Work in progress

THE SFR OF MASS-SELECTED GALAXIES OUT TO Z<5 WITH VLA-COSMOS 3GHZ LARGE PROJECT

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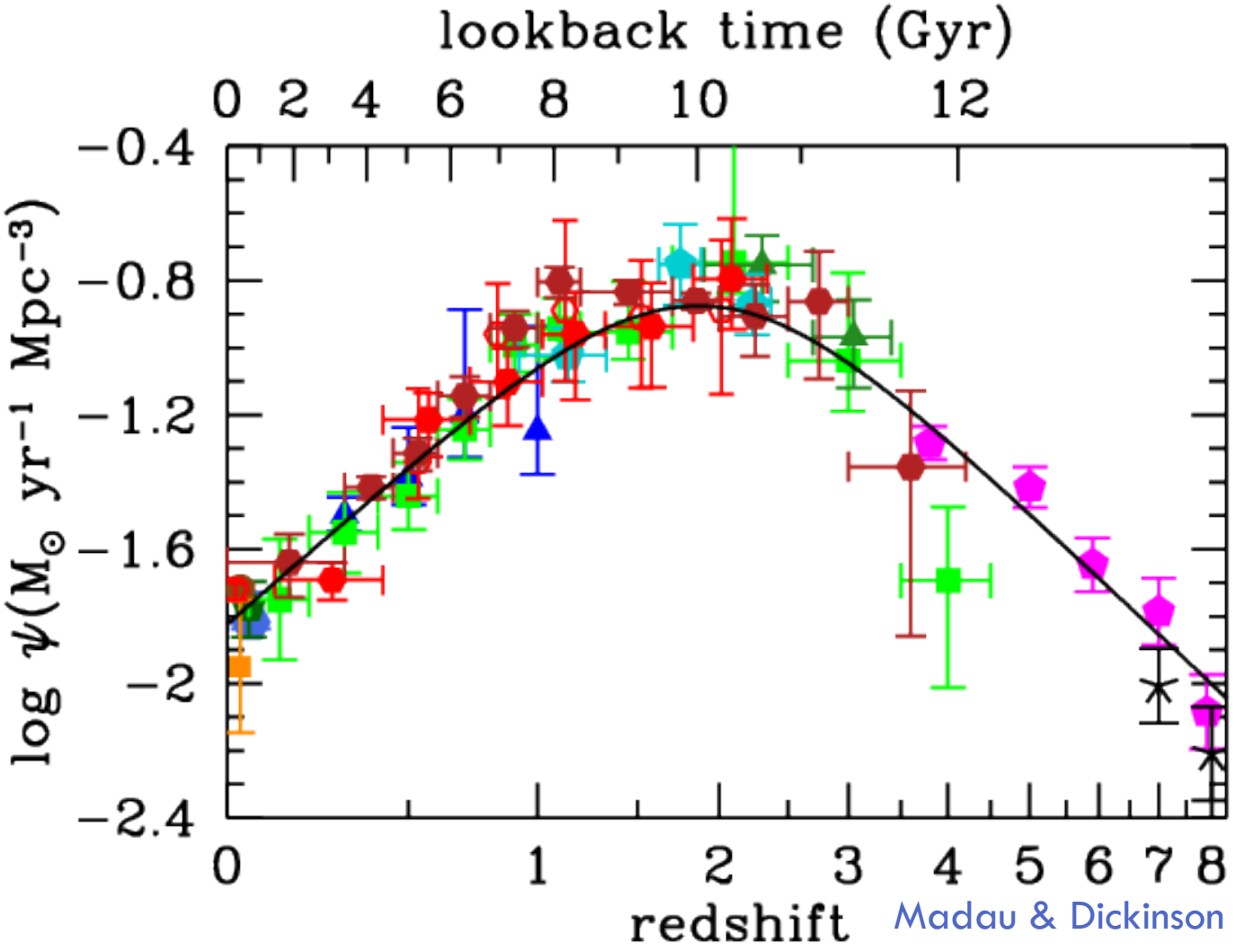
@GalacticSKL

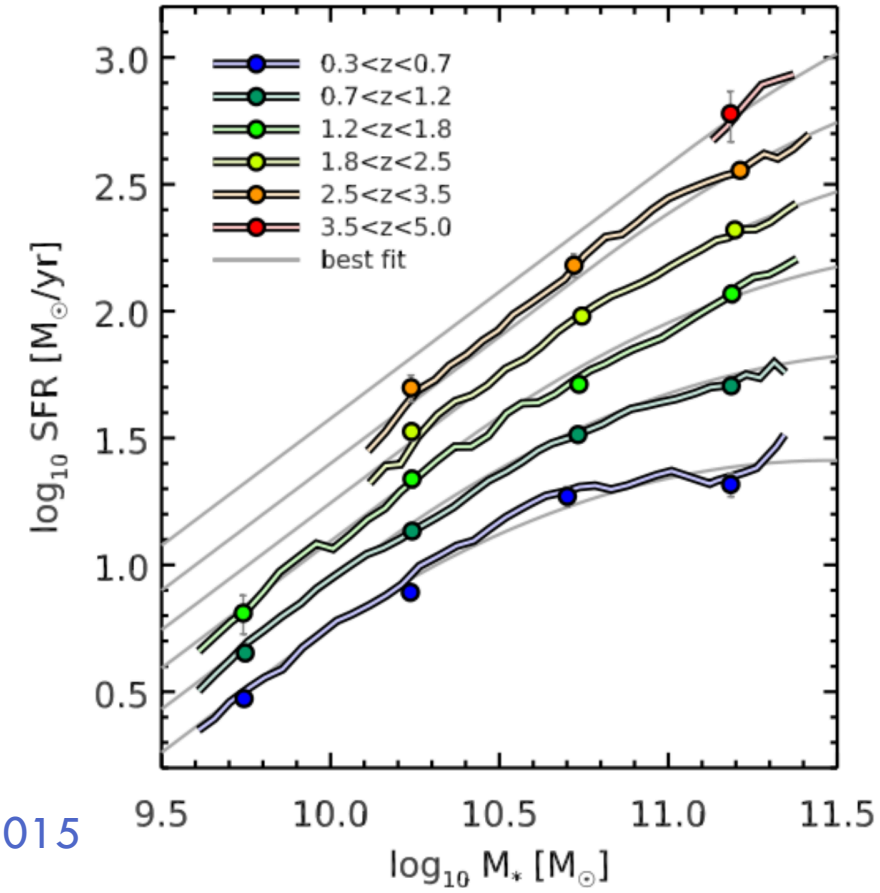
SFRD



Madau & Dickinson 2014

Build up of galaxy stellar mass

- >66% of stars formed in a galaxy on MS.
- Star forming galaxies lie on MS. disp~0.3dex



