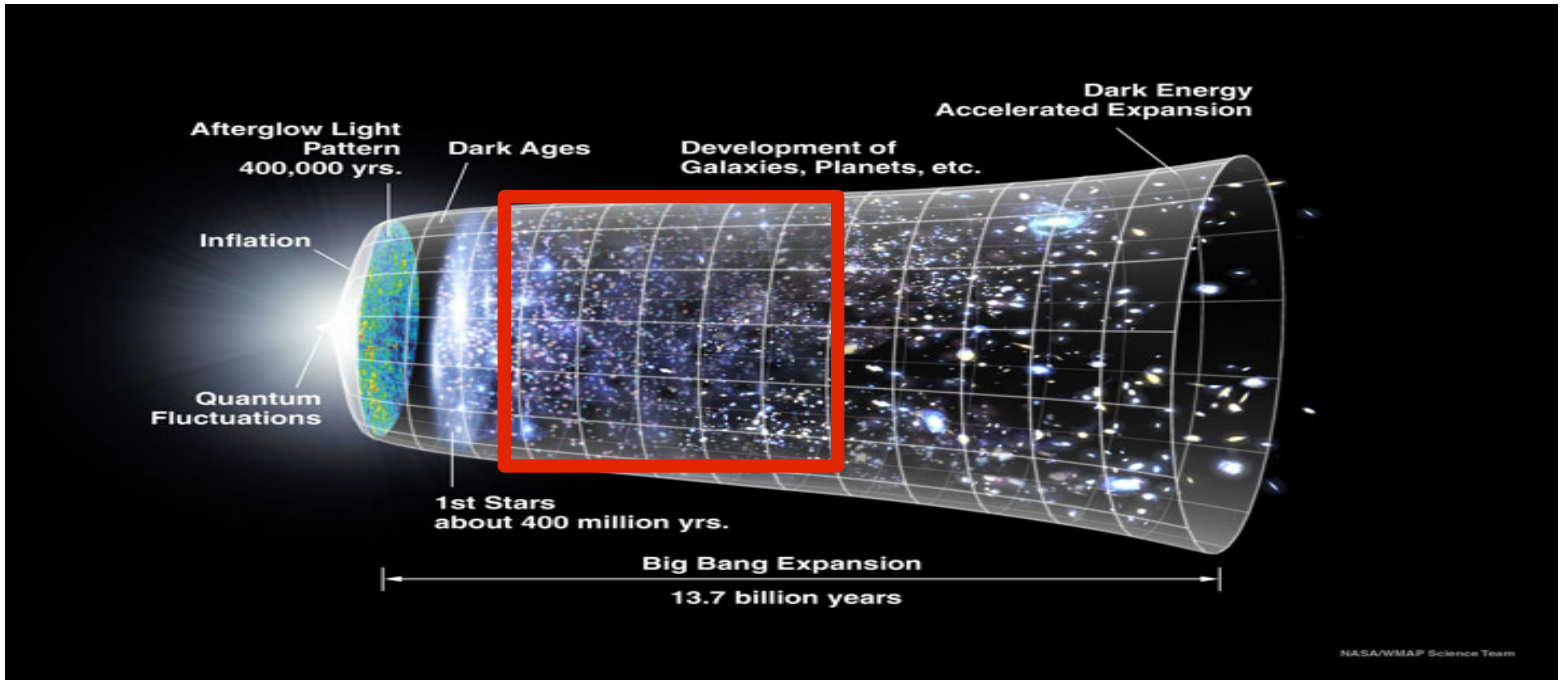
Assembling the earliest galaxies

Pratika Dayal



Collaborators: James Dunlop, Umberto Maio, Benedetta Ciardi

