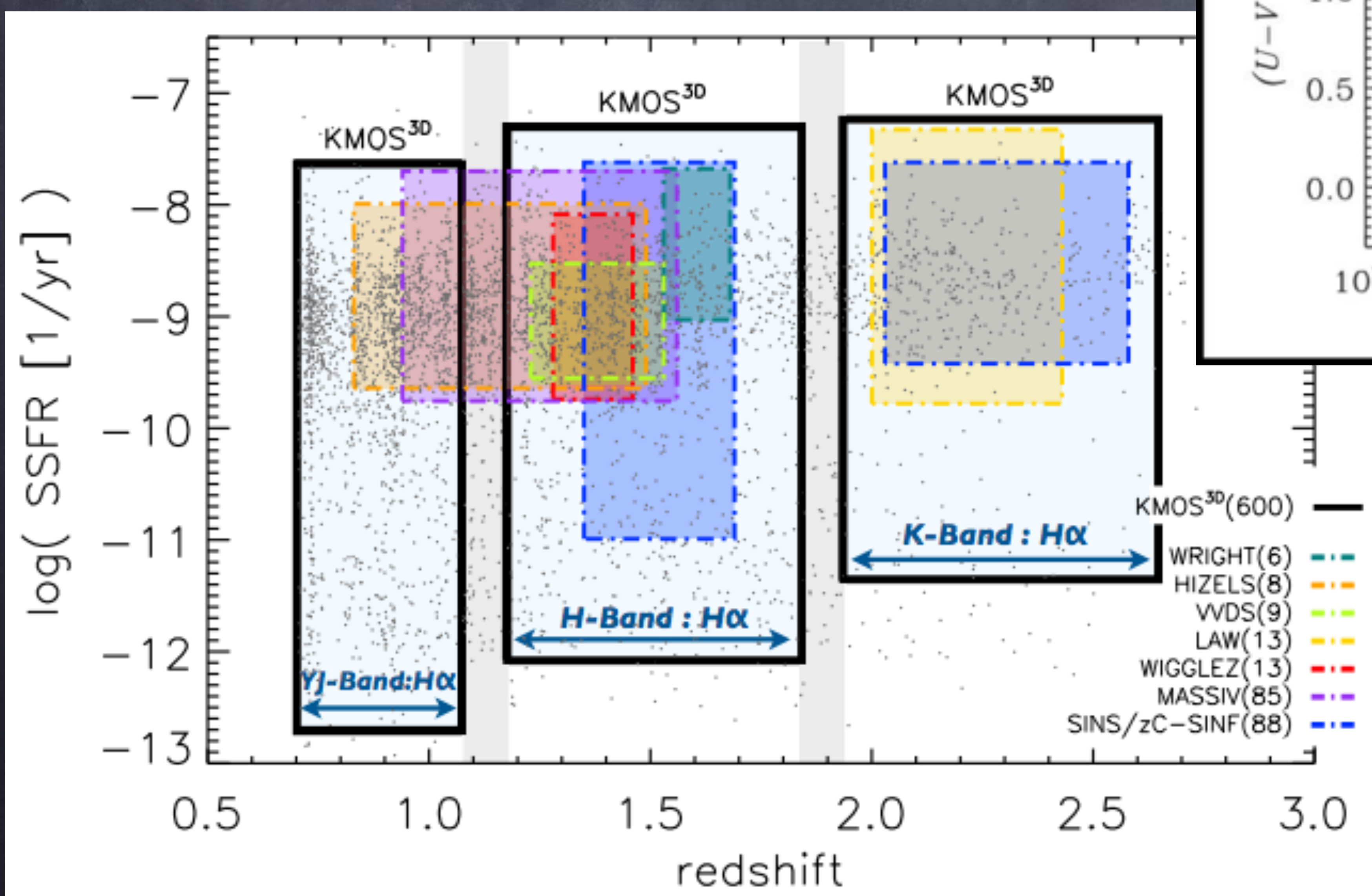
KMOS: a NIR Multi-Object IFU Spectrograph for the ESO VLT

Highly-multiplexed IFU: 24 pick-off arms, image slicing IFU, 7.2′ patrol field, IFU size 2.8″x2.8″ with 0.2″ pixels

KMOS^{3D}

- Mapping Hα+[NII] kinematics for a mass-limited sample of galaxies @ z=0.7-2.6
- Largest GTO Program: 75 nights
- PI / Co-PI: Förster Schreiber / Wilman
- YJ, H and K-bands with R~3400-3800



