Faint Galaxies at z~5-10 for UV Luminosity Functions and Cosmic Reionization

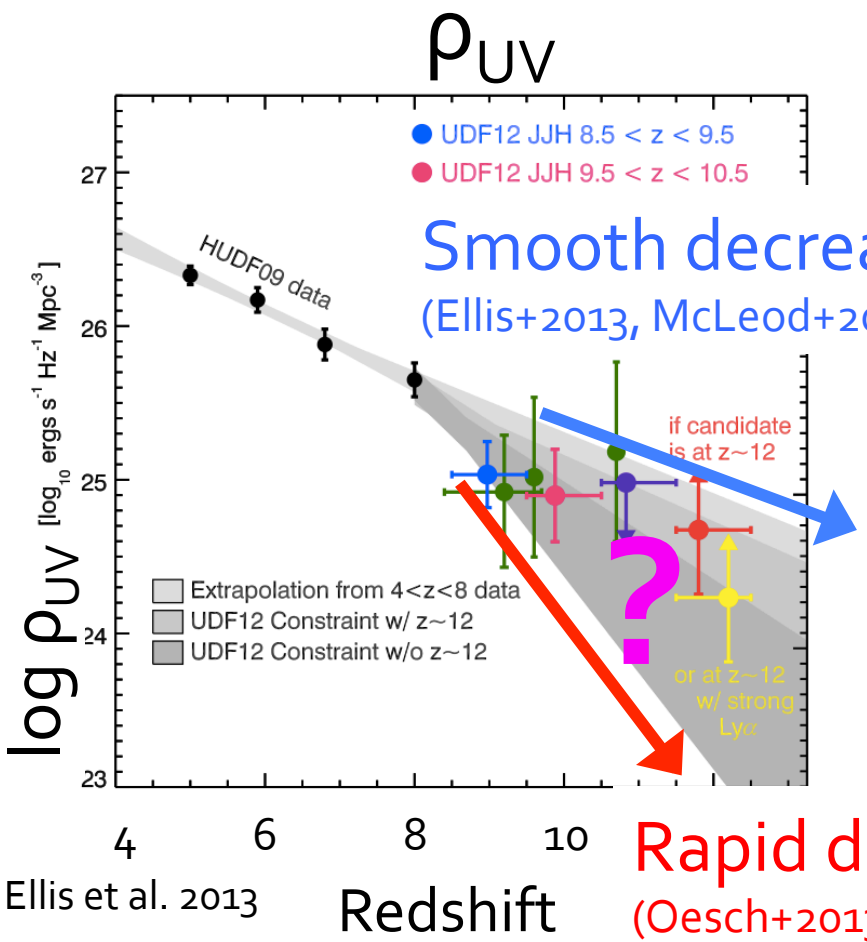
Masafumi Ishigaki

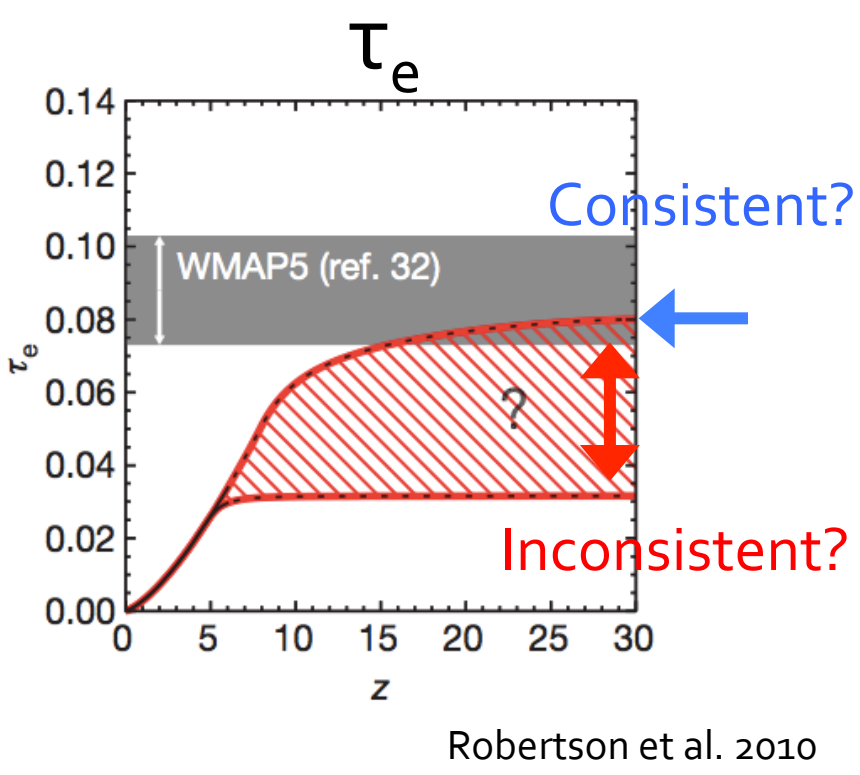
Ryota Kawamata, Masami Ouchi, Masamune Oguri,
Kazuhiro Shimasaku, and Yoshiaki Ono
(The University of Tokyo)

