Science with the deep layer

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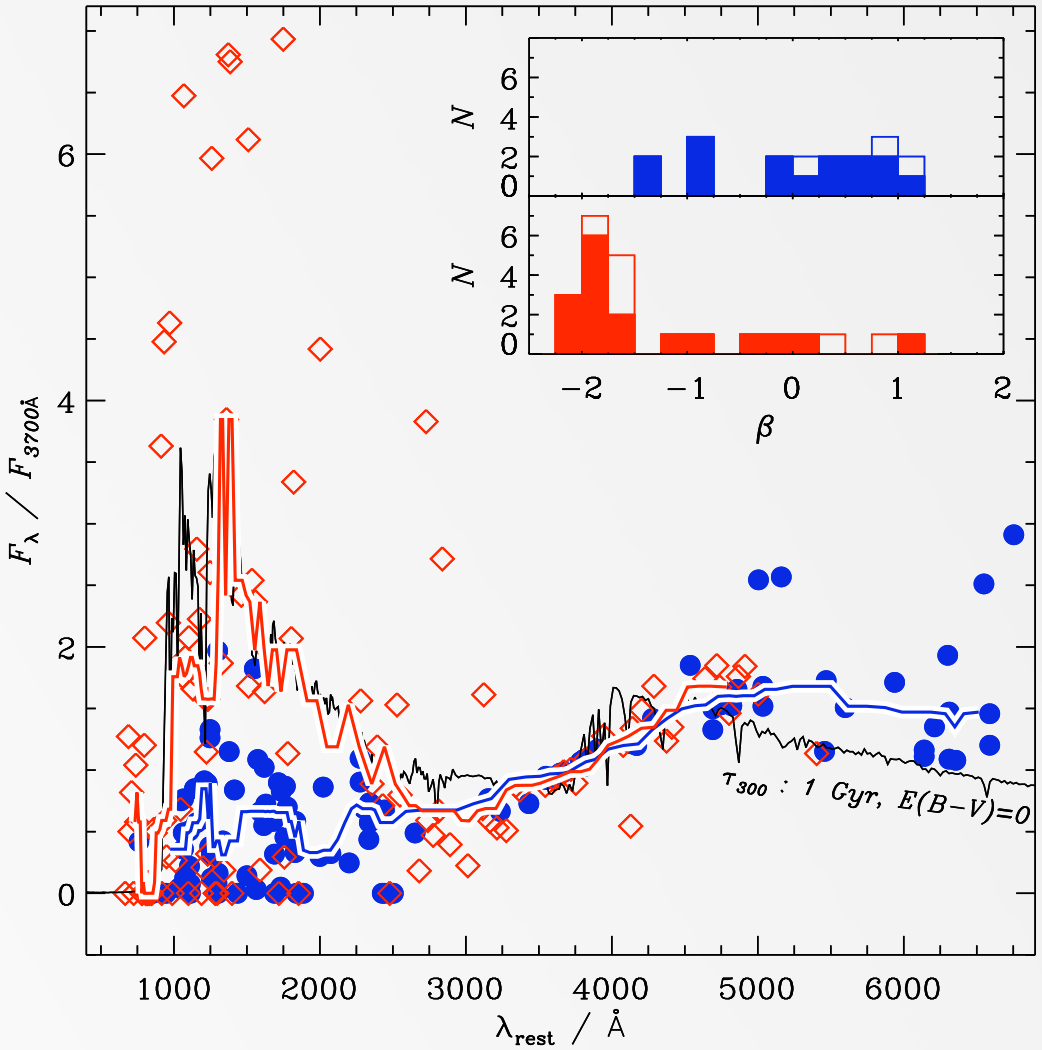
for Princeton University

The deep layer

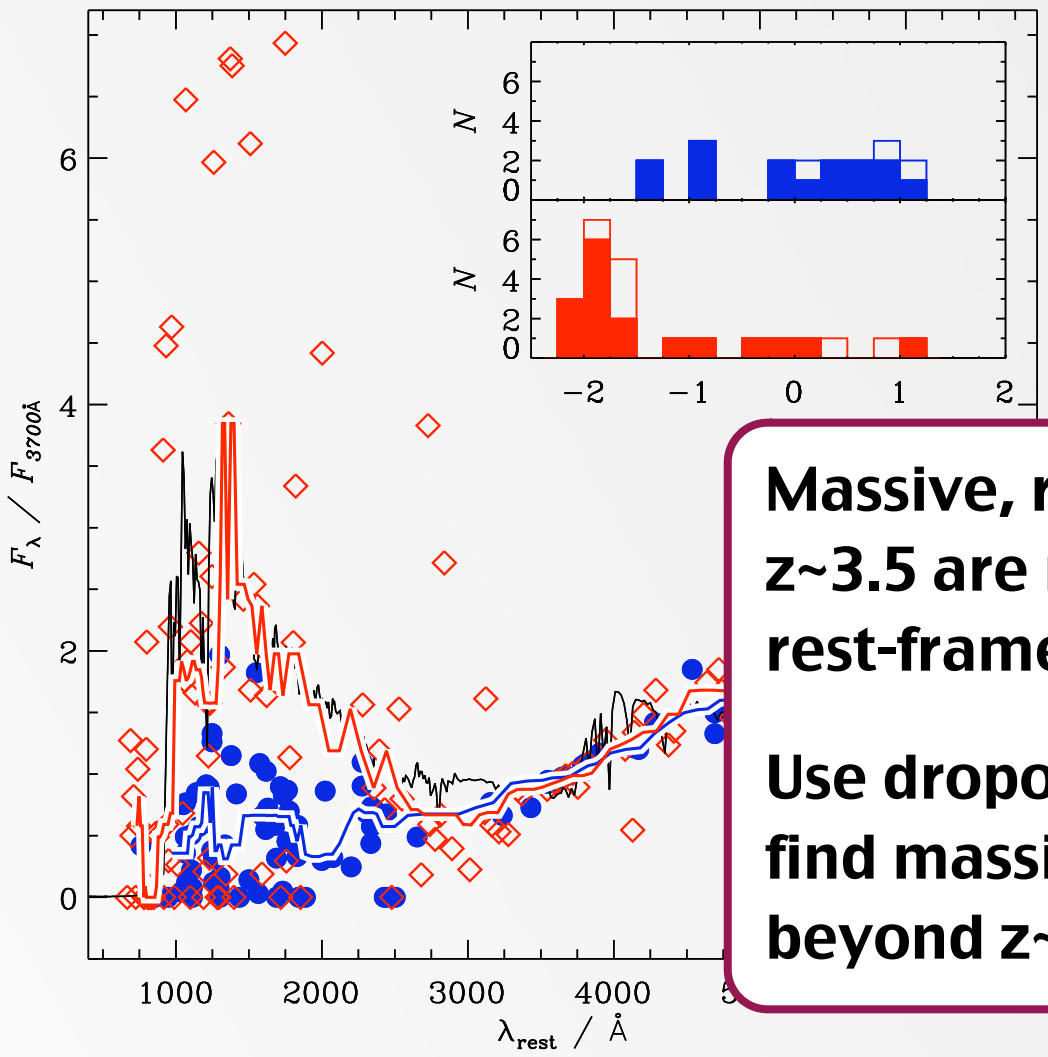
- **Depth:** g=29.8, r=29.3, i=28.9, z=28.2, y=27.4
- **Area: 5 arcmin^2**
- **4 Narrow bands at z ~ 4, 5, 6, 7**
- **Main science goals:**
  - **Dropouts / Lyman break galaxies (LBGs) at $3.5 \lesssim z \lesssim 6.0$**
  - **Lyman Alpha emitters (LAEs) at z = [4,5,6,7]**

Comparison massive galaxies at z~2.5 and z~3.5



Brammer & van Dokkum 2007

Comparison massive galaxies at z~2.5 and z~3.5



Massive, red galaxies at z~3.5 are much bluer in the rest-frame UV than at z~2.5:

