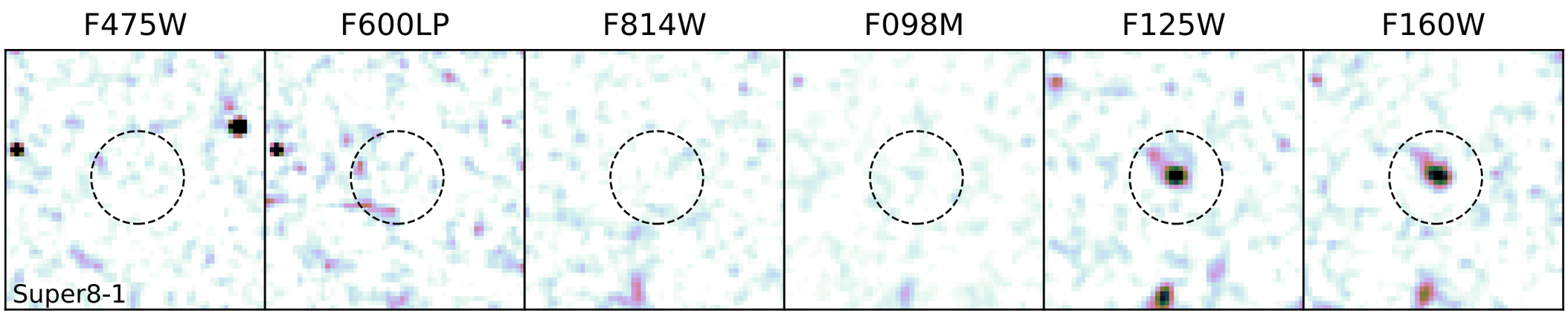

The Super Eight Galaxies: Very Bright Galaxies at $z \sim 8$

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University of Louisville, Kentucky

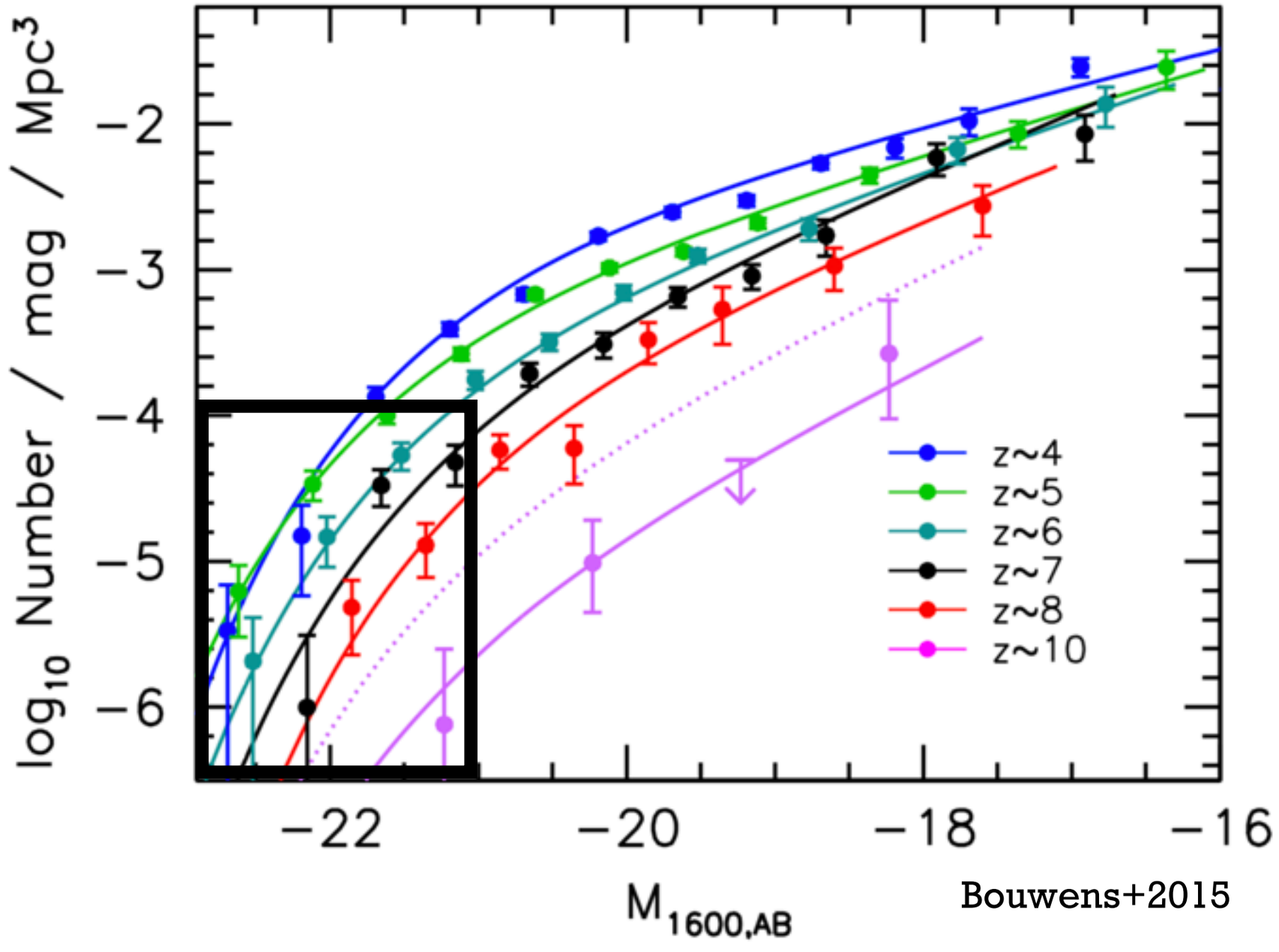
with Benne Holwerda, Rychard Bouwens, Mauro Stefanon and others

Galactic Labyrinths, Crete
September 12, 2018

Some of the questions we will answer today:

- Why are bright galaxies at high redshift interesting?
- How do we find galaxies at high redshift?
- What do bright galaxies tell us about reionization?