Outline

- **"Can star-forming galaxies reionize the universe?"**
- Derive ρ_{UV} of dropouts at z~5-10 in HFF A2744 field
- ρ_{UV} is inconsistent with τ_e from WMAP + Planck 2013

Cosmic Reionization

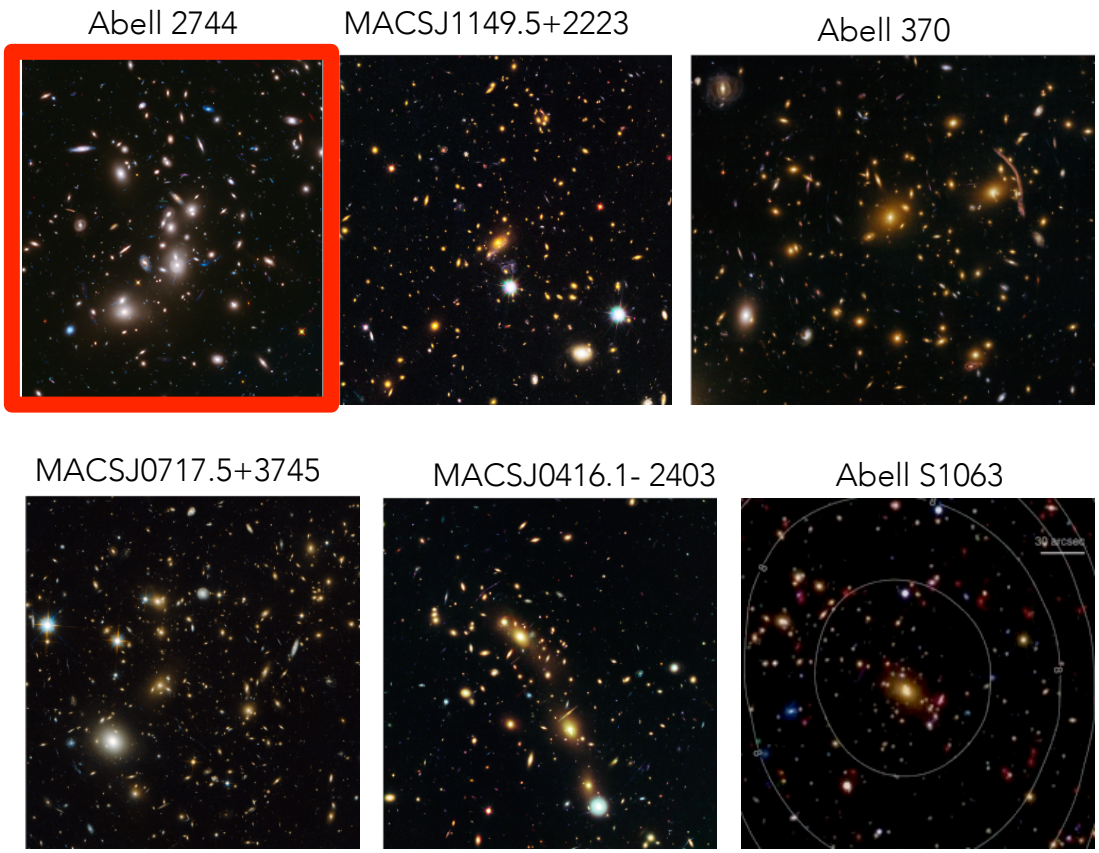




Rapid decrease at z>8?
(Oesch+2013, Bouwens+2014)