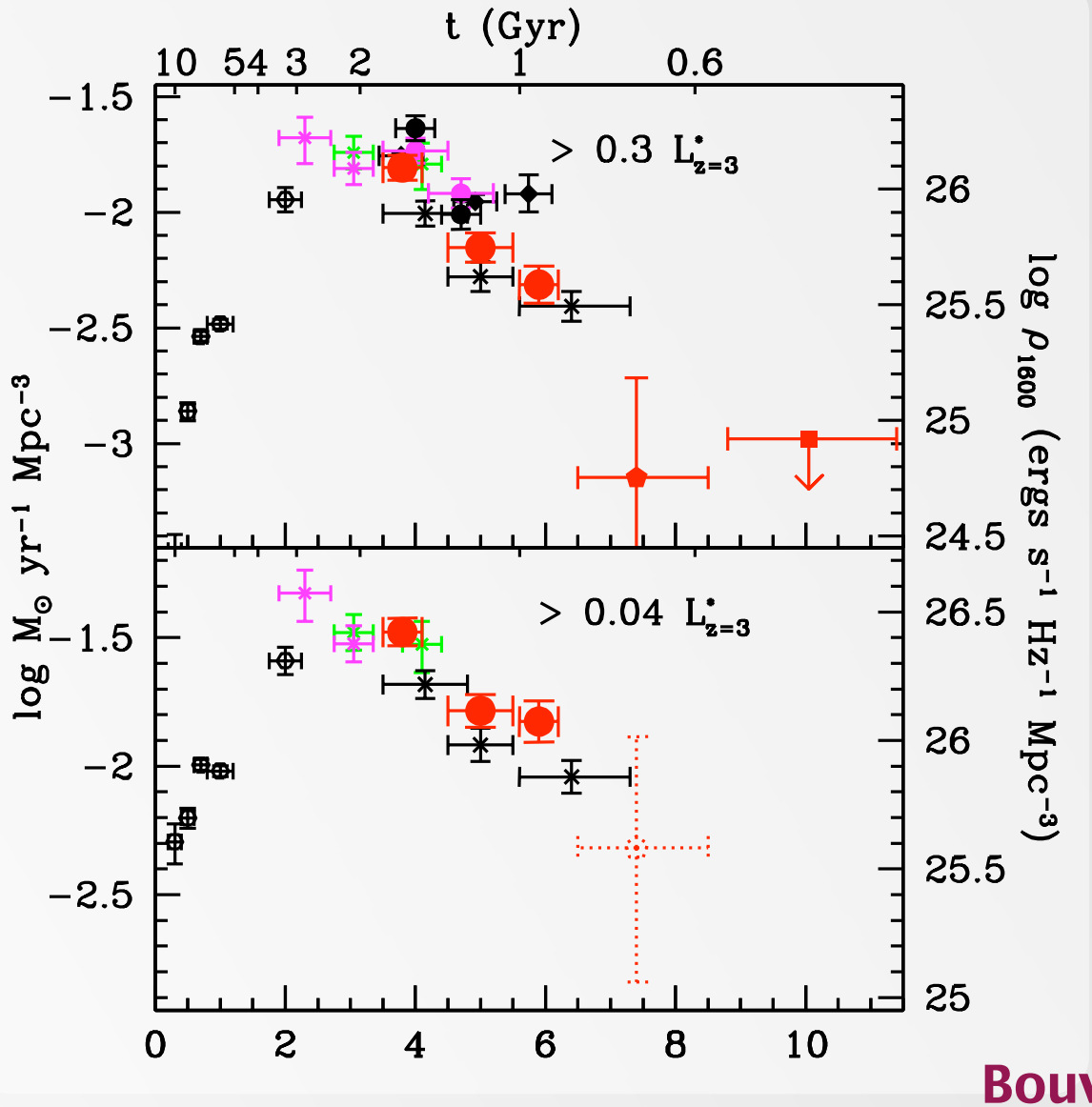
Use dropout technique to find massive galaxies beyond z~3.5

Brammer & van Dokkum 2007

Science with dropouts / LBGs

- **UV Luminosity functions: star formation history (SFH) of the early universe** (e.g., Shimasaku et al. 2005, Yoshida et al. 2006, Tresse et al. 2007, Bouwens et al. 2007)
- **Clustering: importance of the environment for the SFH of galaxies**

SFR density of the universe

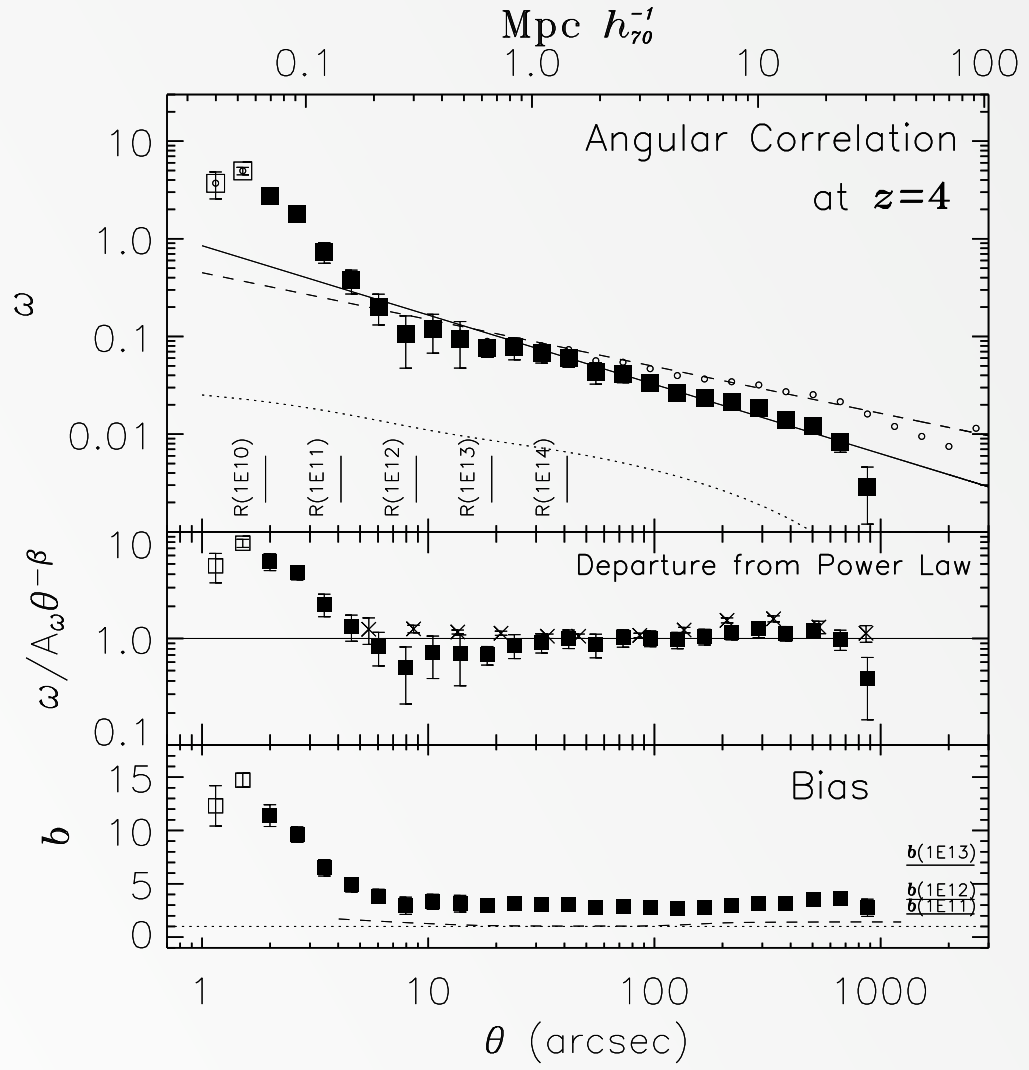


Bouwens et al. 2007

Science with dropouts / LBGs

- **UV Luminosity functions: star formation history (SFH) of the early universe** (e.g., Shimasaku et al. 2005, Yoshida et al. 2006, Tresse et al. 2007, Bouwens et al. 2007)
- **Clustering: importance of the environment for the SFH of galaxies**