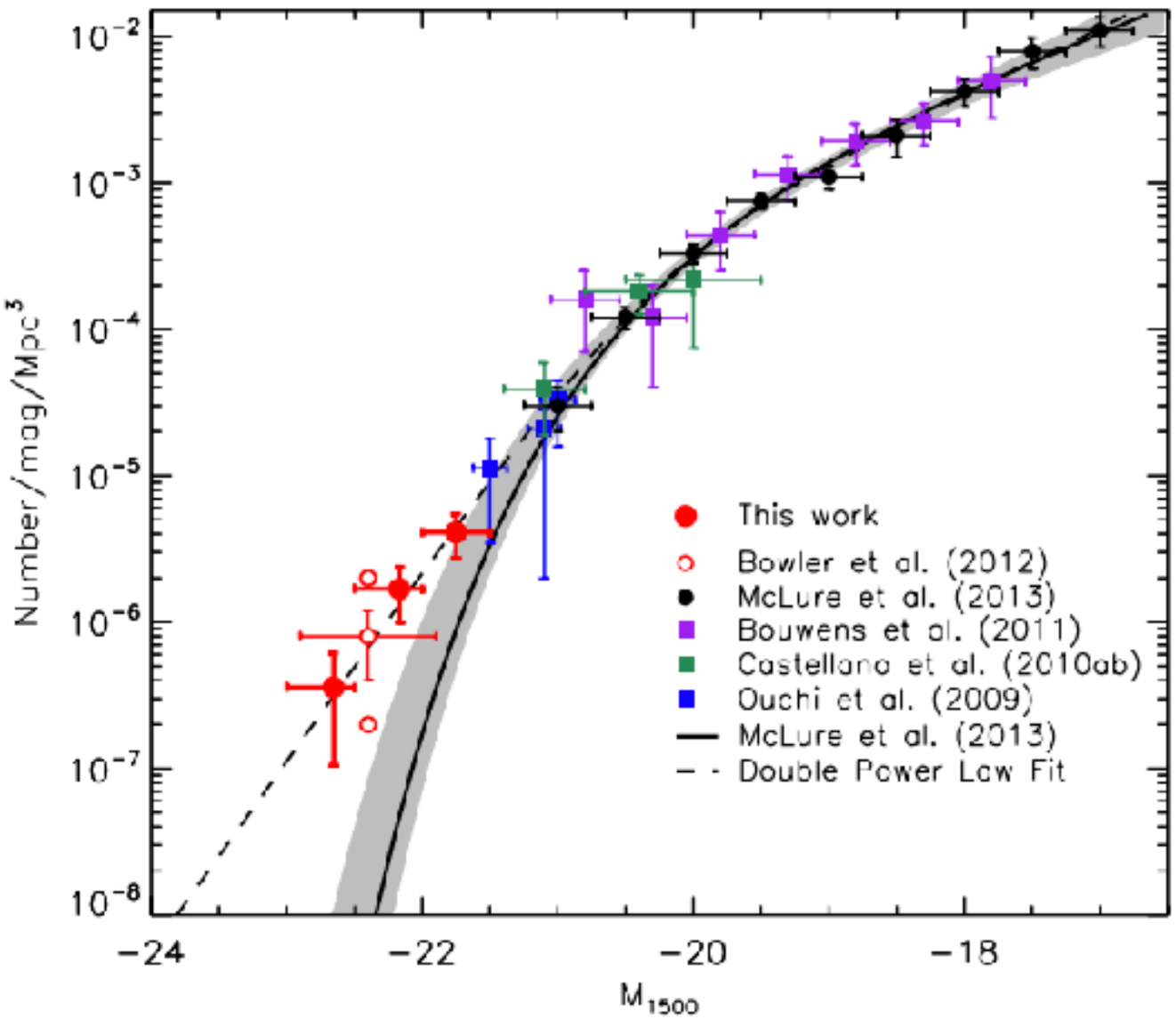
The luminosity function is well described by the Schechter function that evolves with redshift



Bouwens+2015

Is the bright end of the luminosity function still fit by a Schechter function at high redshift?

Bowler+2014

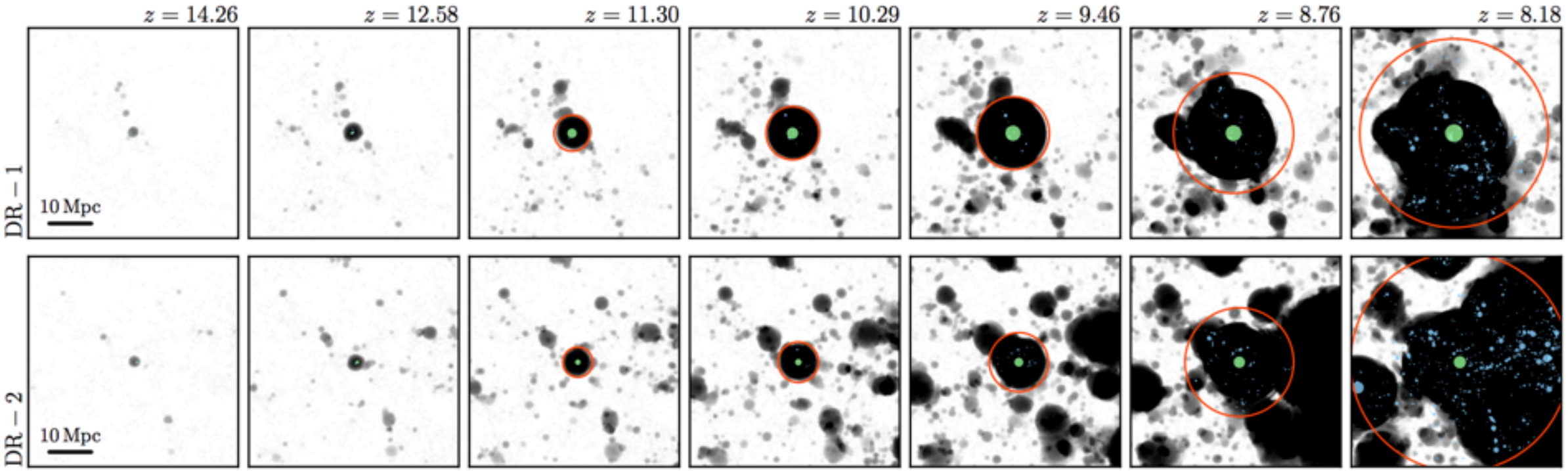


- Maybe? The jury is still out

- Several studies (e.g., Bowler+2014, Stefanon+2017, Ono+2018) point to the possibility that a double-power law is a better fit

- Need more galaxies!

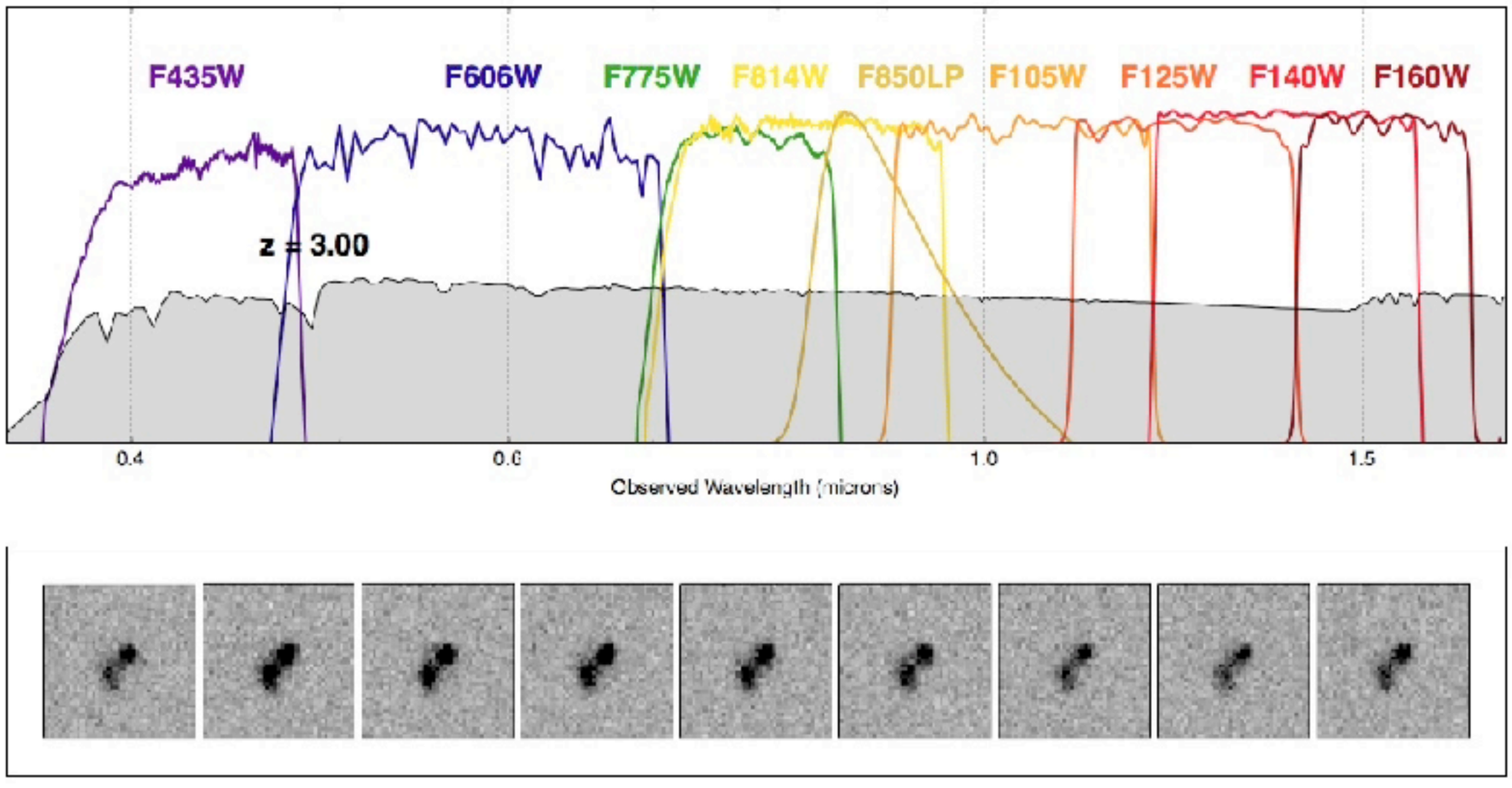
Why do we care about the bright end of the luminosity function?