Large uncertainty of ρ_{UV} at z>8

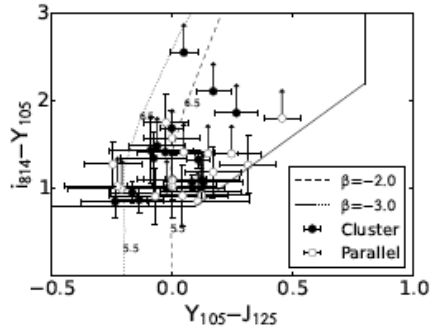
Hubble Frontier Fields

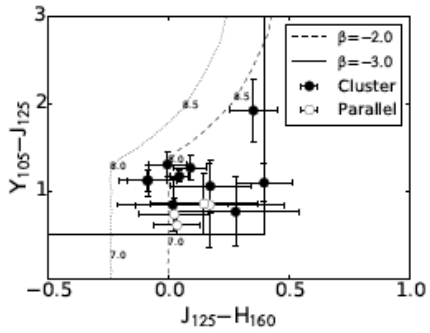


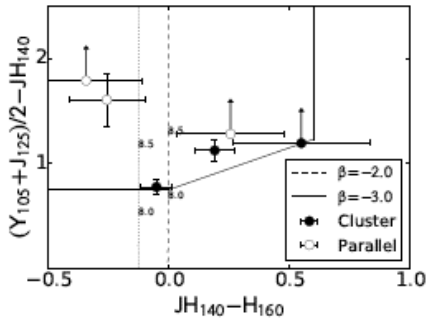
J. Lotz

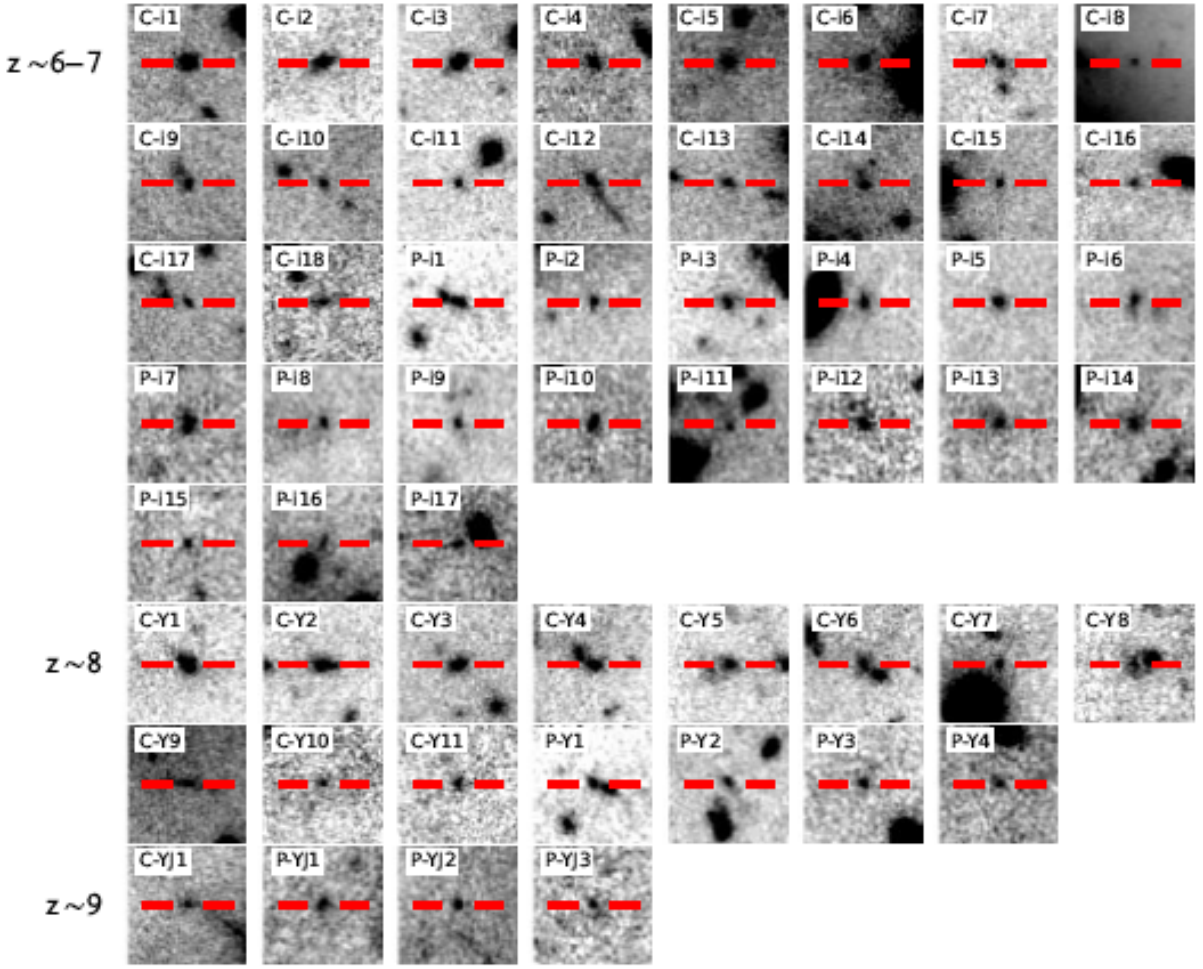
First complete cluster, Abell 2744 and its parallel fields data