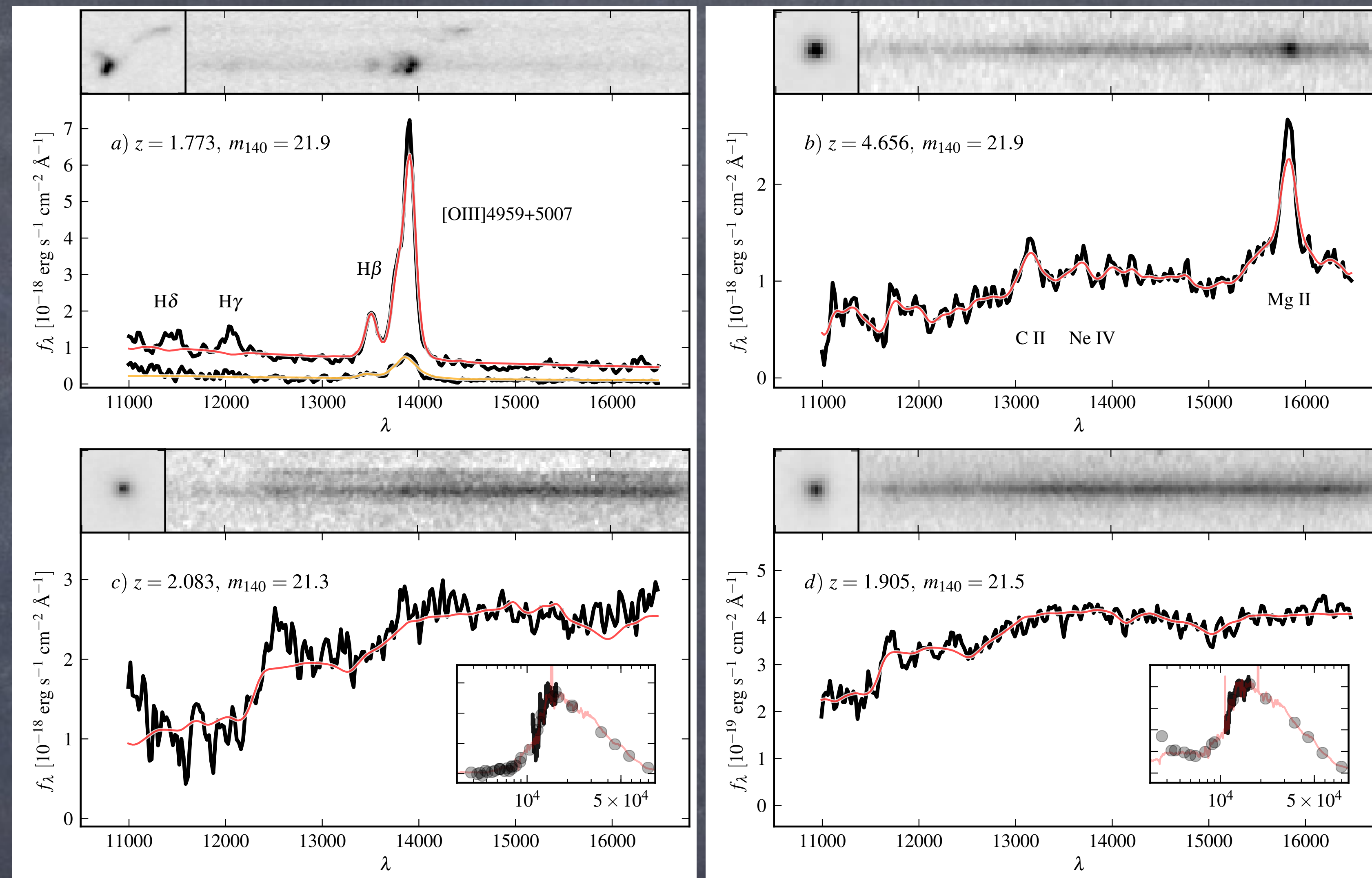


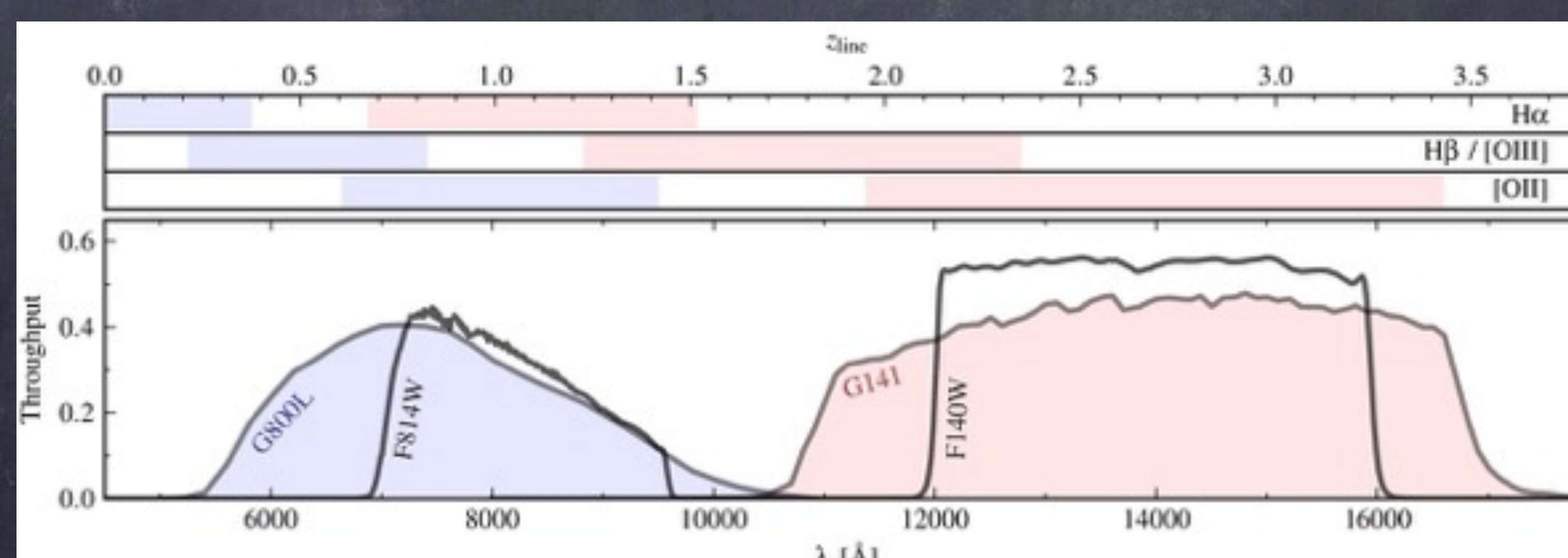
Credit: Emily Wisnioski

NIR selection with 3D-HST + CANDELS

- 3DHST (PI P. Van Dokkum) grism spectroscopy in deep HST multi-band CANDELS fields. We use GOODS-S, COSMOS, UDS.

