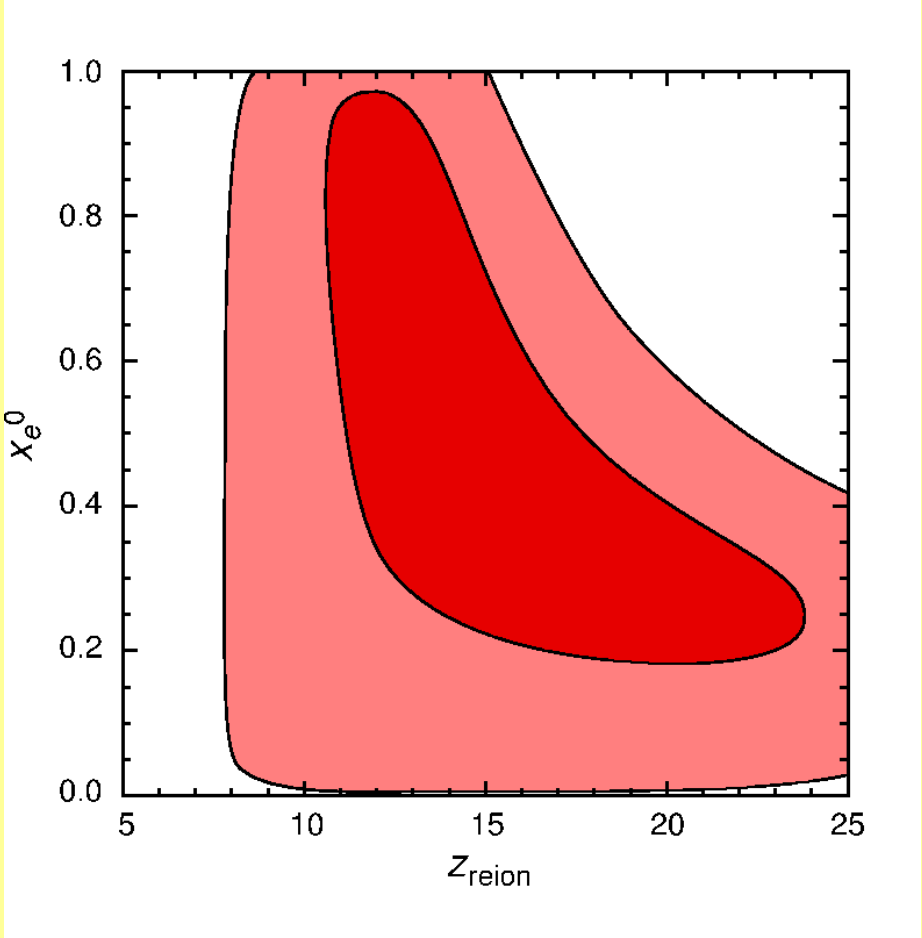
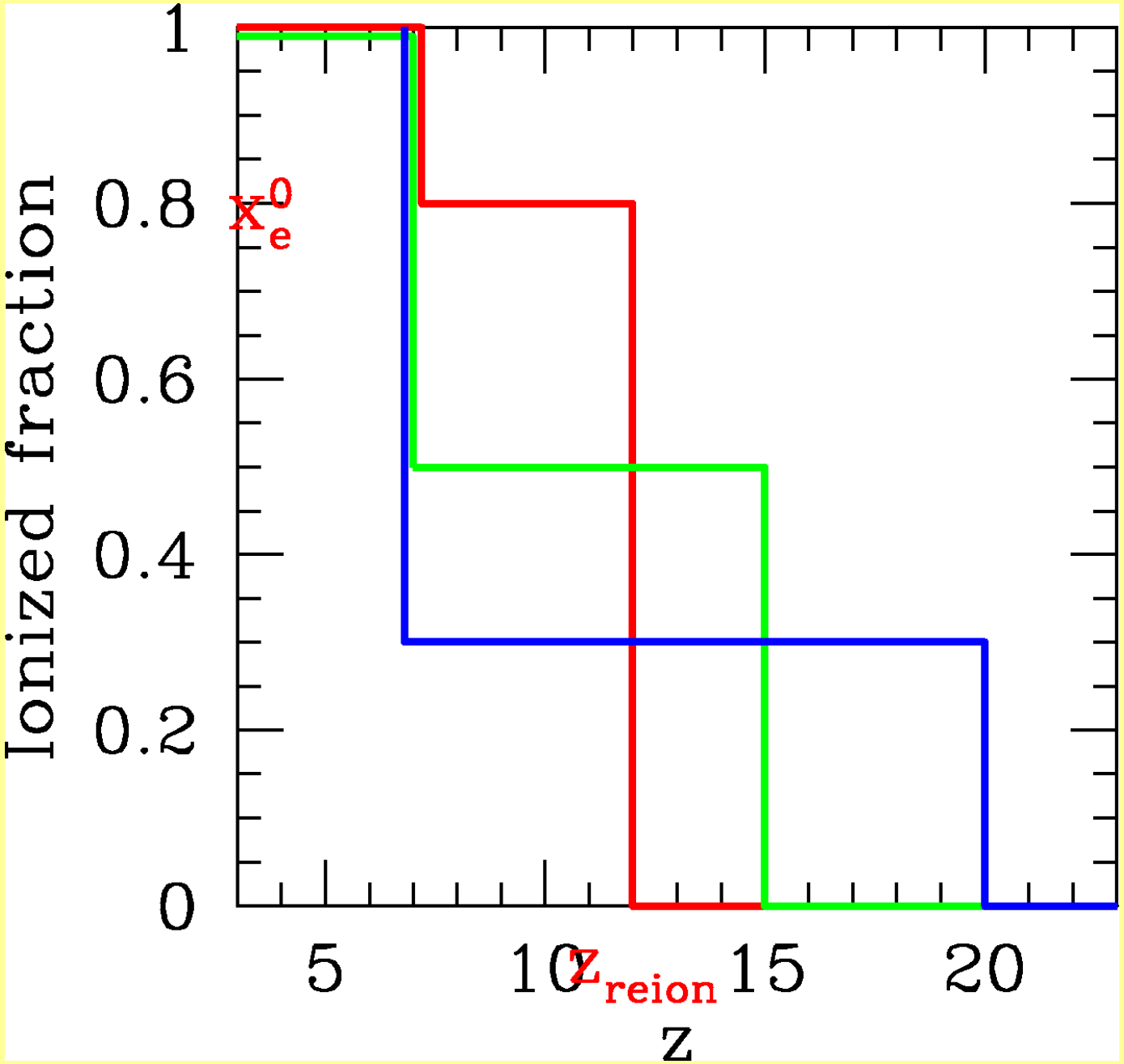
The highest redshift galaxies at z>6