Dropout Selection









Similar to Atek+14, Oesch+14, Zheng+14, Zitrin+14, McLeod+15 etc.

LF analysis (previous studies)

$$\phi(M)dM = \frac{N_i(M_i)}{V_{\rm eff}(M_i)}$$

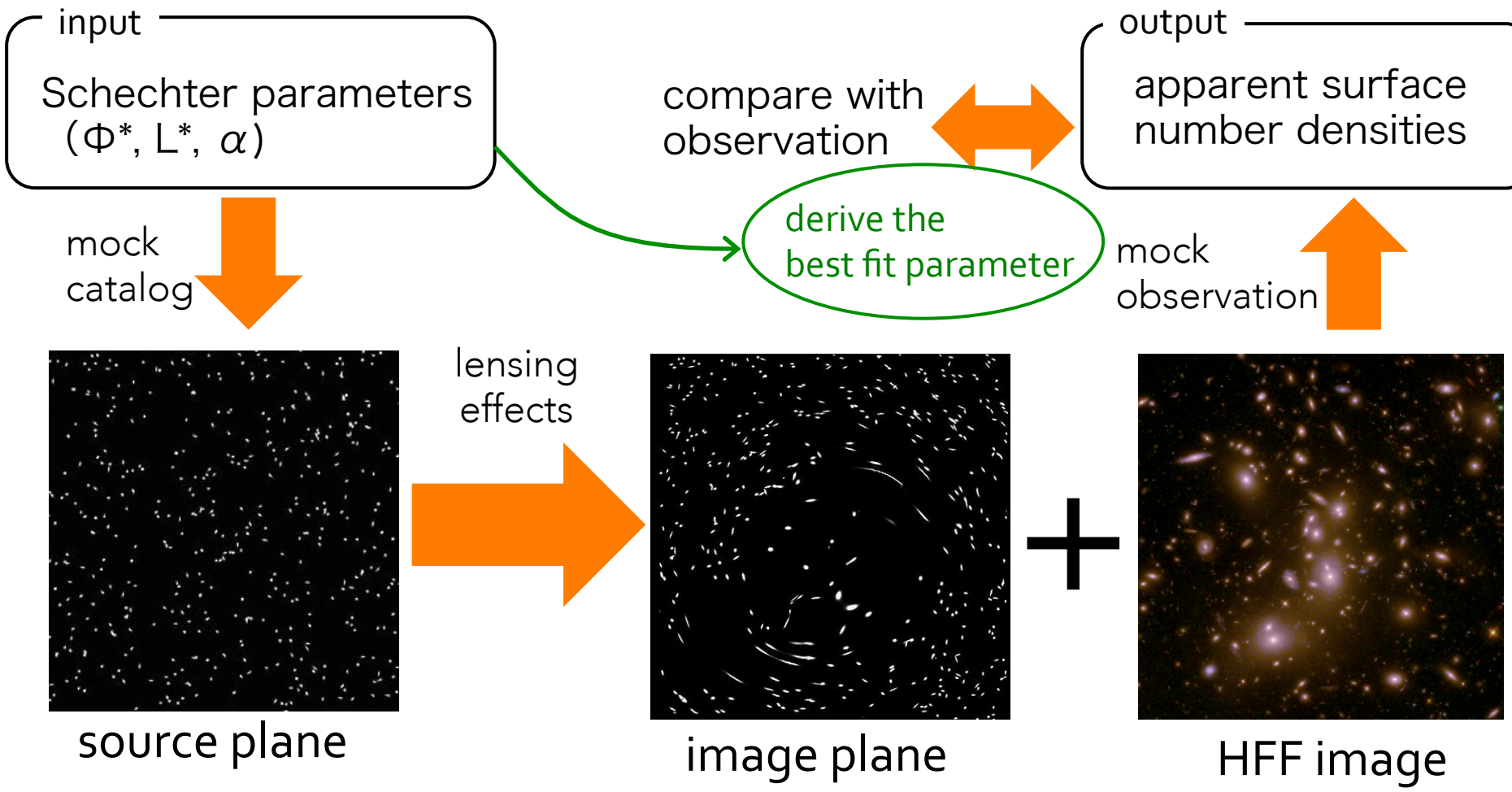
Number

Survey Volume