Schreiber et al. 2015

Continuously rising sSFR

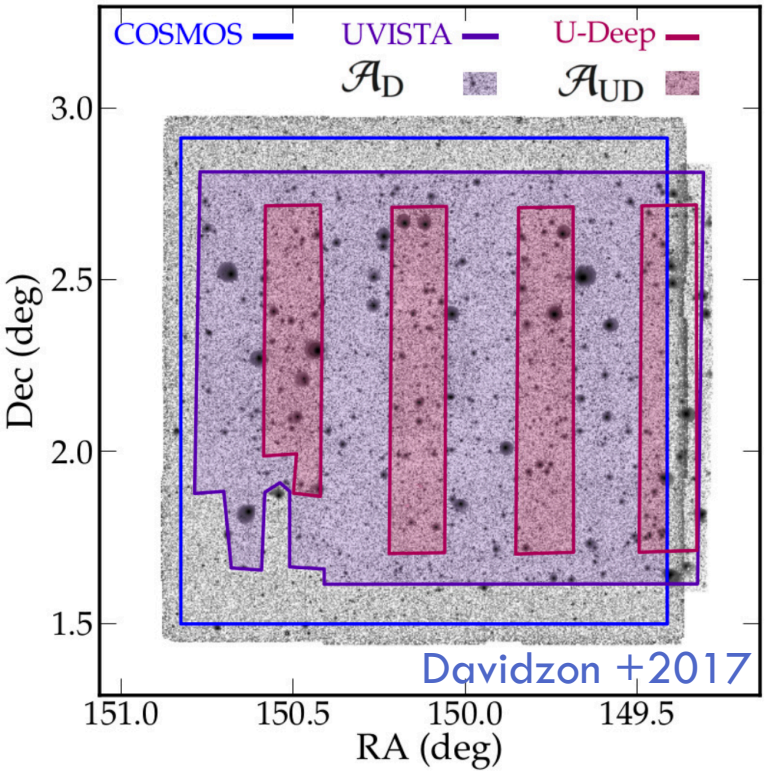
Flattening of high-mass slope at low z.
Increasing contribution of bulge? (e.g. Abramson+2014)
SFR method (e.g. Bisigello+2017)???

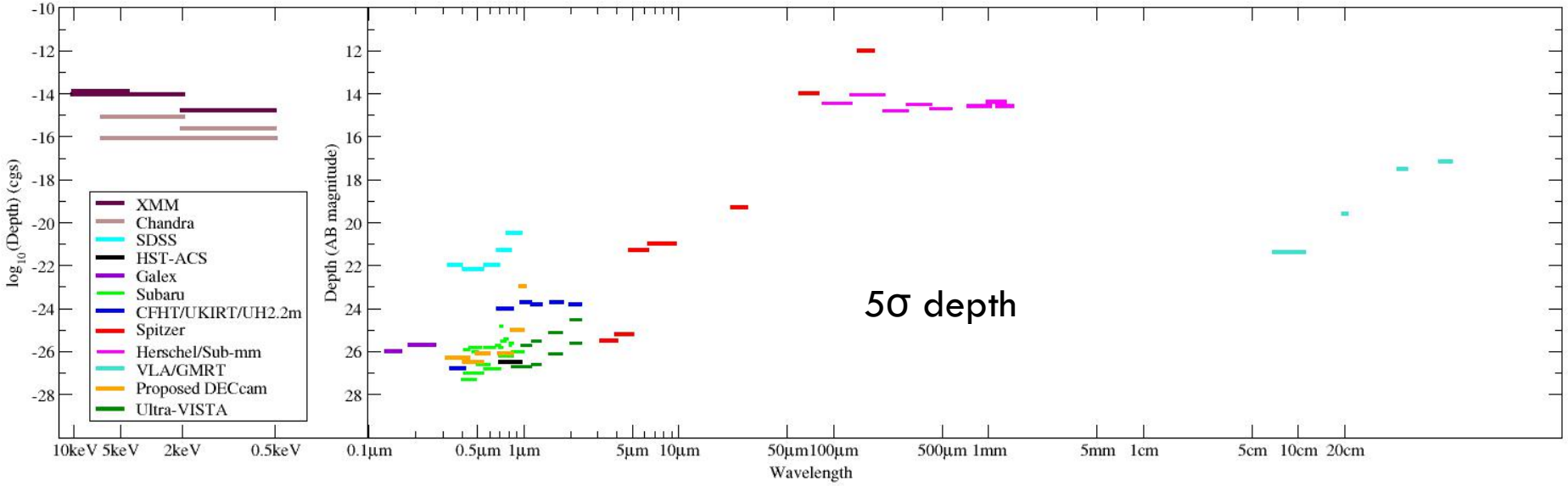
COSMOS

COSMOS is a deep, wide area (2 deg^2), multi-wavelength survey aimed at measuring the evolution of galaxies.

COSMOS2015. Laigle et al. 2016.