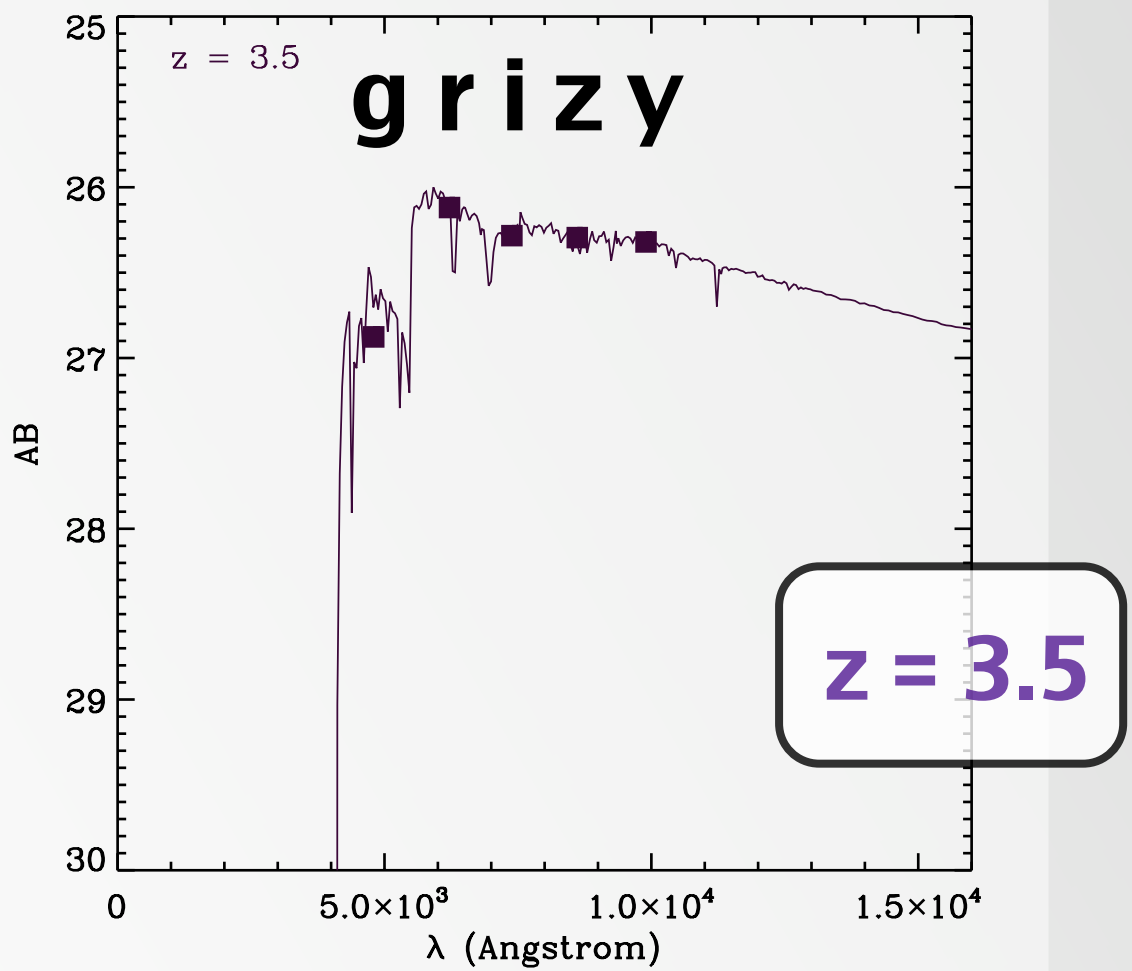
Clustering of dropouts



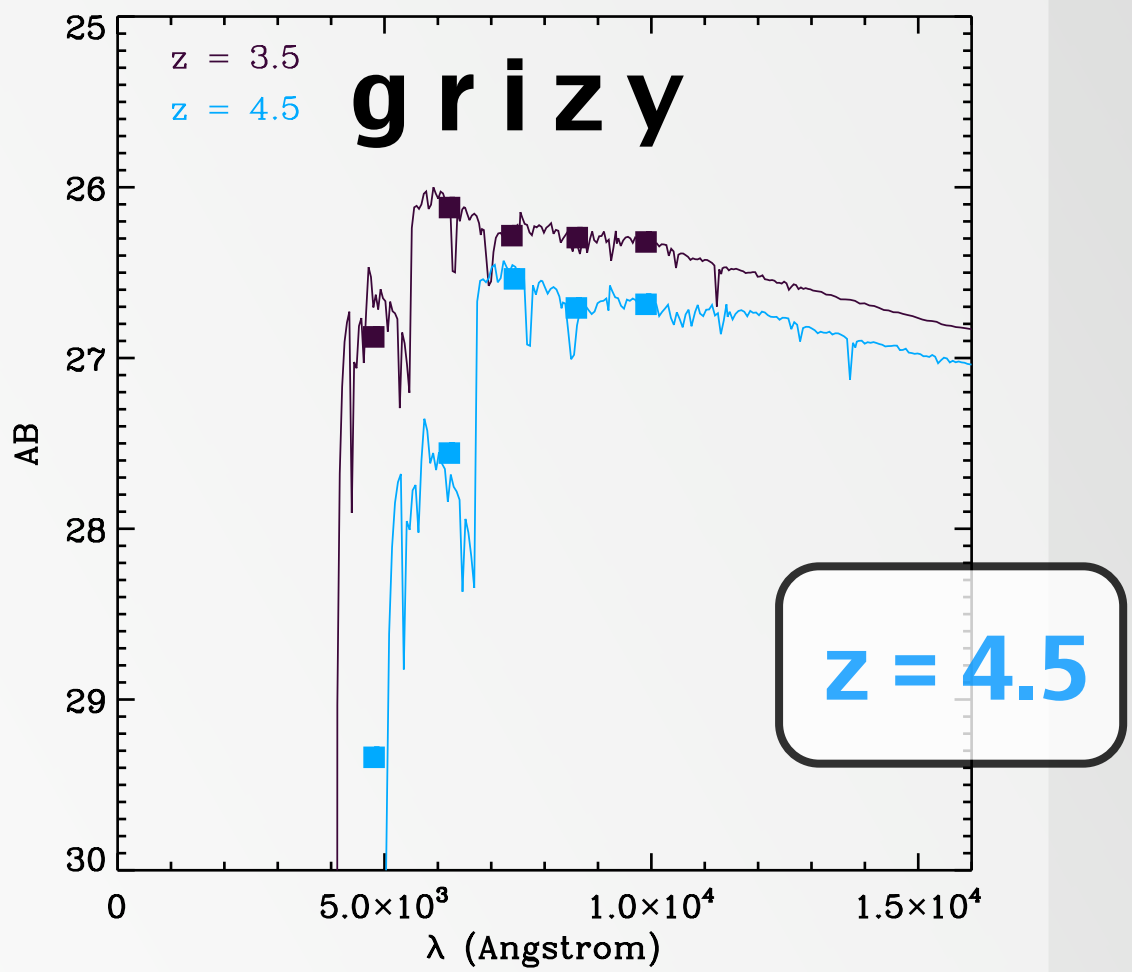
Ouchi et al. 2005:

z~4 LBGs in the Subaru / XXM Newton deep field (1 deg^2)