Geil+2017

Simulations indicate bubble size grows with galaxy luminosity

Most common way to select high redshift galaxies is the Lyman break technique



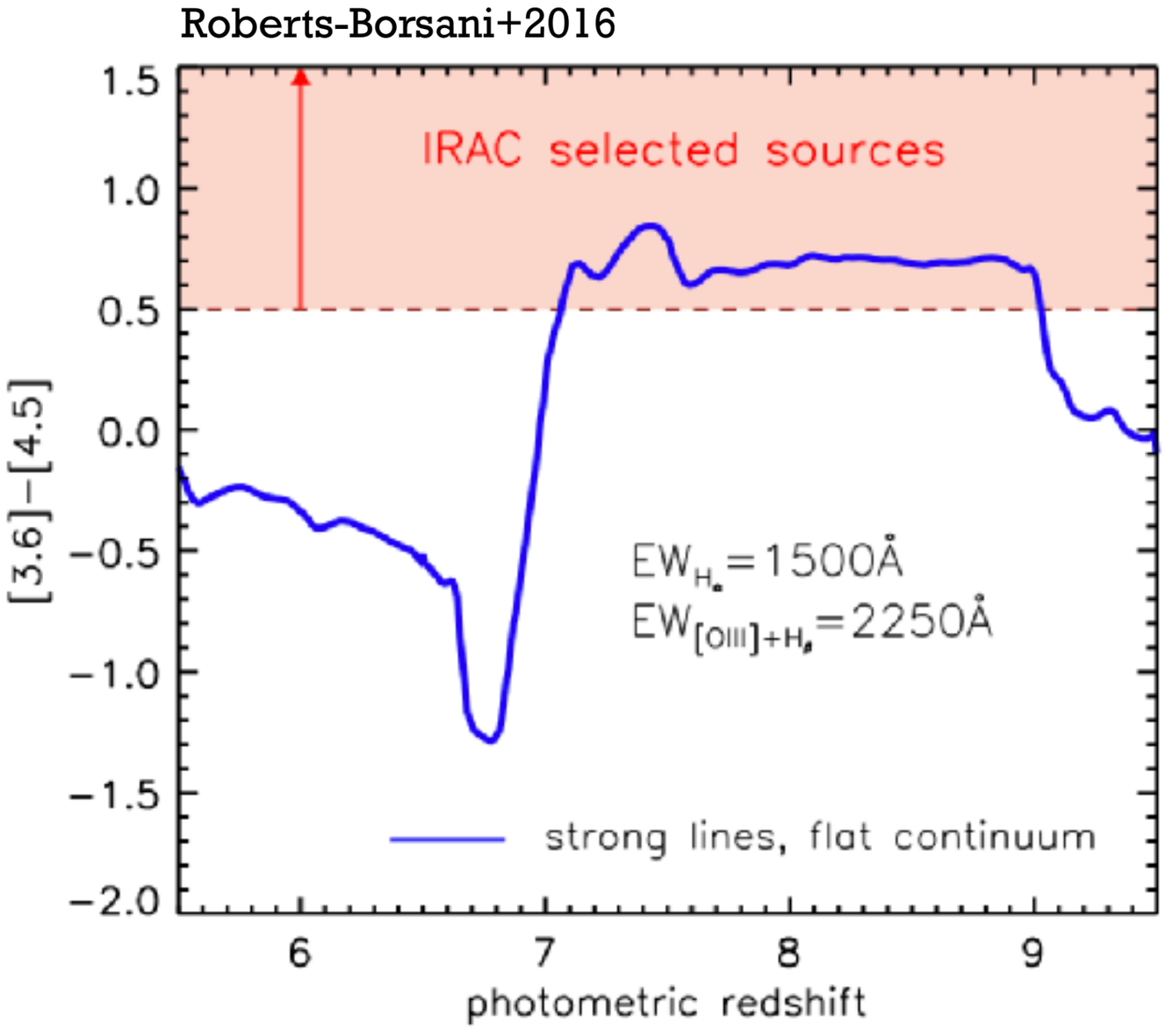
http://xdf.ucolick.org/images.html

We can also identify these extremely energetic, bubble-blowing galaxies via their IRAC colors

- Galaxies with strong star formation exhibit strong nebular emission lines

- At z ~ 8, lines such as [O III] and Hβ are redshifted into the *Spitzer* IRAC 3.6 and 4.5 μm bands

- Four bright galaxies with red IRAC colors have at z ~ 8 have been spectroscopically confirmed (Roberts-Borsani+2016, Zitrin+2015, Oesch+2015, Stark+2017)