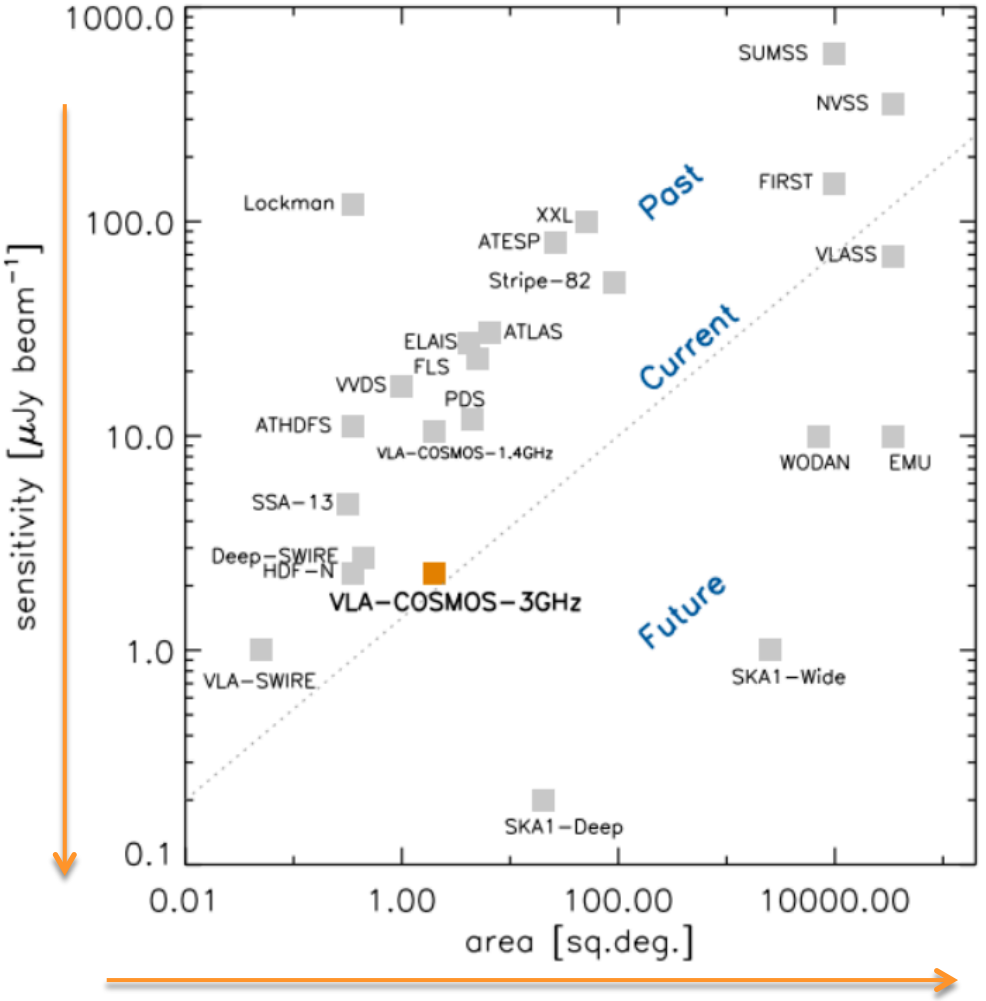
http://cosmos.astro.caltech.edu/





VLA-COSMOS 3GHz Large Project

- VLA 3GHz continuum survey over full 2deg^2 COSMOS field (Smolcic+2017a)
- ~2.3μJy rms, 0.75" resolution
- 10 830 radio sources identified at >5 σ
- Data now public!
- Papers
  - Smolcic (counterparts)
  - Delhaize (FIR/radio)
  - Novak (SF luminosity functions)
  - Delvecchio (AGN & hosts)
  - Smolcic (AGN luminosity function)
- here: Eric, Jacinta, Daniel



Advantages of radio continuum

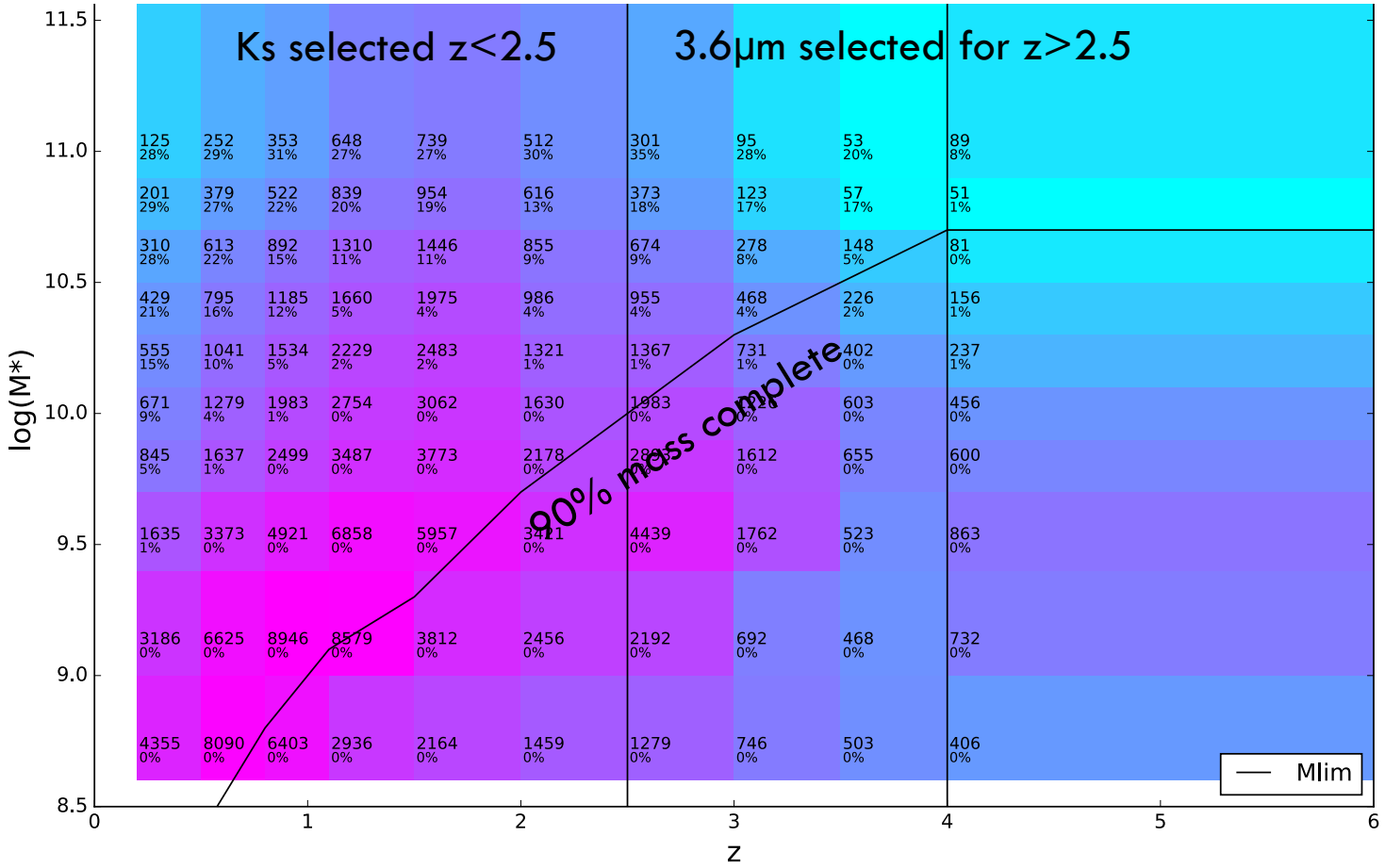
- Advantages
  - No dust attenuation
  - High angular resolution
  - No blending issues
- However,
  - Do we really understand it as a SFR tracer …
  - Can only probe high-mass/high-sfr with direct detections