Dropouts in the deep layer



Dropouts in the deep layer



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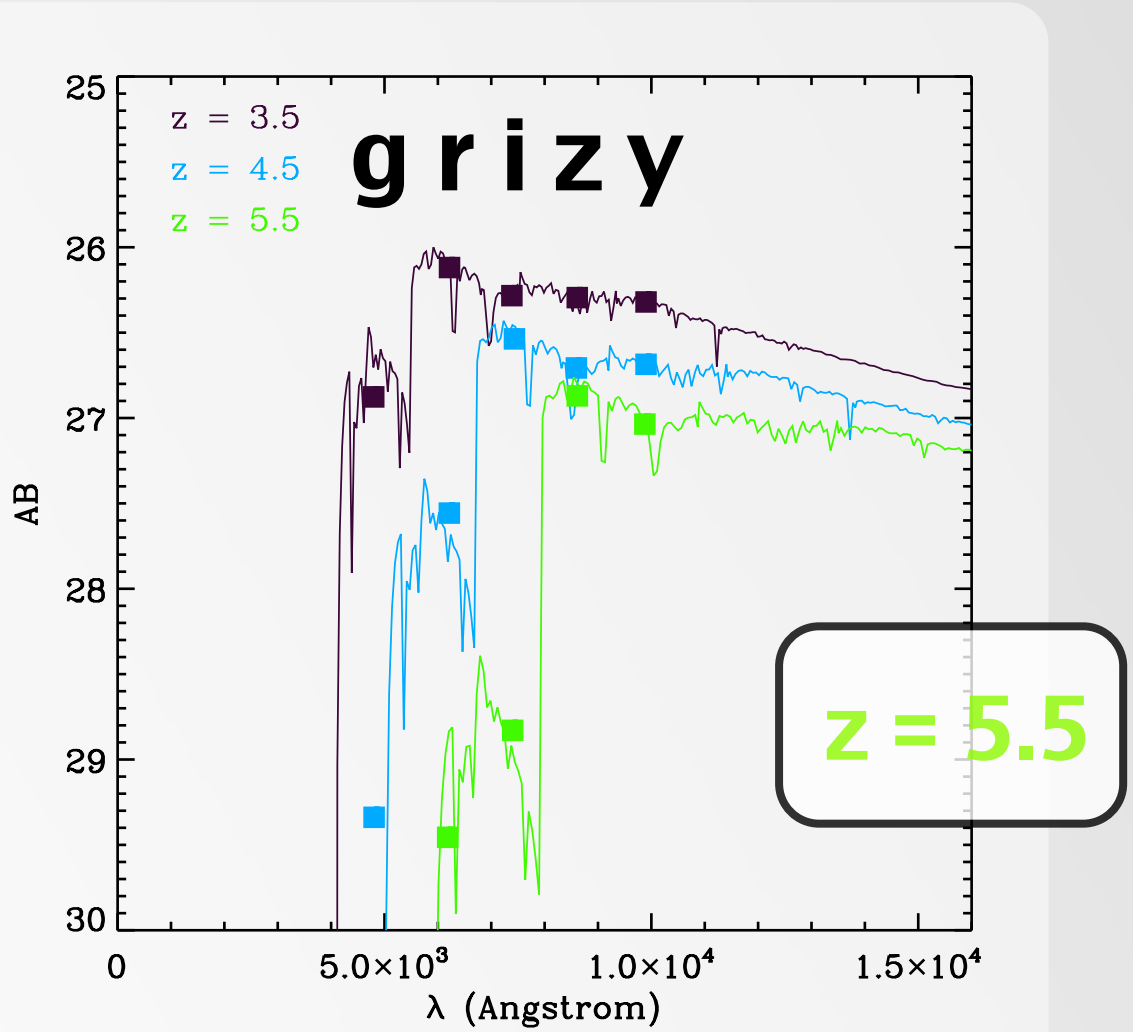
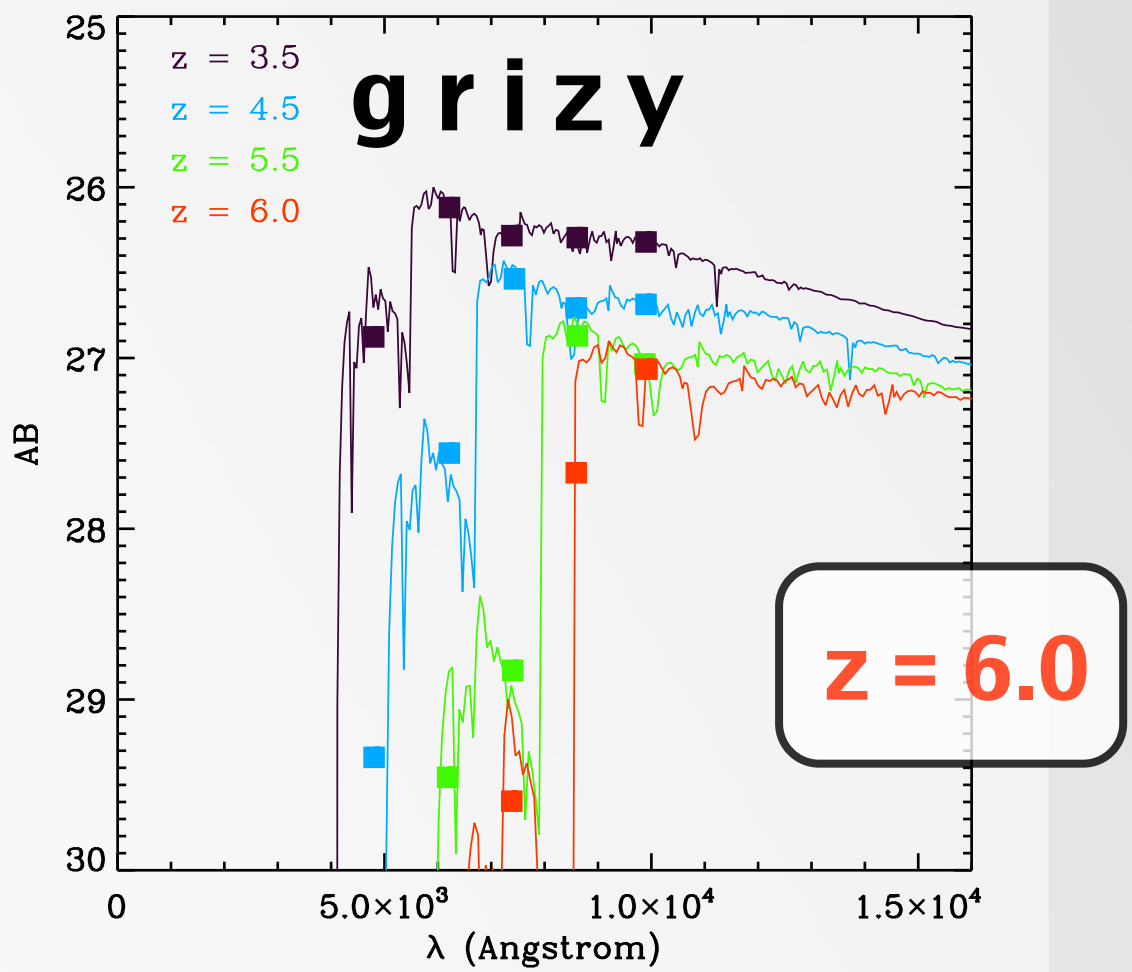


