Motivations for a future UV-visible telescope: High-redshift Galaxy and Deep-field Studies

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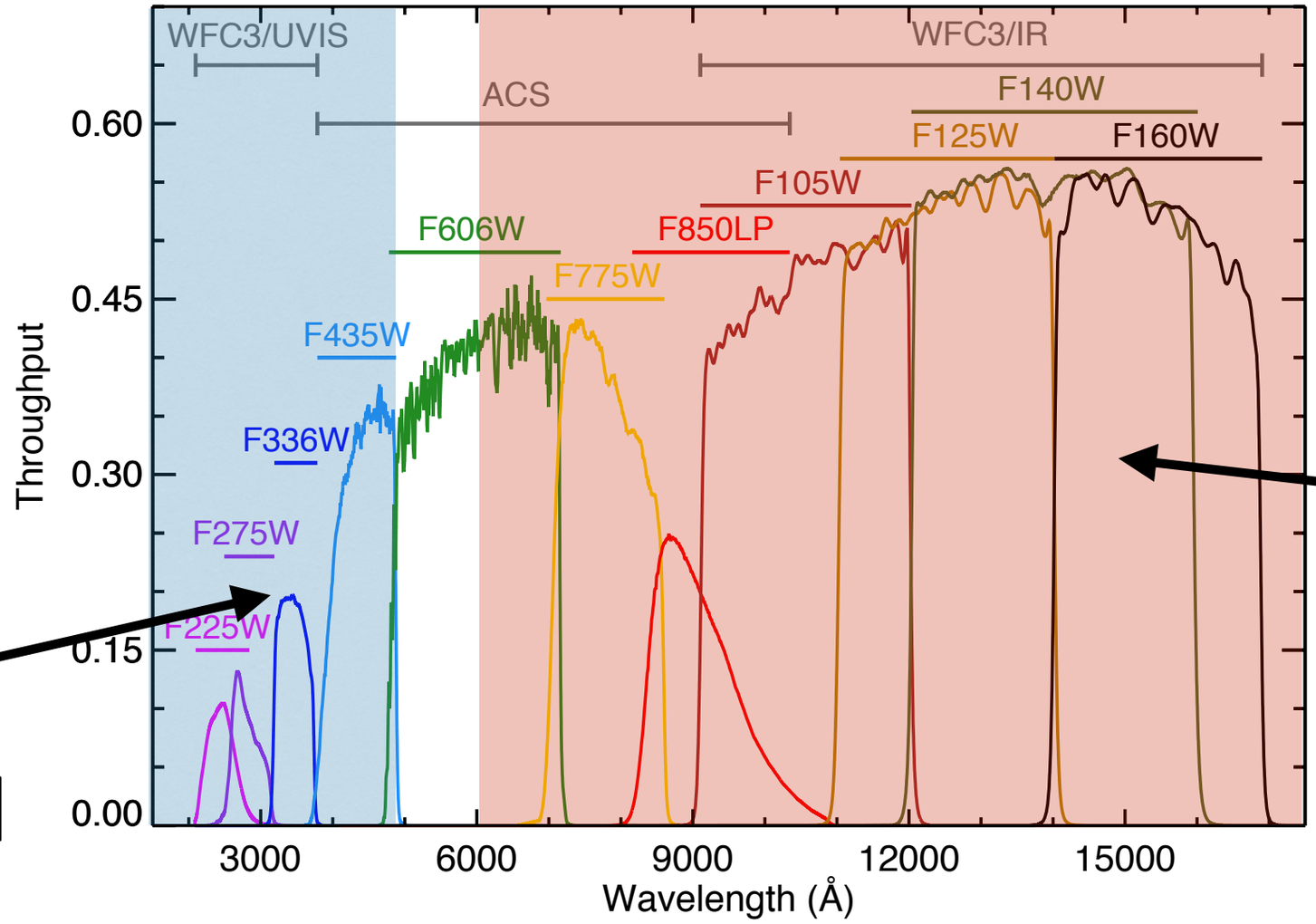
Finding the UV-Visible Path Forward: A Community Workshop to Plan the Future of UV/Visible Space Astrophysics

