

# Probing Reionization: Current Progress and Challenges

V. Tilvi

Arizona State University

Casey Papovich, Steven Finkelstein, James Long, Mimi Song,  
Rachael Livermore, Mark Dickinson, Harry Ferguson,  
Anton Koekemoer, Bahram Mobasher, Mauro Giavelisco

# First Billion Years

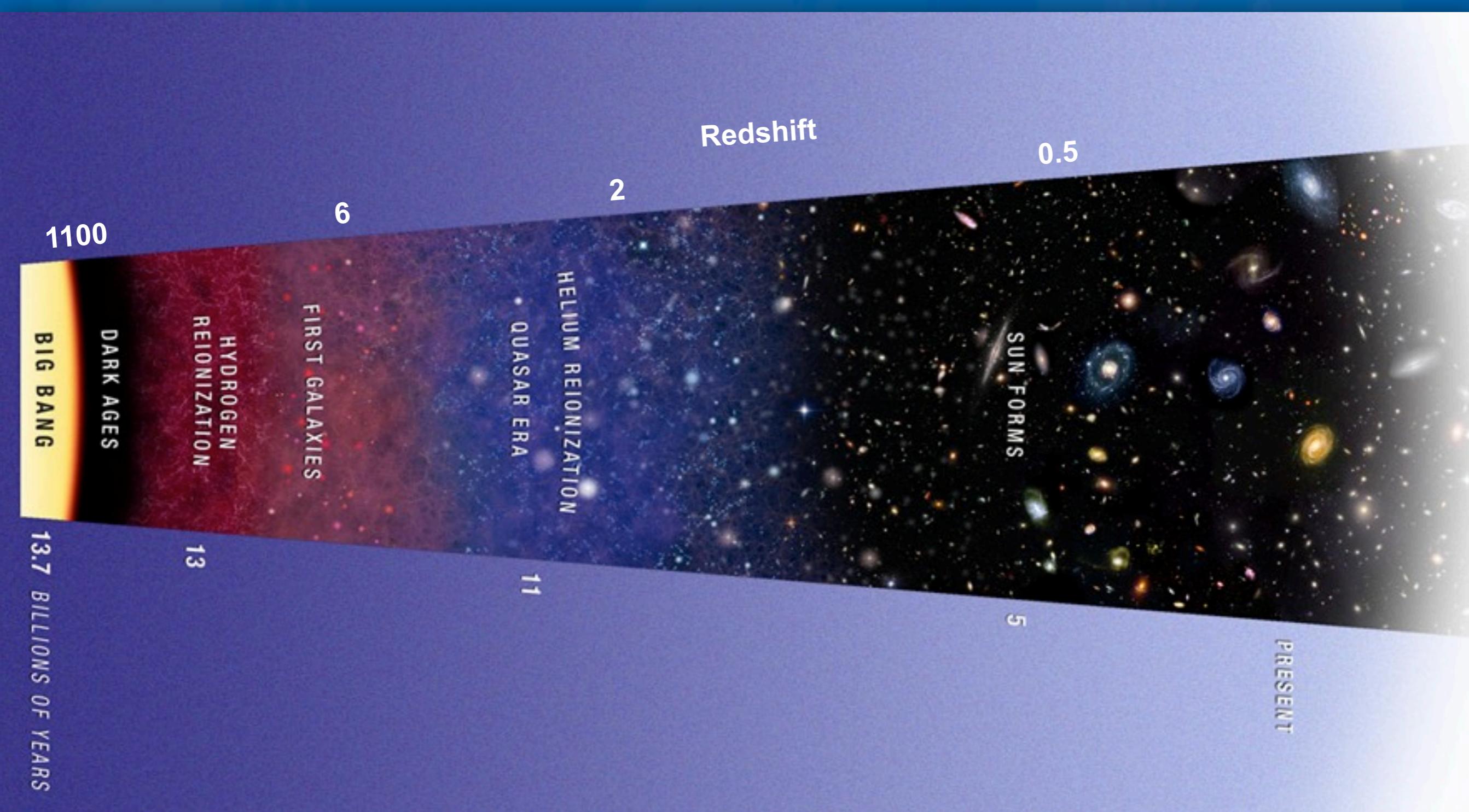
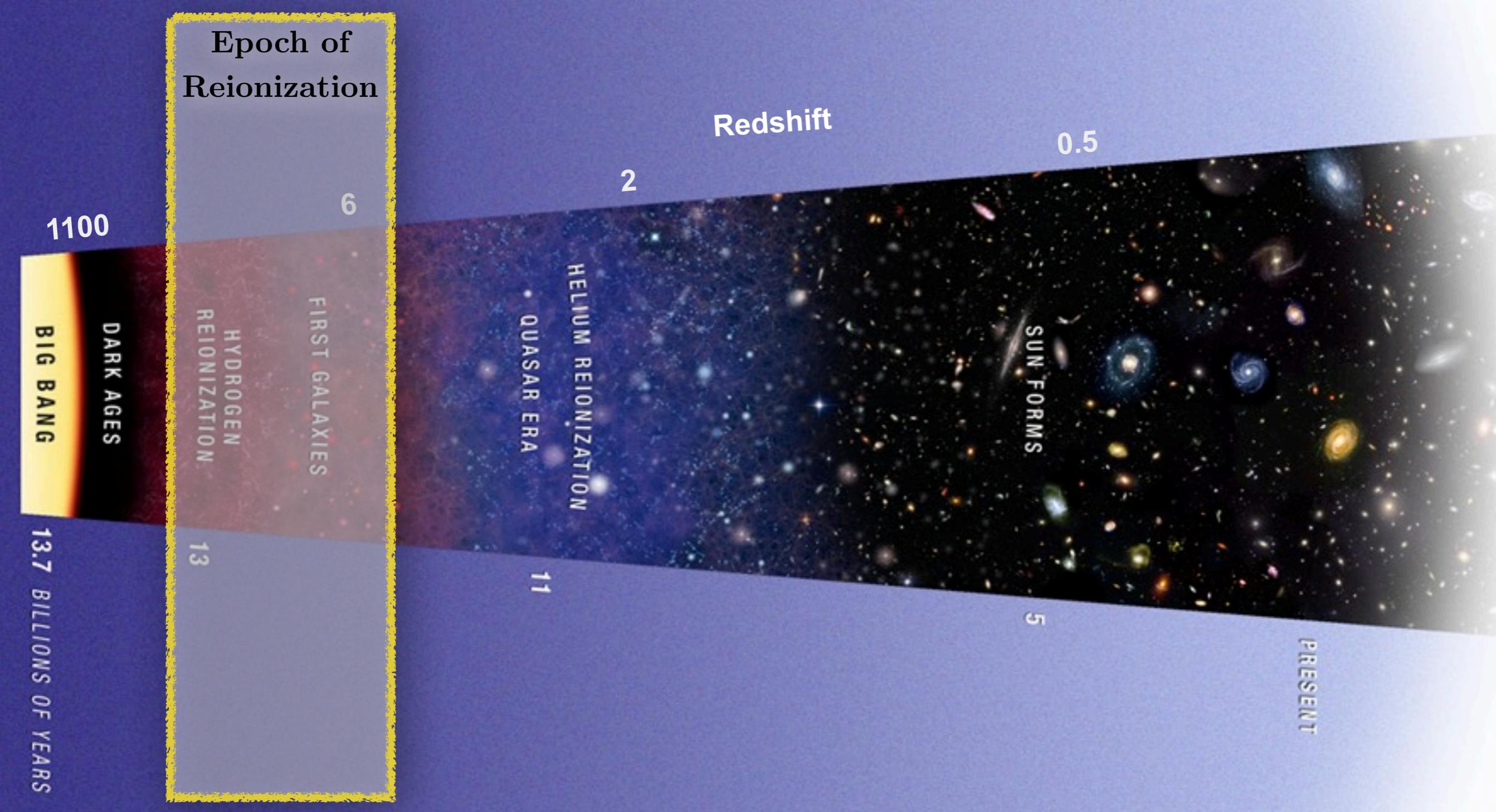


Image: NASA, ESA, and A. Feild (STScI)