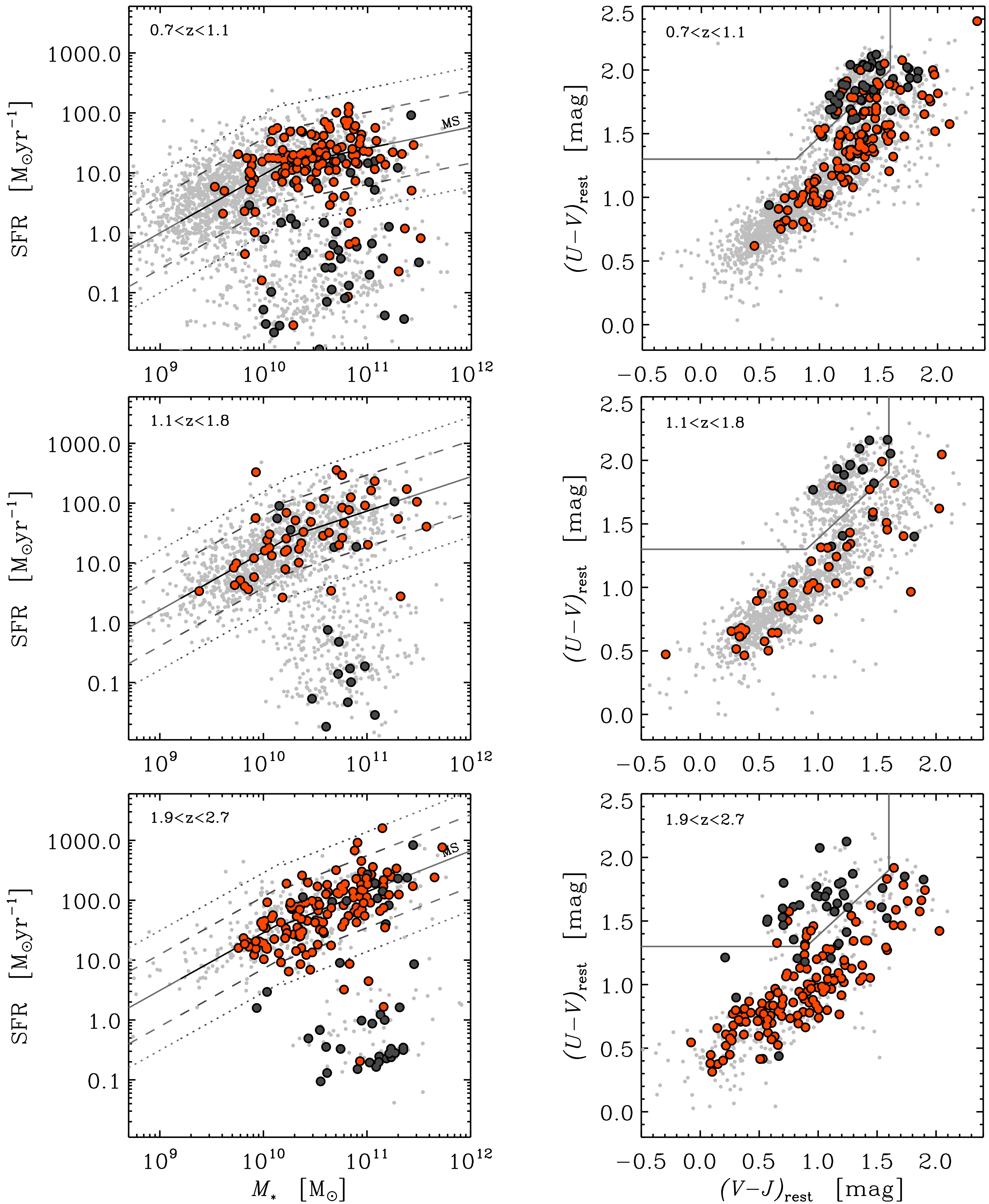
- Better redshifts for H(F140W) < 23-23.5, especially emission line galaxies but also using continuum features.