→ Stacking

Parent sample and binning scheme

- COSMOS2015: Laigle+ 2016 for z_d<2.5 & Davidzon+ 2017 for z_d>2.5.
- SF galaxies NUV-r/r-J

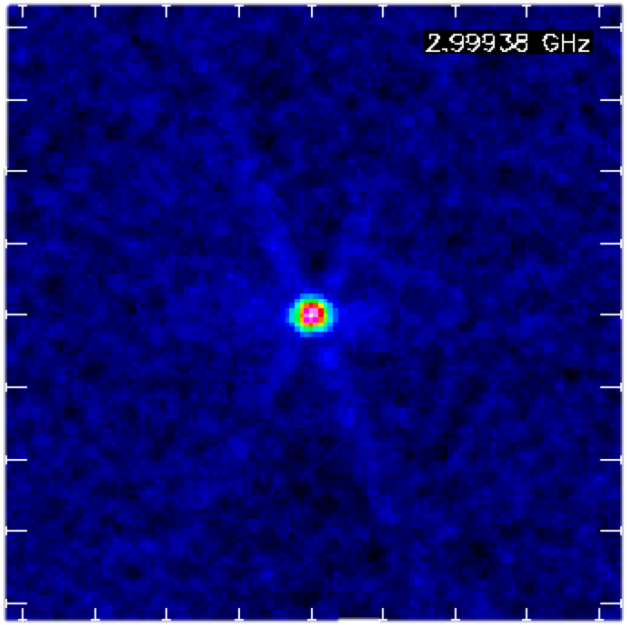
a mass selected sample

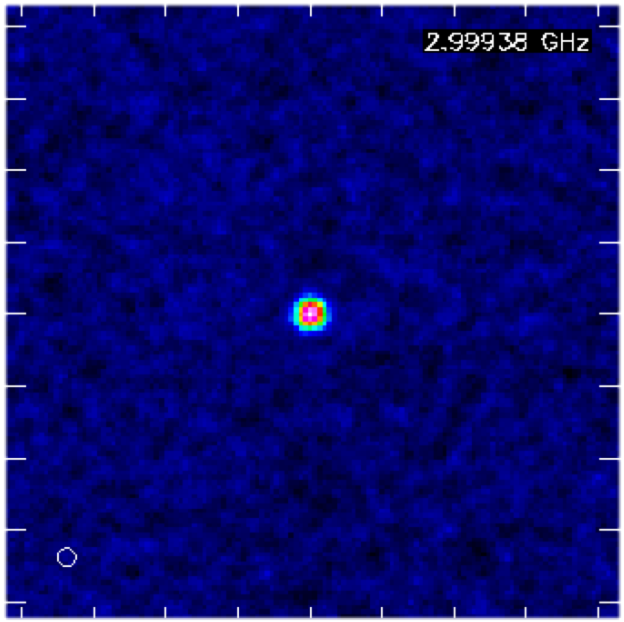


Stacking

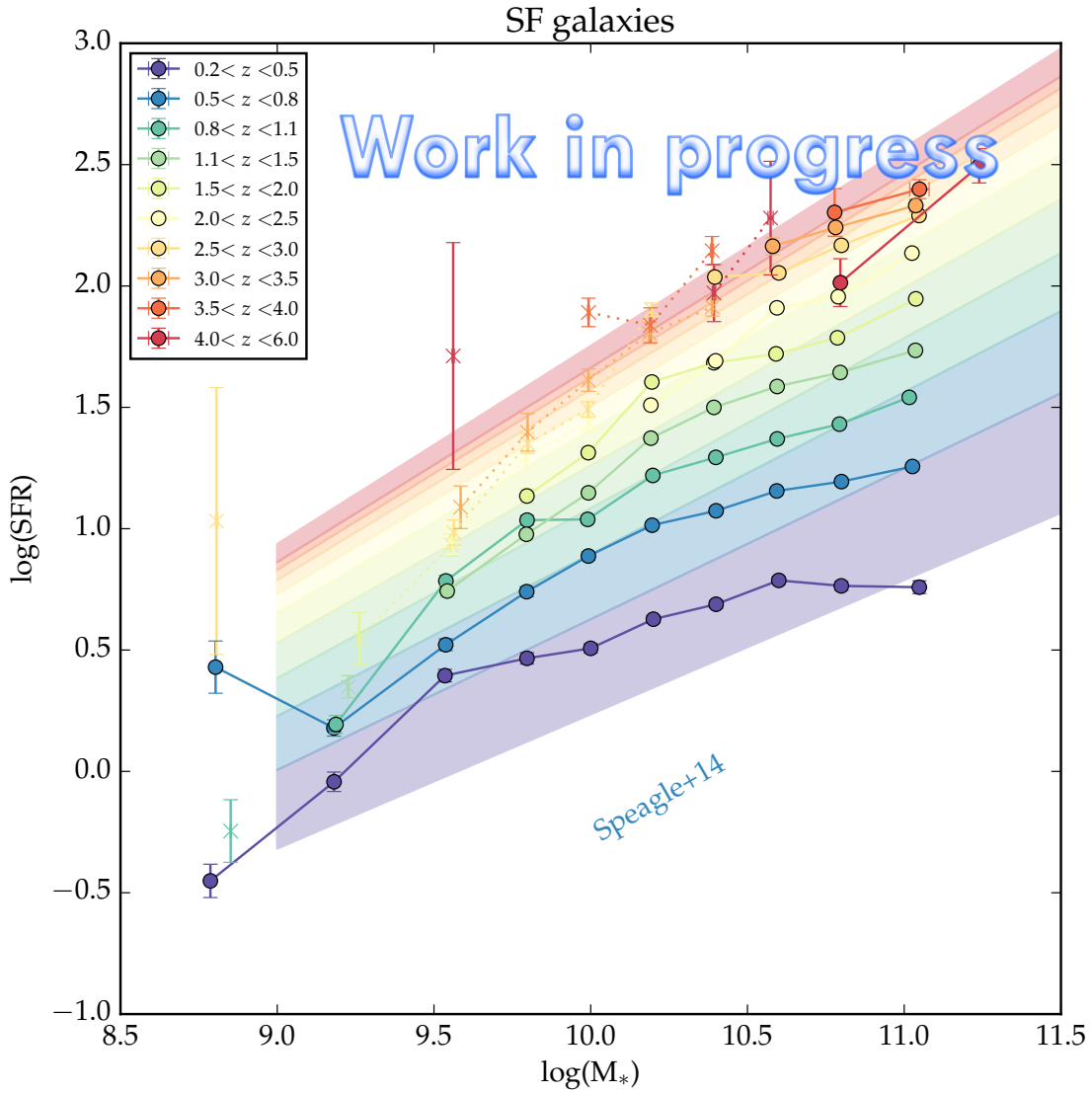
Work in progress