# First Billion Years



*Image: NASA, ESA, and A. Feild (STScI)*

# First Billion Years

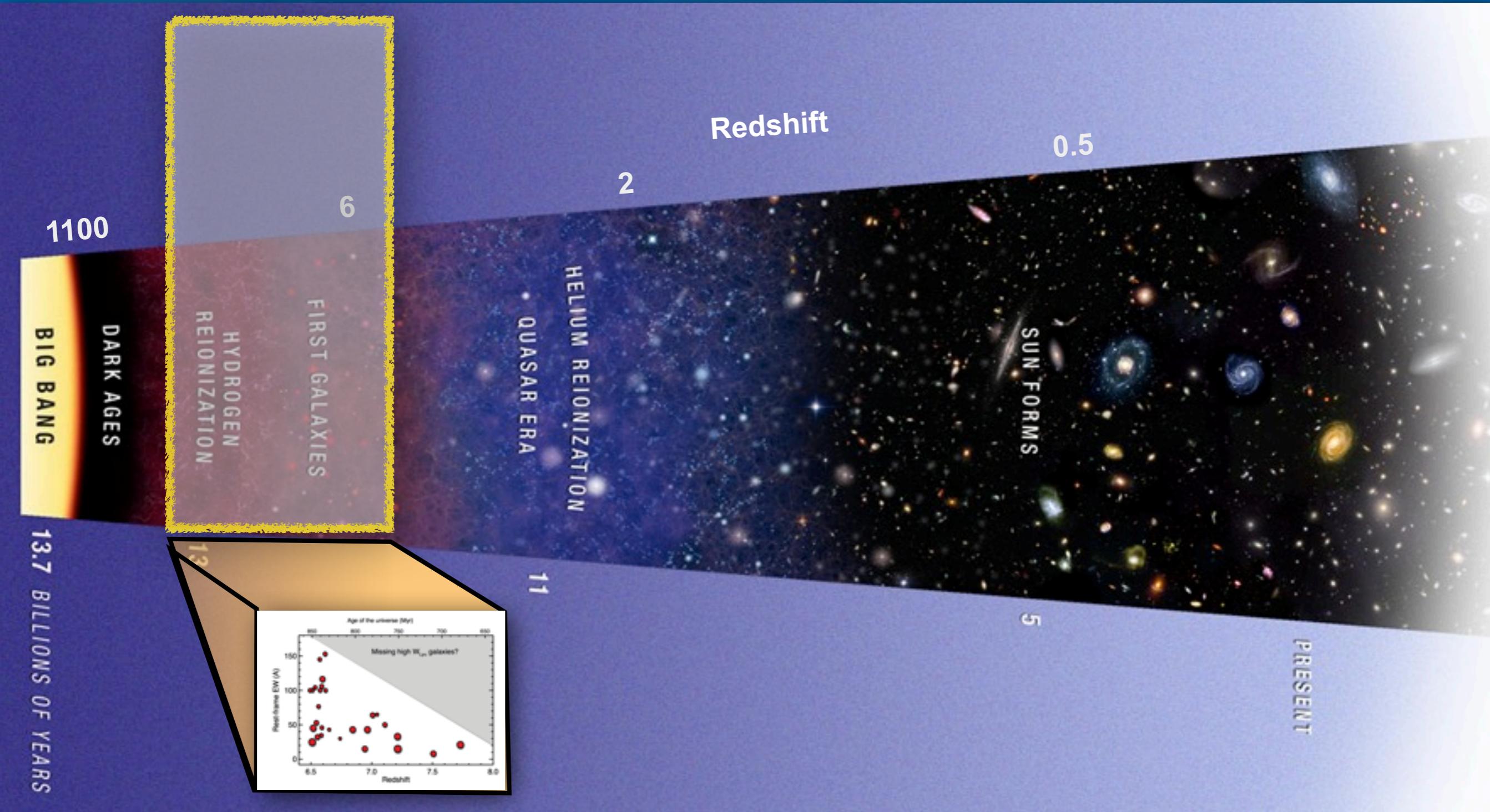
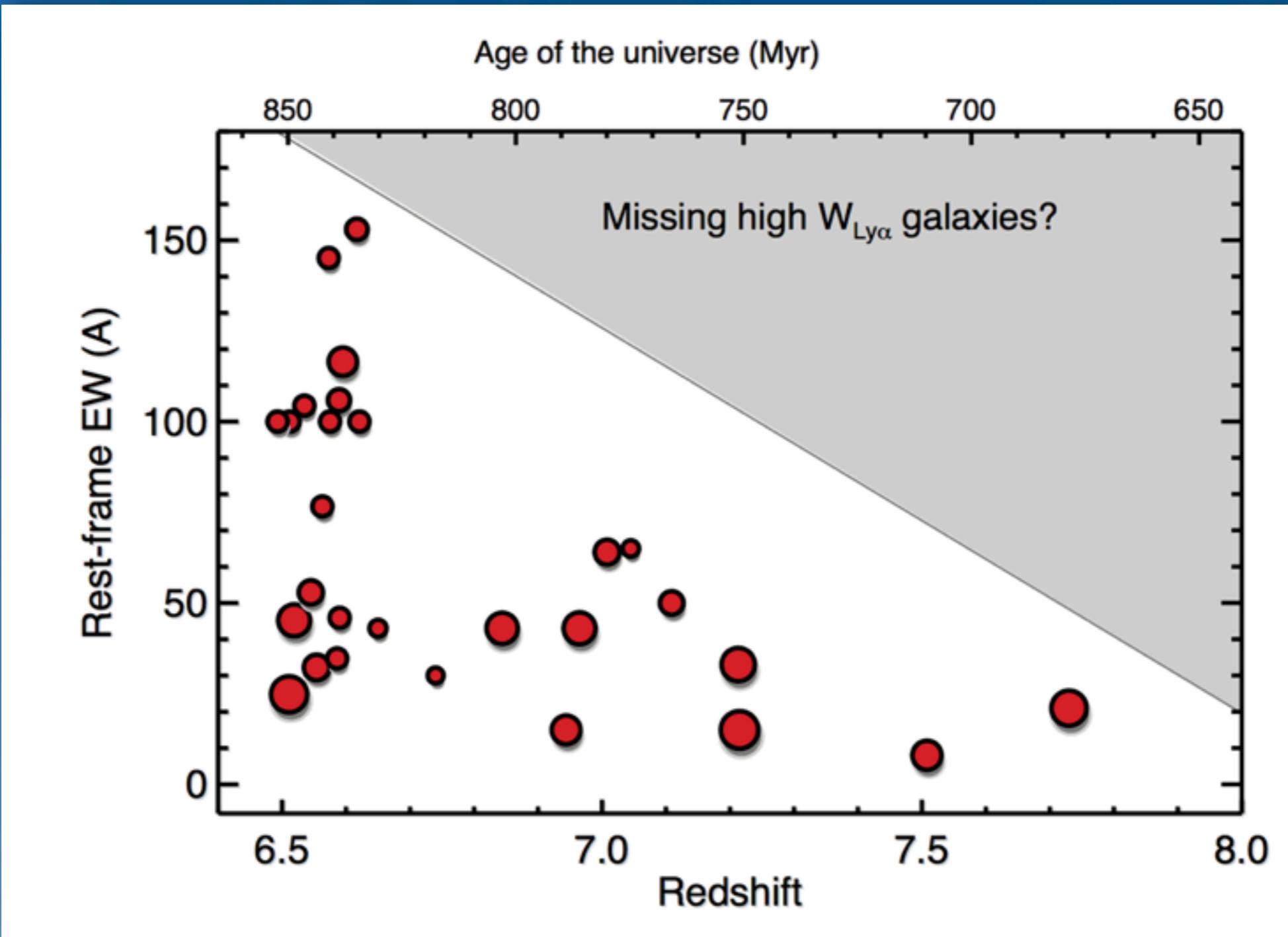
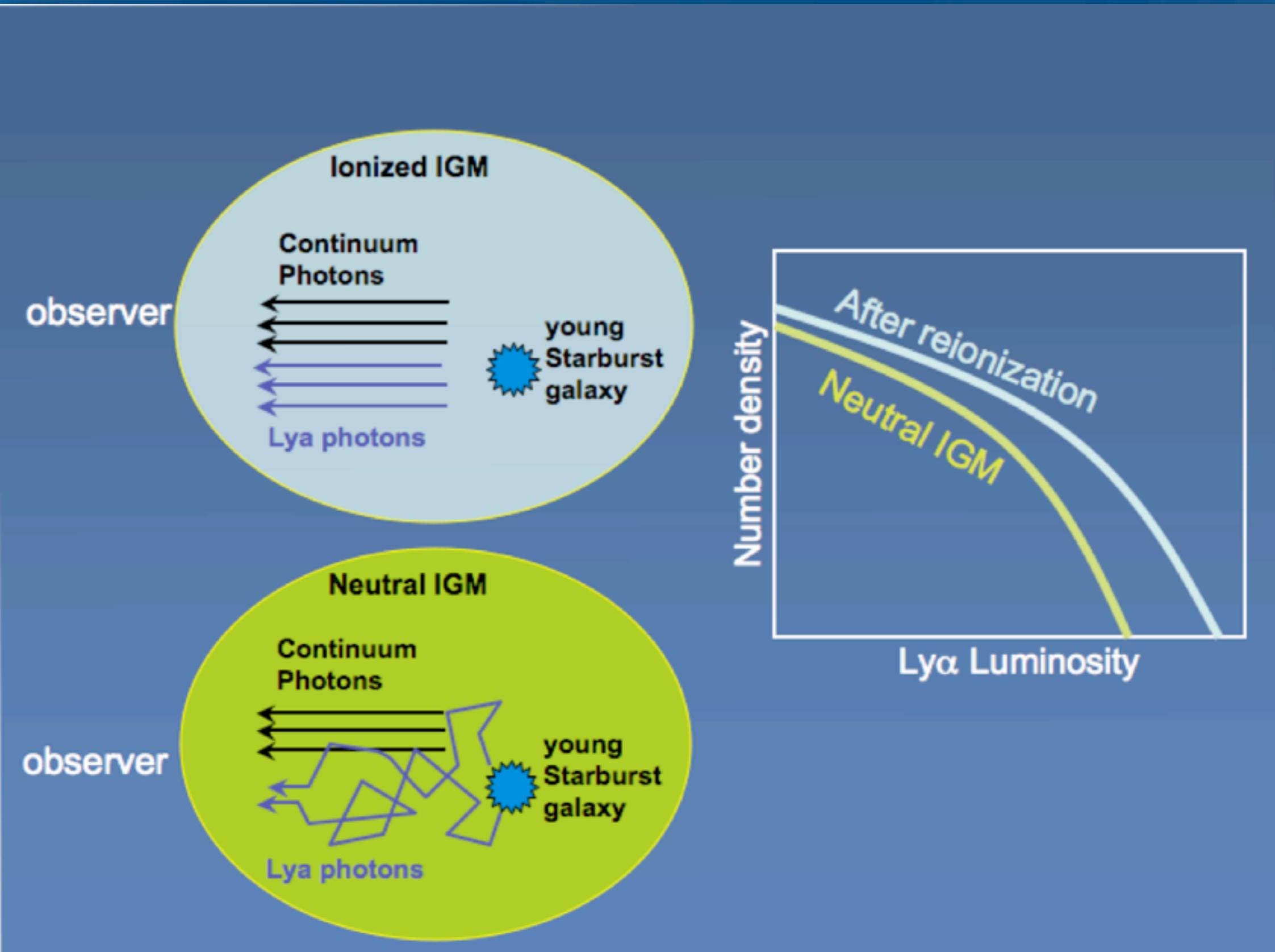