Brammer et al. 2012

Credit: Emily Wisnioski

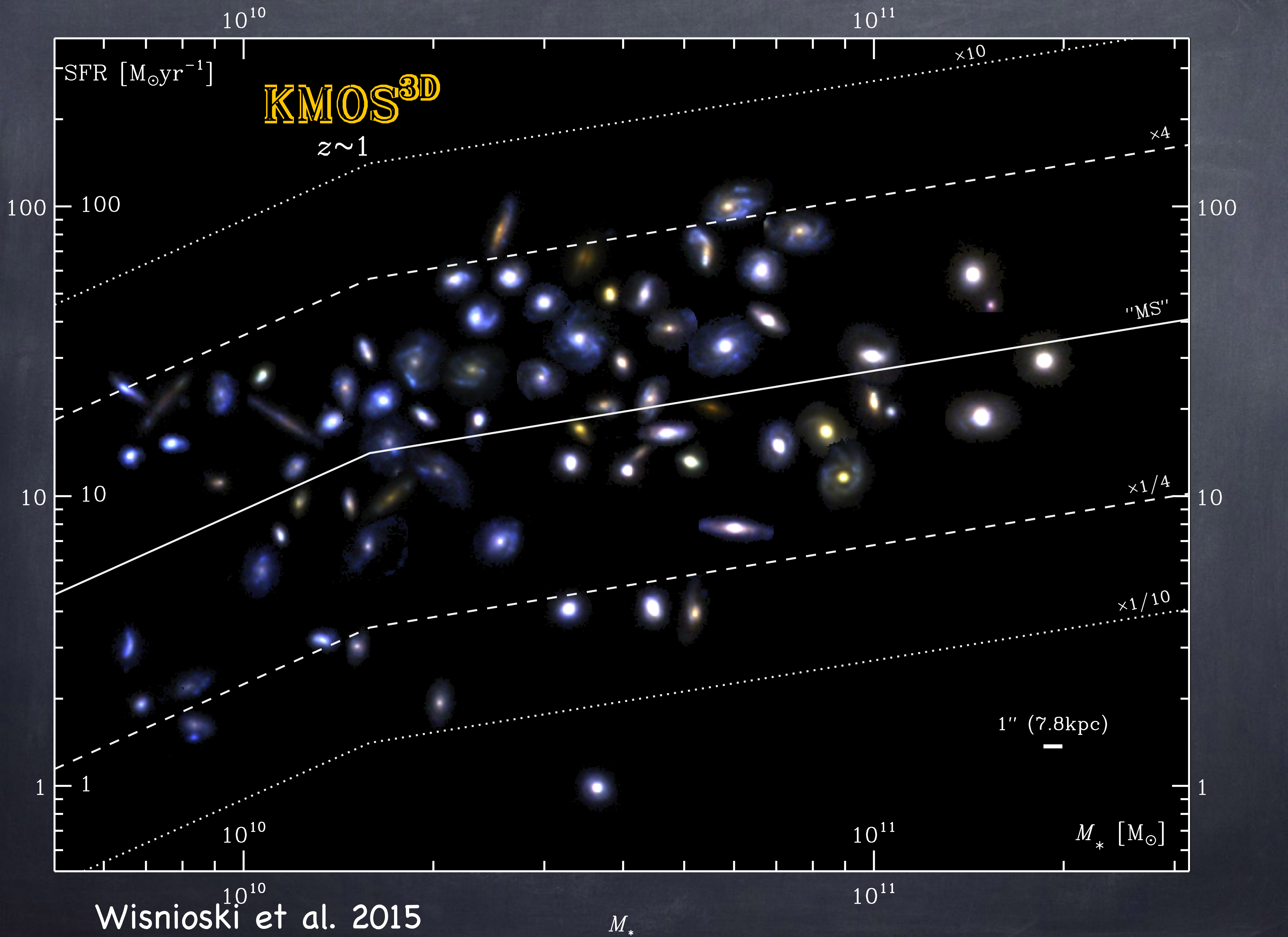


z ~1 T_{int} ~ 4h

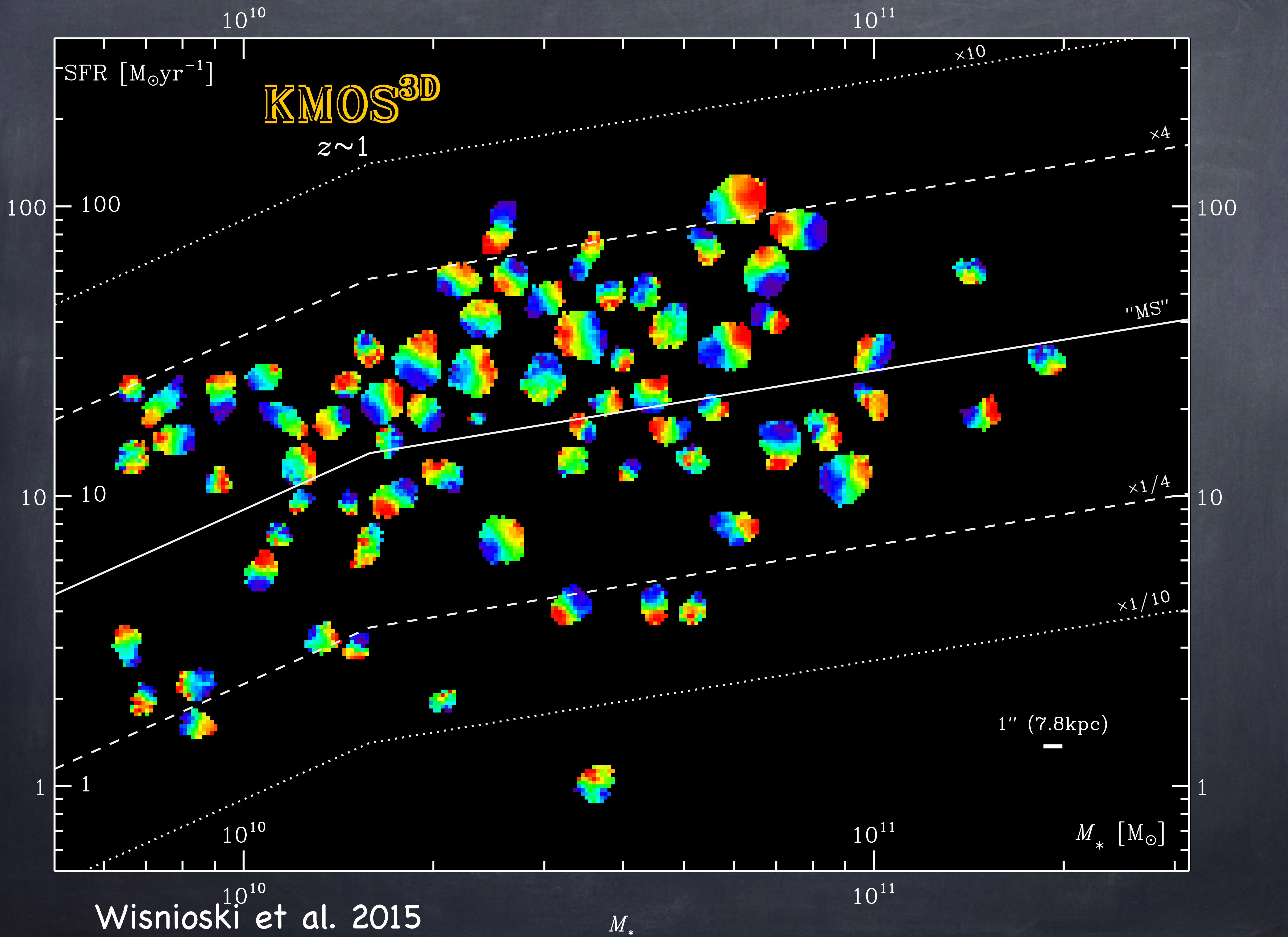