Dropouts in the deep layer



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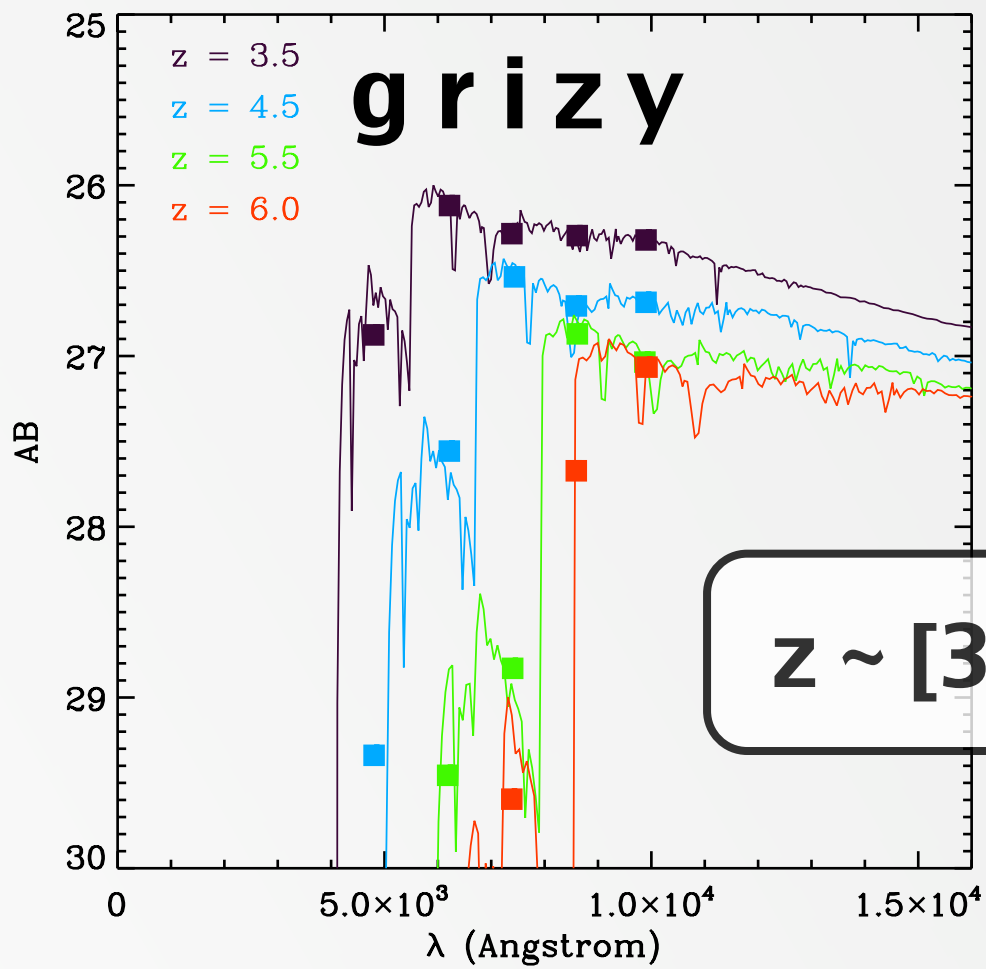
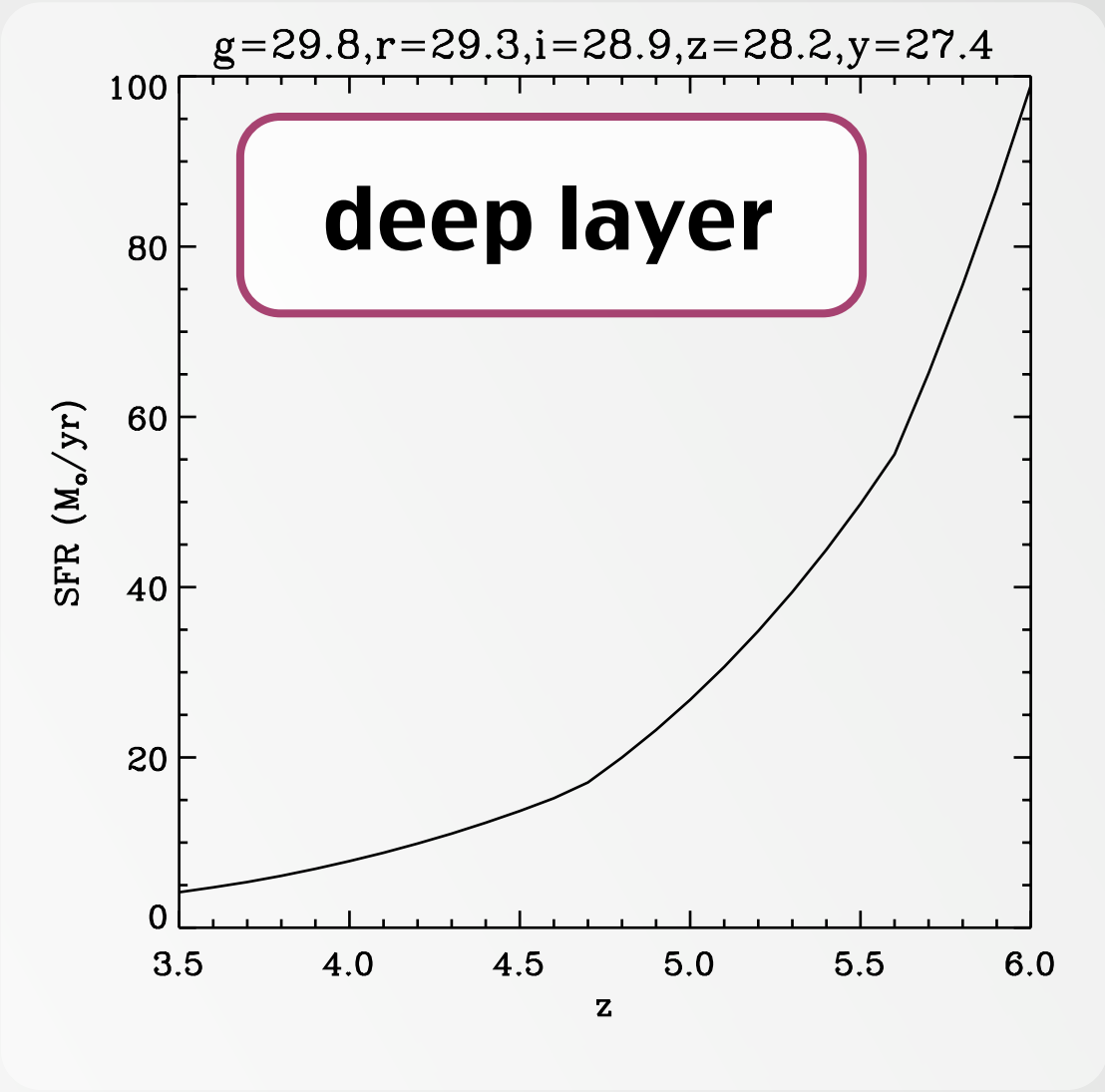


z ~ [3.5, 6.0]