Image: NASA, ESA, and A. Feild (STScI)

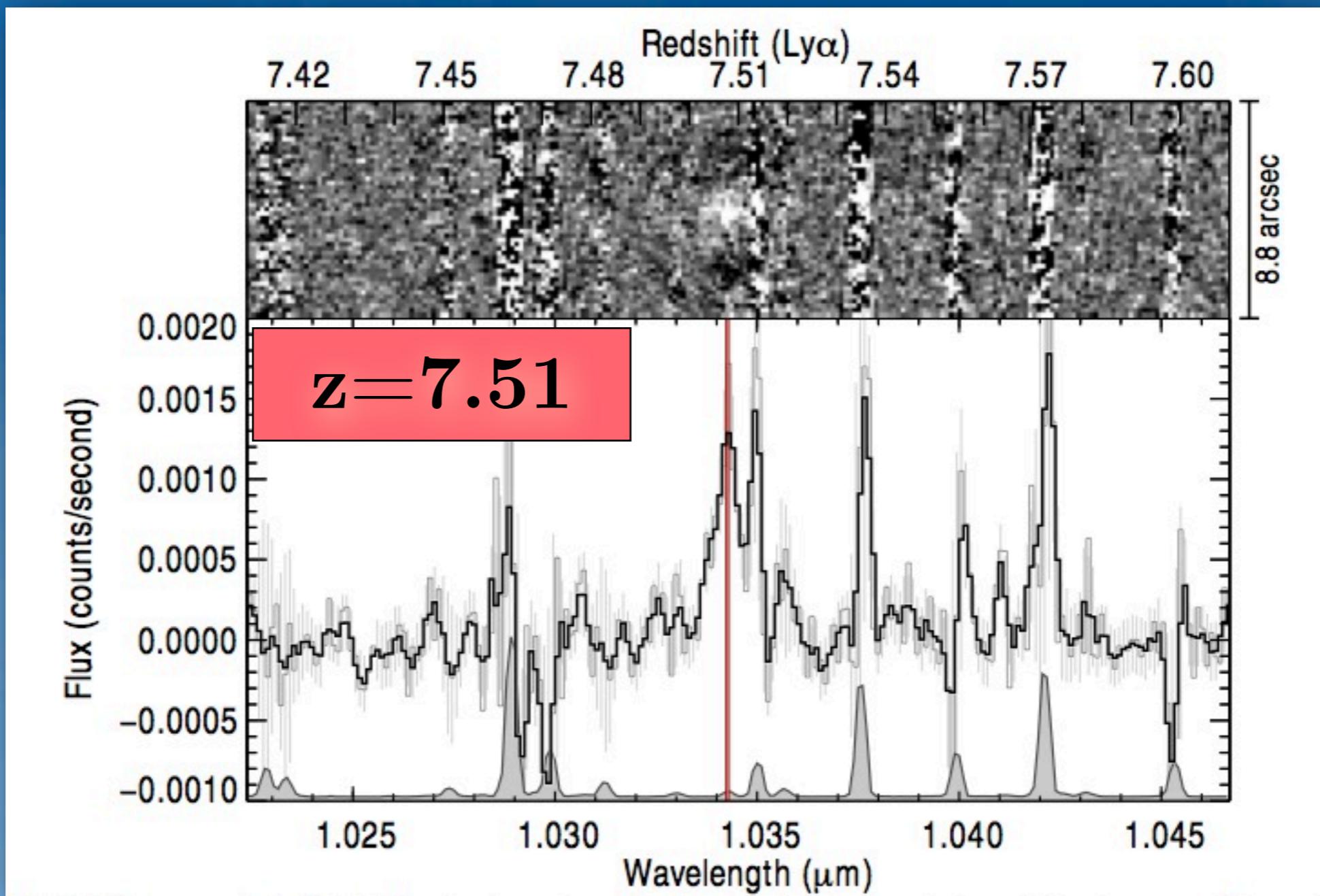
# Equivalent Width Evolution



# Lyman-alpha: Probe of Reionization

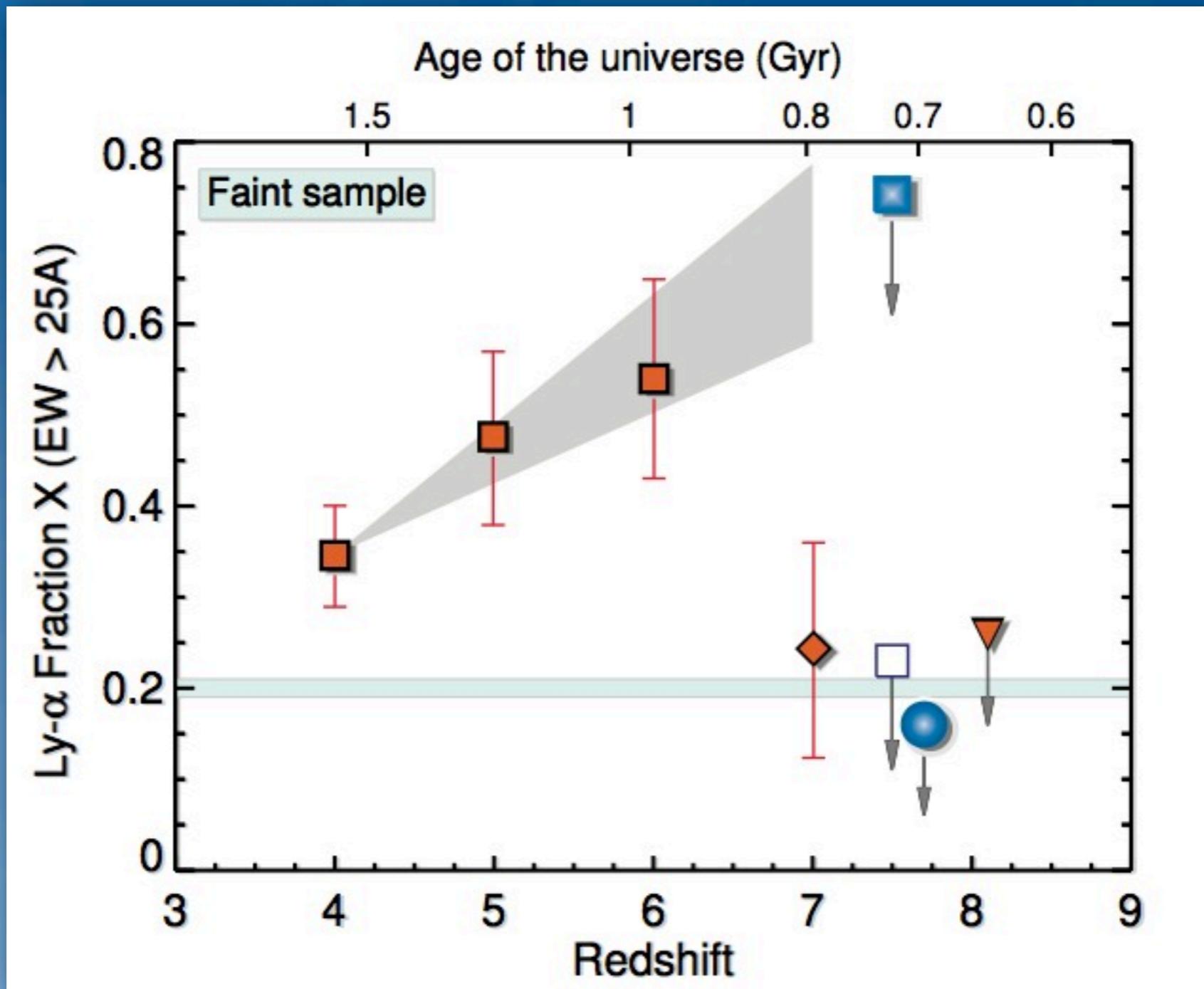