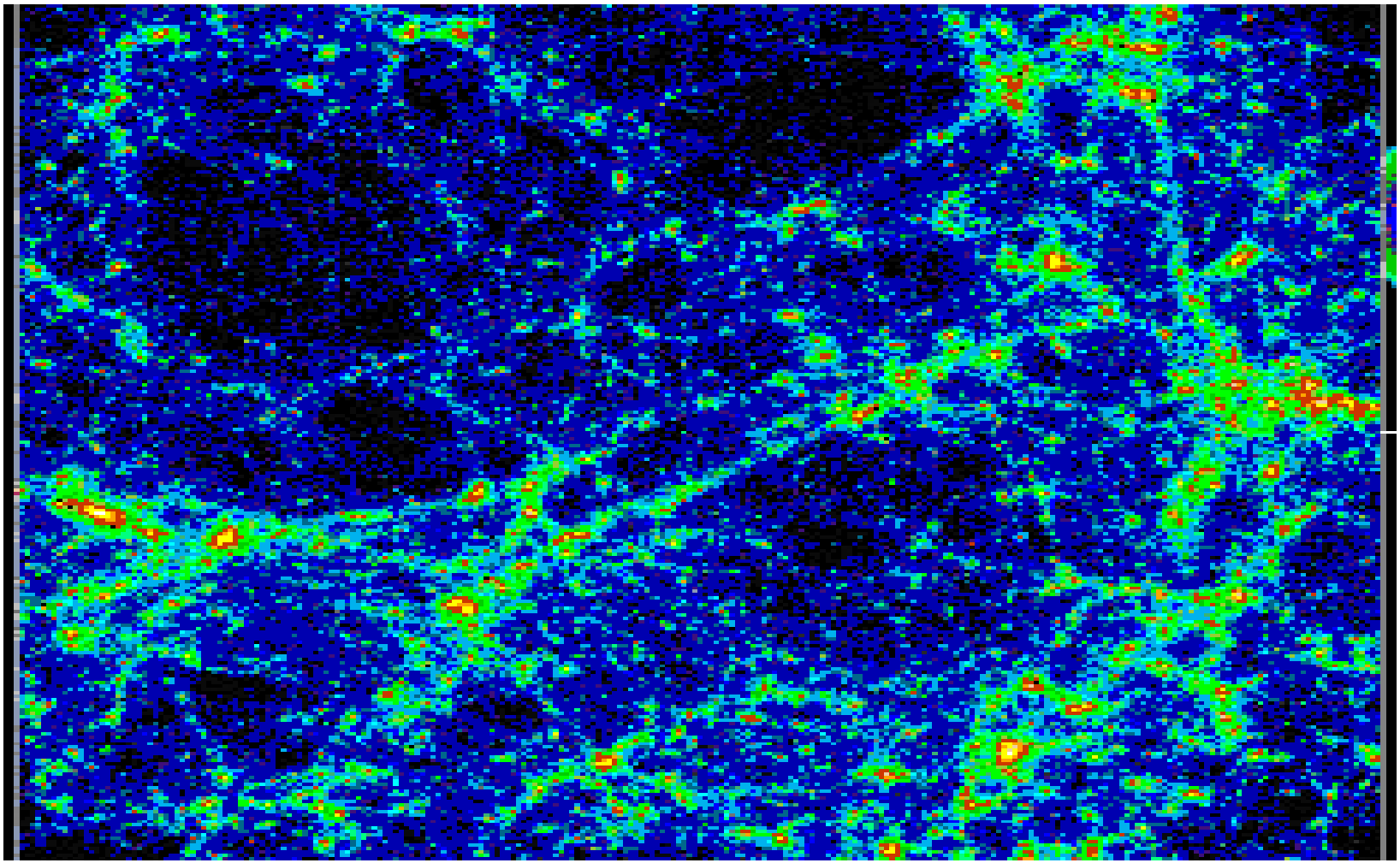
DEX X, 9 January 2014

SUPA

Institute for Astronomy

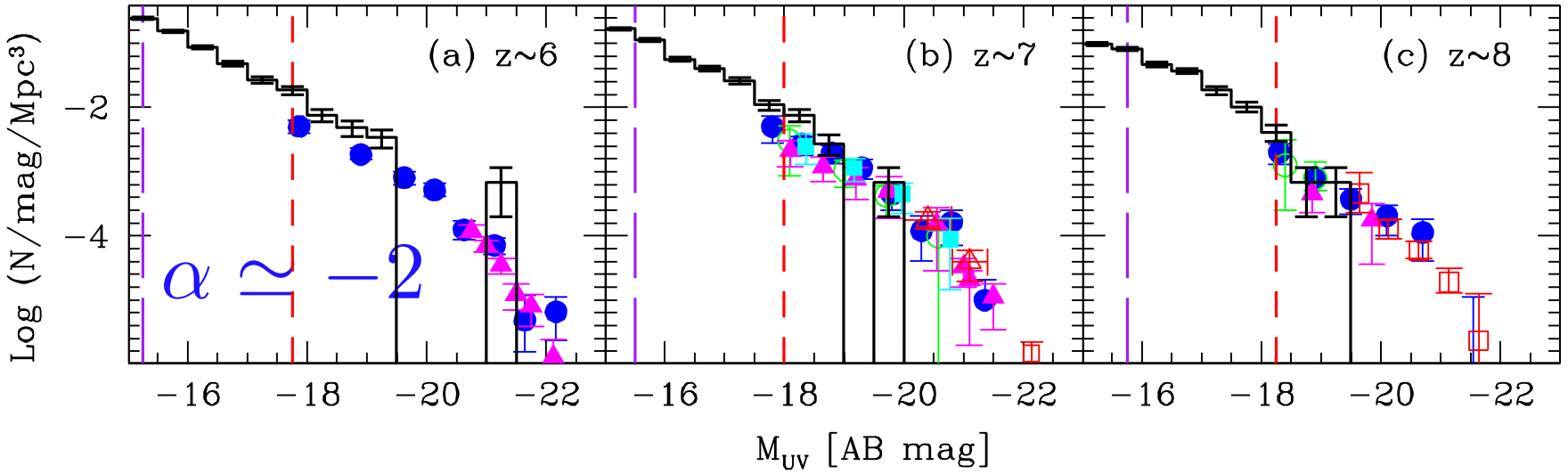
Royal Observatory Edinburgh

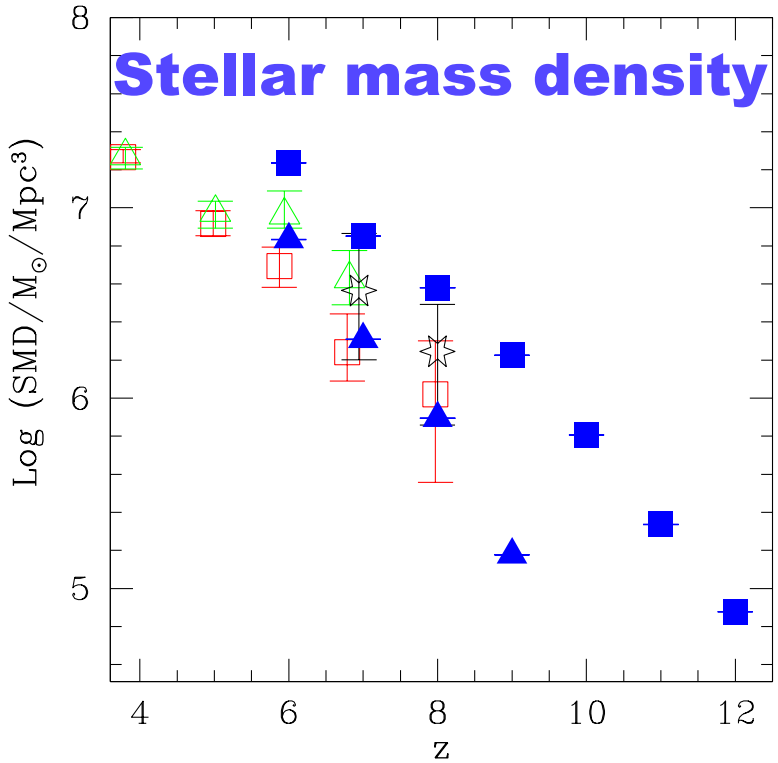