- move these parameters back to ***source plane***

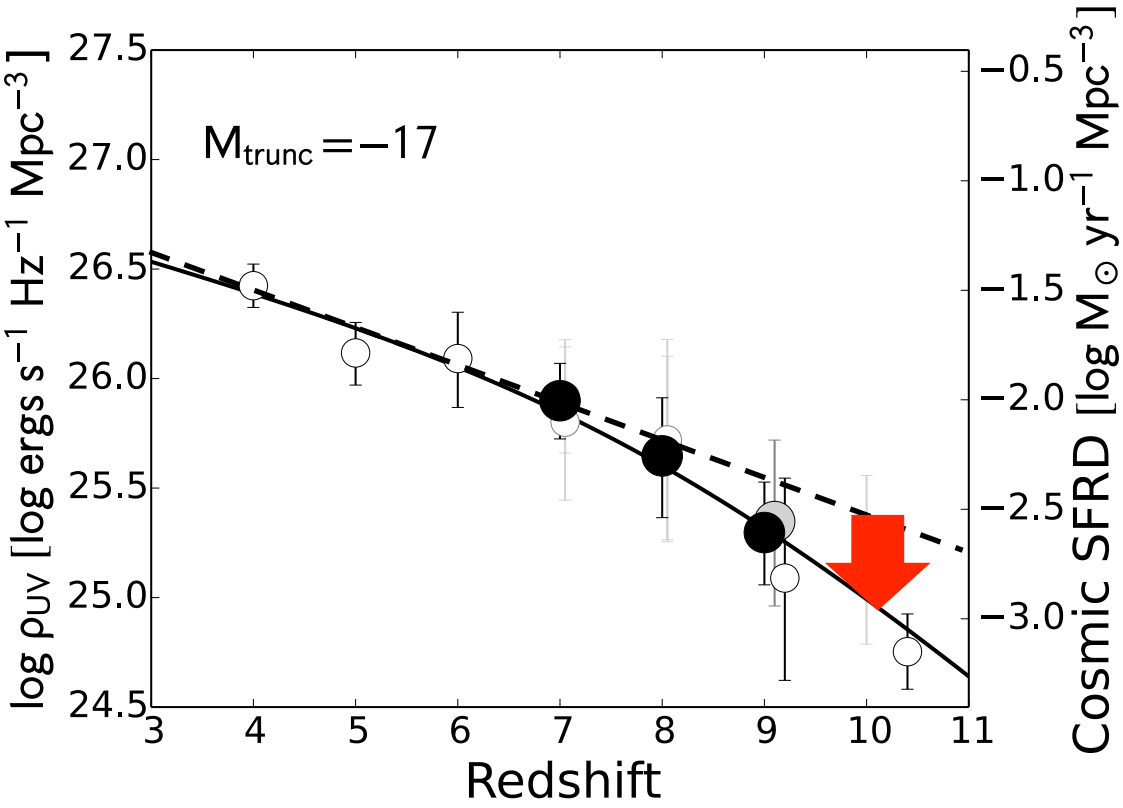
- does **not** include all lensing effects: distortion, multiplication of images (as discussed in Oesch et al. 2014)

New method for LF analysis



Include all lensing effects!