UVUDF - Teplitz et al. 2013 and Rafelski et al. 2015

Wavelength ranges and HST filters of UDF



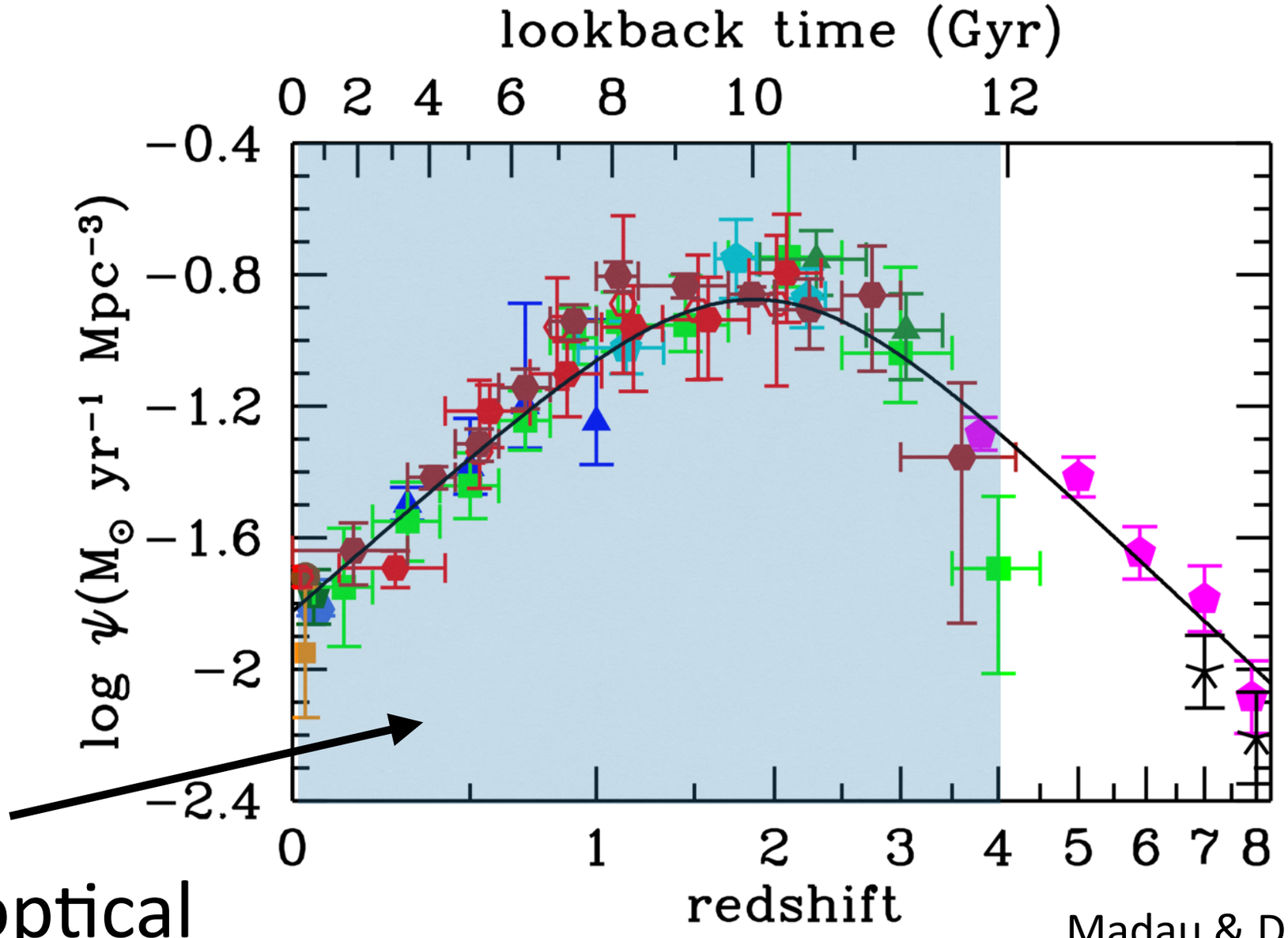
UV / optical

JWST

Rafelski et al. 2015

- What science questions will not be answered by JWST and WFIRST for high redshift galaxies and deep fields?

Star formation rate density - sample the peak



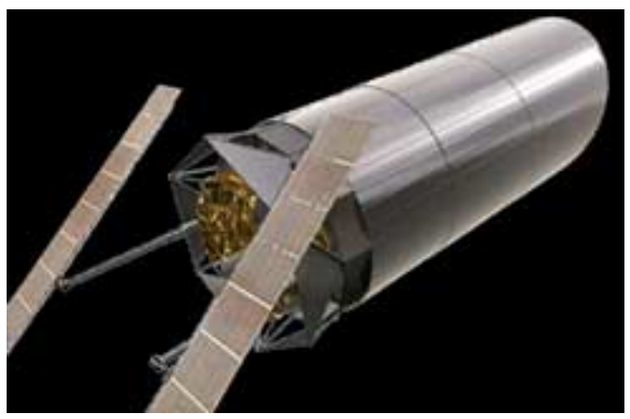
UV / optical

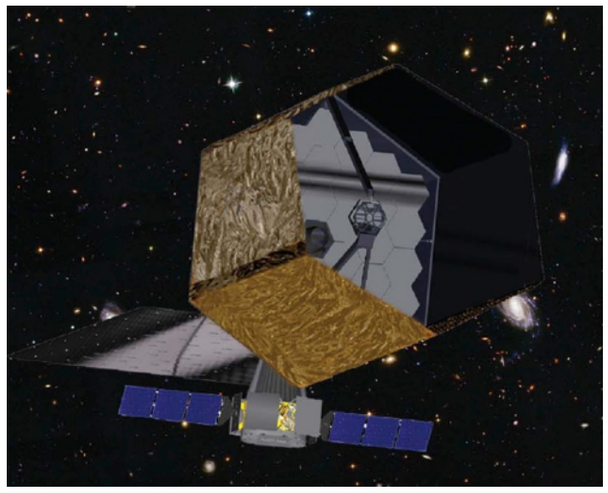
Madau & Dickinson 2014

Measure the star formation from the massive stars at the peak of cosmic star formation

A few science topics - many others too

- Sub-galactic structure: Clumps, SED fits, spatial distribution of dust, etc.
- Low mass galaxies dwarfs: bursty SF, environment, photo-z's, etc.
- Lyman continuum escape fraction: large sample, variation with mass, morphology?
- HI rich galaxies (Damped Lyman-alpha systems): detect in emission, sizes, SF vs. HI density, etc.