z ~1.5 T_{int} ~ 6-8h

z ~2 T_{int} ~ 8-10+ h

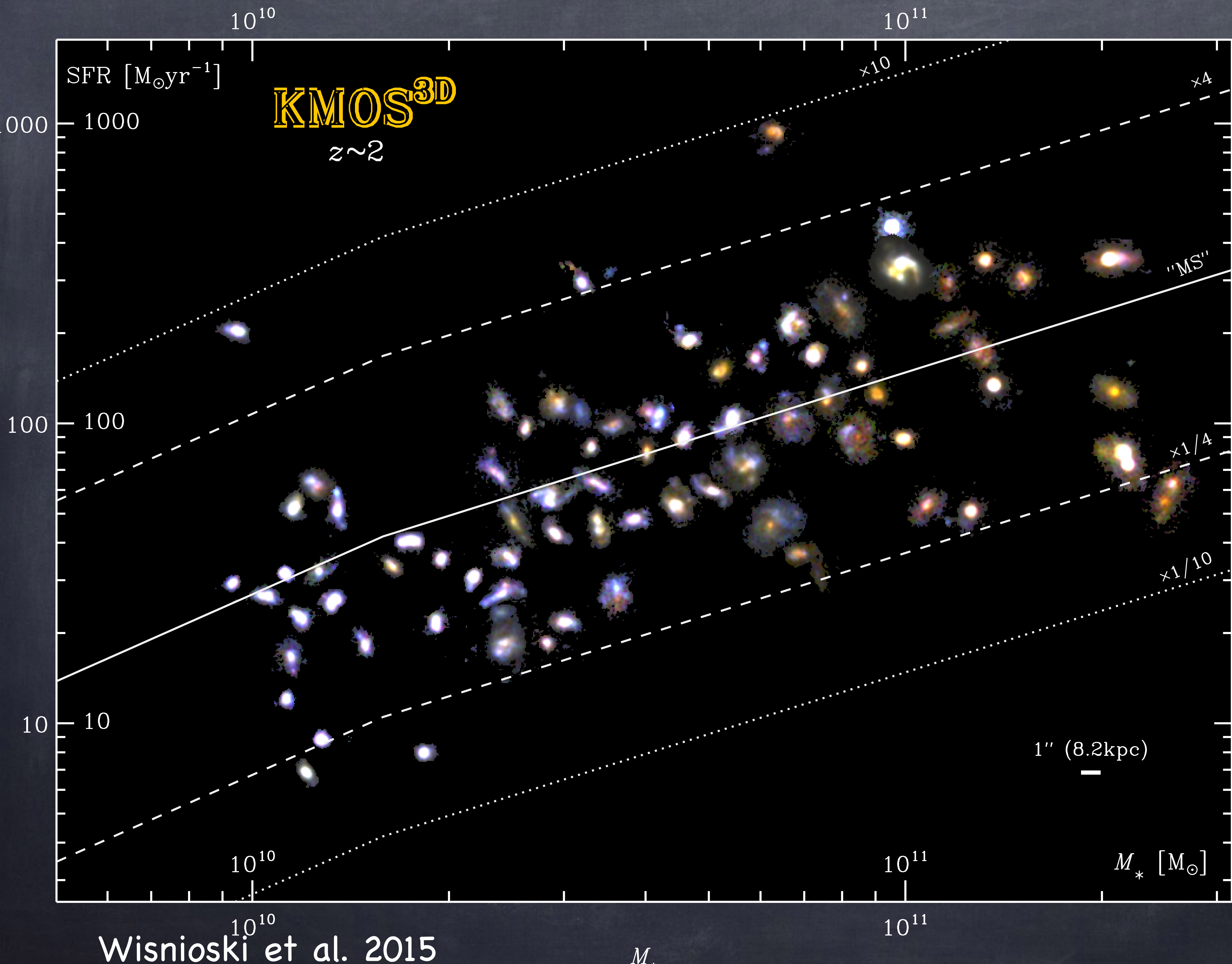
Unbiased selection,
large sample,
deep integrations (80% det.)