- Create cutouts at each optical position in each bin.
- *Median combine, clean the stacks, fit 2D Gaussian*
- Converted to SFR using evolving IR/Radio “q” relation of Delhaize et al. 2017



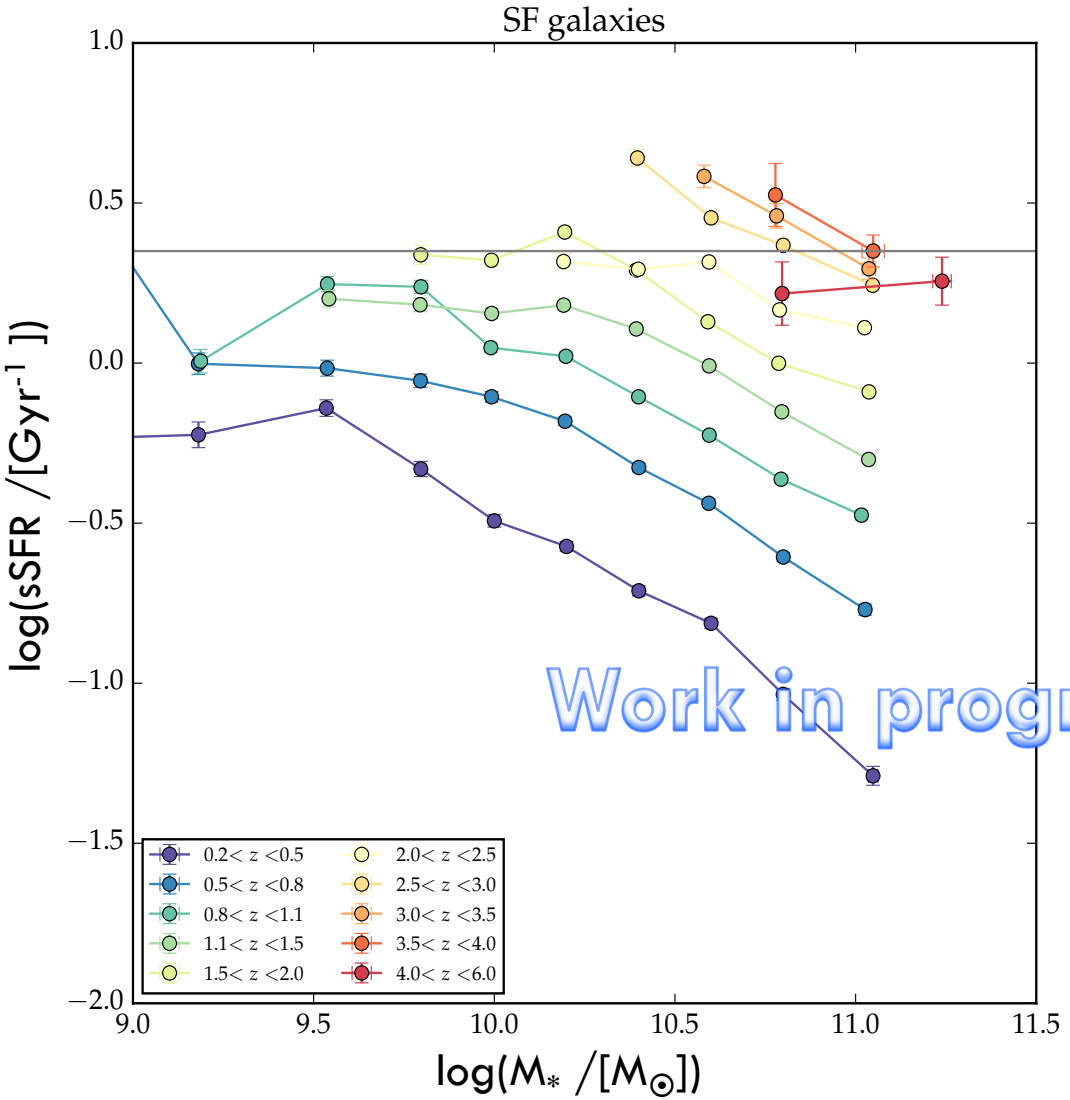


Results: Main Sequence



Results: sSFR vs M*

Is there a maximum sSFR?