Structural Evolution of Galaxies: Clumps

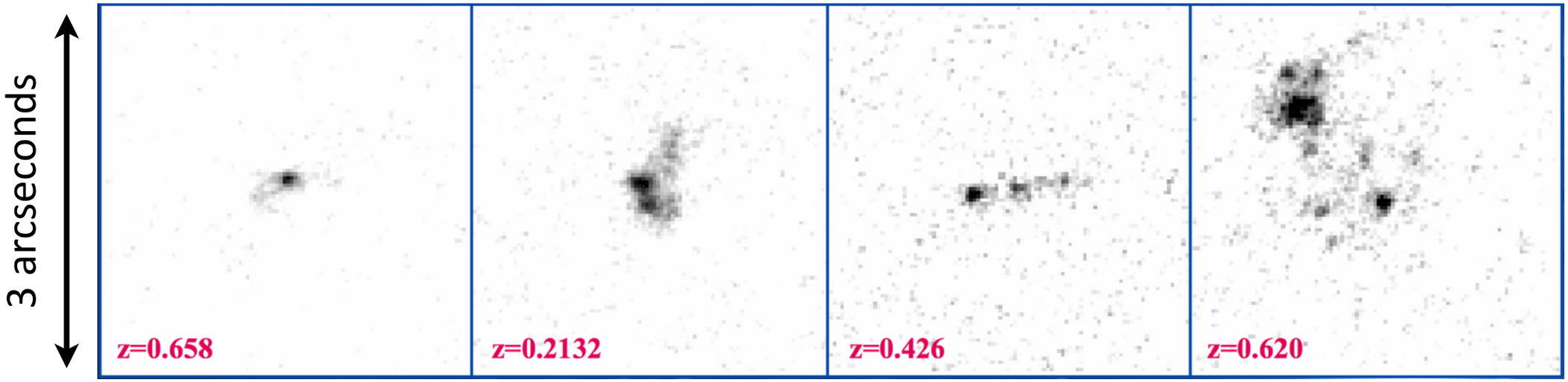
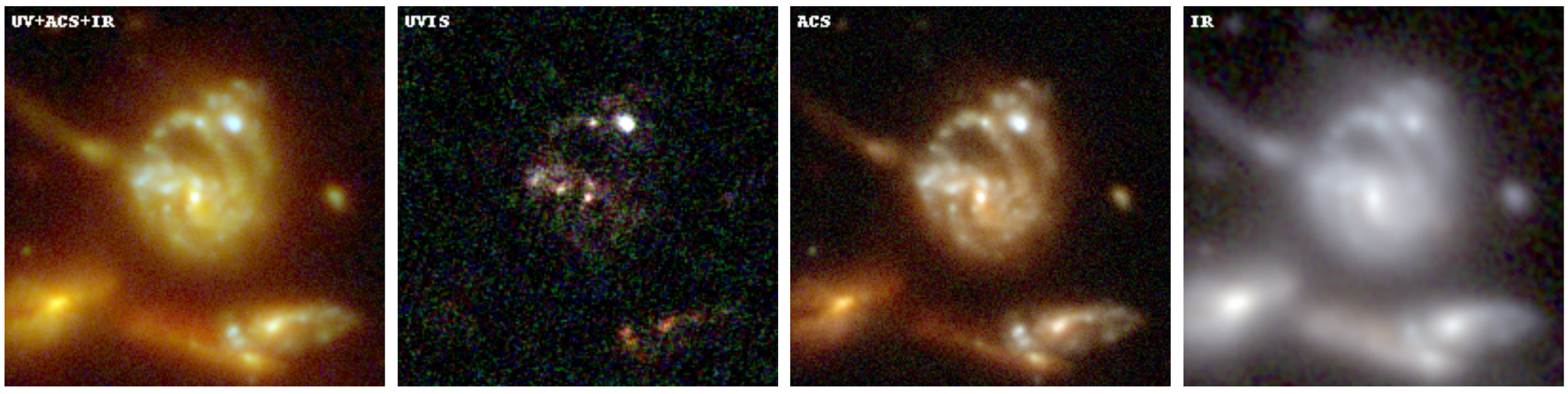


Figure from UVUDF F275W, 3x3”, Emmaris Soto and Duilia de Mello



UV + OPT + IR | UV | OPT | IR

Study of clumpy galaxies at low redshift for comparison to higher redshifts in the rest-frame UV to understand role of sub-galactic clumps in the build up of galaxies.