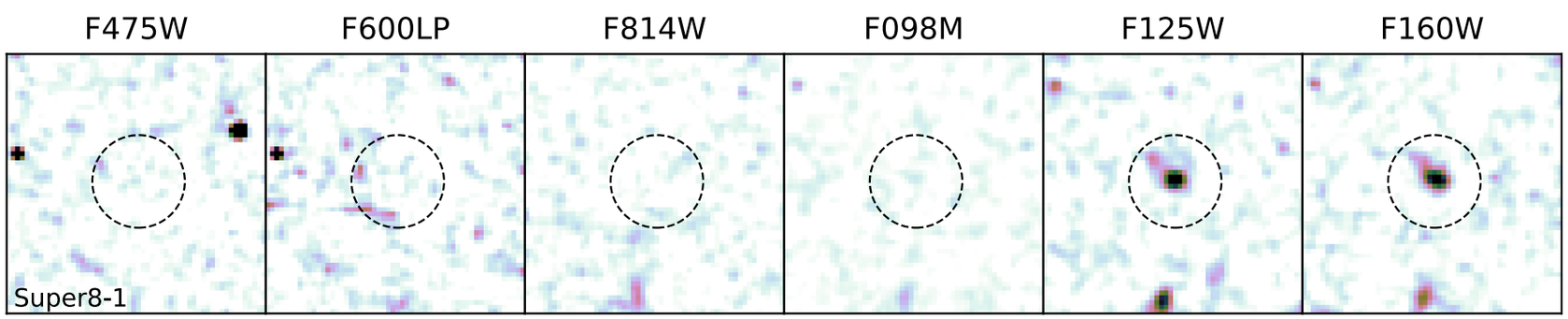


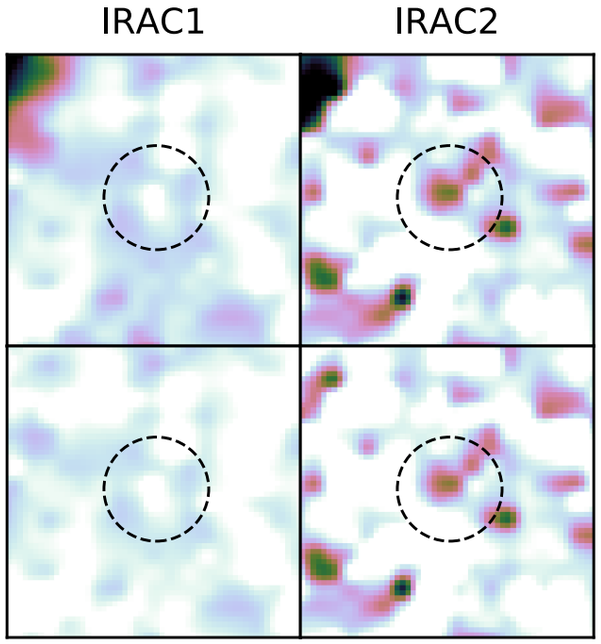
We are looking for a sample of very bright, high-redshift galaxies

- Criteria for selection:
  - *H*-band (*HST* F160W) magnitude greater than 25.5,
  - Lyman break falls somewhere past the *Y*-band (*HST* F098M)
- Brightest of Reionizing Galaxies (BoRG) Survey (Trenti+2011) is ideal for this search
  - Pure parallel search - wide but shallow (avoids issues of cosmic variance

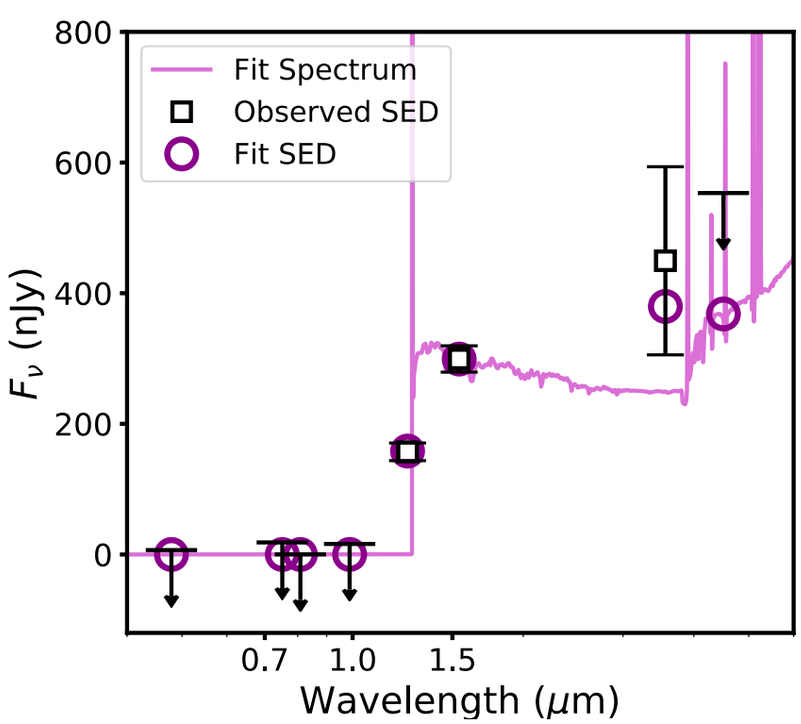
We collected a sample of eight galaxies with these properties, dubbed the **Super Eights**

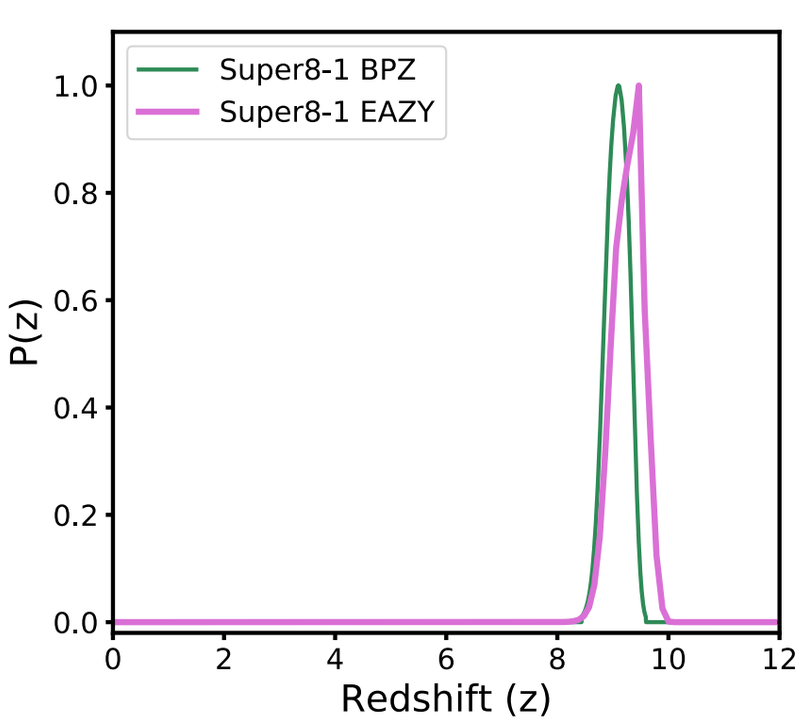
Photometric redshift fitting determines best fit galaxy templates to determine the galaxy's redshift





Bridge+in press





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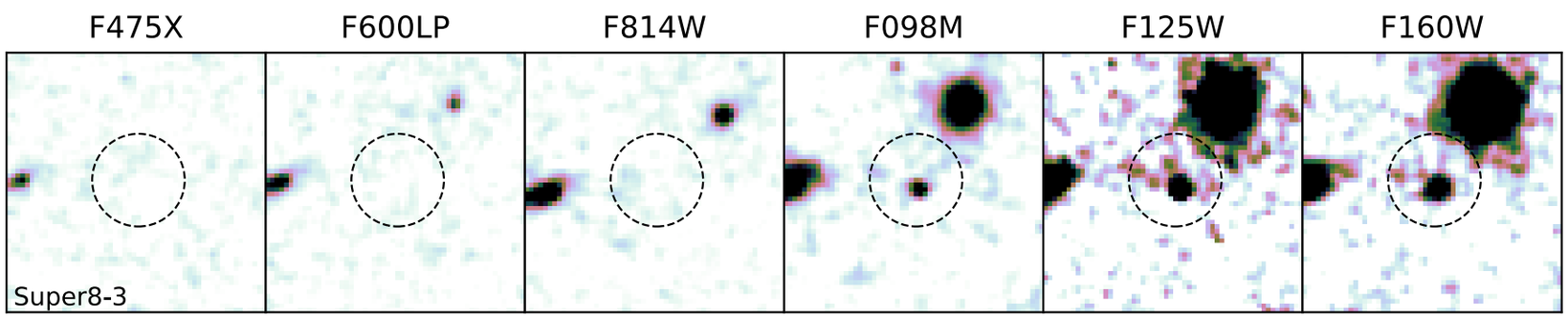