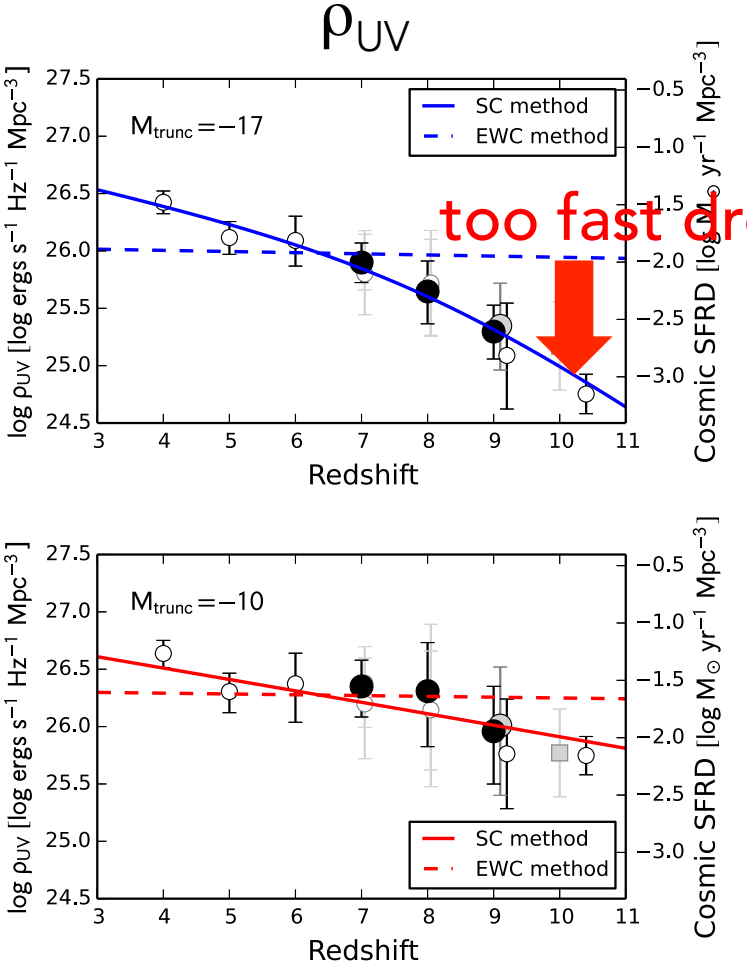
UV luminosity Densities ρ_{UV}

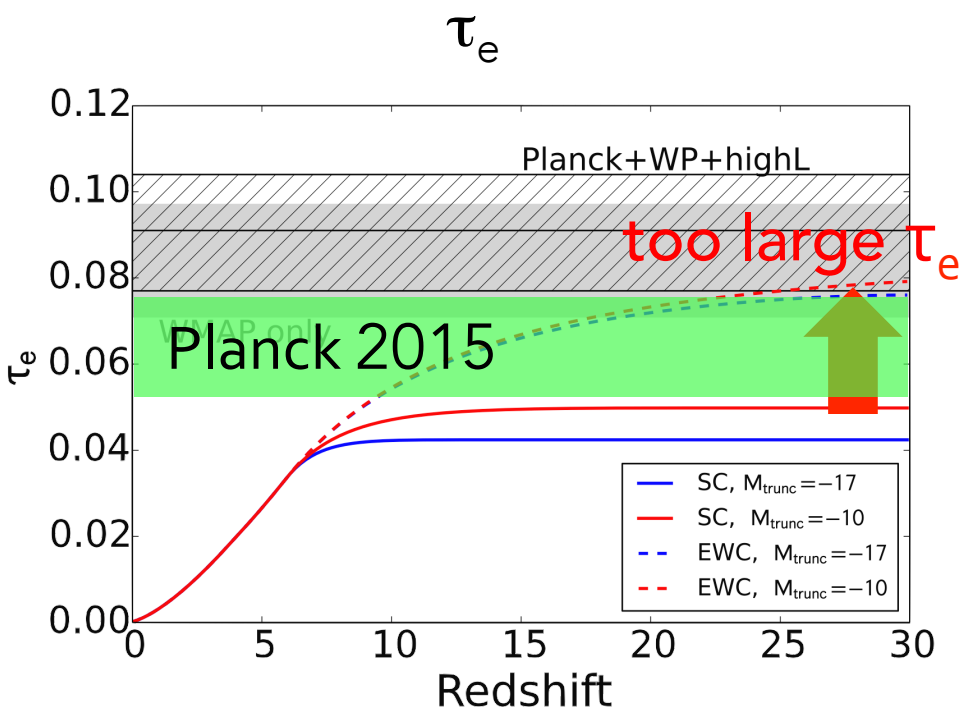


Support the rapid decrease of ρ_{UV} at z>8

(although the rapid decrease of ρ_{UV} at z~9 is modest; see Derek's talk)