Structural Evolution of Galaxies: Resolved SEDs

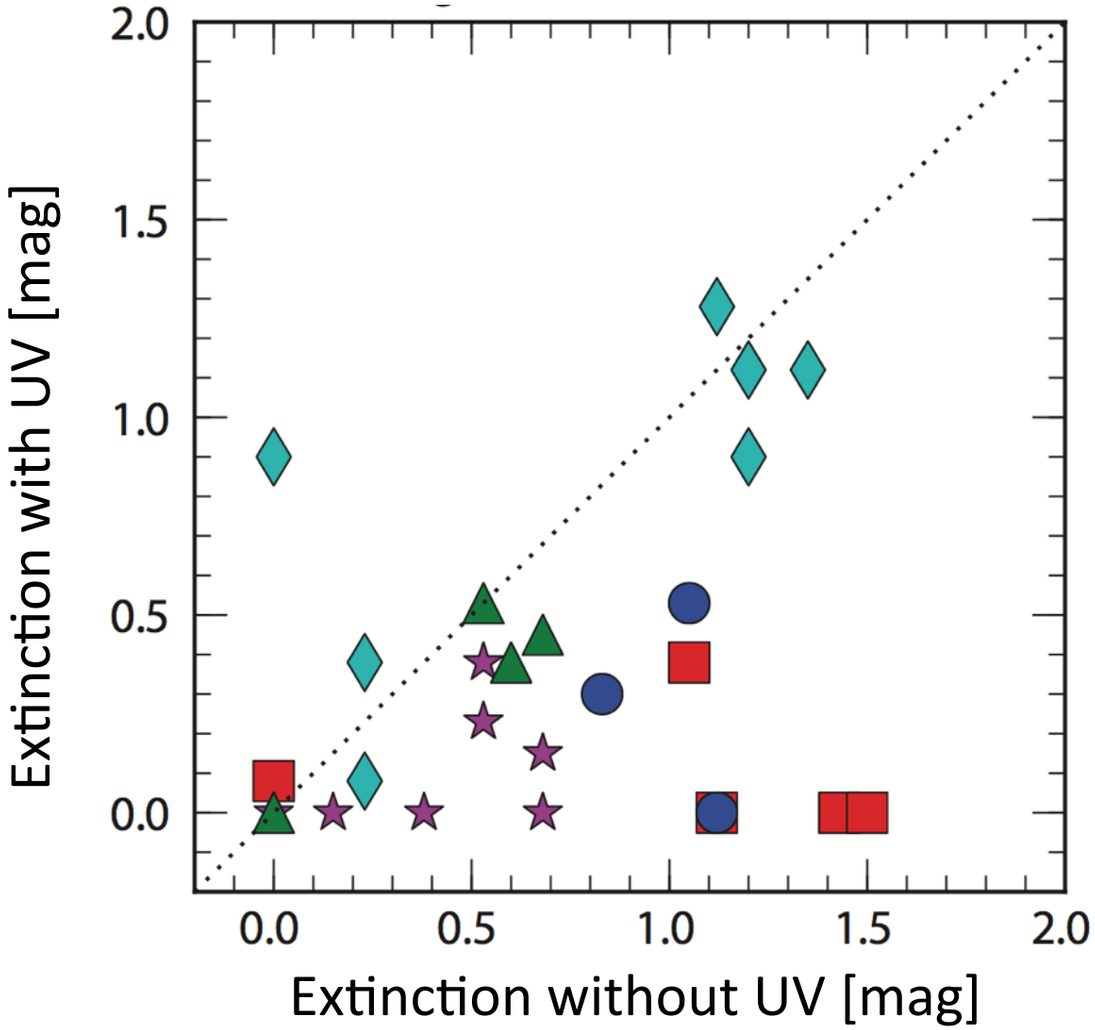
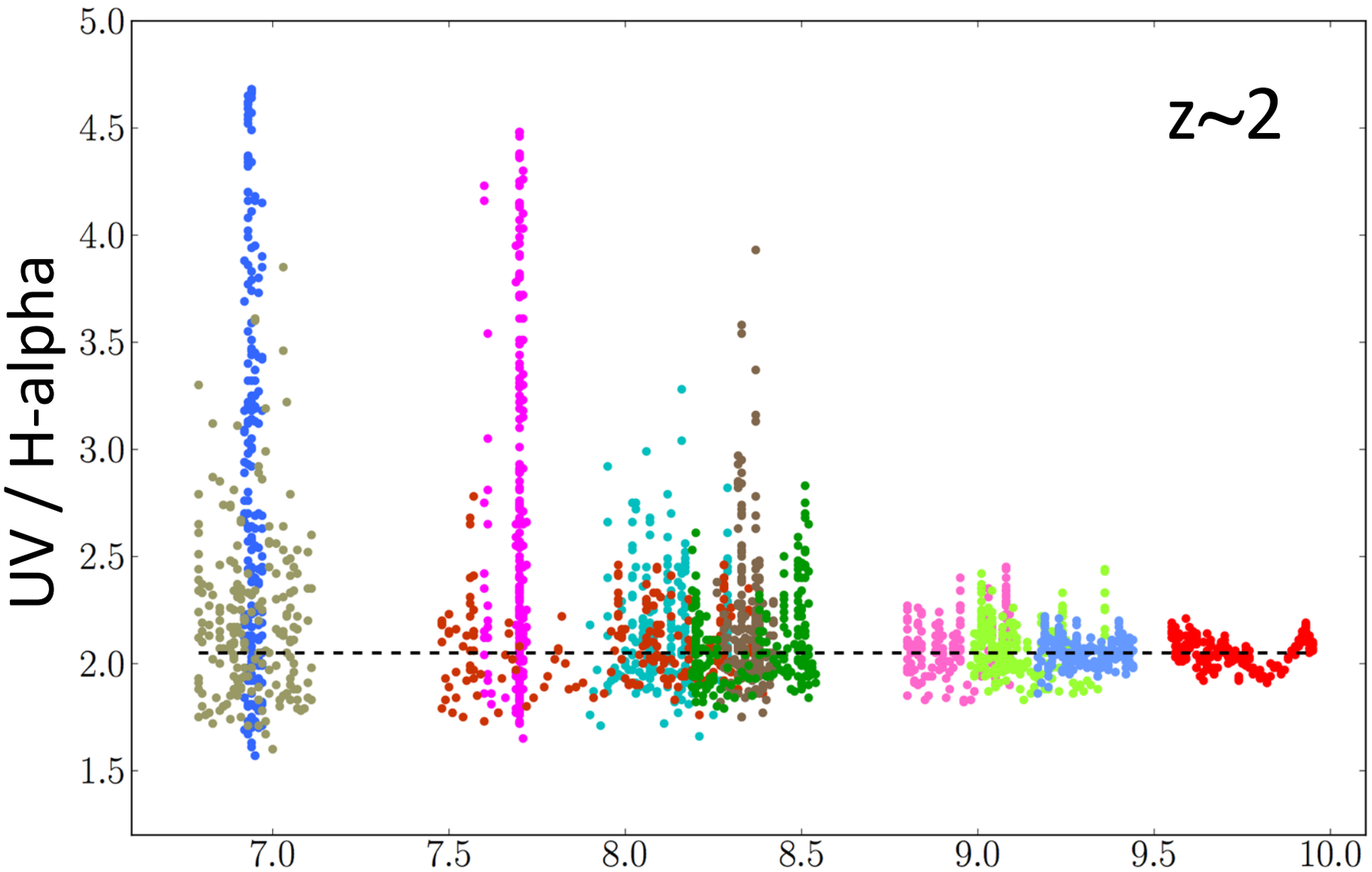