The tool: cosmological simulations

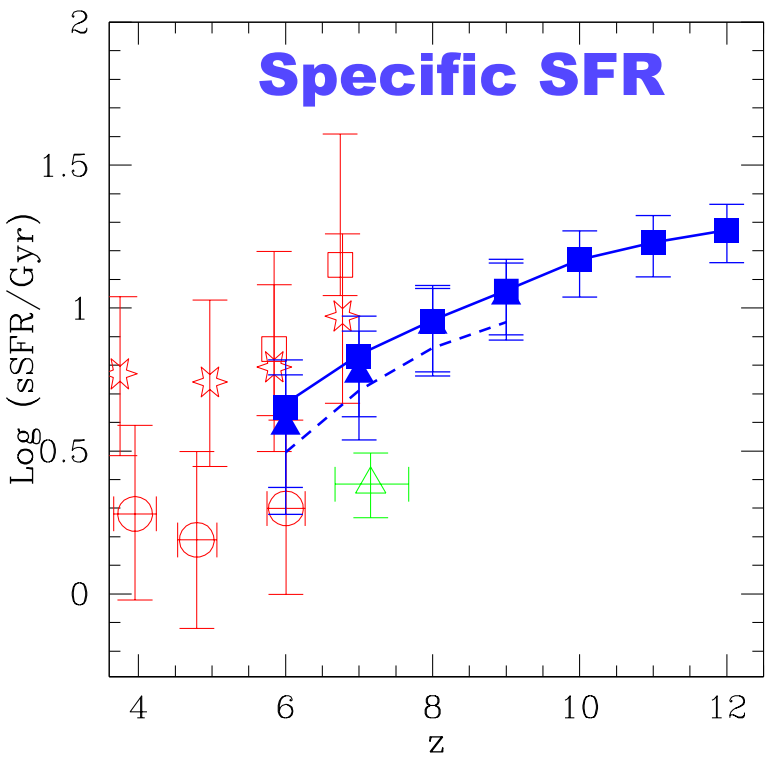


Ultraviolet Luminosity Functions

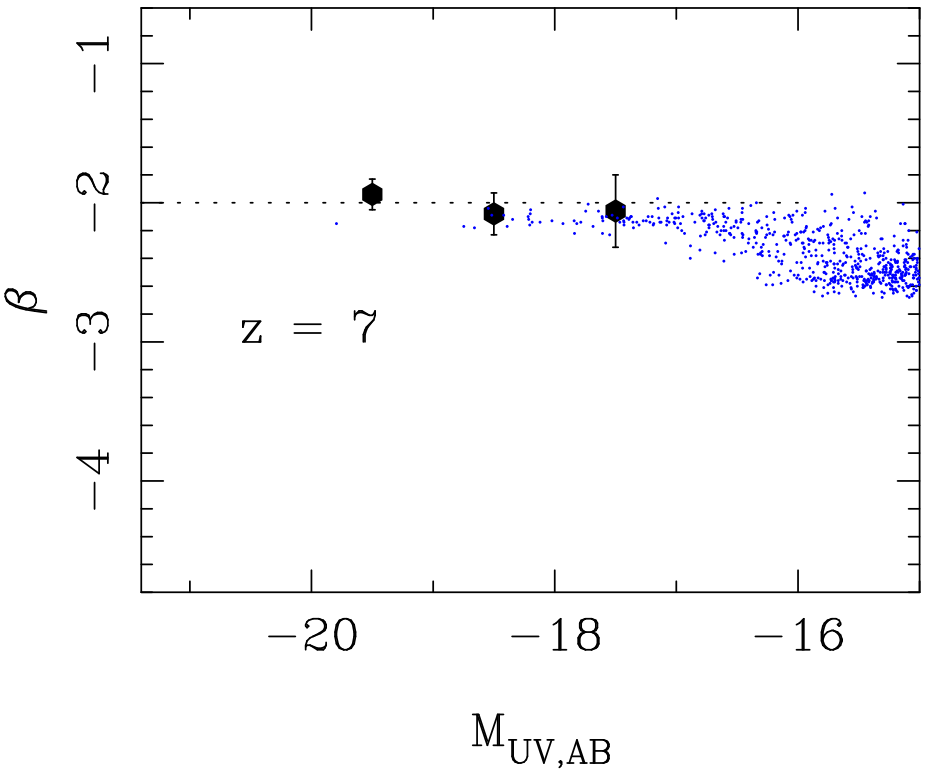