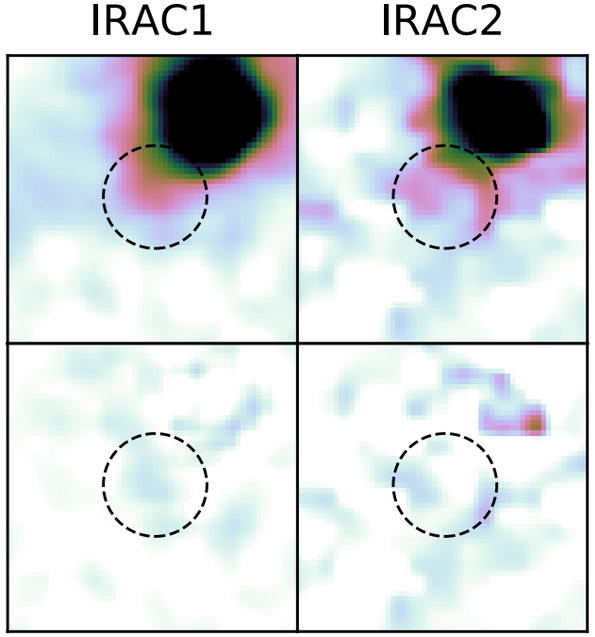

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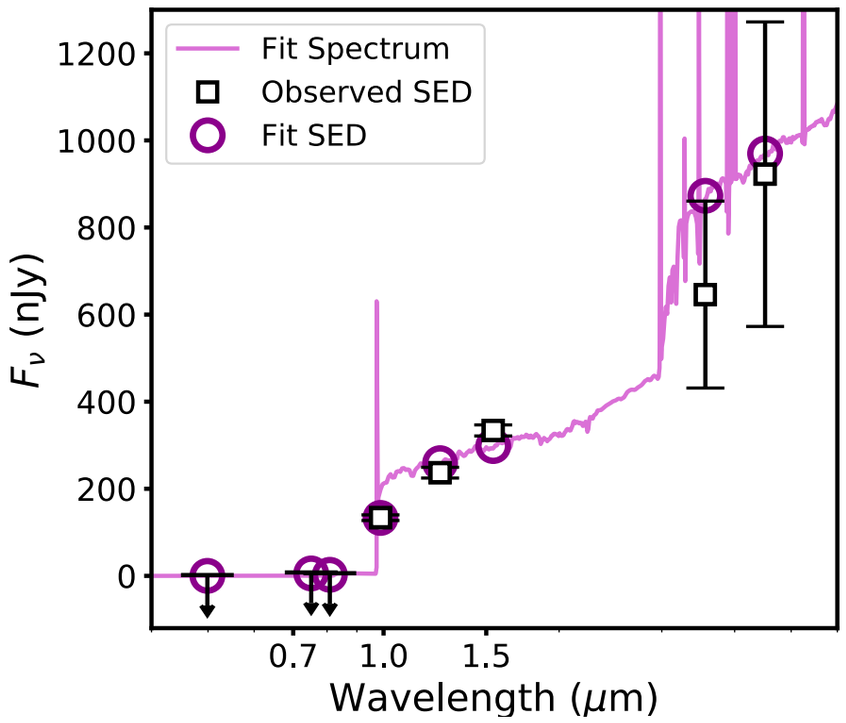