Figure: Mathew Hayes

The reddening of a galaxy or clumps within galaxies are poorly constrained without UV data at z=0.5-1.3 and optical data at z<2.5

Understanding dwarfs: bursty star formation



Dominguez et al. 2015

Rapid quenching of star formation results in luminous UV and faint H-alpha

Sampling different environments and cosmic variance

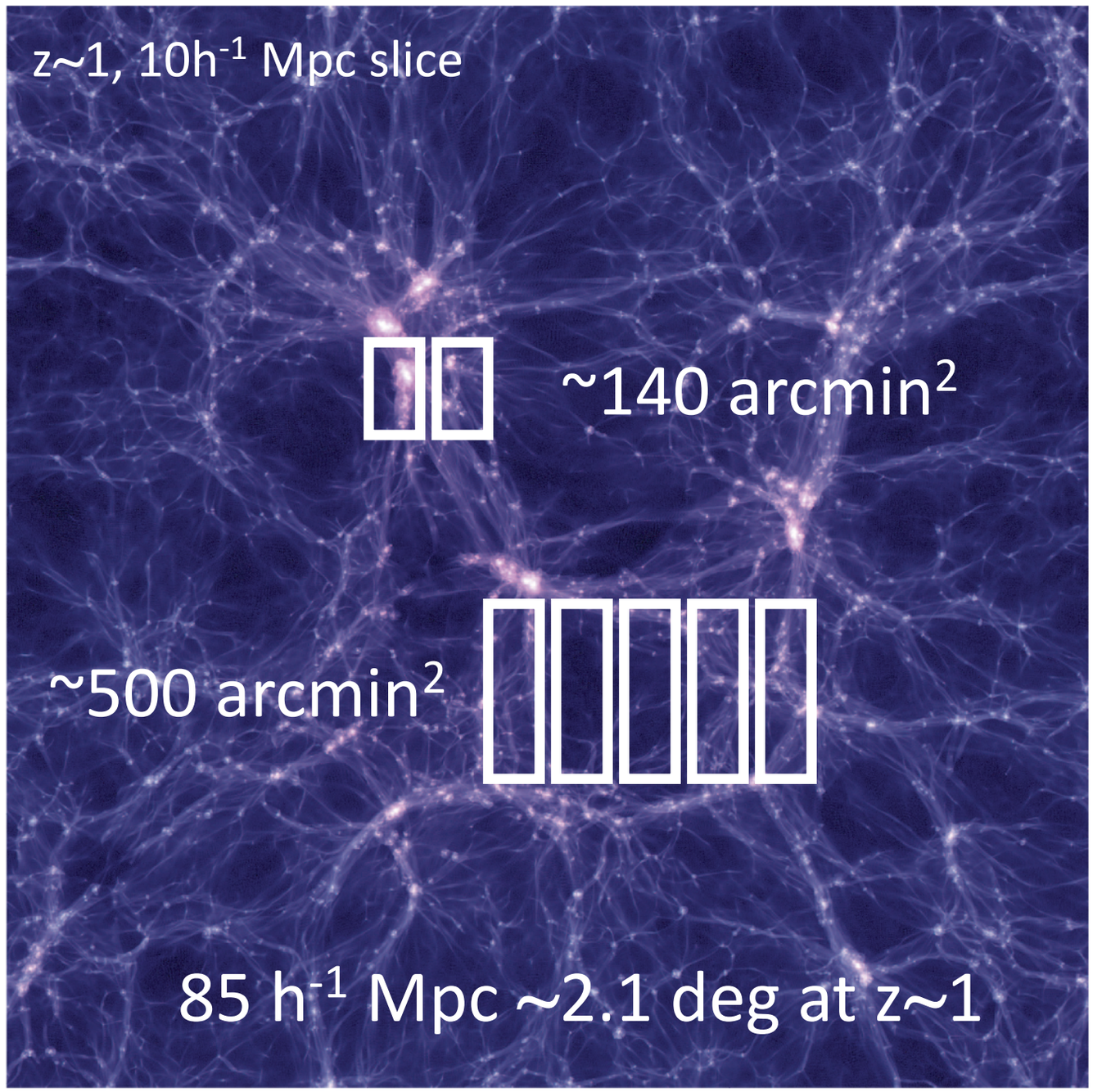


Figure: Brandt Robertson

Need to have large area to sample different environments and avoid cosmic variance