# First Billion Years

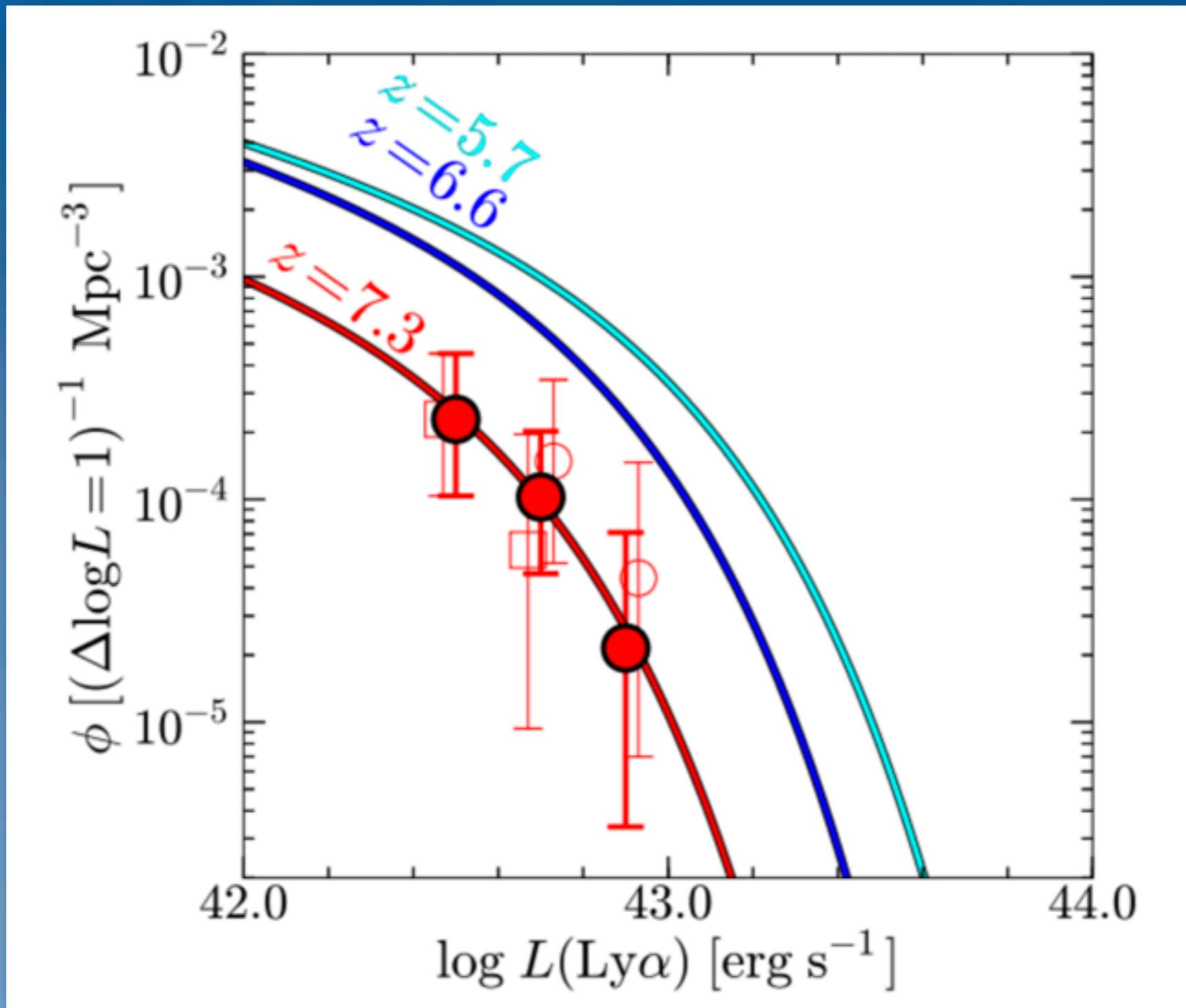


Finkelstein et al 2013, Nature

# Lyman-alpha Fraction Evolution

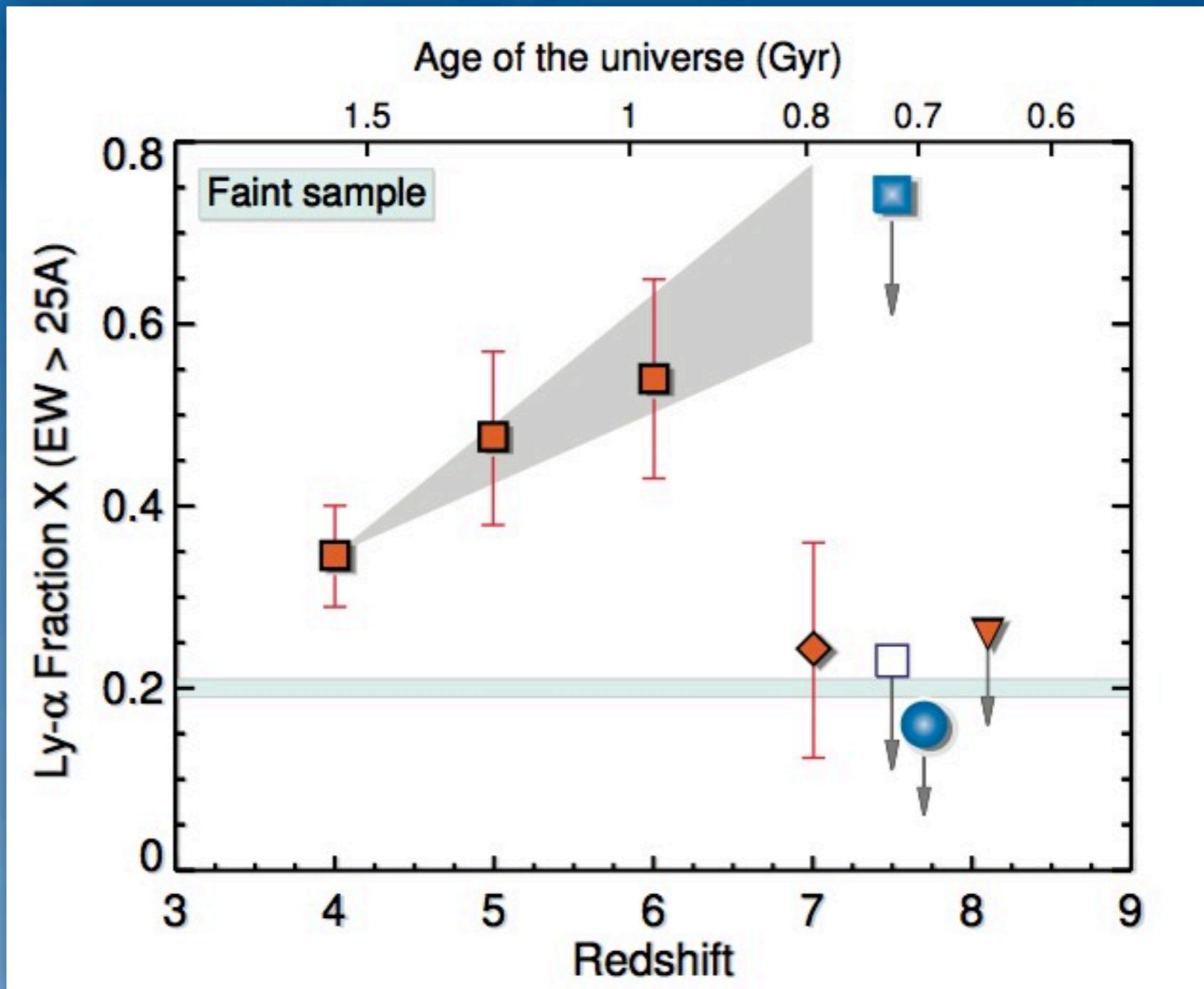


# Lyman-alpha Luminosity Function at z=7.3

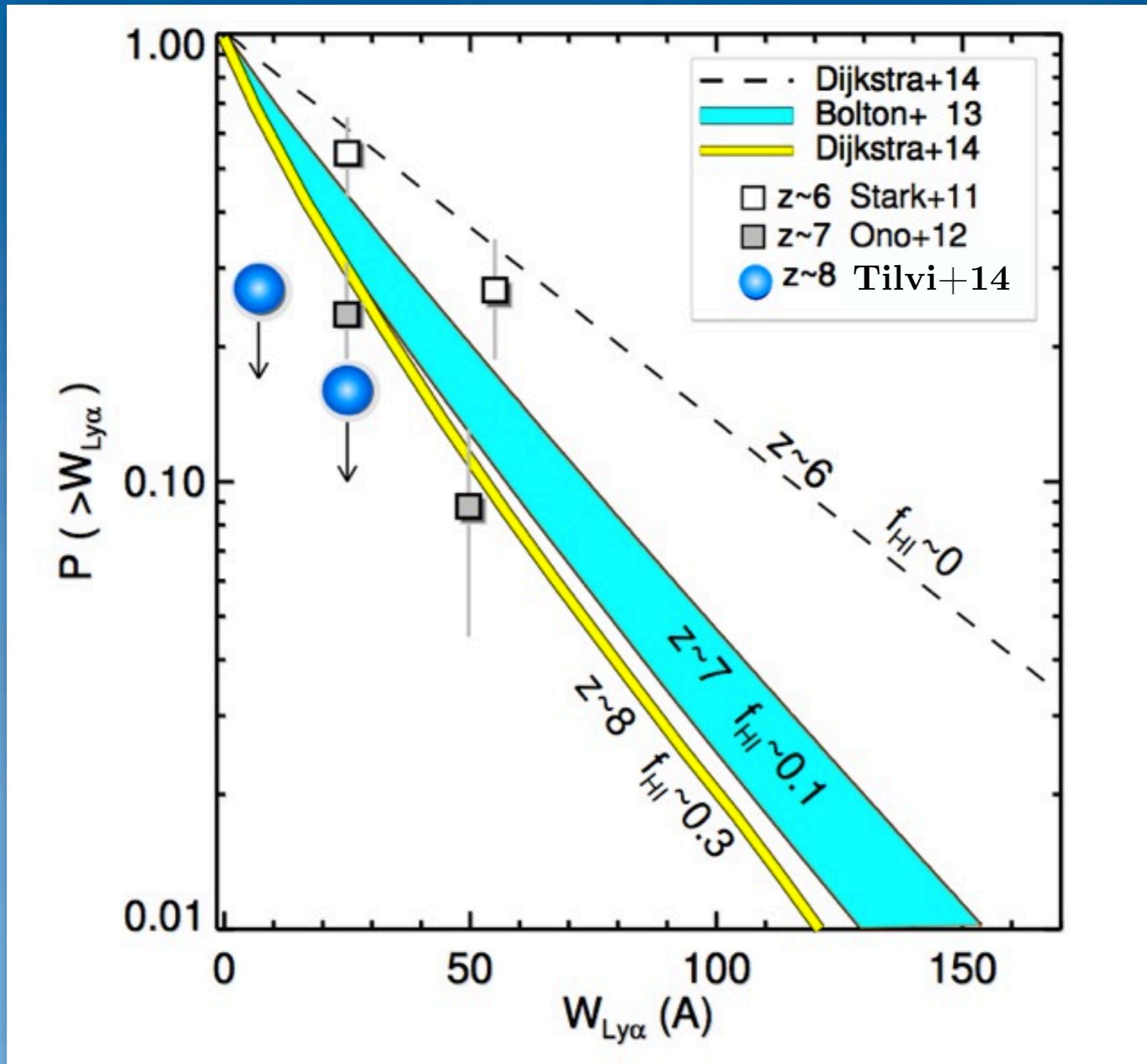