Dayal et al. 2013



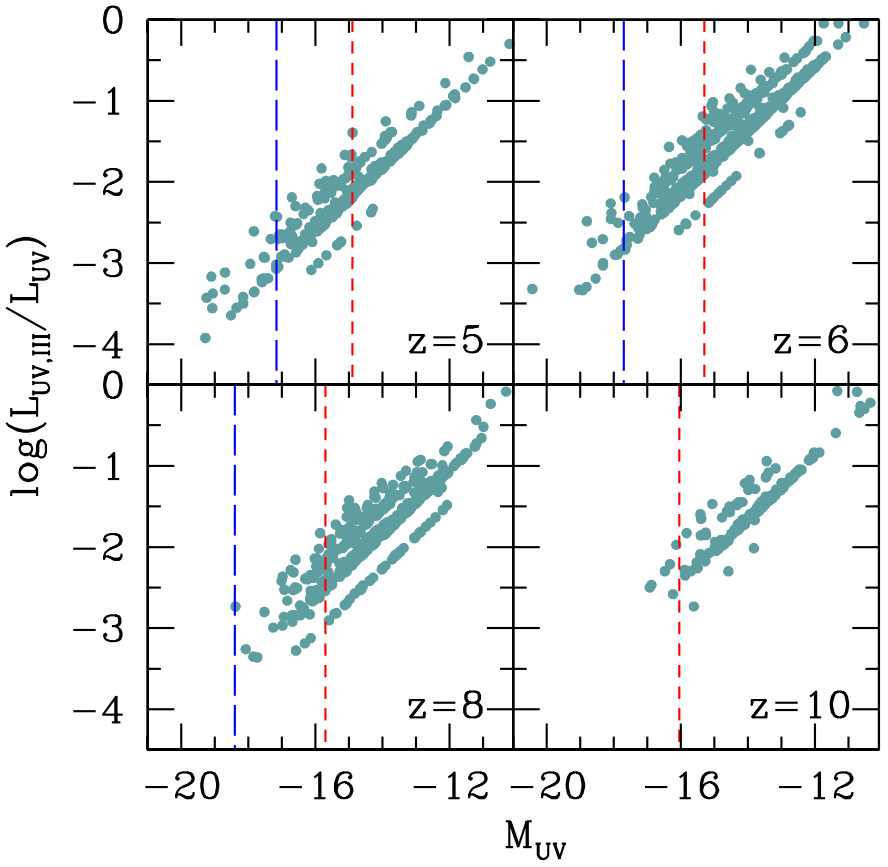




The LBG UV spectral slopes



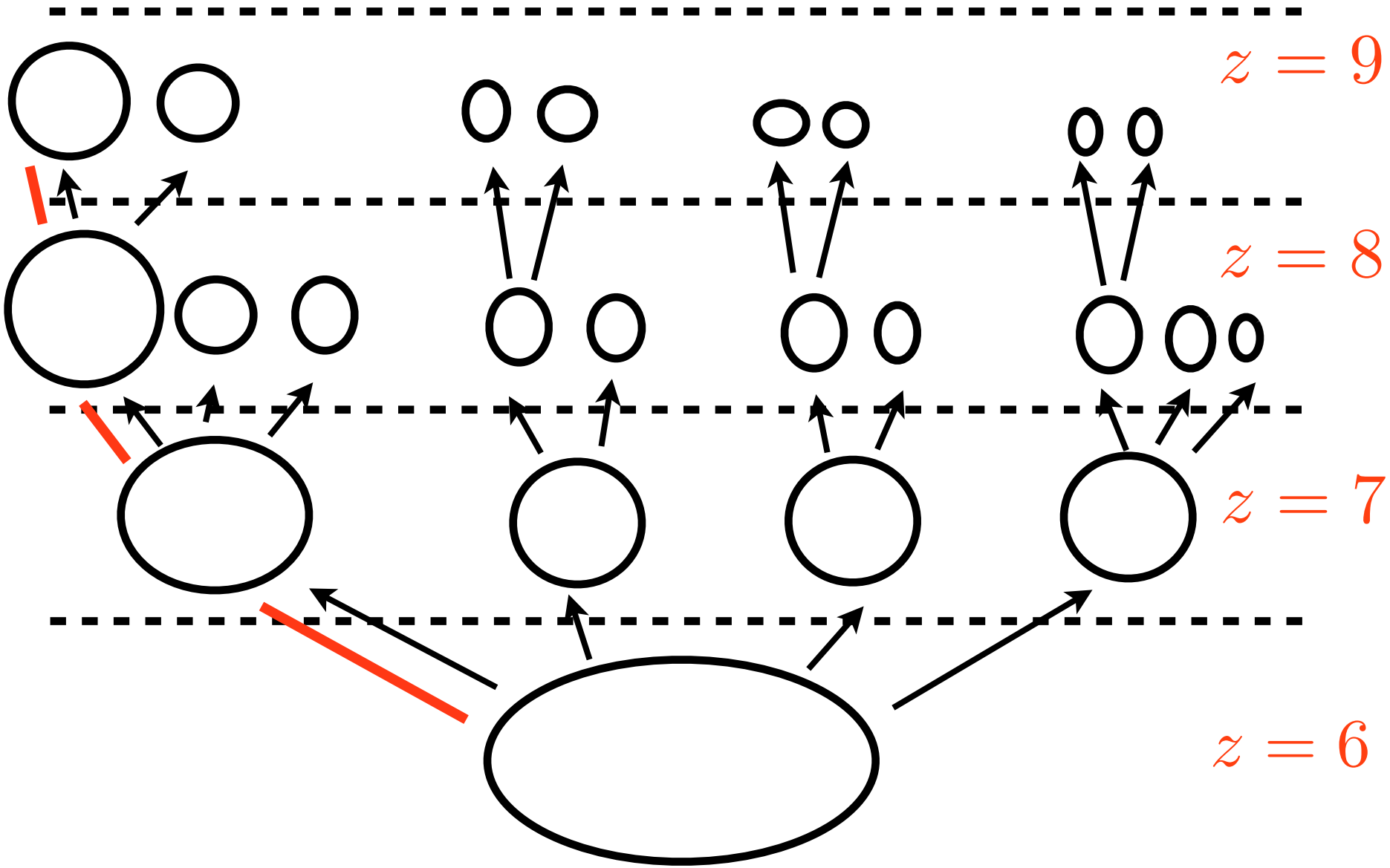
Dunlop et al. 2013