SFR limits from UV continuum



g=29.8
r=29.3
i=28.9
z=28.2
y=27.4

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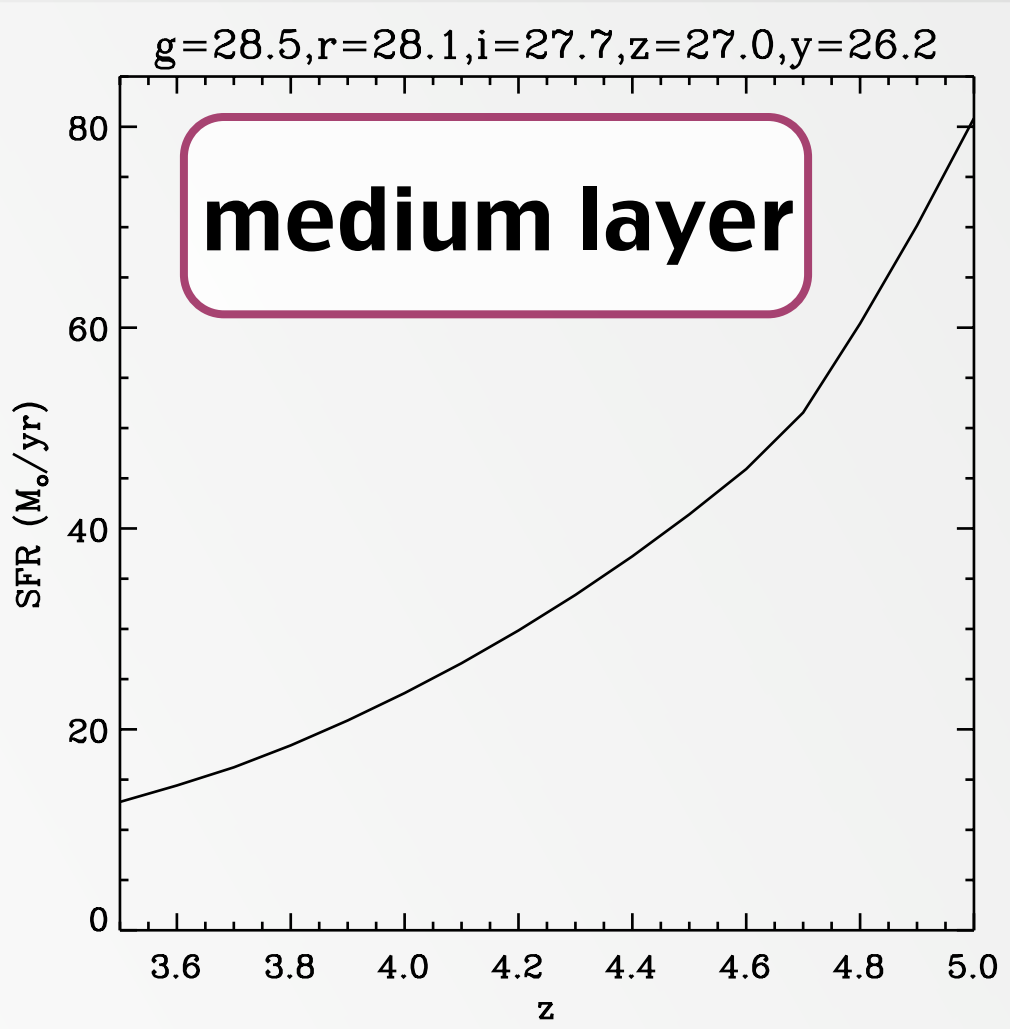
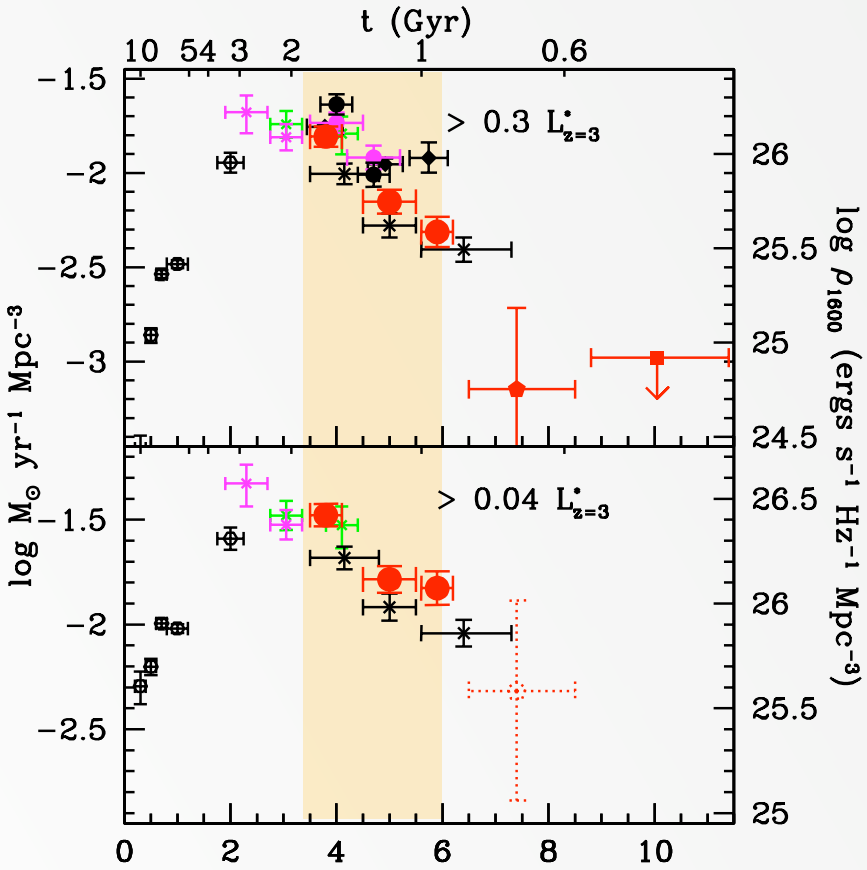


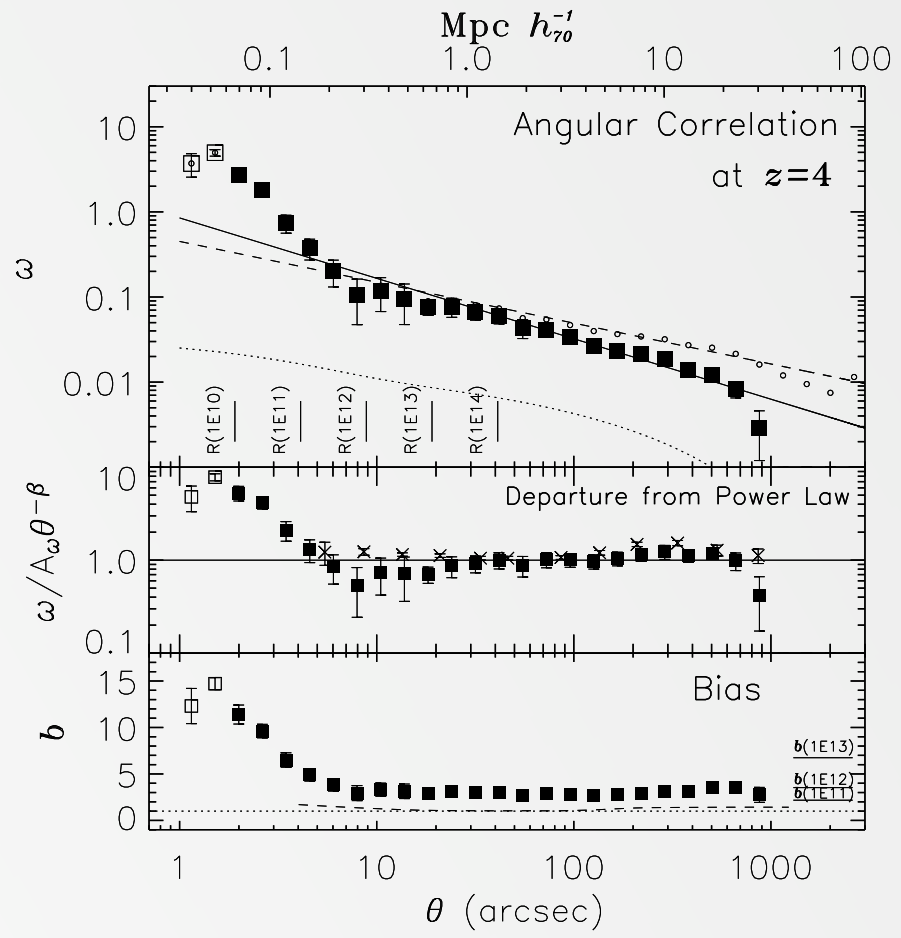
g=28.5
r=28.1
i=27.7
z=27.0
y=26.2

Comparison to current LBG studies



UV Luminosity function: less influenced by cosmic variance

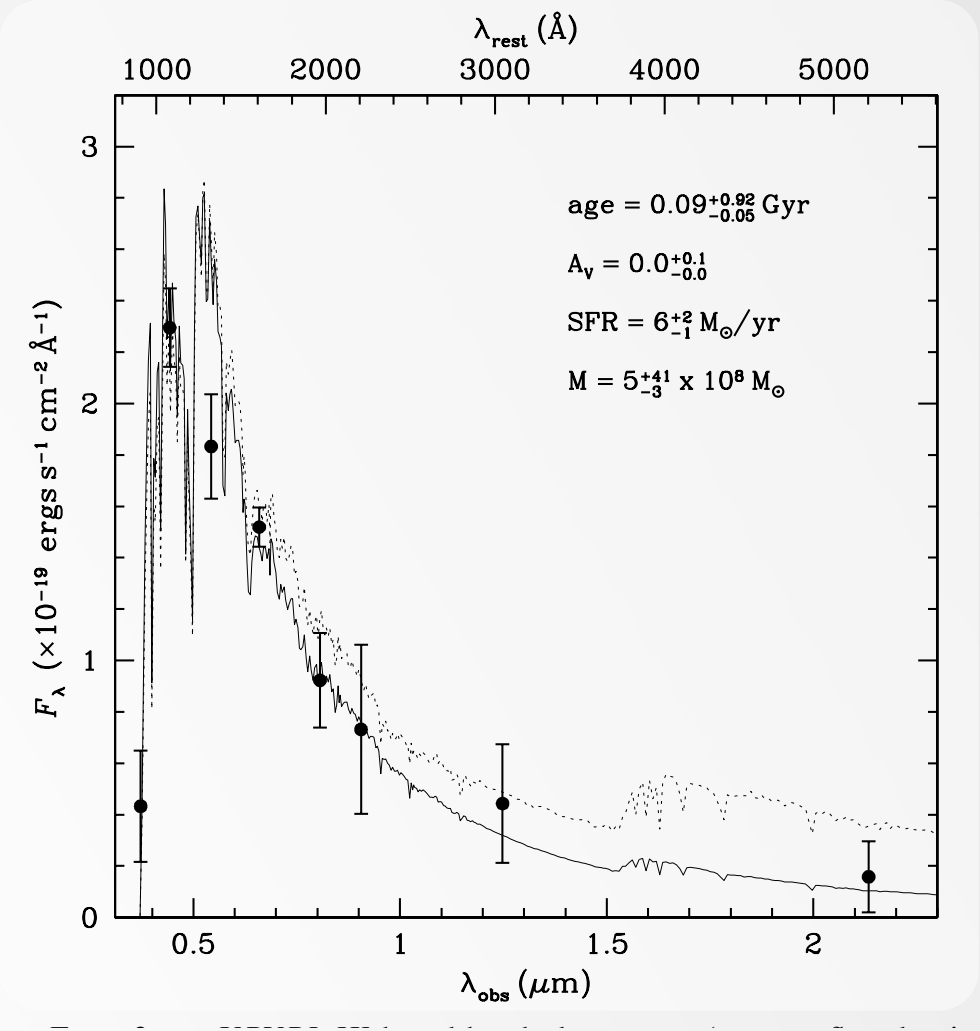
Clustering: deep layer 5 x larger area & about 1.5 mag deeper or 20 x larger area at the same depth