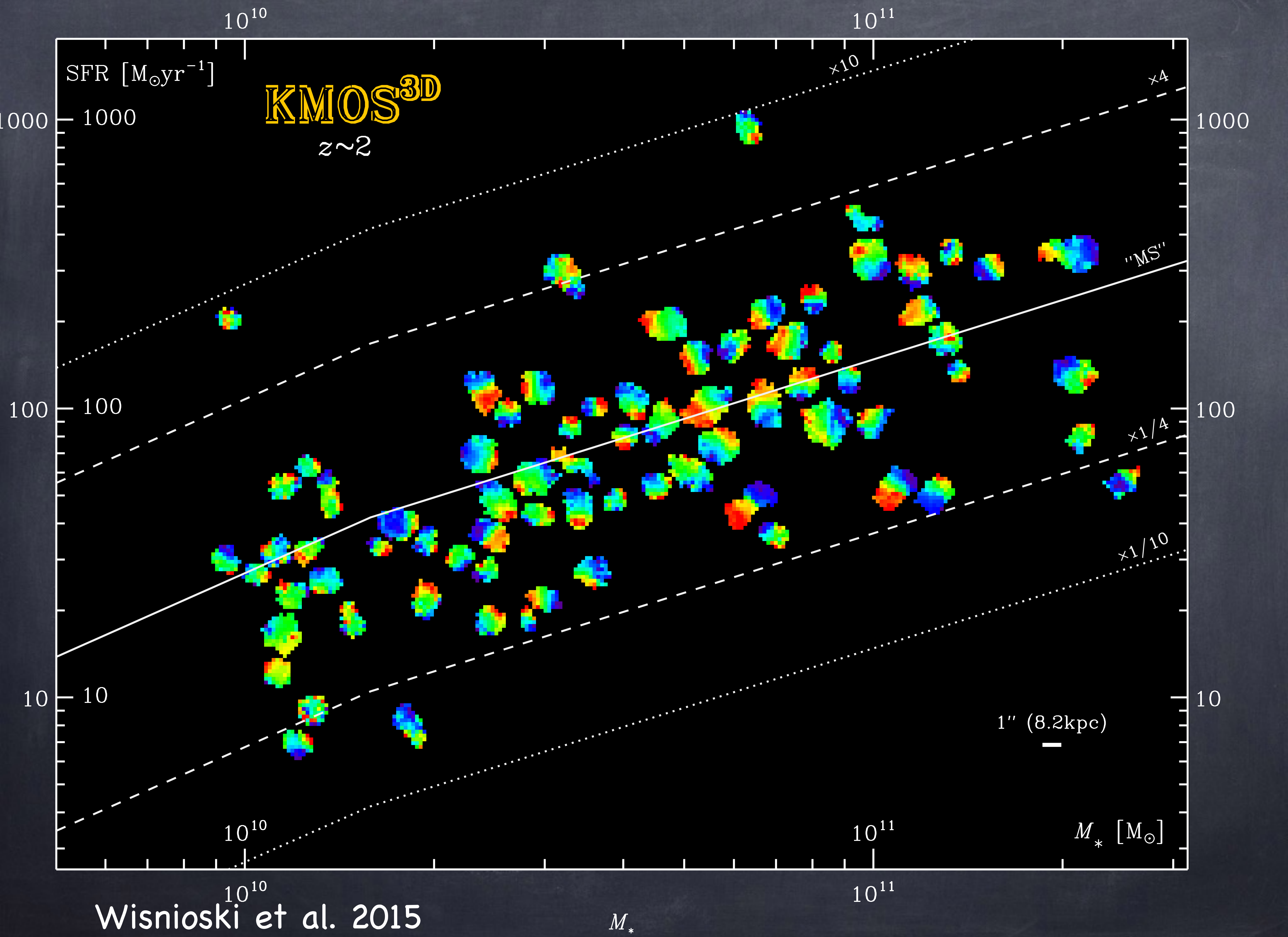
Wisnioski et al. 2015



Wisnioski et al. 2015

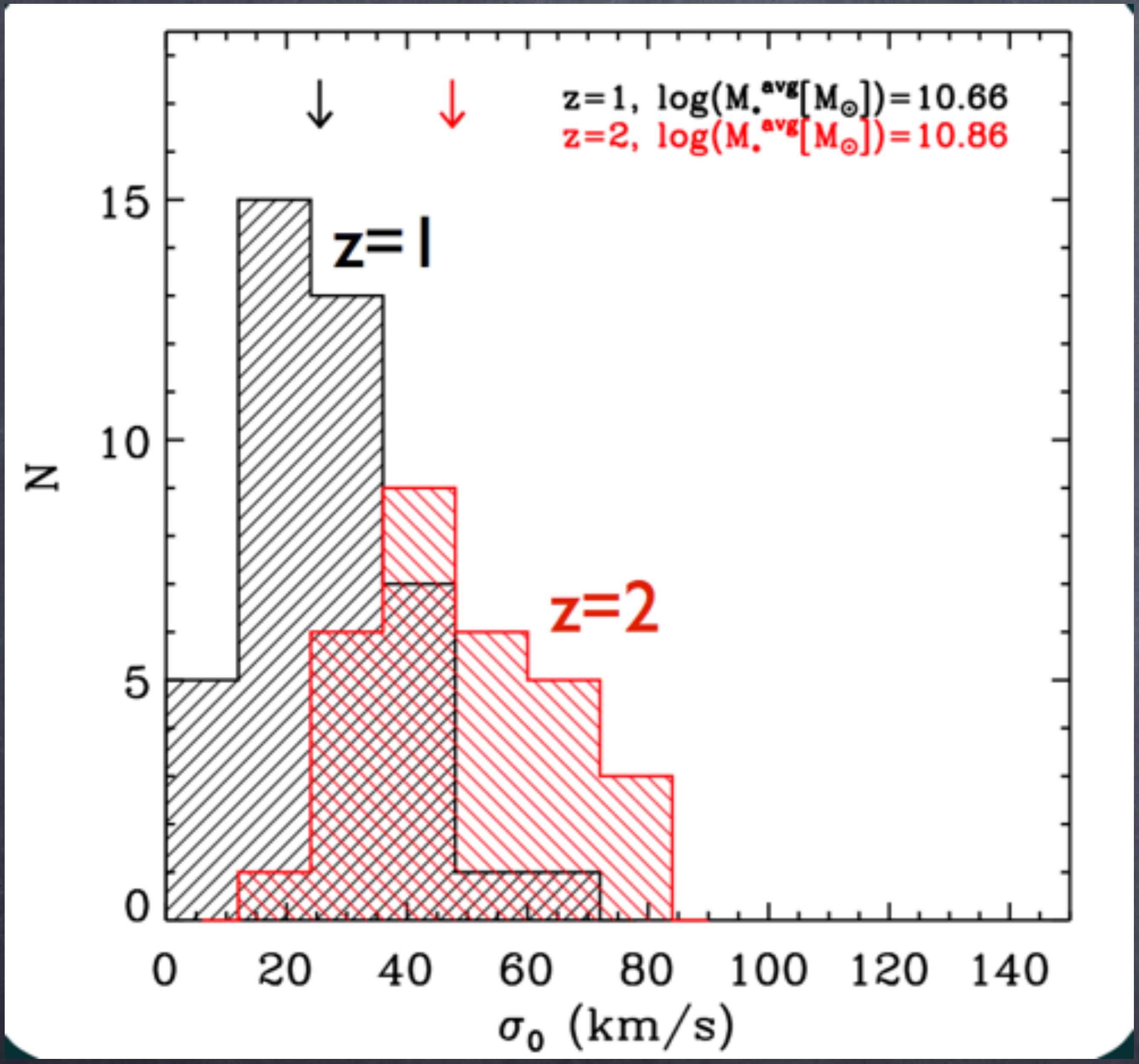


Wisnioski et al. 2015



Wisnioski et al. 2015

First Results: Kinematics