Salvaterra, Ferrara, PD, 2011, MNRAS, 414, 847

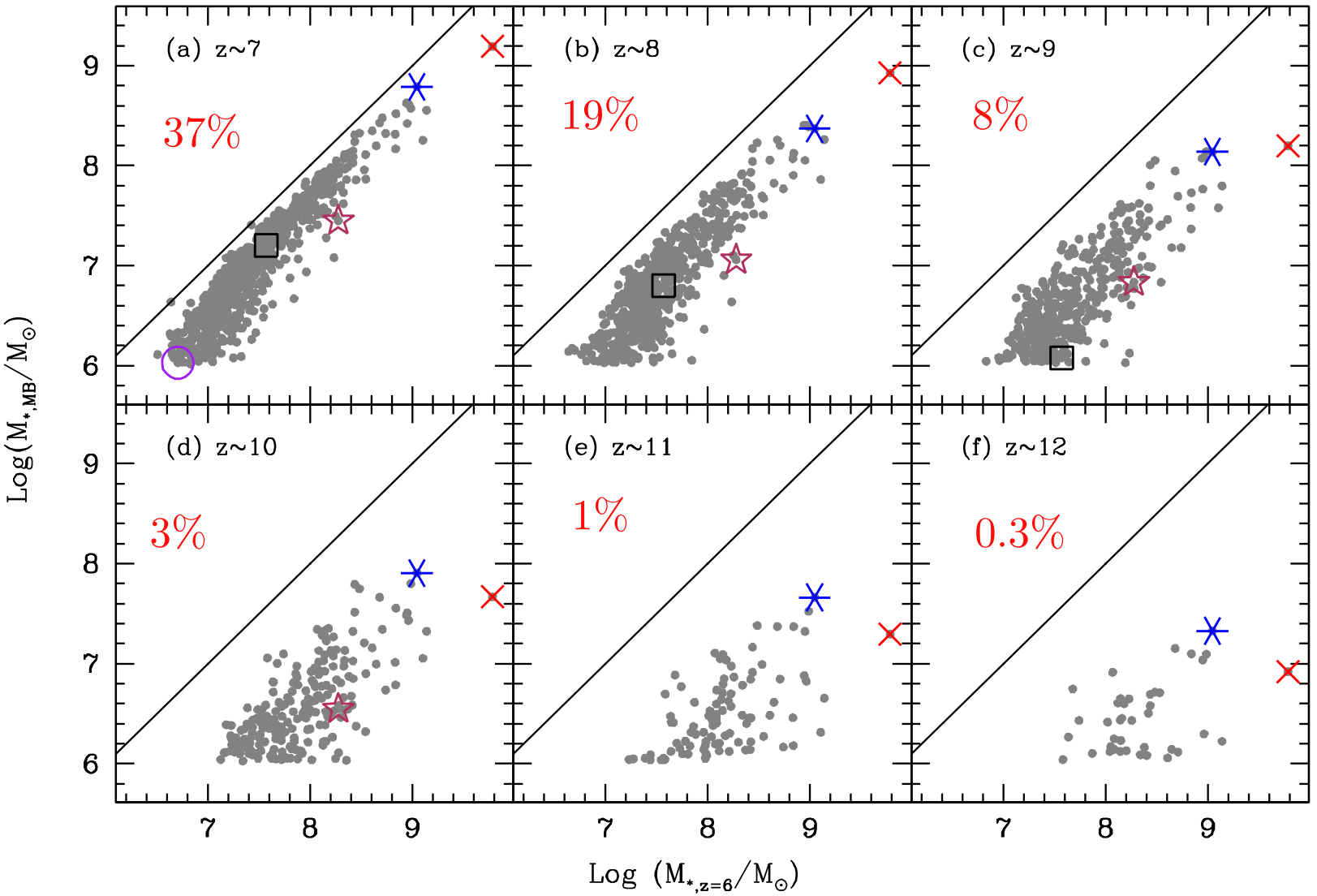
Negligible (no) contribution from PopIII stars even at z~7, 8 in galaxies detectable with JWST (HST).