Work in progress

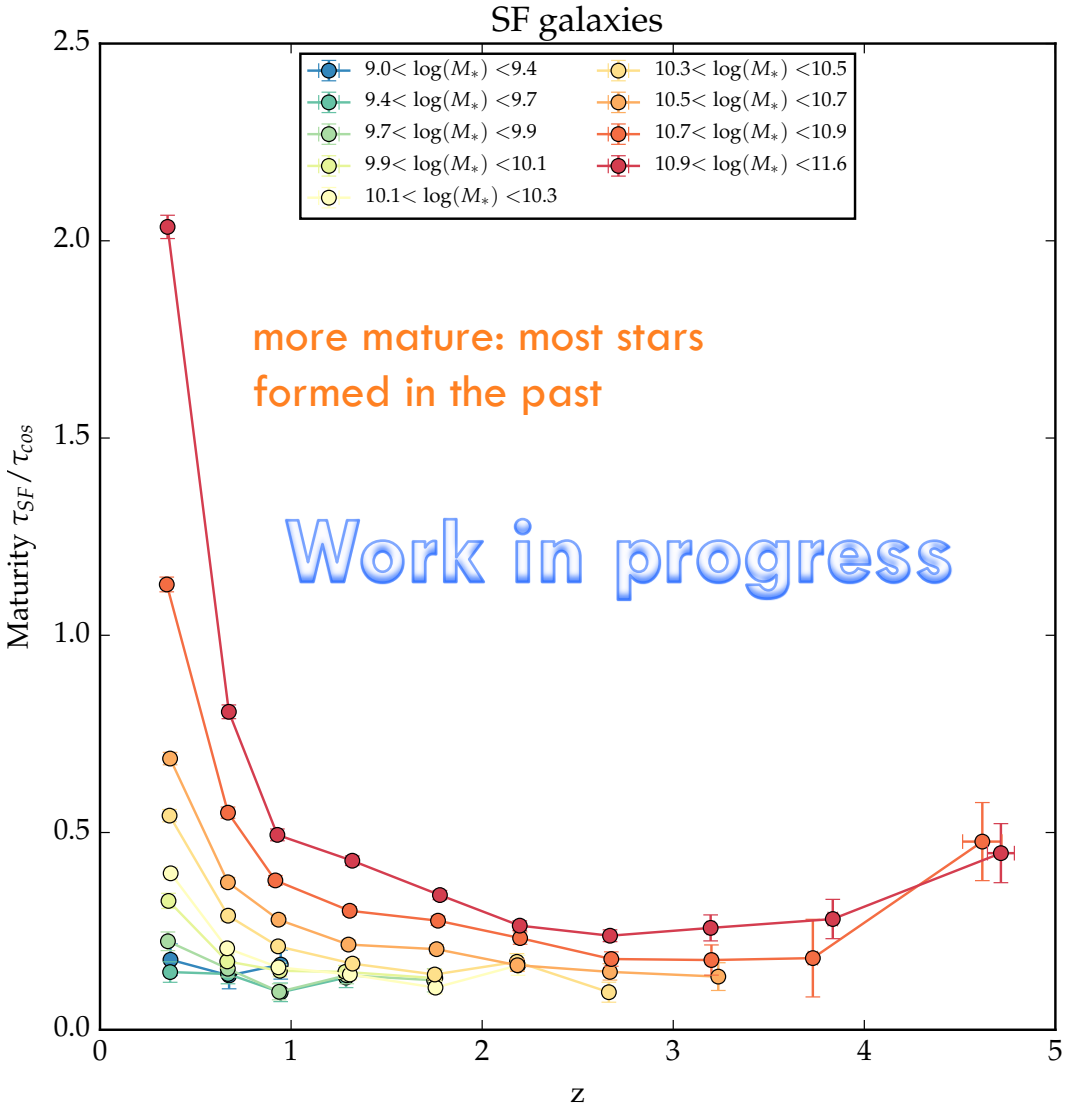
Results: Maturity

$\tau_{SF} = M_*/SFR$
a mass doubling time….