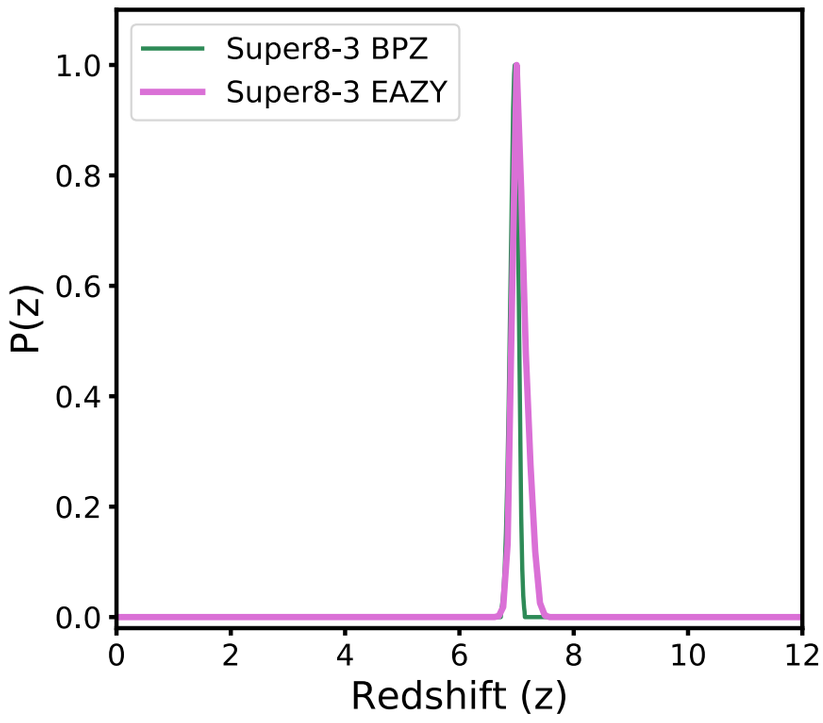
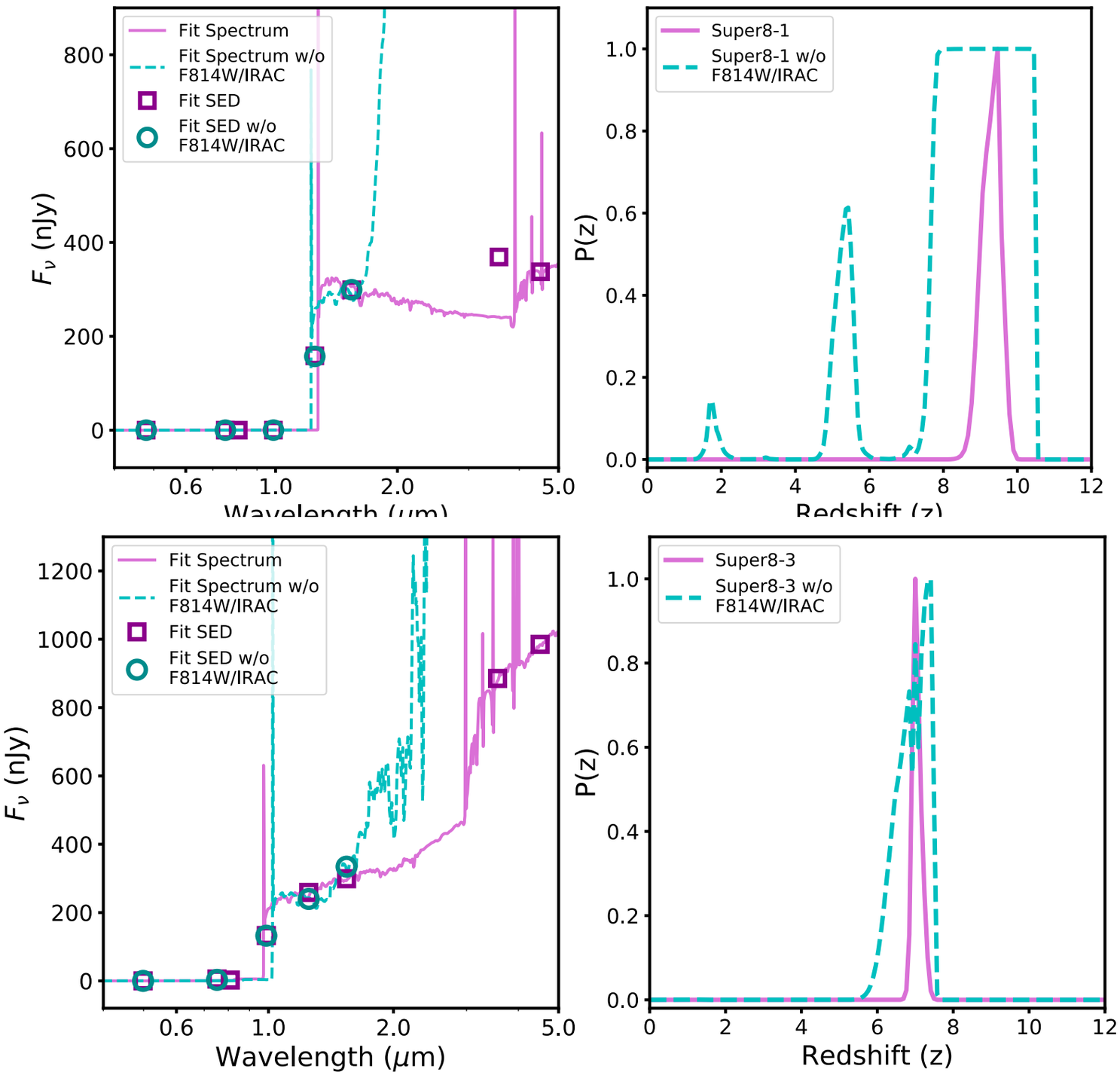
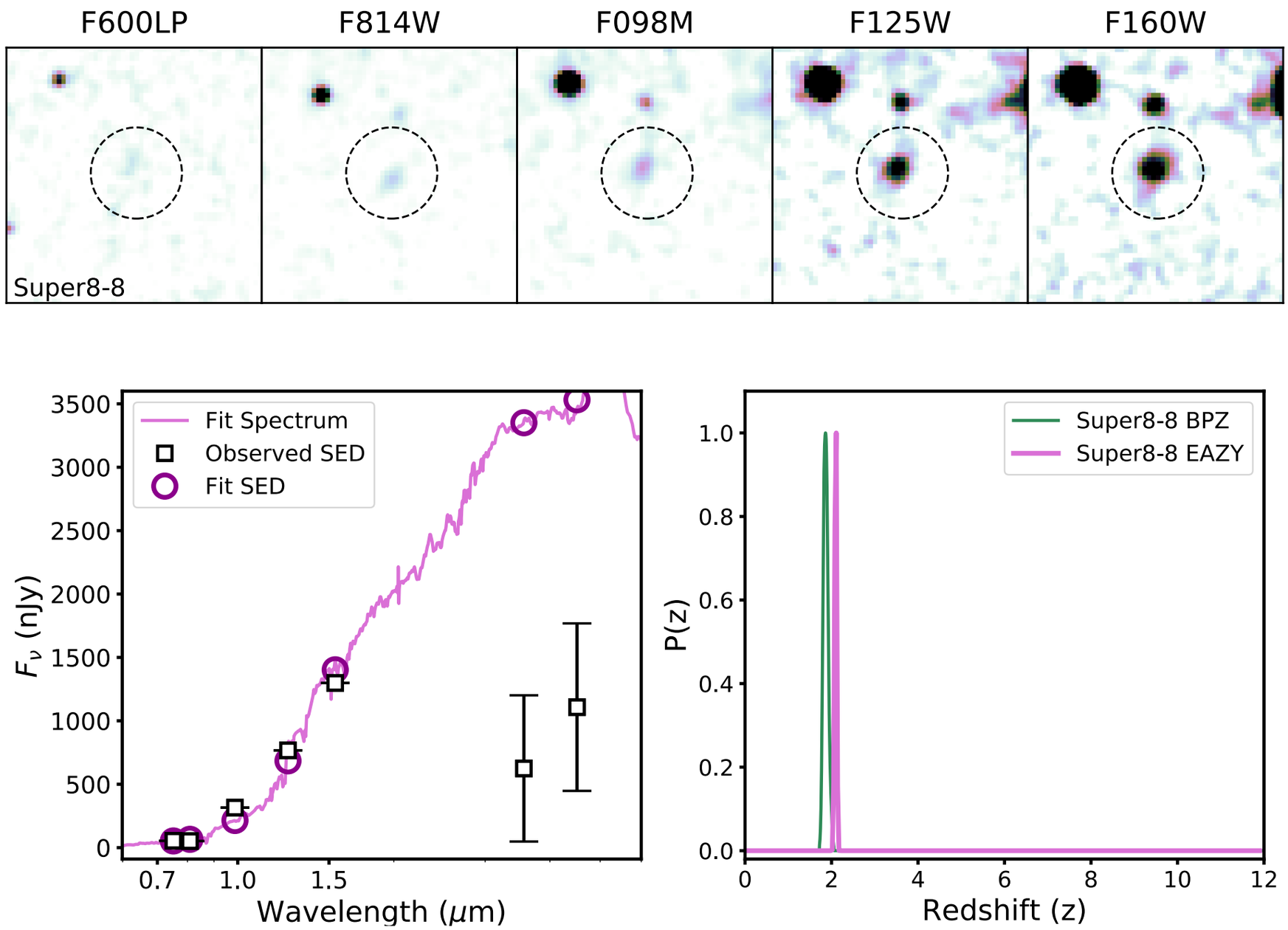