Galaxy Redshifts with UV well determined by photo-z

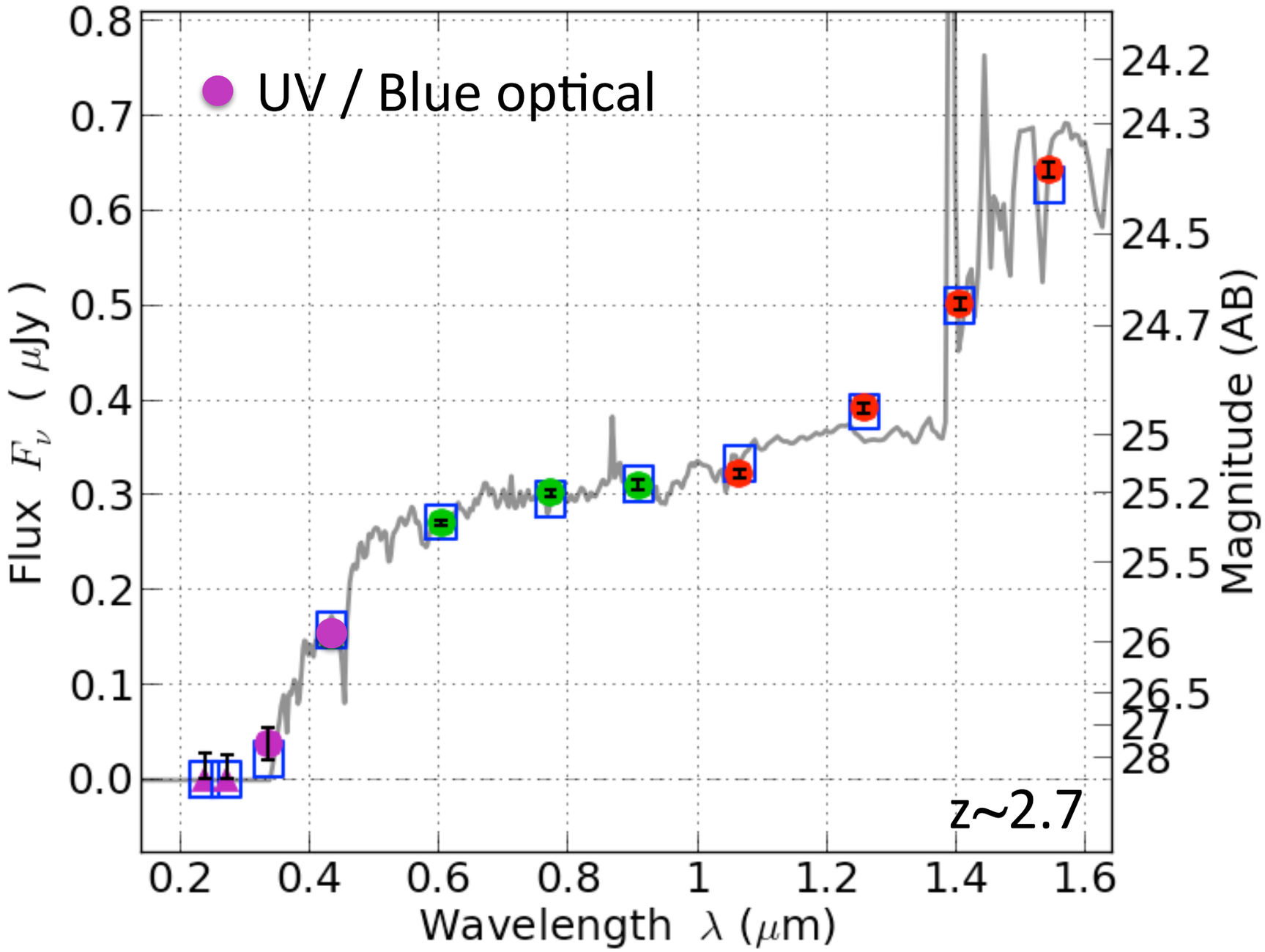
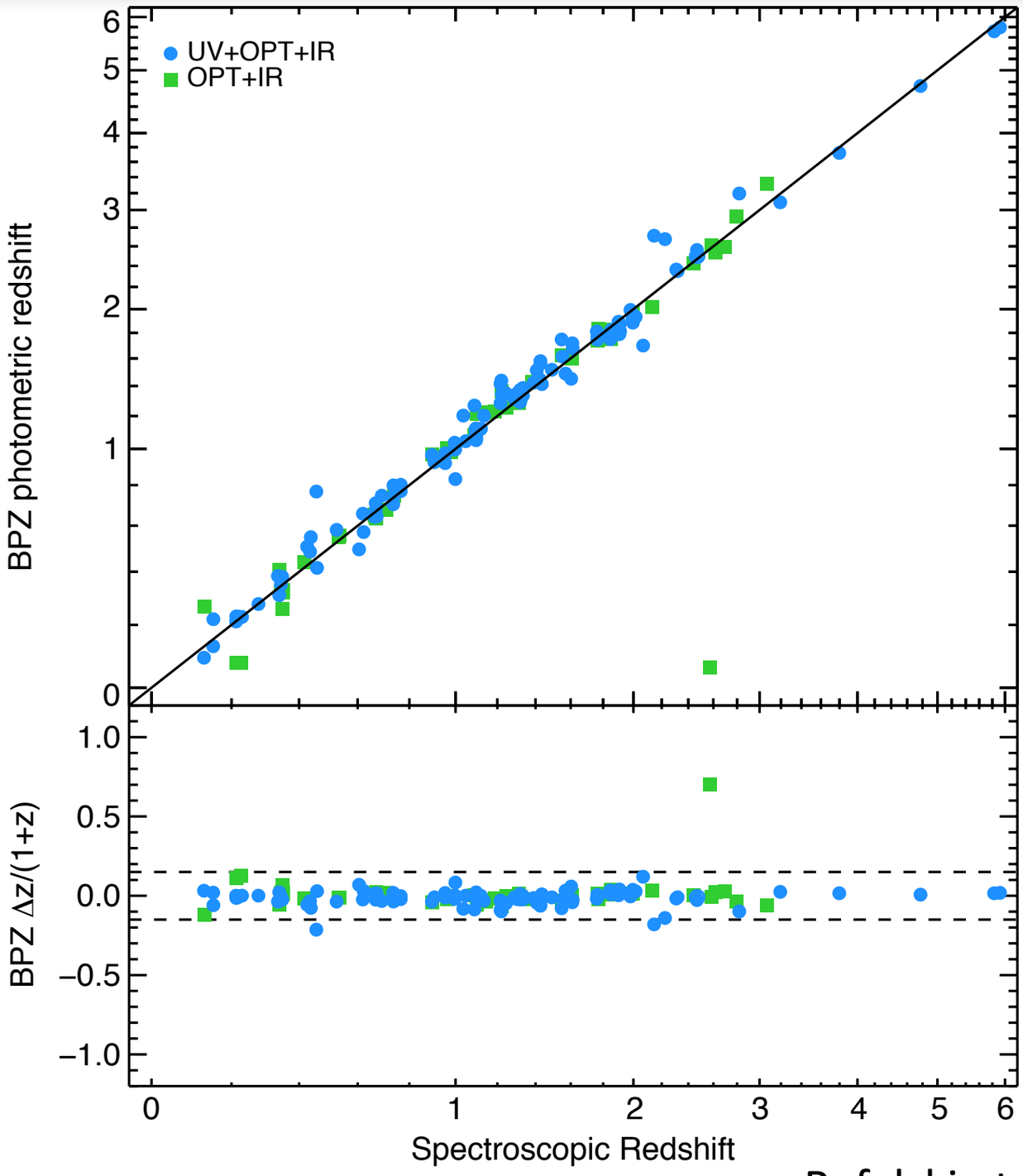