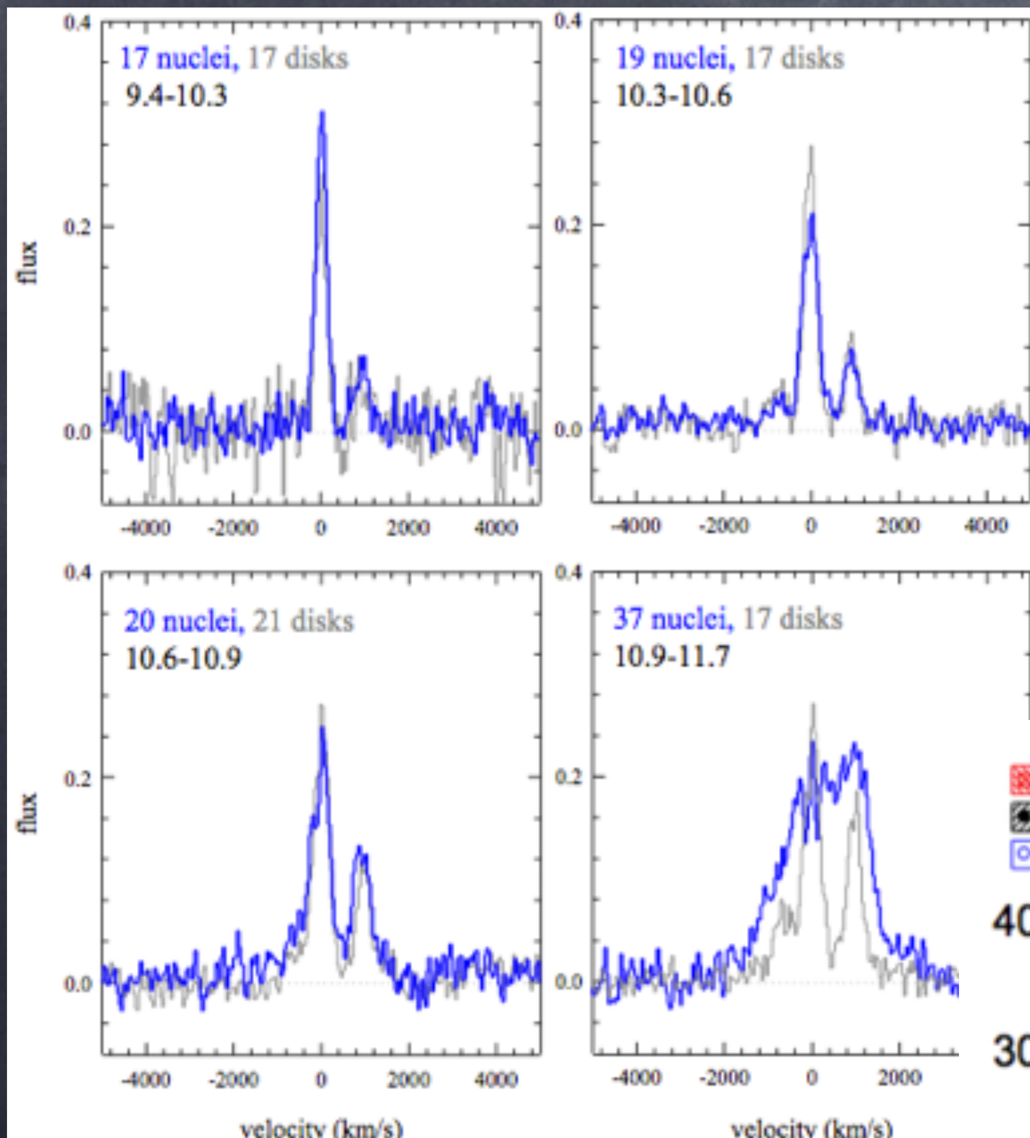
93% (z=1) and 74% (z=2) of the galaxies are disks

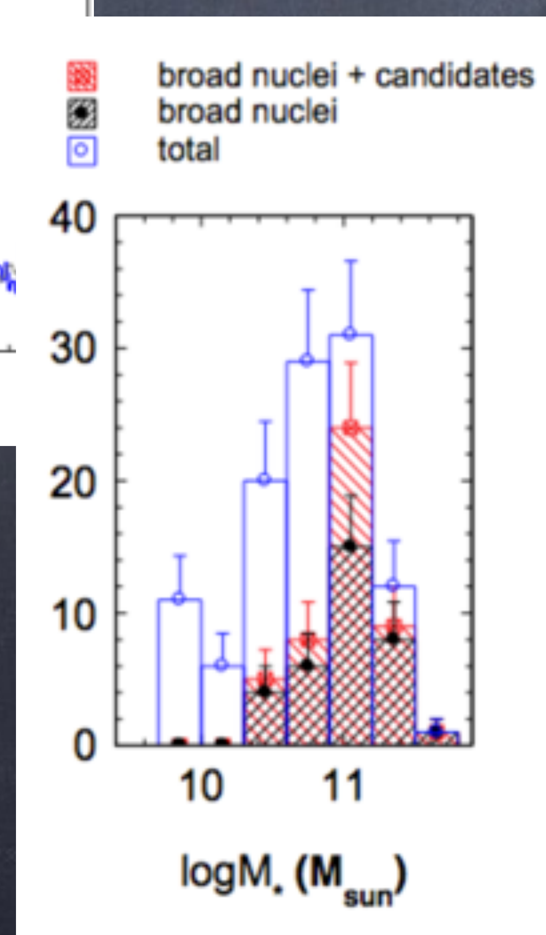
Average dispersion at z=2 is twice that at z=1