Z>6 = special



WMAP

Spergel et al 06


Ionized fraction
1
0.8
0.6
0.4
0.2
0
x_e^0
5
10
15
20
z_{reion}
z

Questions

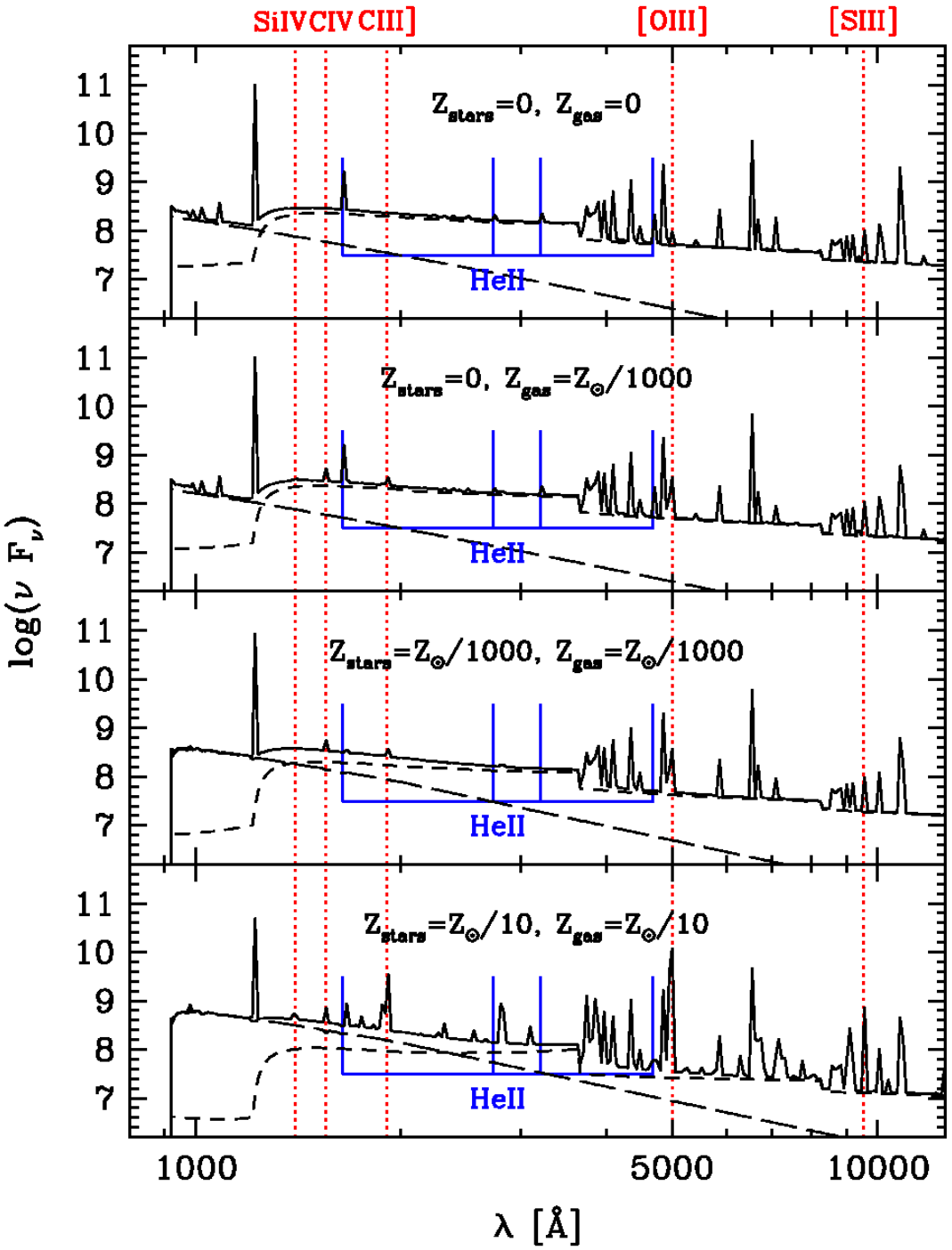
- What sources cause reionization

  AGN, Galaxies, which L
- What are their physical properties?

  Pop III ?
- In what kind of halos do they reside ?

Needed

- Good Luminosity Functions at various z [JWST]
- Spectroscopic confirmation [JWST, R=100]
- Higher resolution spectroscopy for physical parameters [ELT]


SiIV CIV CIII]
[OIII]
[SIII]
$Z_{stars}=0,\ Z_{gas}=0$
$Z_{stars}=0,\ Z_{gas}=Z_\odot/1000$
$Z_{stars}=Z_\odot/1000,\ Z_{gas}=Z_\odot/1000$
$Z_{stars}=Z_\odot/10,\ Z_{gas}=Z_\odot/10$
HeII
log(ν F_ν)
11
10
9
8
7
1000
5000
10000
λ [Å]

Center for Scientific Creation

In the Beginning: Compelling Evidence for Creation and the Flood

This is the online edition of *In the Beginning: Compelling Evidence for Creation and the Flood* (7th Edition) by Dr. Walt Brown.

Click here to order the hardbound print edition of this online book.

u *"Astronomers have never seen a pure Population III star, despite years of combing our Milky Way galaxy."* Robert Irion, "The Quest for Population III," *Science*, Vol. 295, 4 January 2002, p. 66.

Supposedly, Population II stars, stars having slight amounts of some heavy elements, evolved after Population III stars. Predicted characteristics of Population II stars have never been observed.