Photo-z's still needed for large samples of low-mass galaxies

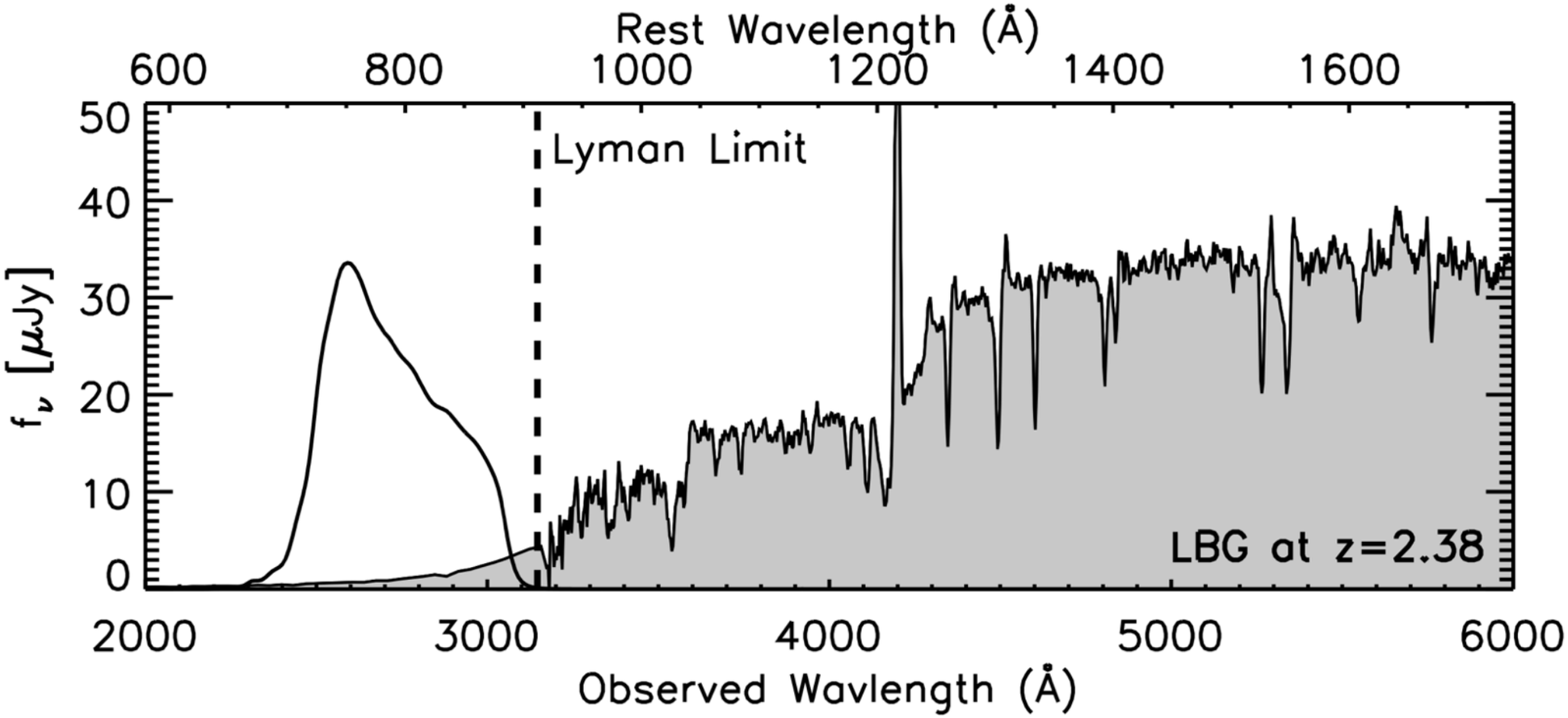
Improved redshifts from UVUDF



Rafelski et al. 2015

Factor of >2 improvement in outlier fraction with NUV data

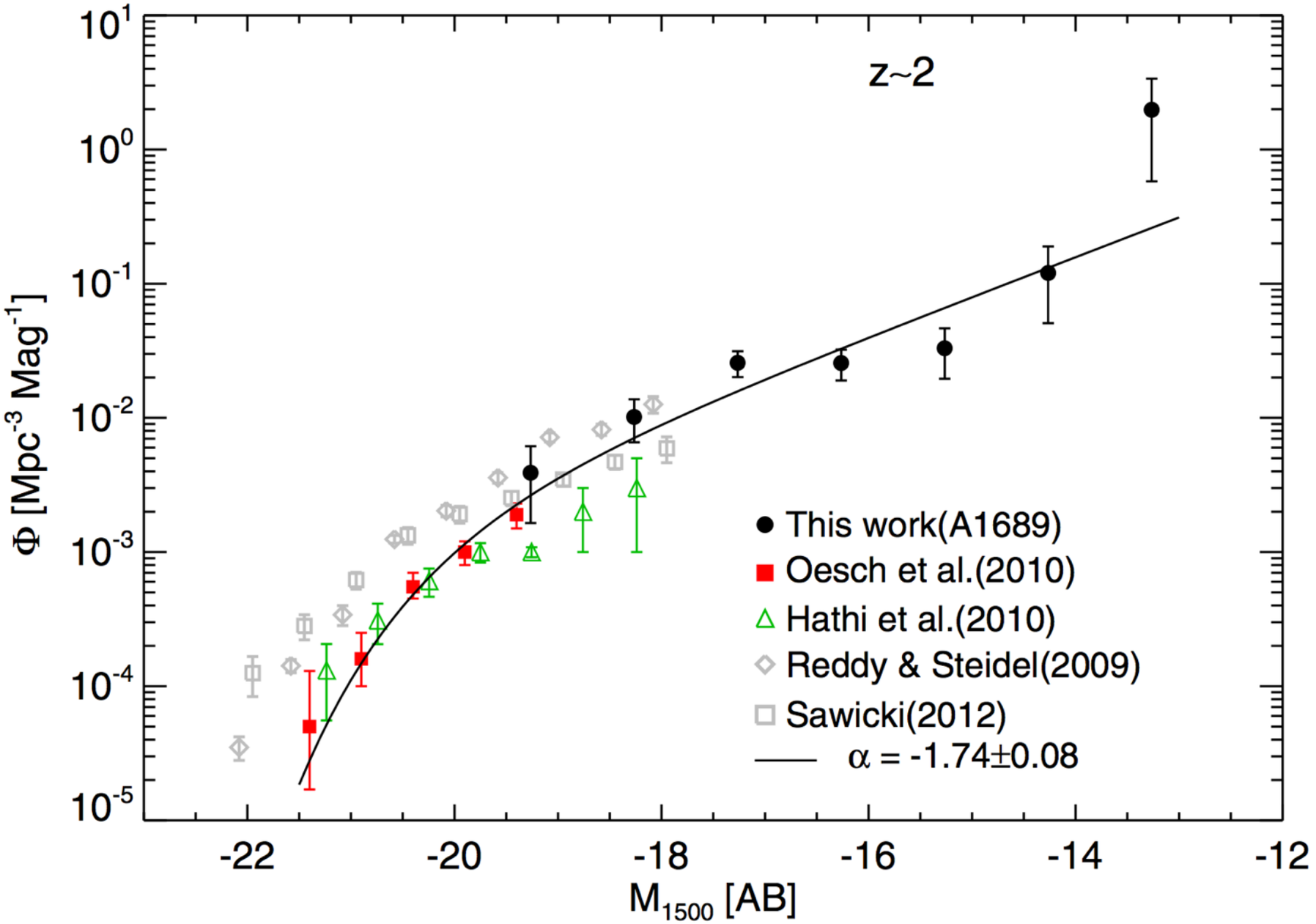
Lyman Continuum Escape Fraction



Example from Brian Siana

The escape fraction is an important parameter in understanding Reionization and the evolution of the ionizing background, and is best measured at $z < 3$.