Disks are turbulent and thicker at high-z

Wisnioski et al. 2015

First Results: Outflows

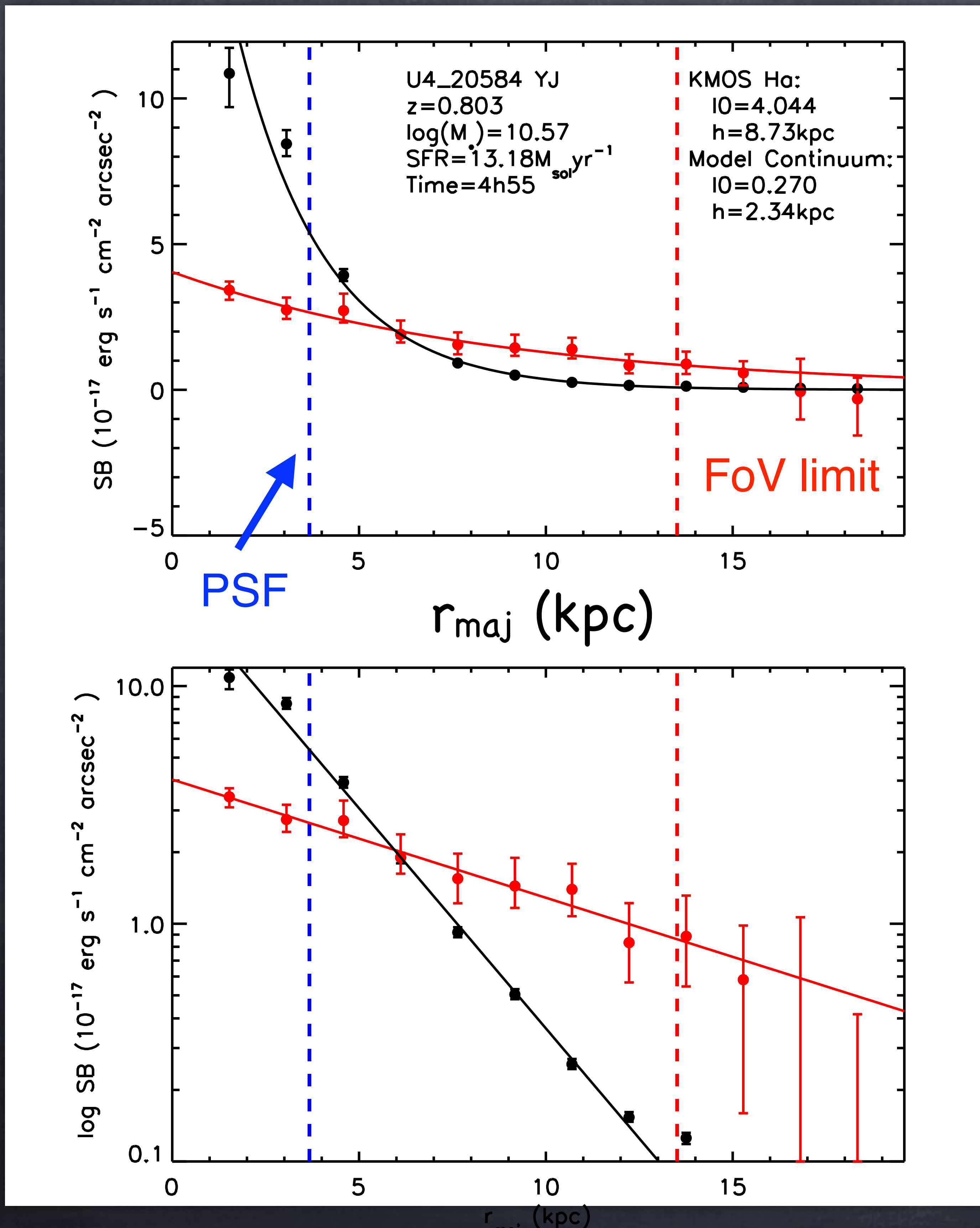


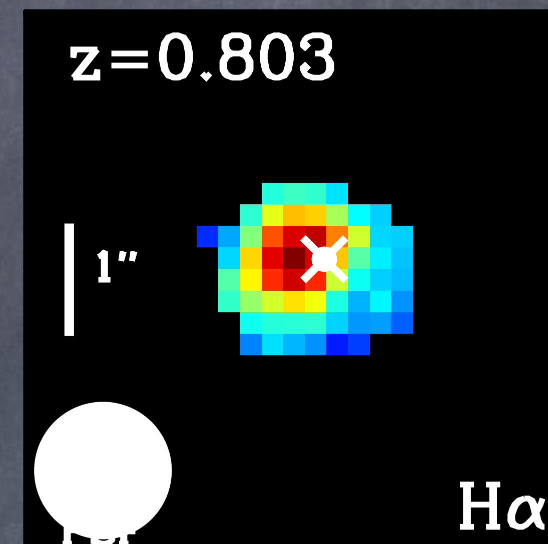


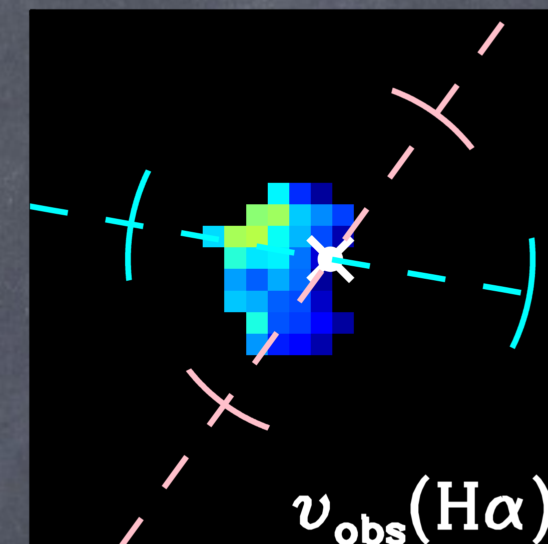
- Spectra stacked in bins of stellar mass and nuclear vs outer disc
- Nuclear spectra much broader in high mass galaxies
- Likely AGN driven outflows in massive galaxies

Genzel et al. 2014

Size growth from KMOS^{3D}

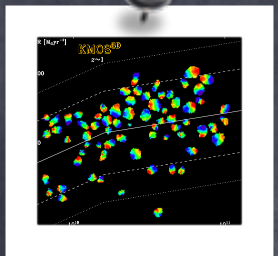




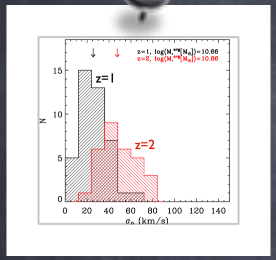


- KMOS Spectra co-added in elliptical masks.
- Continuum from convolved CANDELS images.
- Bootstrap errors.
- MCMC fit of exponential profiles.

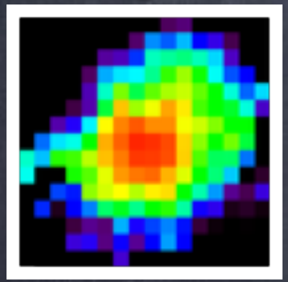
Take-home messages



KMOS is delivering high-quality data that pave the road for statistical studies of spatially resolved spectroscopy at $1 < z < 3$.
KMOS^{3D} is the largest GTO program and 400+ galaxies have been observed so far.



High-z disks are on average more turbulent than in the local Universe.



Ongoing growth of exponential disks is found for MS galaxies on a large range of redshifts (0-2.5).

The role of environment at high-z? Centrals vs. Satellites?
Re-growth of disks around pre-existing bulges? Size growth vs morphology