Science with LAEs

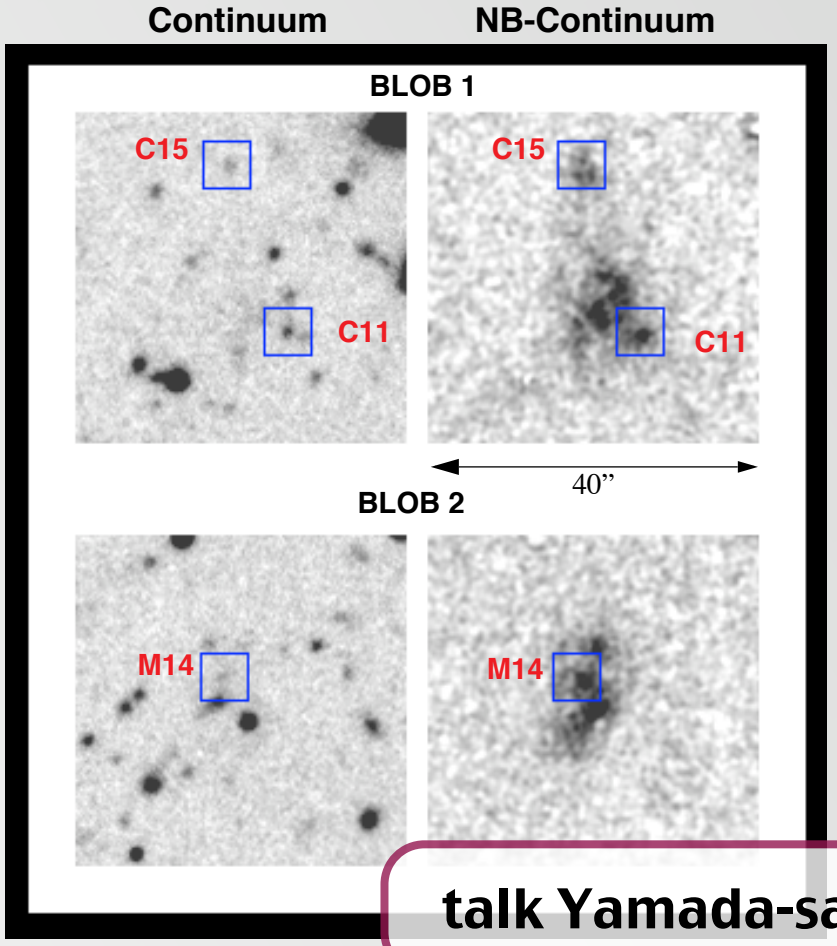
- **Nature of Lyman Alpha emitters**
  - **Early phases of star formation, low-mass galaxies**
  - **High EW sources: lyman alpha blobs**
- **Probing reionization**
  - **Clustering of LAEs**

Nature of LAEs?



Gawiser et al. 2006

Steidel et al. 2000

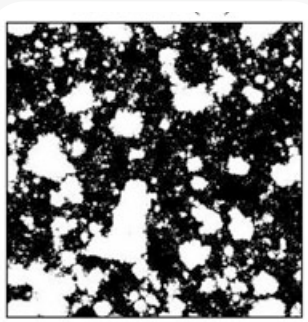


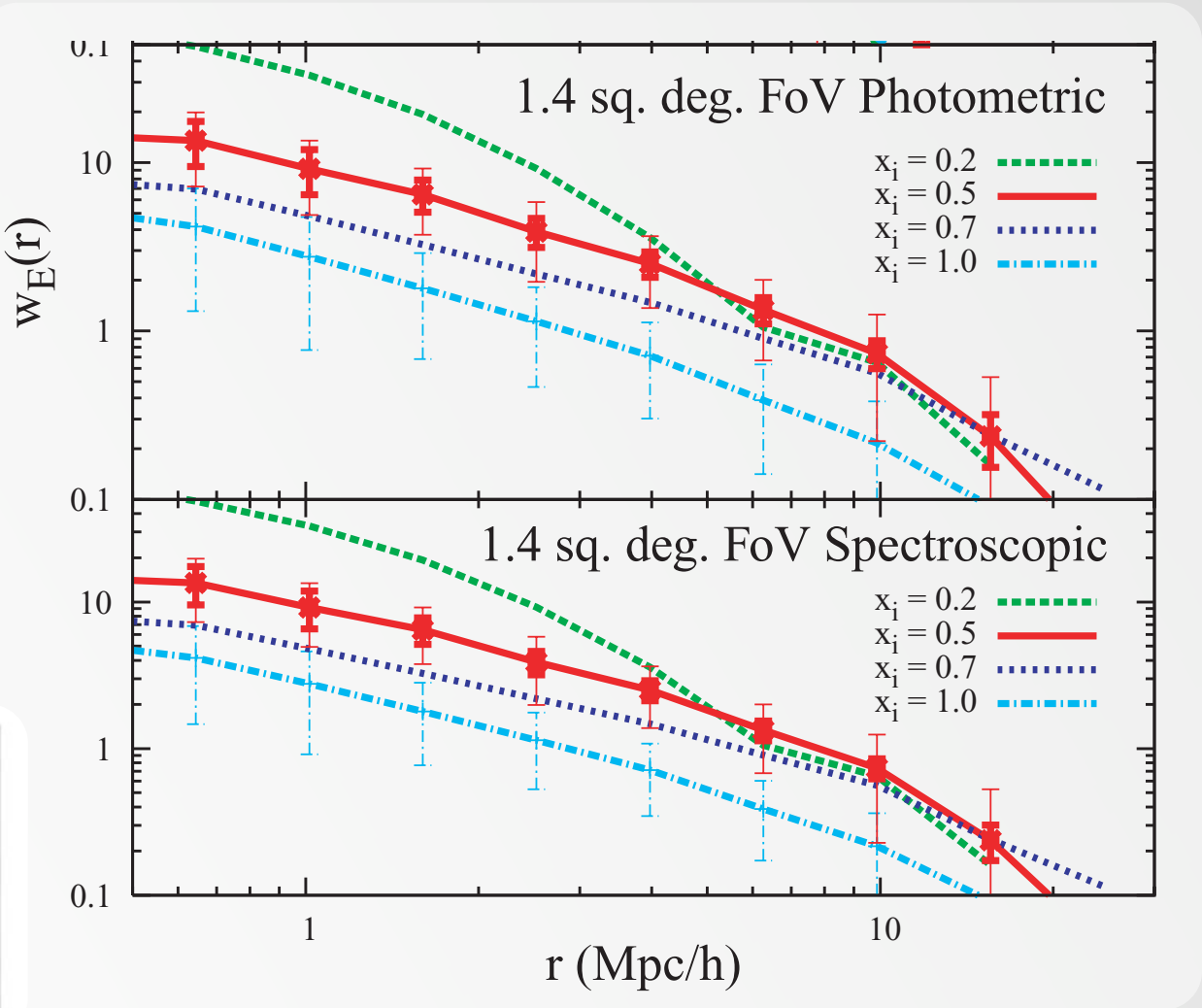
talk Yamada-san

Science with LAEs

- Nature of Lyman Alpha emitters
  - Early phases of star formation, low-mass galaxies
  - High EW sources: lyman alpha blobs
- Probing reionization
  - Clustering of LAEs