Rest-UV Luminosity Functions

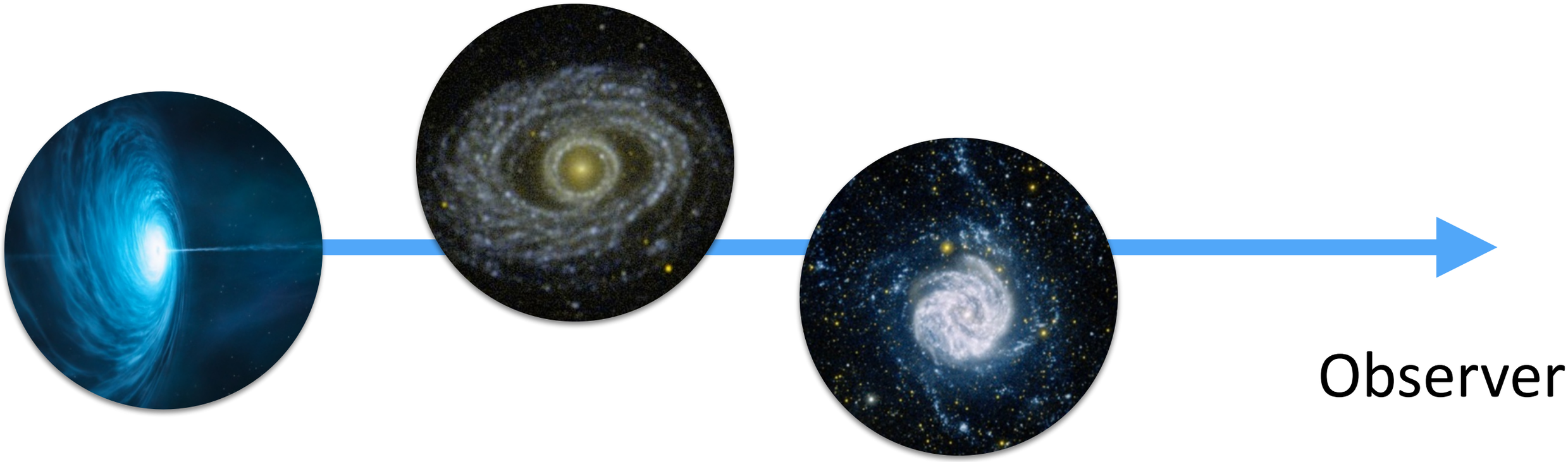


Alavi et al. 2014

Improve uncertainties in the luminosity function
at z~1-3 down to low-mass dwarf galaxies

Measuring HI rich galaxies (DLAs) in emission

Blocking DLA (HI rich galaxy)



Quasar

Target DLA (HI rich galaxy)

Observer

Summary

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