Konno et al 2014

# Lyman-alpha Fraction Evolution

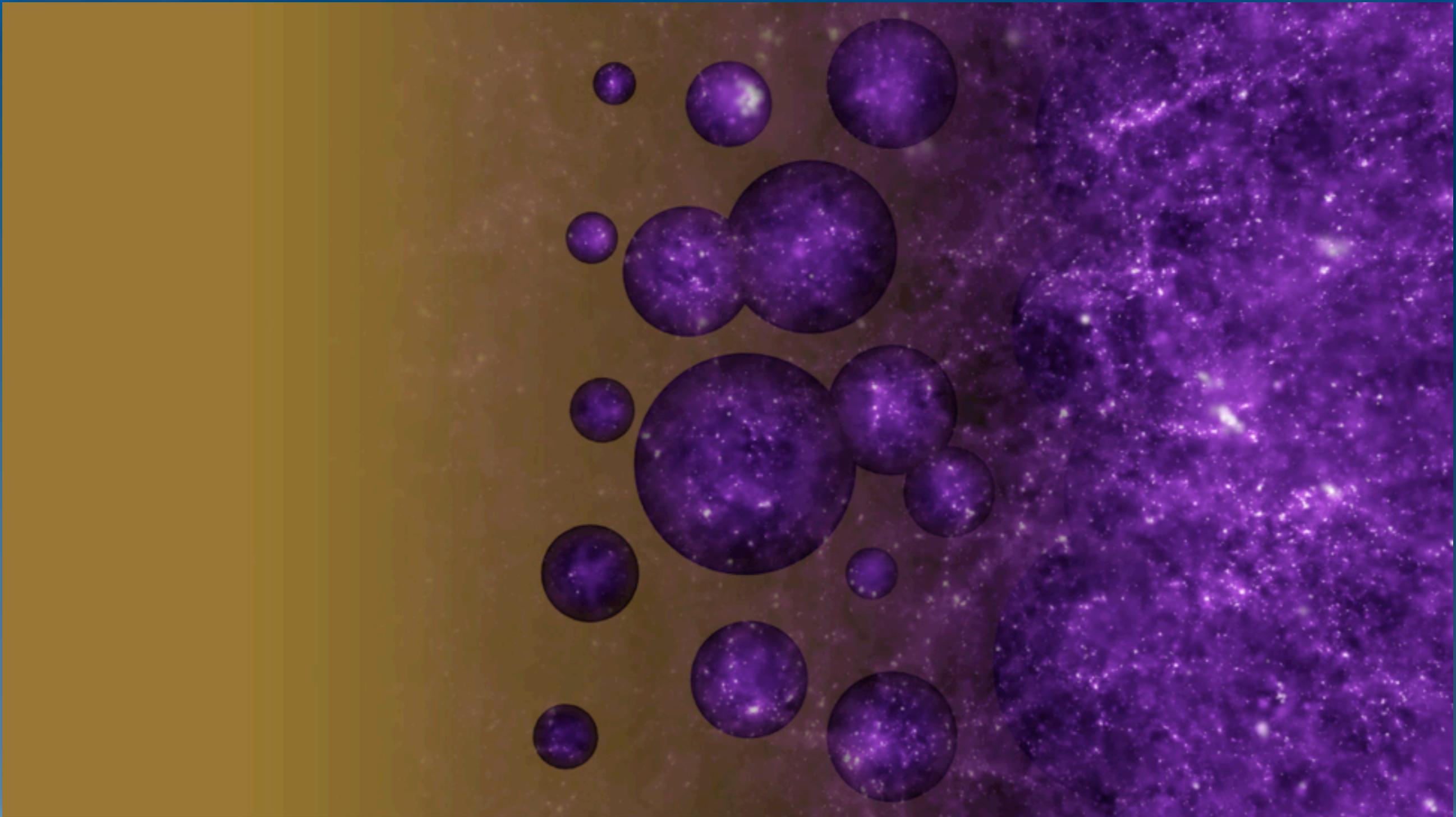


# Neutral Hydrogen Fraction

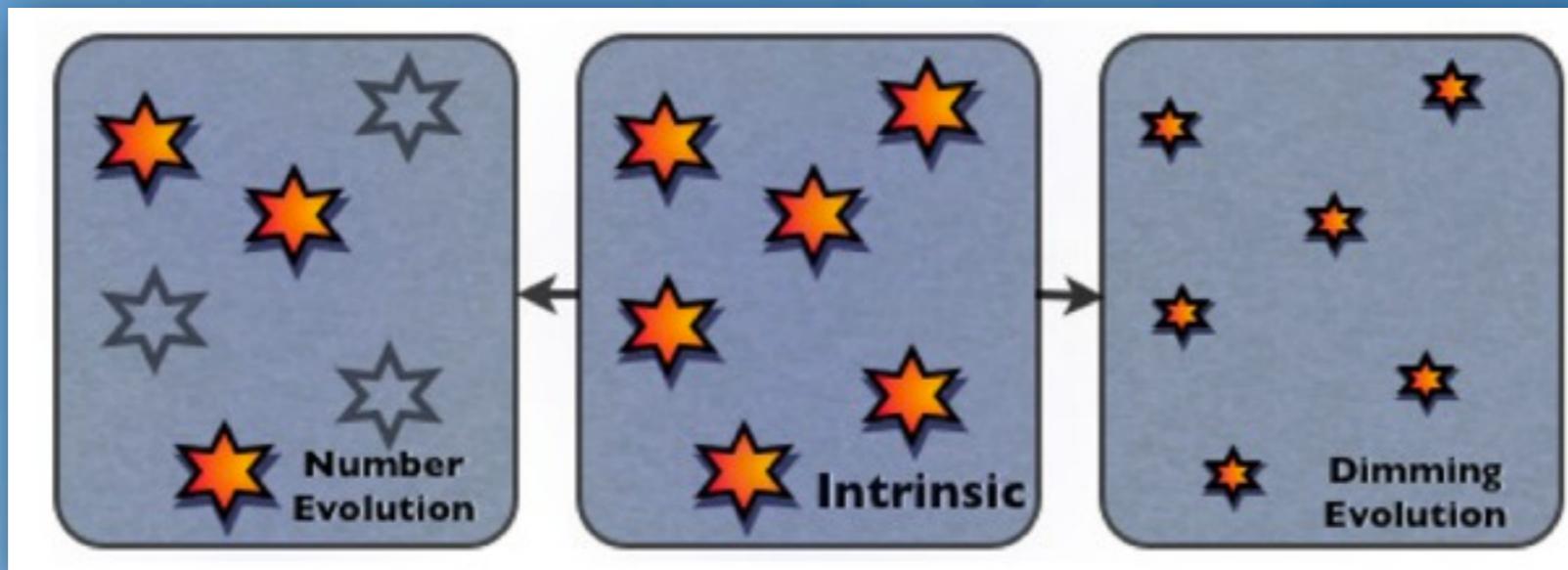
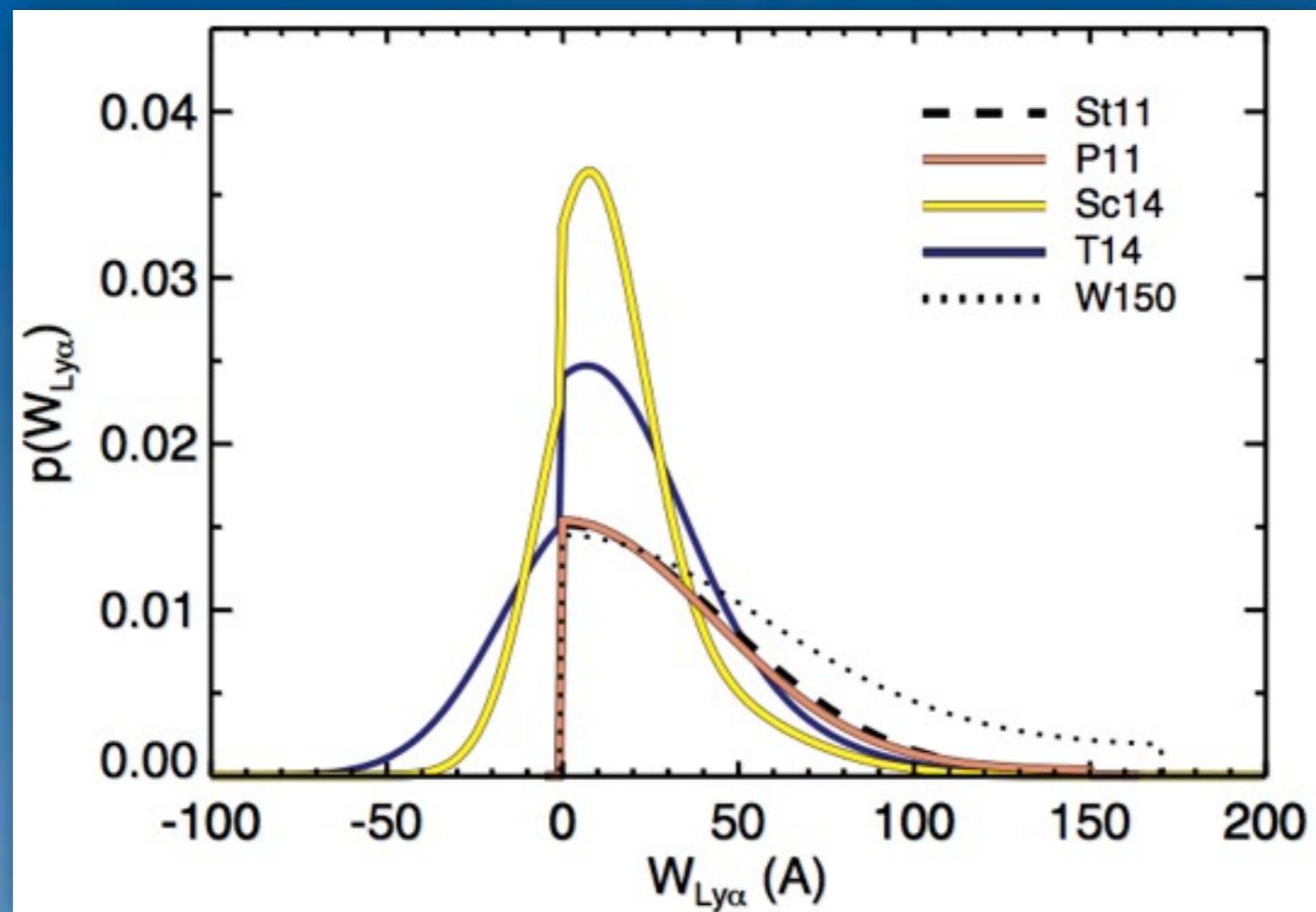