Assembling high-z LBGs



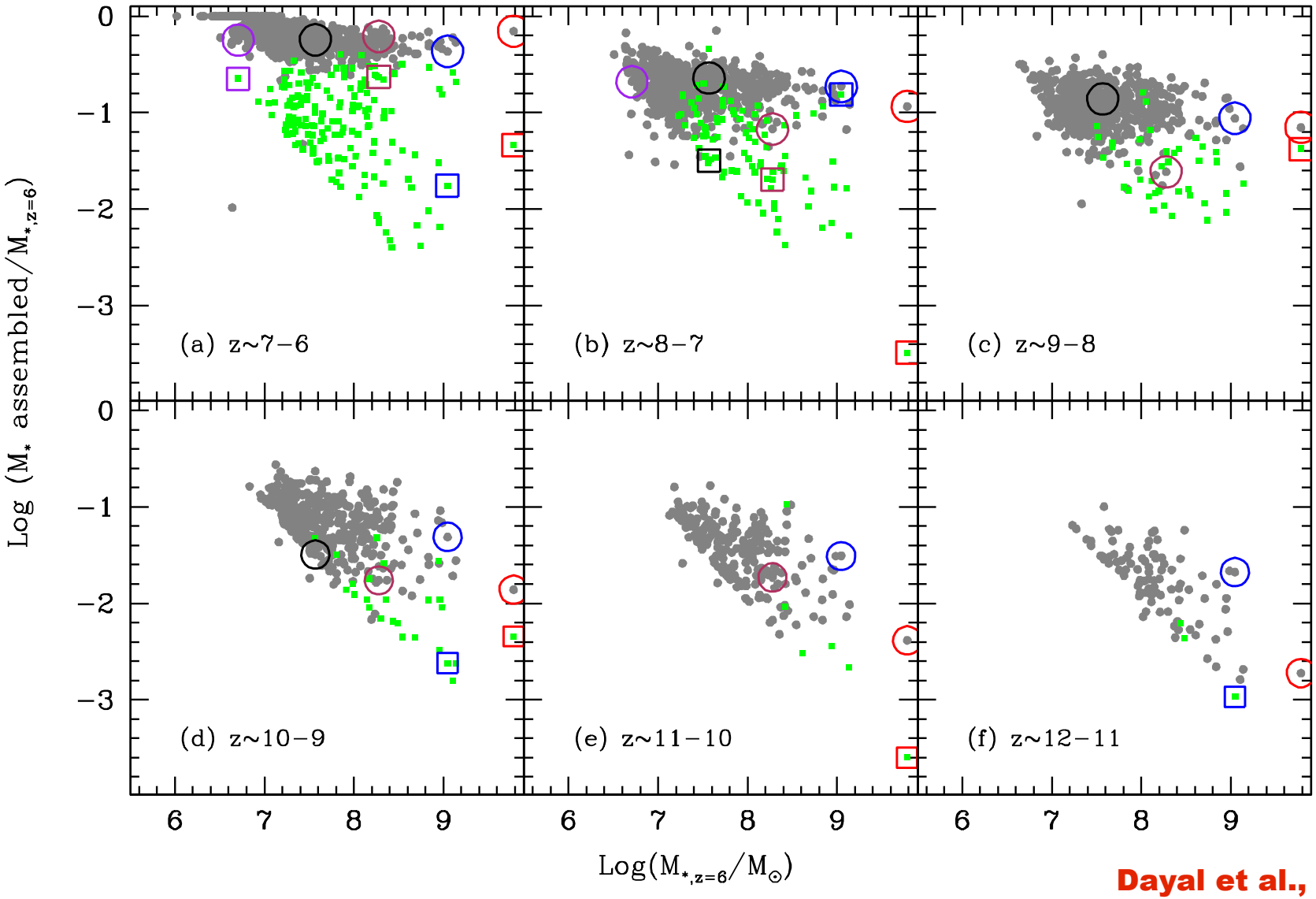
Building up the major branch mass

Dayal et al., 2013



Progenitors of largest z~6 LBGs start assembling first with progenitors of smaller systems forming at progressively lower redshifts.