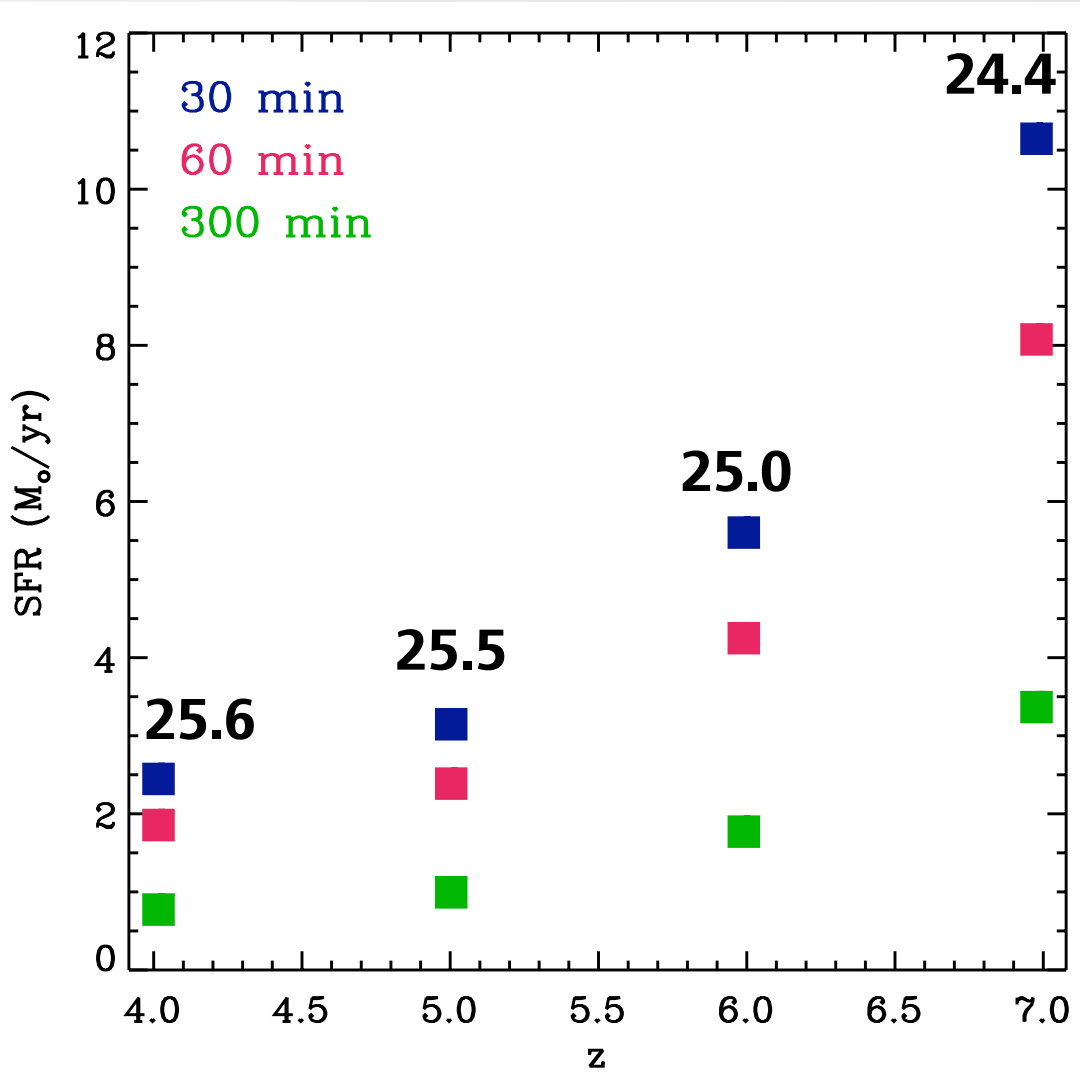
Clustering of LAEs and Reionization





McQuinn et al. 2007

SFR limits for the deep layer from Lyα



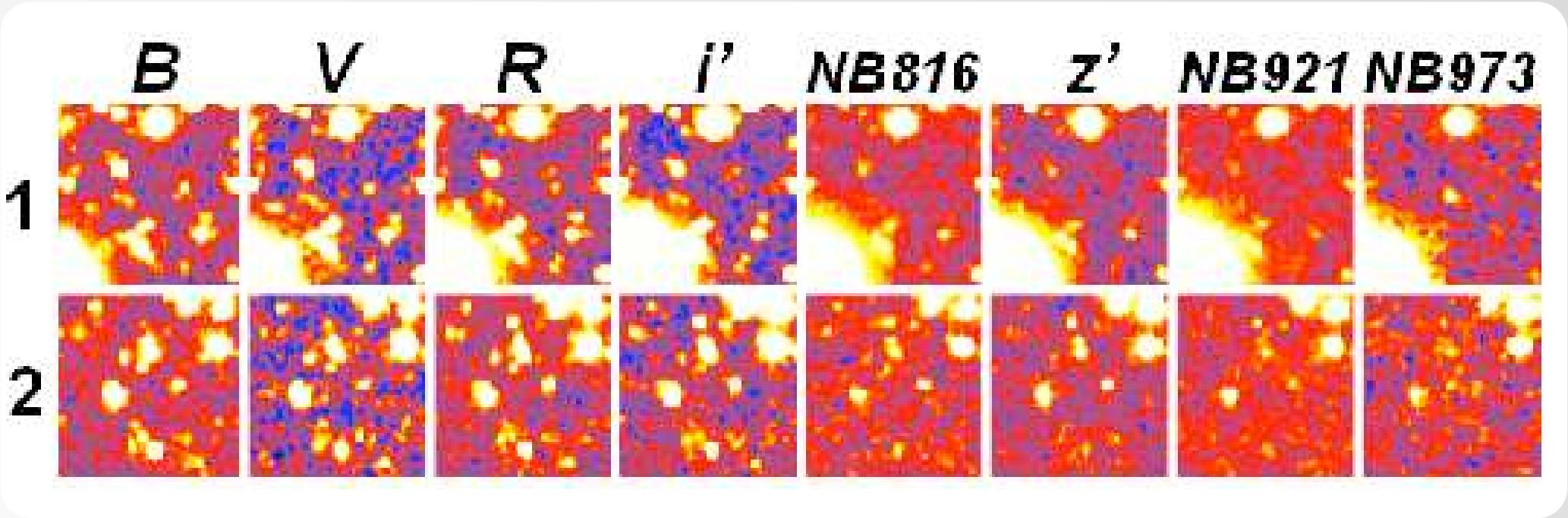
Volumes in Mpc^3:

z~4: 4.6x10^6
z~5: 4.2x10^6
z~6: 3.7x10^6
z~7: 3.4x10^6

Comparison to current LAE studies

- **Ouchi et al. (2007):**
  - z~3.1: AB= 25.3, 1 deg^2
  - z~3.7, AB = 24.7, 1 deg^2
  - z~5.7, AB = 26.0, 1 deg^2
- **Kashikawa et al. (2006):**
  - z~6.5, AB = 26.0, 0.25 deg^2
- **Ota et al. (2007):**
  - z~7.0, AB = 24.9, 0.25 deg^2

LAEs at z~7.0



Ota et al. 2007

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  - z~7.0, AB = 24.9, 0.25 deg^2

Deep layer (300 min)

- z~4: AB = 26.9, 5 deg^2
- z~5: AB = 26.8, 5 deg^2
- z~6: AB = 26.3, 5 deg^2
- z~7: AB = 25.7, 5 deg^2

Thank you!