# First Billion Years

---

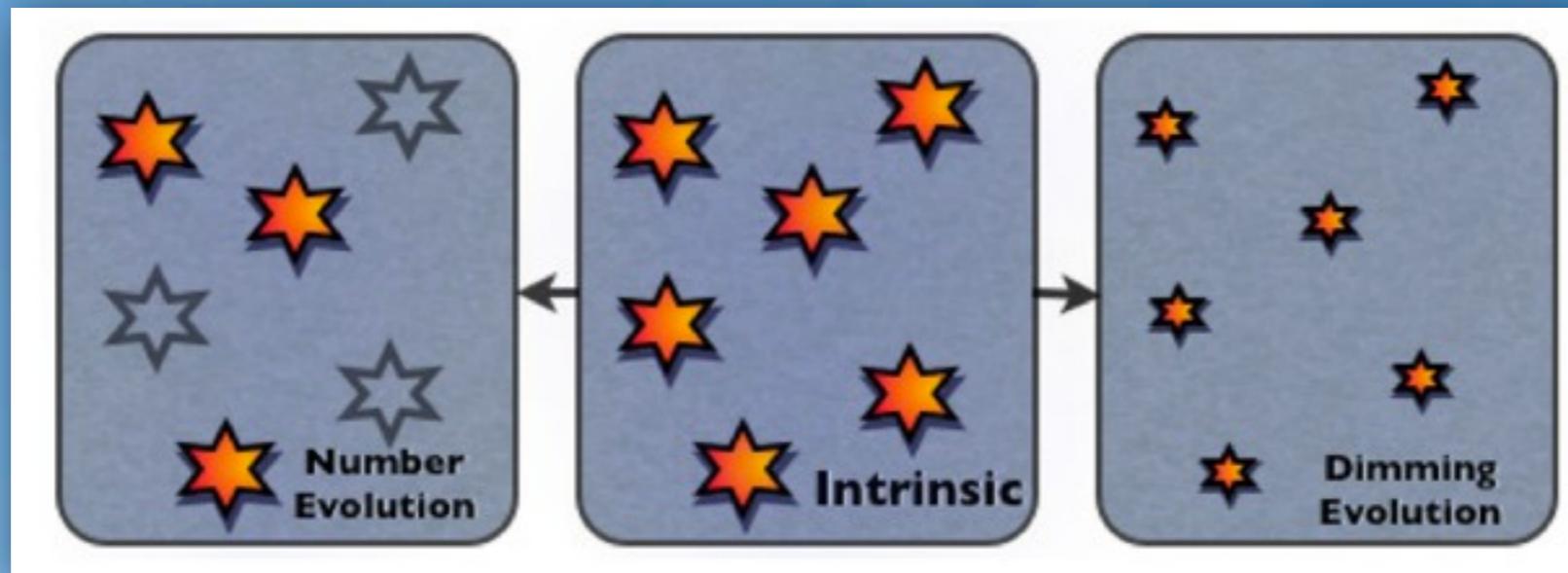
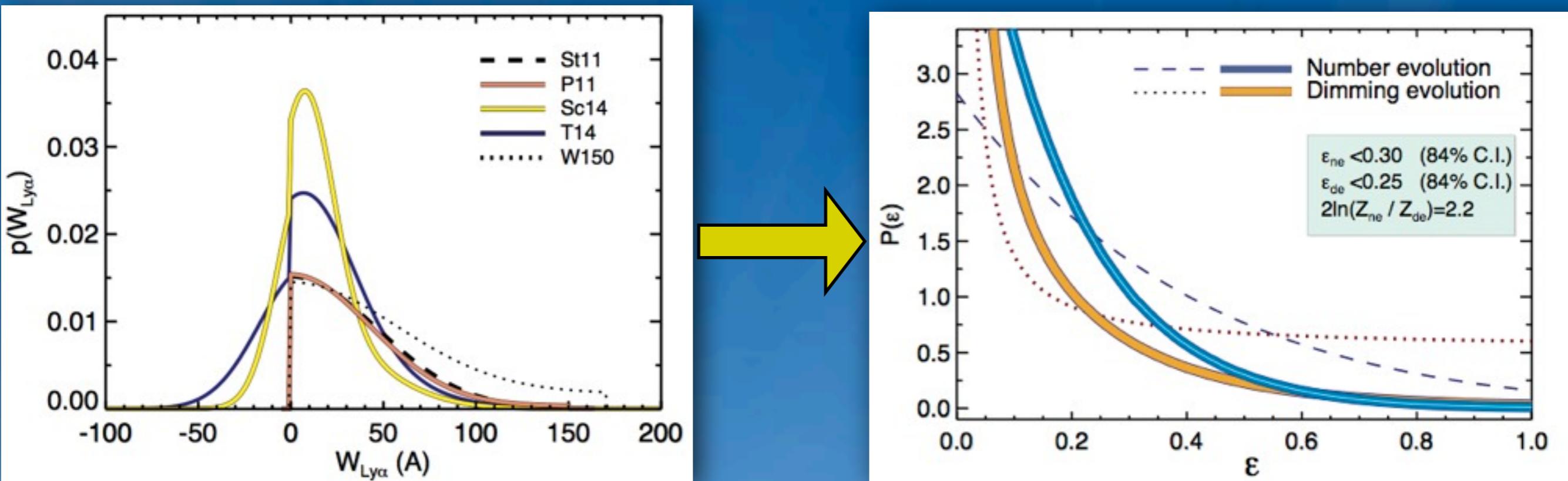


# Lyman-alpha Source Distribution



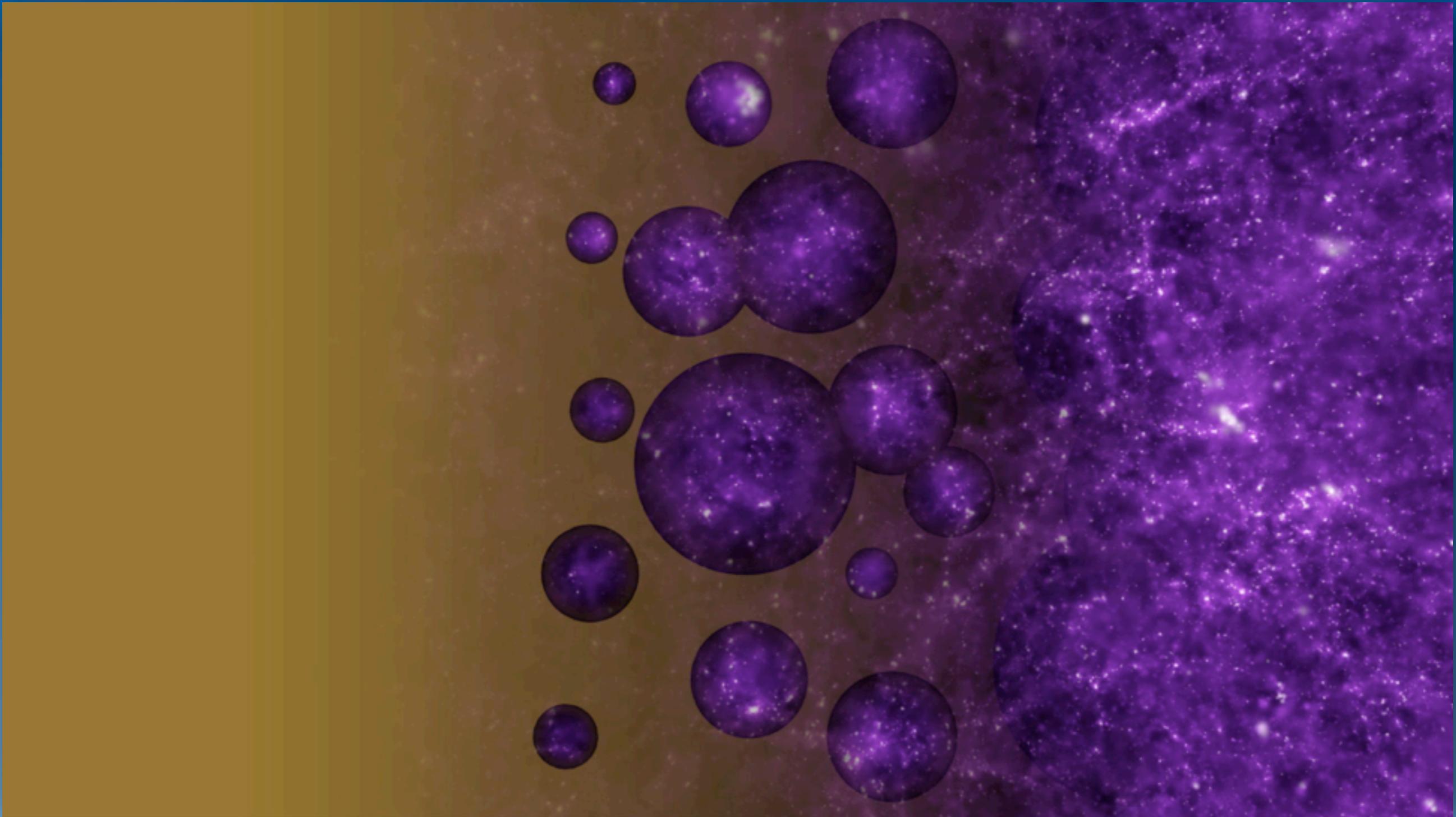
See  
Treu et al 2013  
Pentericci et al 14  
Tilvi et al 2014