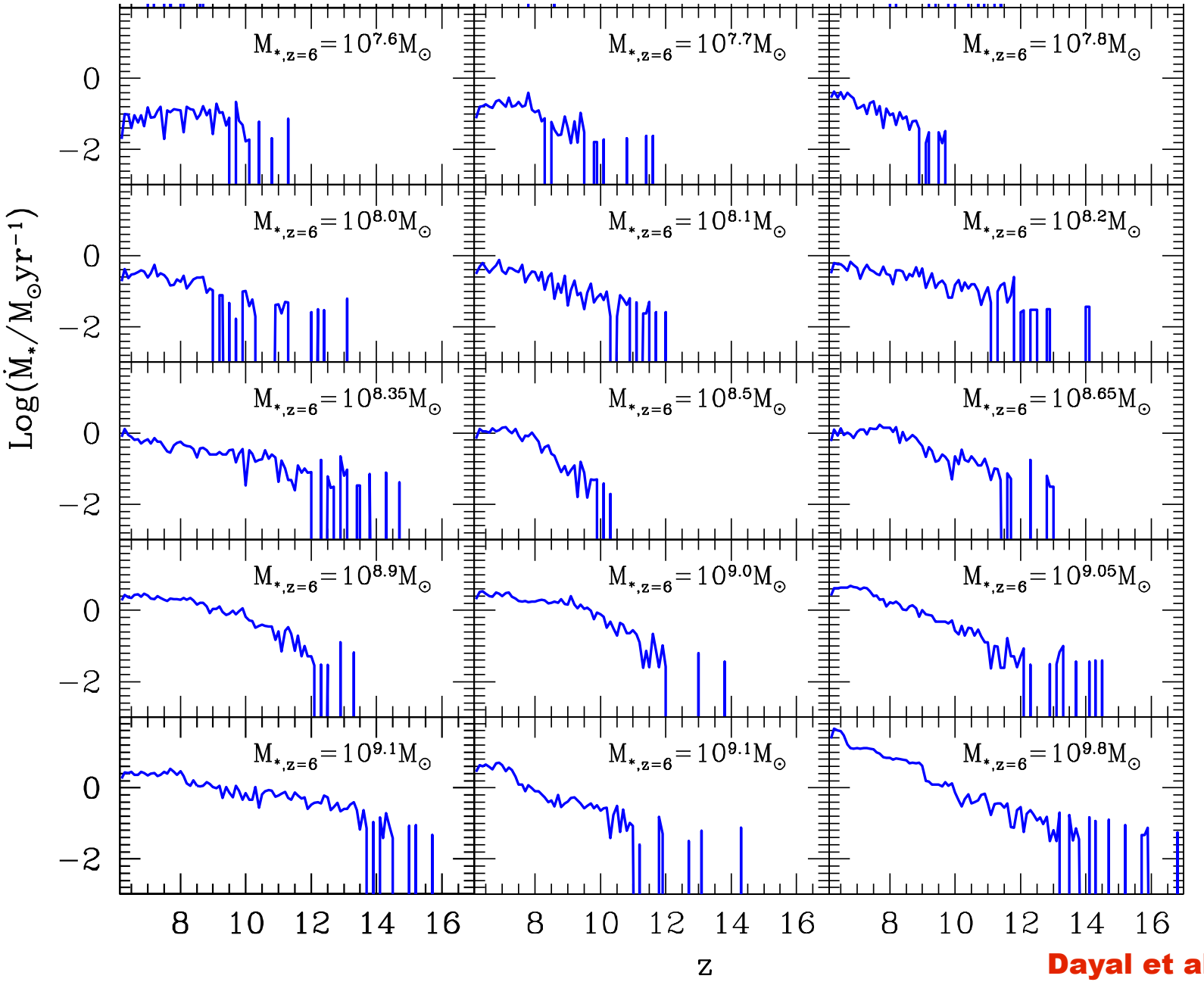
The major branch mass buildup: SF or mergers?



Dayal et al., 2013

At any z, most major branch mass built up by star formation in the major branch with mergers contributing tiny amount to the total mass.