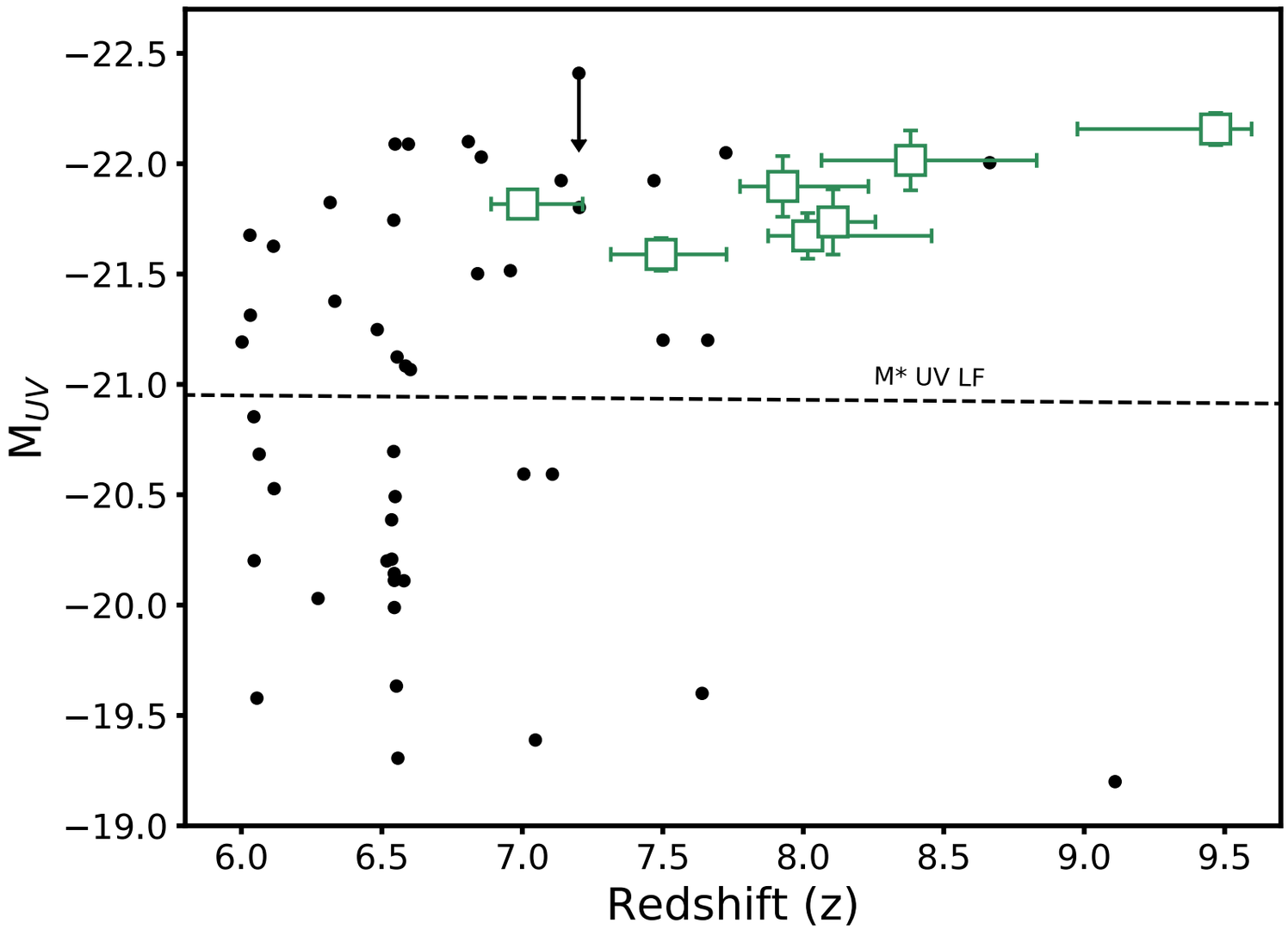
The addition of the F814W and IRAC bands constrained helps to constrain the existence of the Lyman break



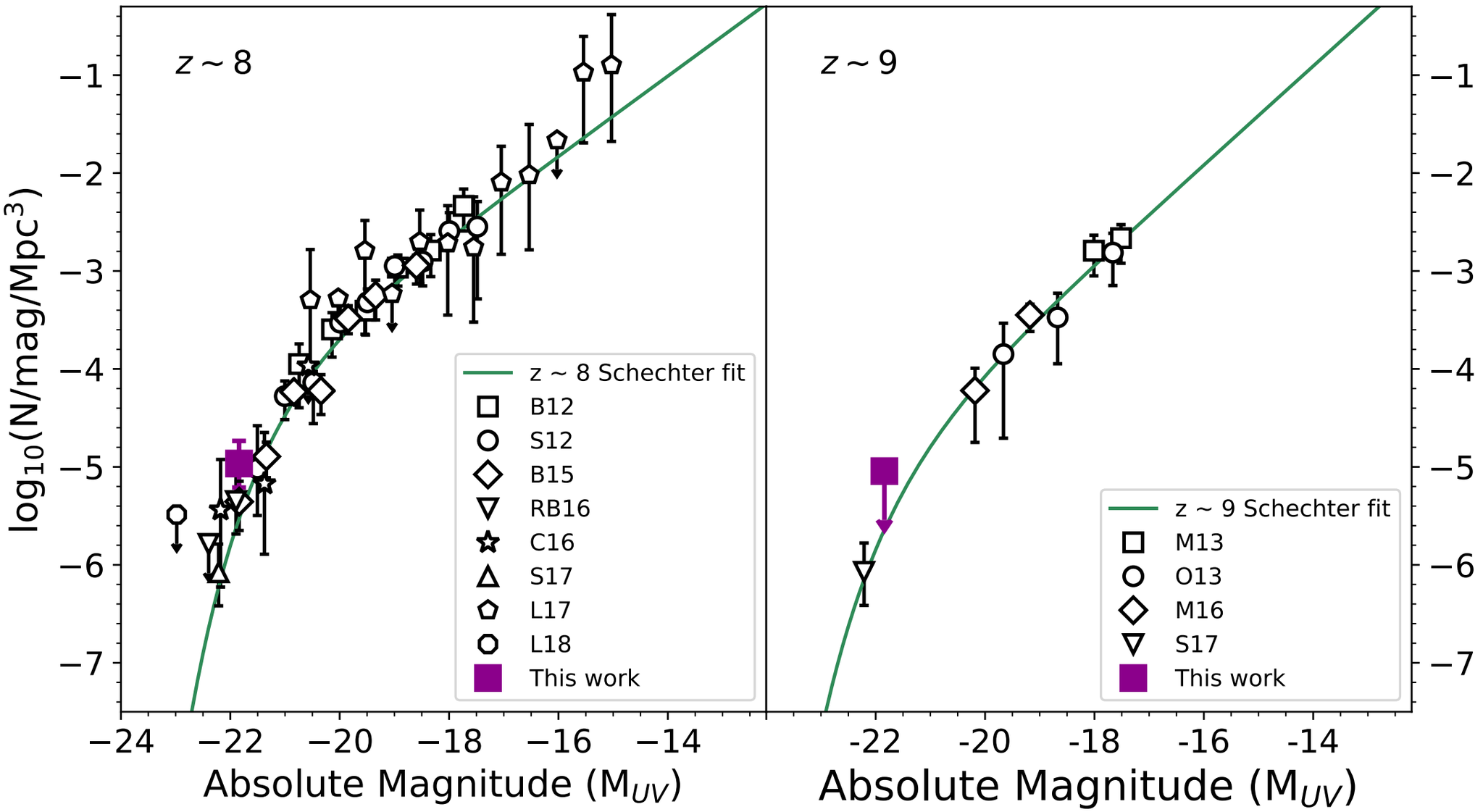
One of the Super Eights was determined to be a low-redshift interloper at z ~ 2