# Lyman-alpha Source Distribution

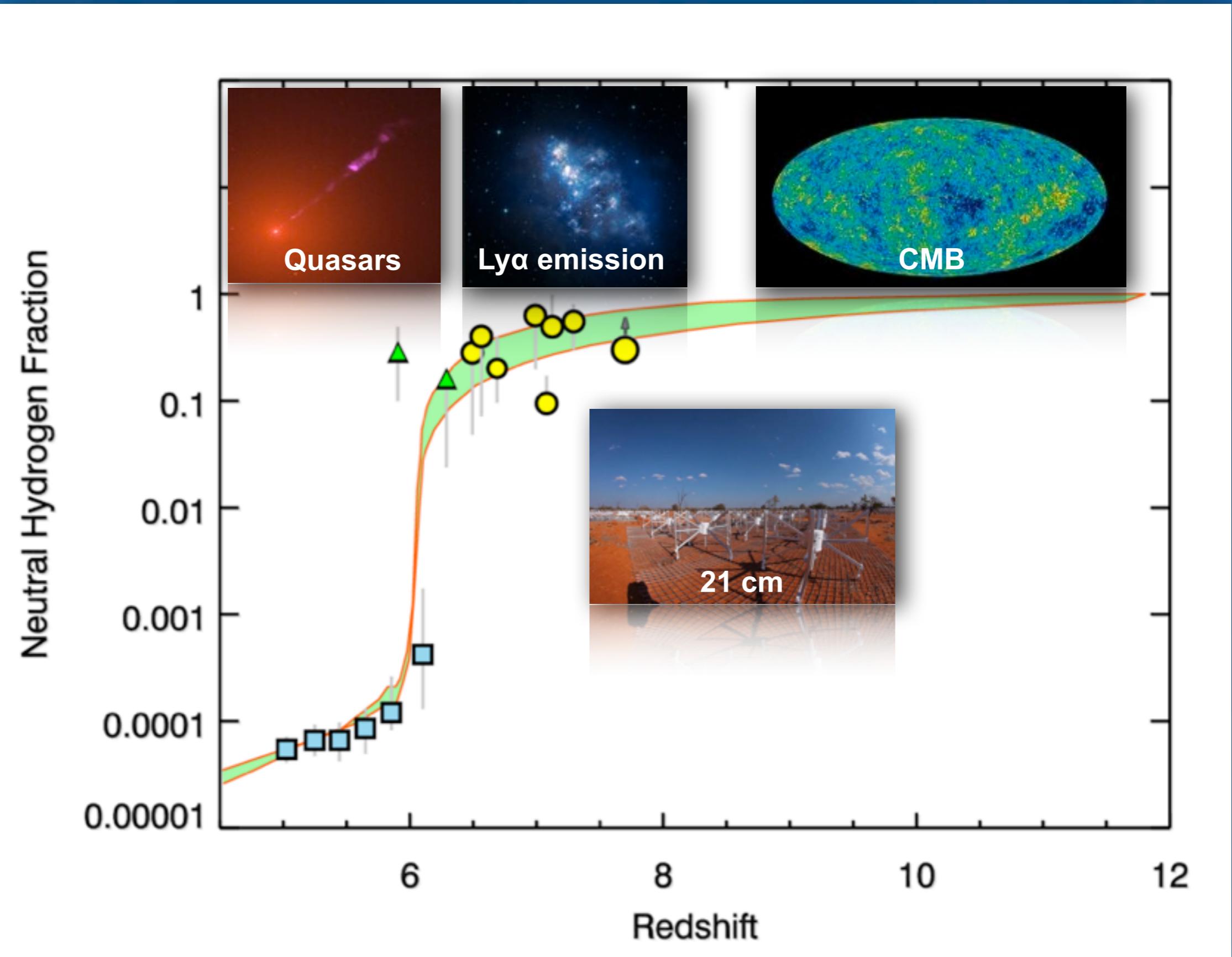


# First Billion Years

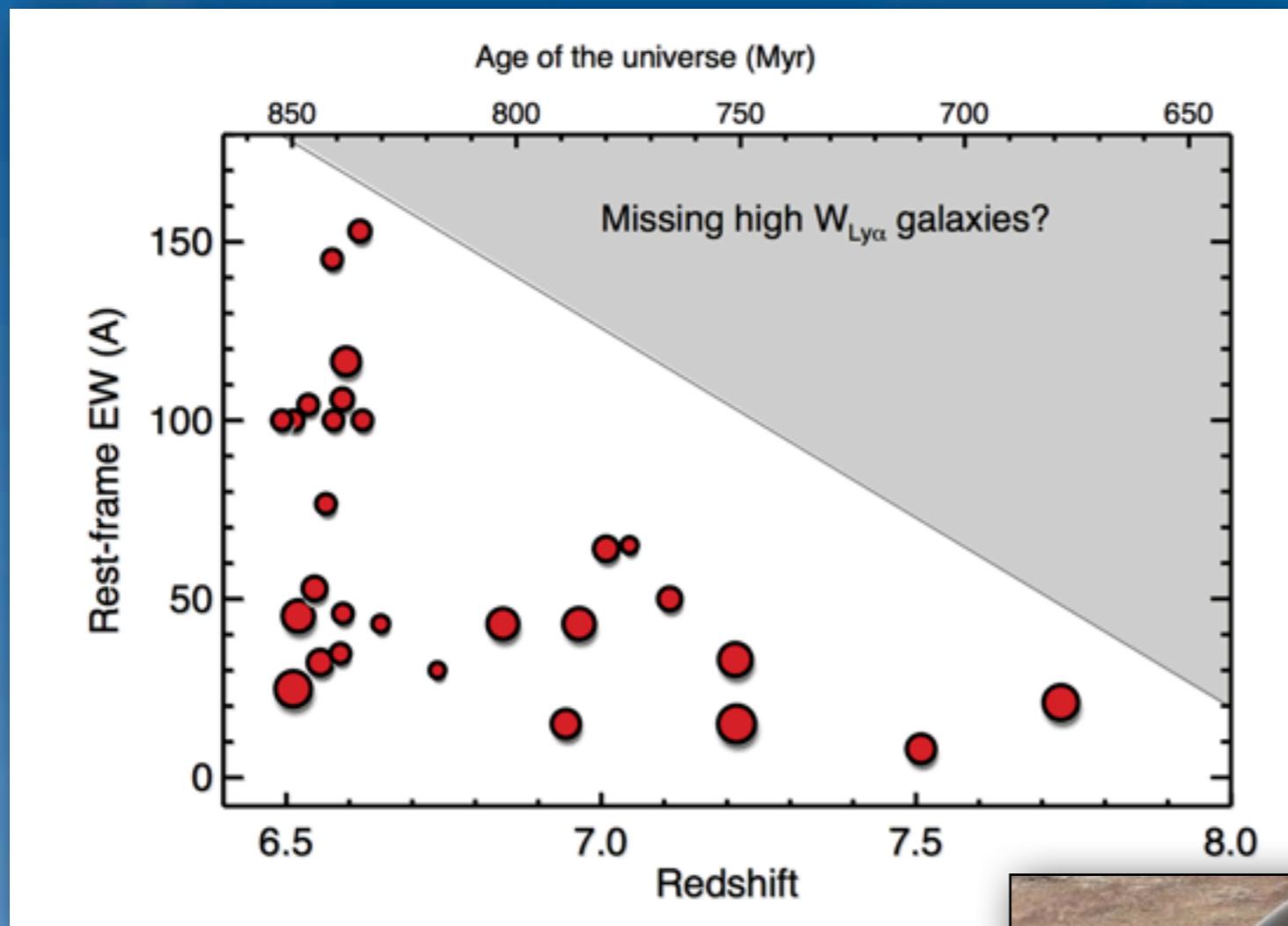
---



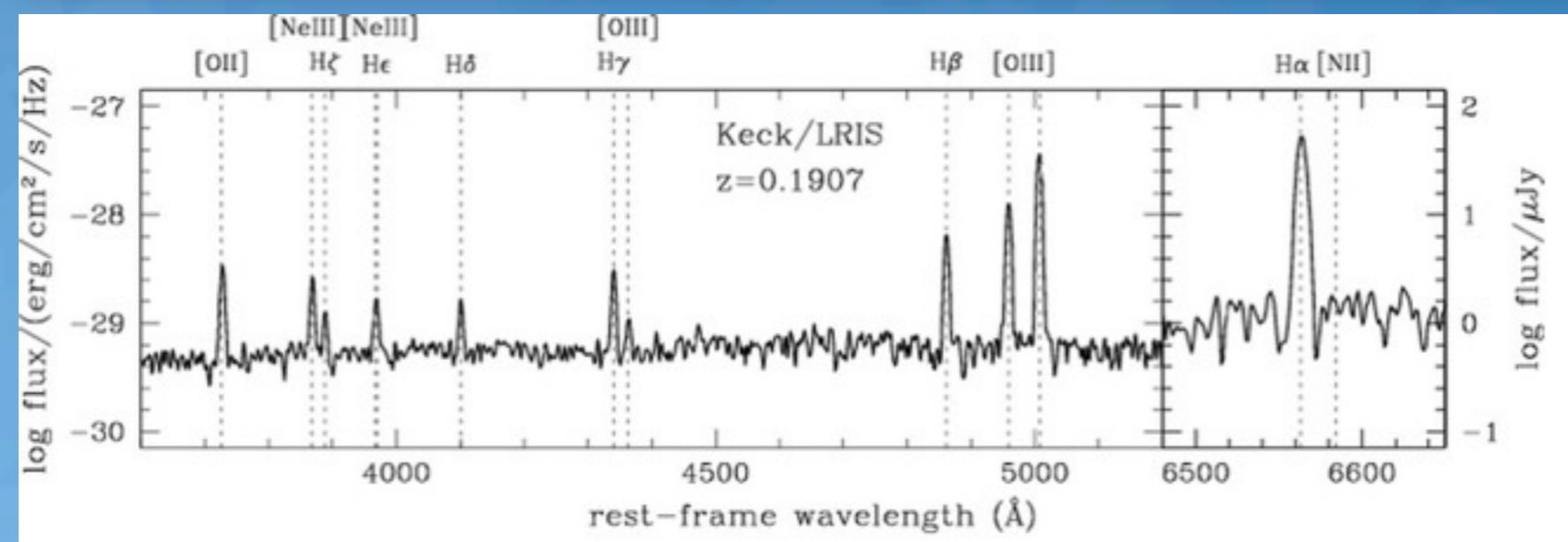
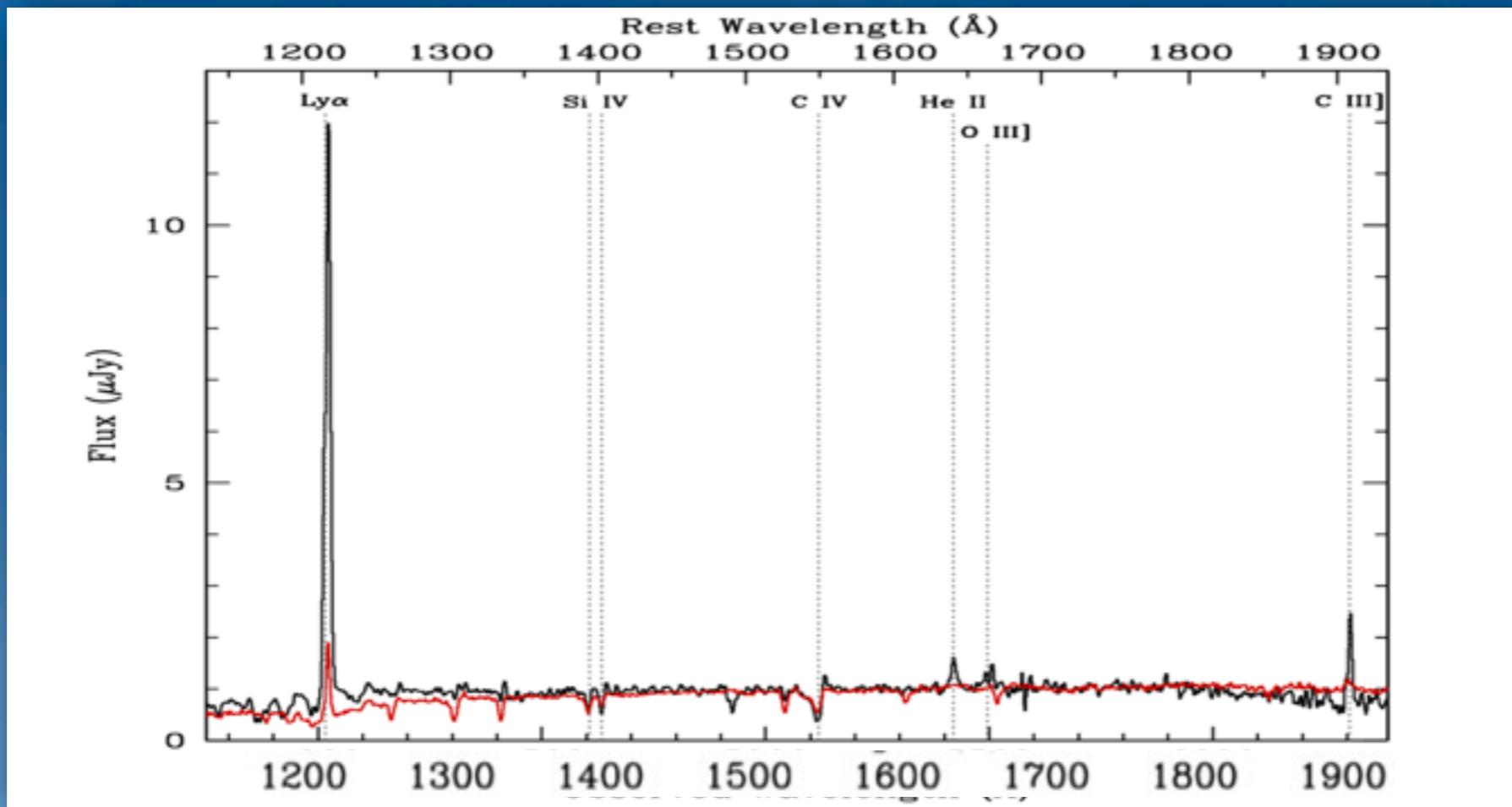
# Neutral Hydrogen Fraction



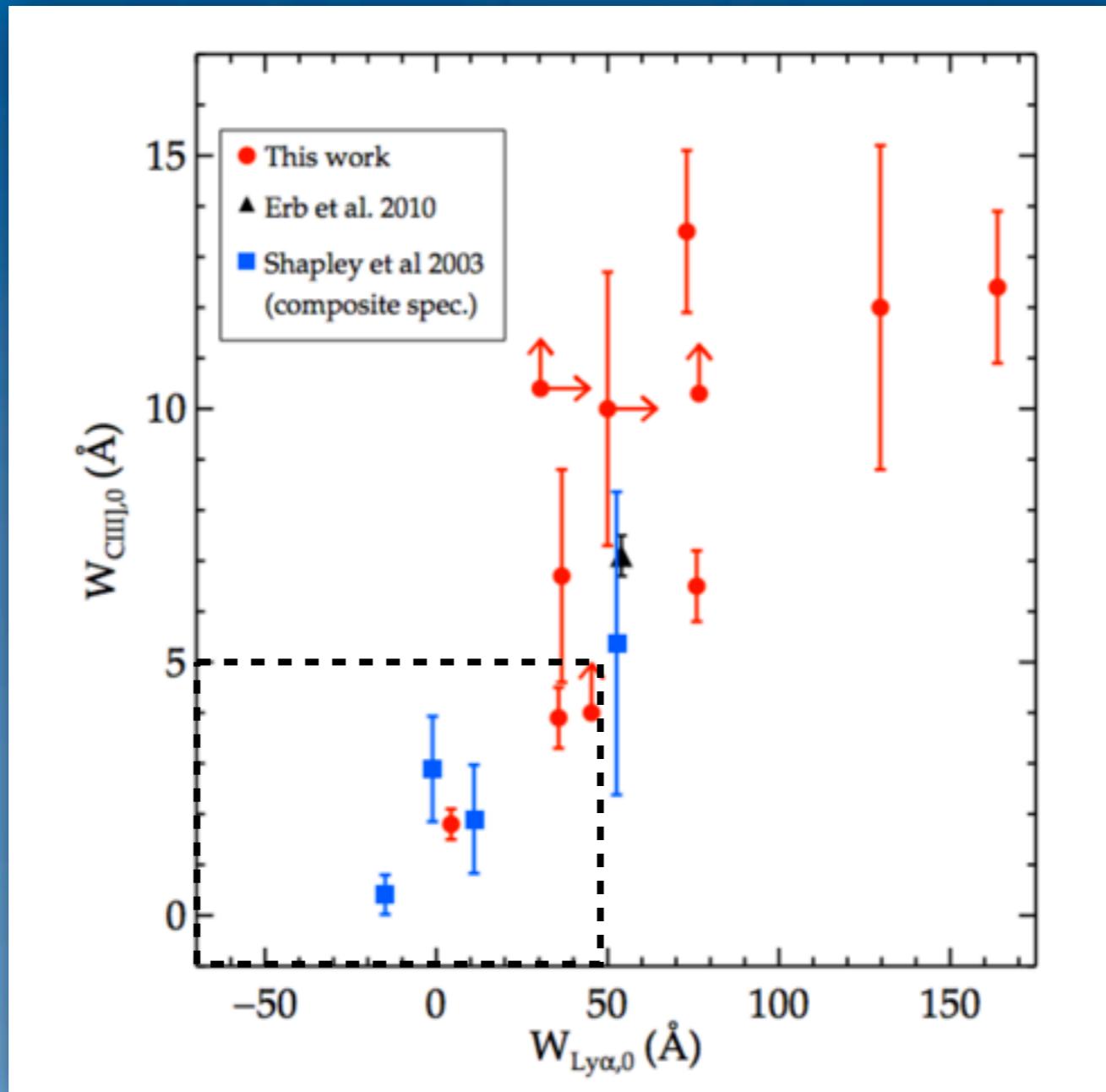
# Equivalent Width Evolution



# Lyman-alpha Line



# [C III] vs Lyman-alpha



Stark et al 2014

# Current Surveys

## Continuum selected

- ⦿ CANDELS
- ⦿ FRONTIER FIELDS

## Narrow-band

- ⦿ DAWN

## WFC3 GRISM

- ⦿ 3D HST
- ⦿ GLASS
- ⦿ FIGS