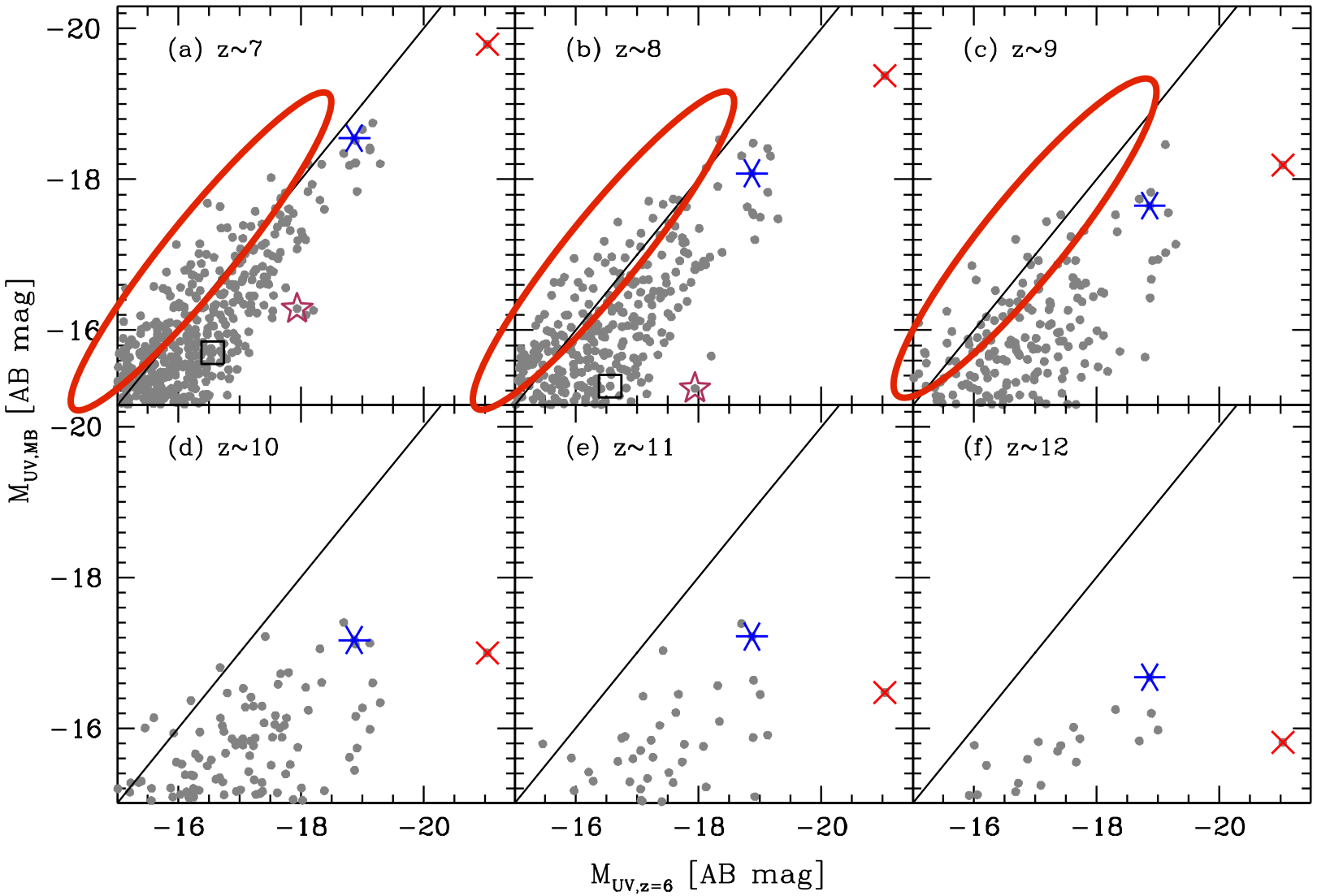
A common story: stochastic SF



Dayal et al., 2013

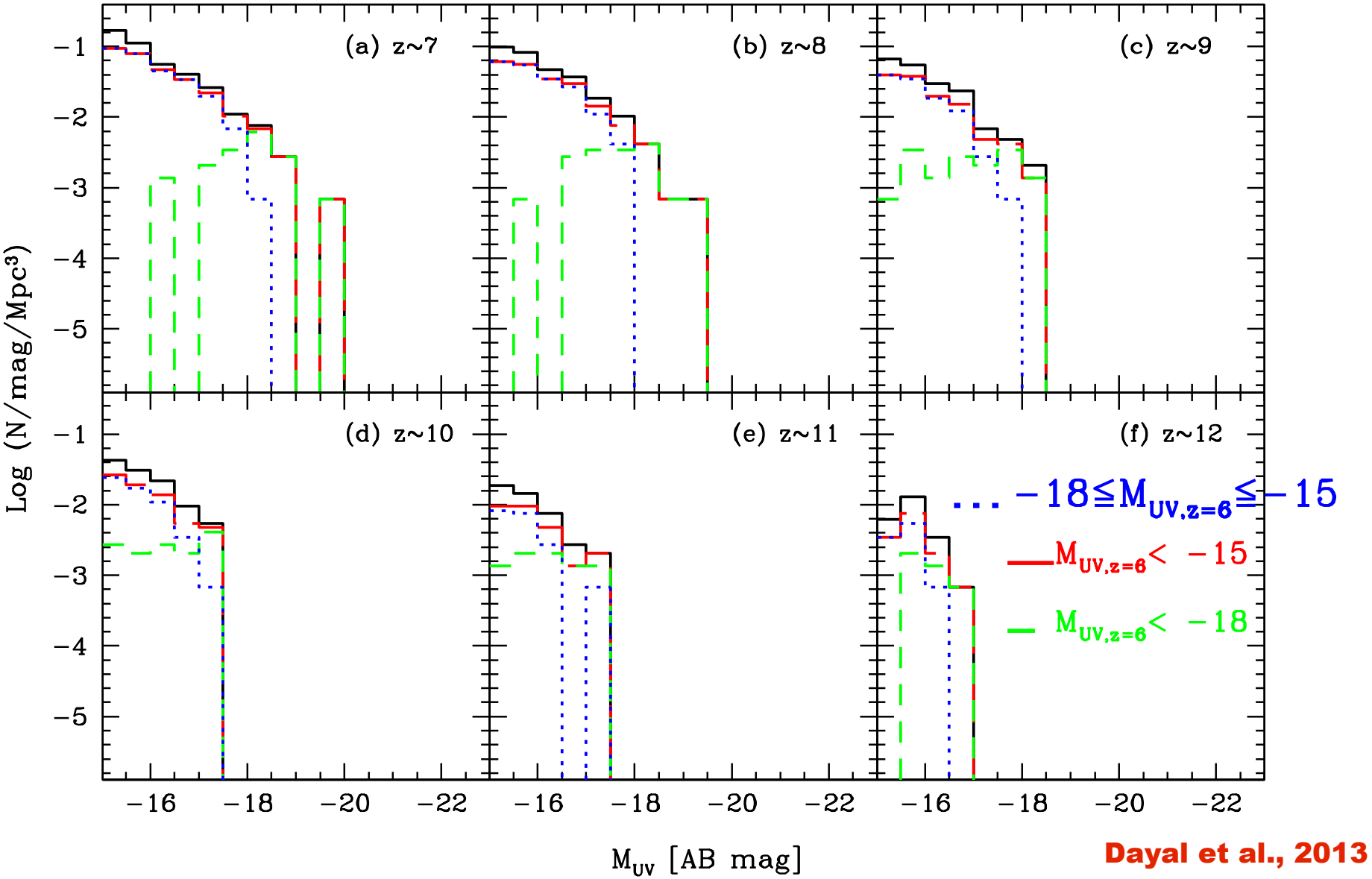
Building up the major branch luminosity

Dayal et al., 2013



Galaxies at the bright end gently build up their luminosity i.e. a positive luminosity evolution while galaxies at the faint end undergo a positive and negative luminosity evolution as they brighten and fade

The evolving UV LF: density + luminosity evolution



Dayal et al., 2013

- **Evolution of the bright end solely due to an increase in the luminosity**
- **Evolution of the faint end due to an evolution in both the luminosity and number density**

The story of high-z galaxy assembly:

☑ **Rate of stellar mass assembly increases with decreasing redshift from z~12 to z~6.**

☑ **Majority (~90%) of stellar mass of z~6 LBGs assembled by star formation in the major branch, with only 10% brought in by mergers.**

☑ **UV LF evolution depends on luminosity range probed:**

- **genuine physical luminosity evolution at bright end**
- **faint end is a mix of positive and negative luminosity and density evolution.**