Maturity= τ_{SF}/τ_{cosm}

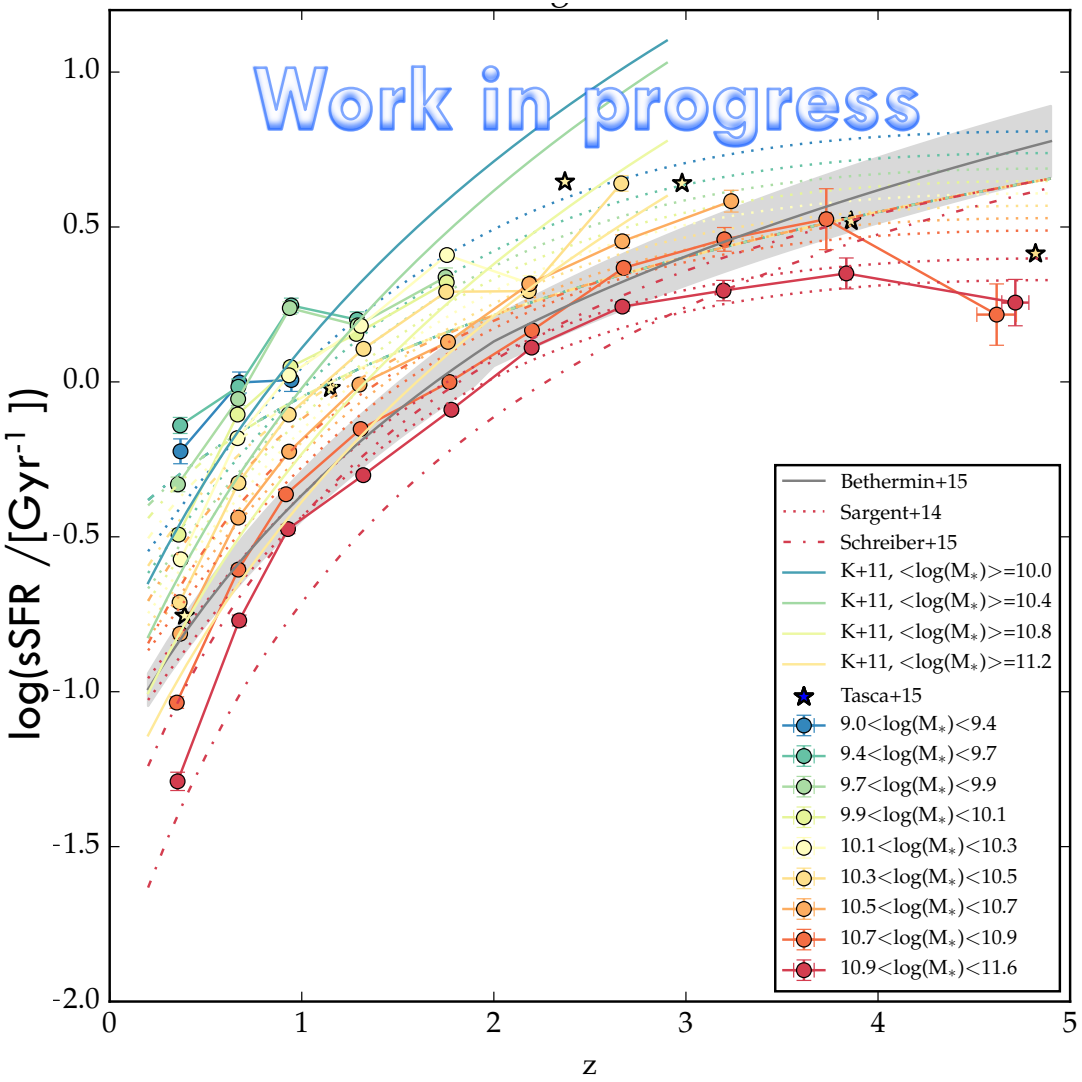
…normalized by the age of the Universe

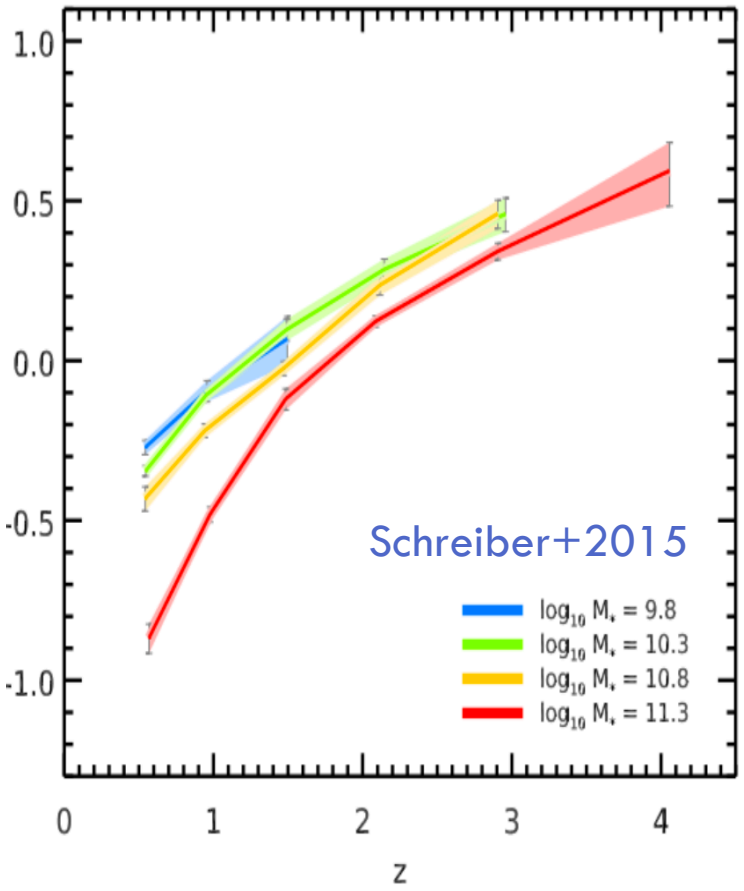
ETG have maturity ~10.
LTG have maturity <2