How to find candidates ?

- Spectrum cuts off below 1216 Angstrom
- Select from multi-wavelength imaging, require a sharp cut-off
- Z-drops, Y-drops, J-drops, …

Brightnesses, number densities

- Hab < 26, z>6.3: 0.4/sq arcmin
- Obtain targets from ULTRA-VISTA survey

  z,Y,J,H,K imaging of COSMOS field, 0.73 sq degree
- > 1000 targets to Hab=26

Going Deep

- Hab=28 (from JWST imaging)
- 2 per sq arcmin

Required integration time

- Assume GLAO spectroscopy
- Galaxies are small [0.2 arcec, pointsource]
- Hab=26 : 10 hours for S/N=10
- Hab=28: 100 hours for S/N=5

Compare to JWST

- JWST very fast for R=100 [photon limited]
- R=1000, Hab=28, 100 hours

  JWST: S/N=0.5-1

  ELT: S/N=4-5

But…

- JWST observes full decade wavelength
  - 1-1.8 micron in one shot
- JWST has very large multiplex
  - > 100 galaxies at the same time
  - Not so efficient on the bright end
    - Still 18 galaxies at Hab=28

Required for ELT

- Complete program:
  - Hab=26: 1000 spectra total over area of 0.7 sq degree,
    - 10arcmin useful field -> 30 pointings, 300 hours
  - Hab=28: 100 hours, 10 arcmin fov -> 200 galaxies
    - 500 hours -> 1000 galaxies

Required

- Large field of view (10 arcmin)
- High multiplex (up to 200)
- Large instantaneous wavelength coverage

  [Y,J, H] – 0.9-1.8 micron

work needed

- Performance of GLAO + sizes of galaxies -> efficiency
- Instrument concept ?