The Super Eight galaxies are among the brightest ever found at high redshift



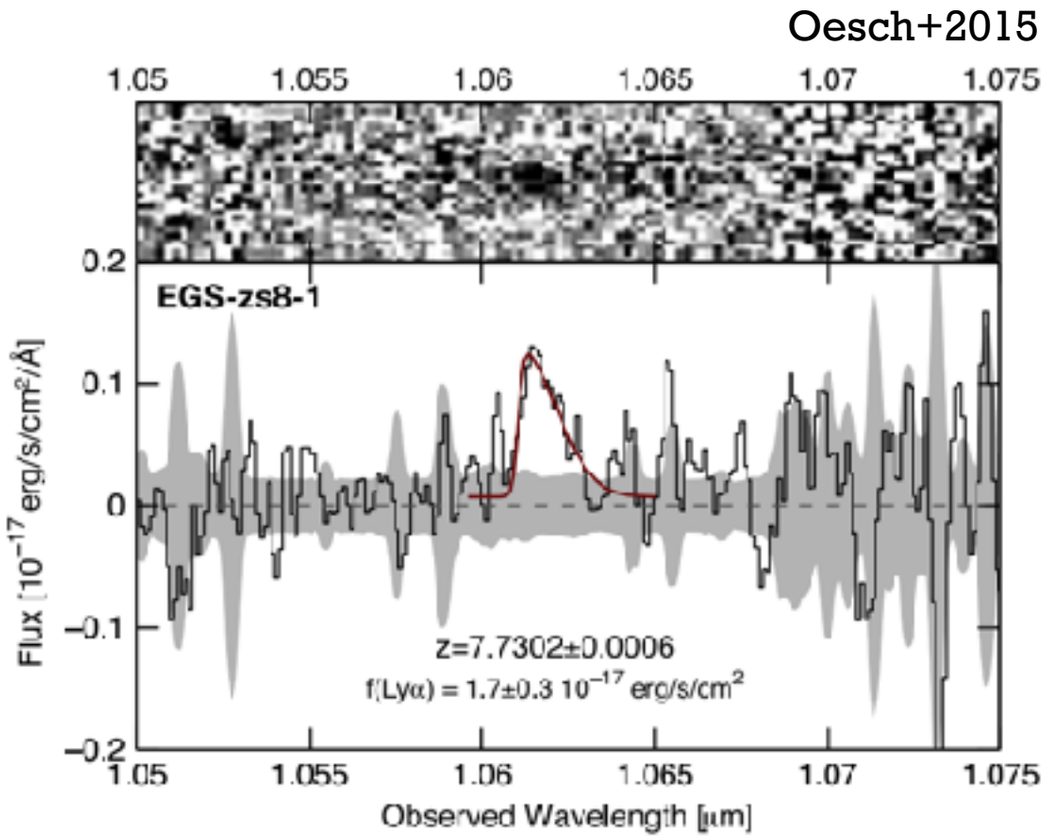
The volume density of the Super Eights are consistent with previous studies at these redshifts



There is still room for discussion as to whether a single power law function is still the best fit

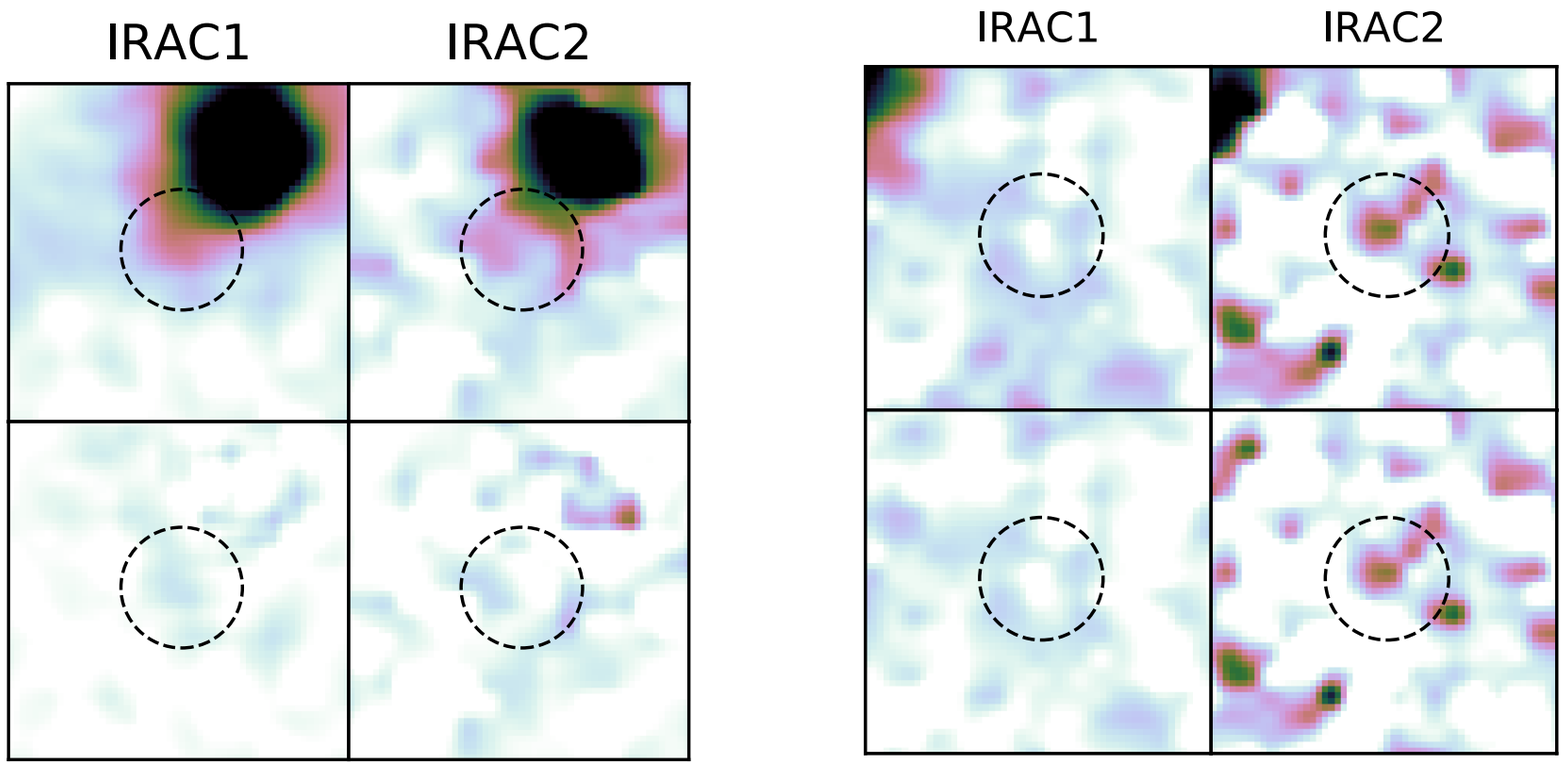
Next step: Hunt for Lyα emission

- There has been 100% success rate looking for Lyα in galaxies with red IRAC colors (Oesch+2015, Zitrin+2015, Roberts-Borsani+2016, Stark+2017)



- Do all luminous galaxies at z ~ 8 have visible Lyα?
- We have done observations using MOSFIRE on Keck, results are pending

Next step: Deeper IRAC data



- The Super Eight's IRAC colors are inconclusive - most of our objects are barely detected, if at all
- We have deeper *Spitzer* data on the way

Hopefully we've answered these questions:

- Why are bright galaxies at high redshift interesting?
- How do we find these galaxies at high redshift?
- What can bright galaxies tell us about reionization?