See Scoville et al. 2013

Results: sSFR vs z

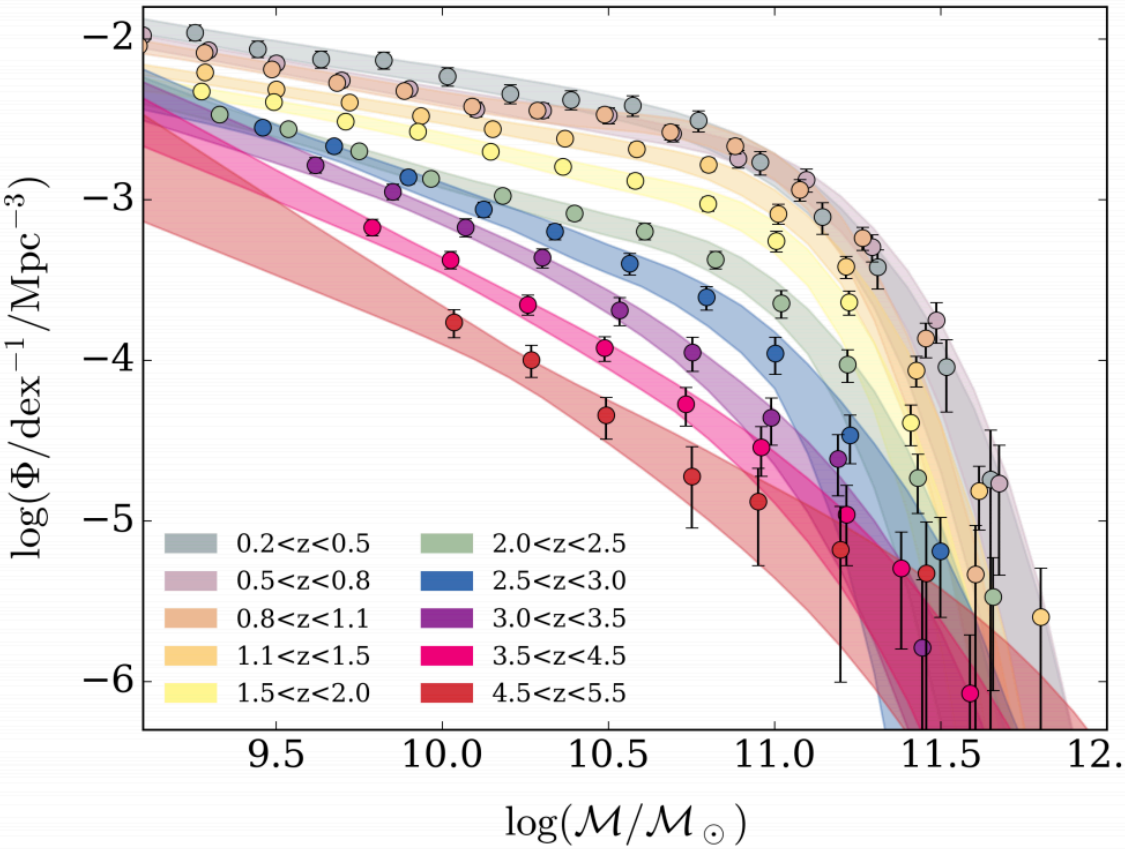




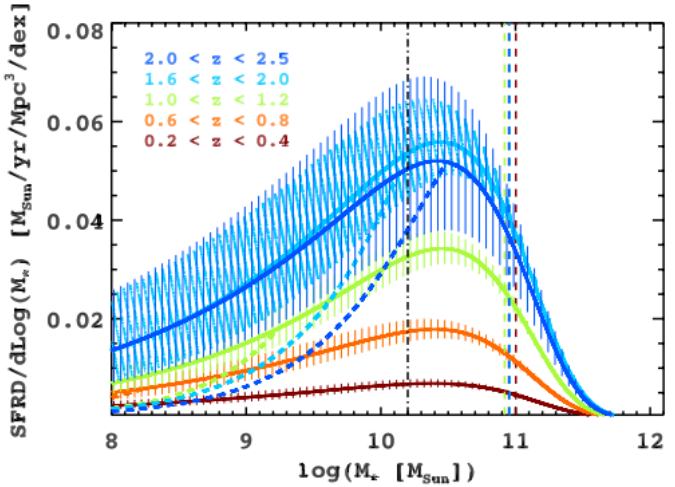
Next Steps

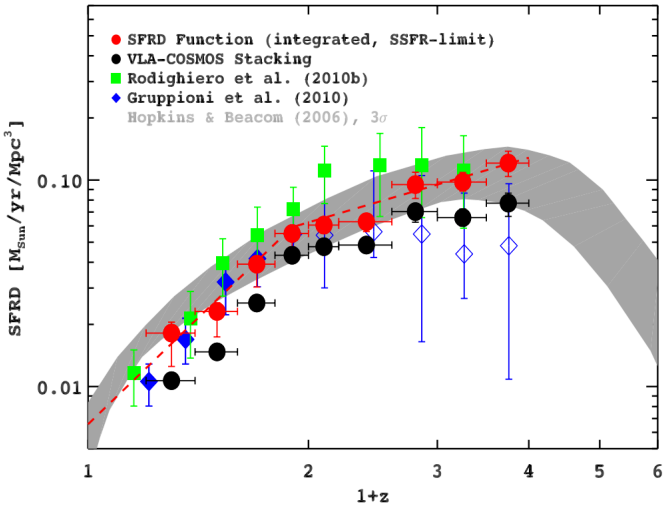
- Convolve with stellar mass functions

Davidzon et al. 2017



Karim et al. 2011

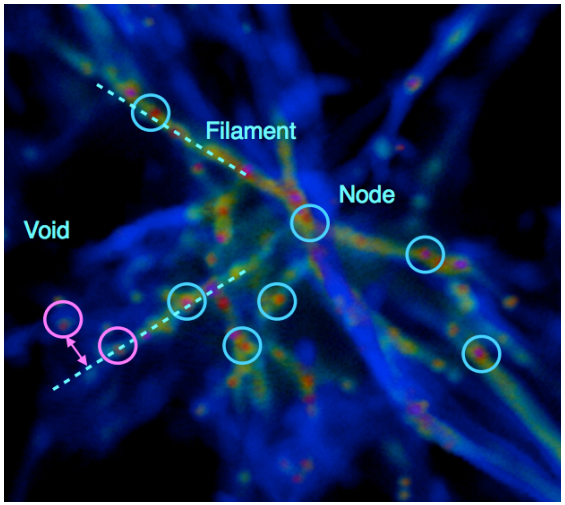




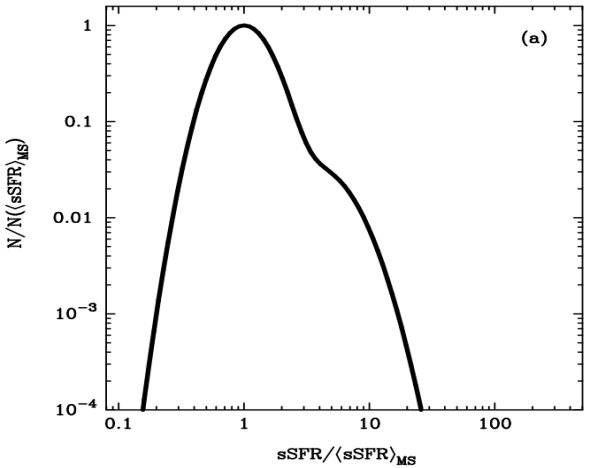
Further Steps

- Local density: z<3
  - Filaments z<1
- Bayesian analysis: Model for flux distribution expected and then use MCMC.
  - Detections and upper limits

Image credit: Clotilde Laigle



Sargent et al. 2014



Summary

- SFR from stacking 3GHz for galaxies in COSMOS

Work in progress

- Flattening/turn-over in MS at high-M_*, $z<1.5$
  - Due to more mature galaxies
- More variation in galaxy sSFR/maturity at low-z.
- Flattening of sSFR with z

- Further work includes
  - Finalize fluxes
  - SFD, characteristic stellar mass, environment dependence.
  - Bayesian approach.