Contribution to Cosmic Reionization

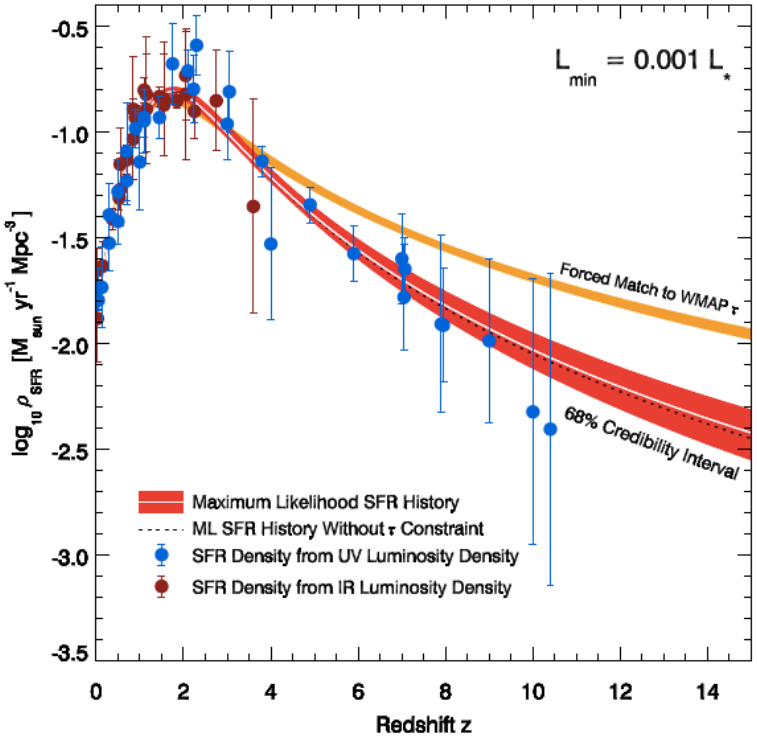


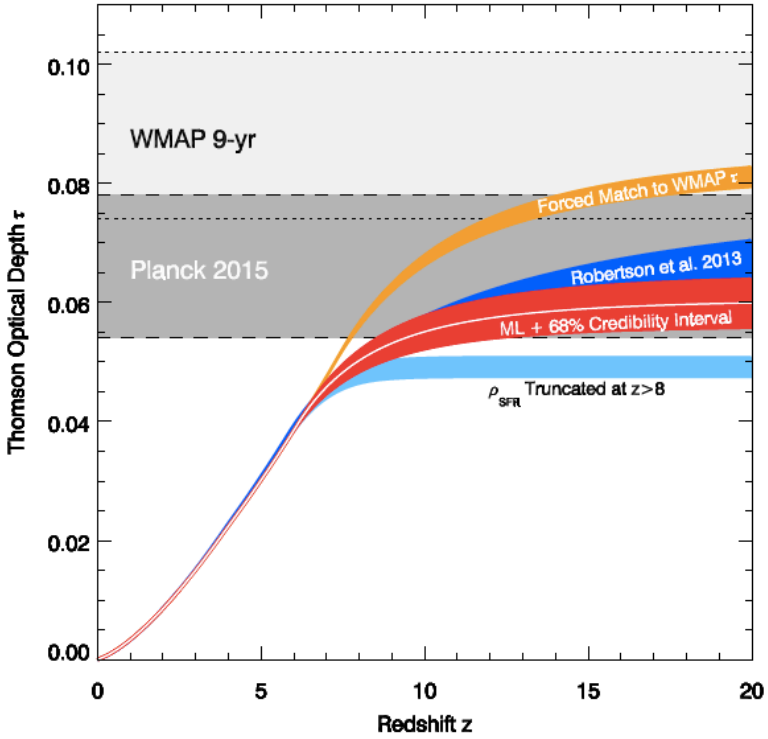


τe does not agree with WMAP+Planck2013 results

Decrease of ρ_{UV} (z) is too fast to produce the large τ_e

Comparison with Robertson+2015





This work's value

- assume downward-convex function

  ↔ this work (upward-convex)

- It is important to investigate the shape of $\rho_{UV}(z)$ at z~8-10

Summary

- Detect ~50 dropout galaxies at z~5-10
  in the HFF Abell 2744 cluster and parallel field

- Support the rapid decrease of ρ_{UV} at $z > 8$

- 1σ discrepancy between ρ_{UV} and τ_e
  $\rightarrow$ need accurate constraints on ρ_{UV} at $8 < z < 10$