

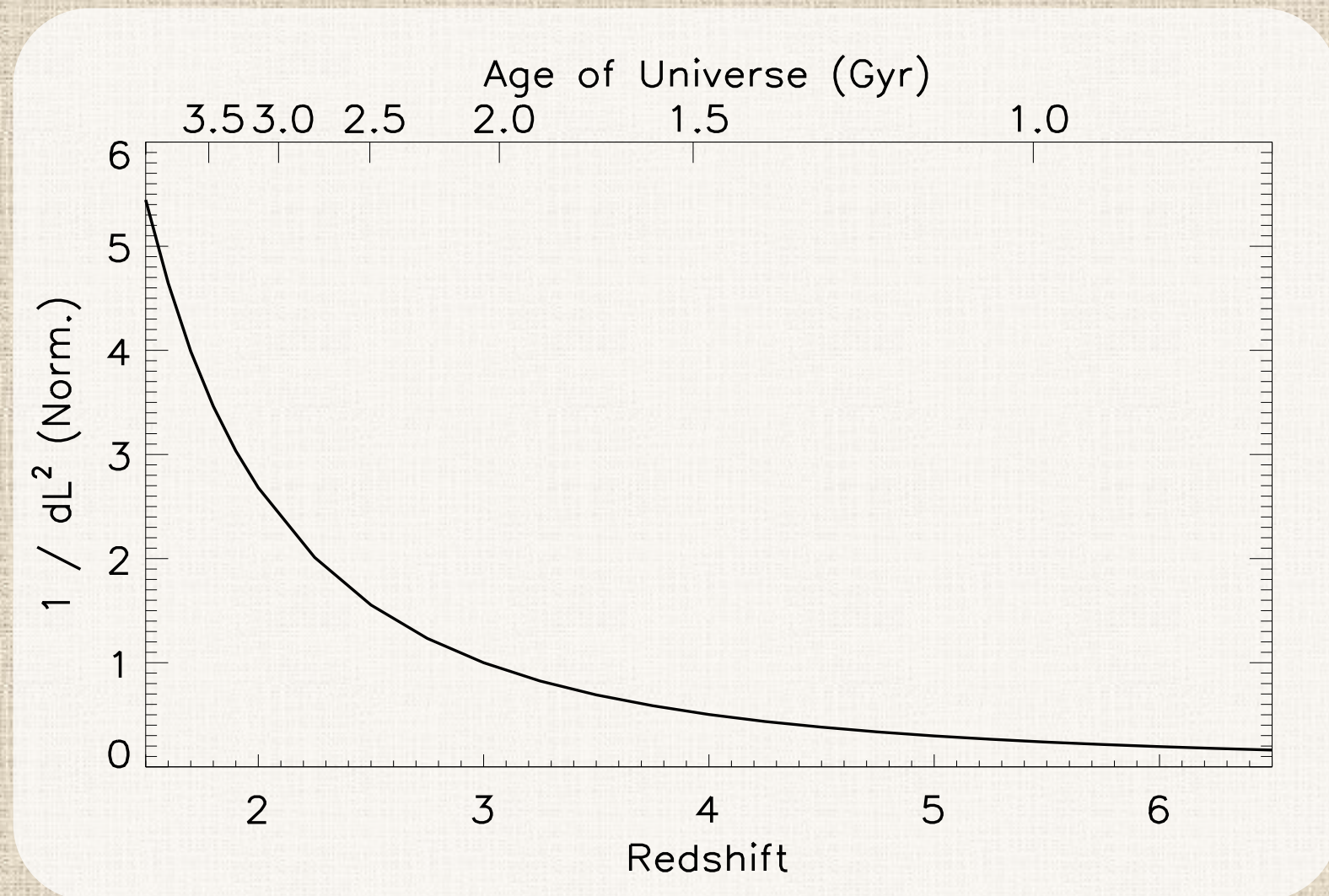
Observations of the Ly- α Universe at $z \sim 2$

Kim K. Nilsson

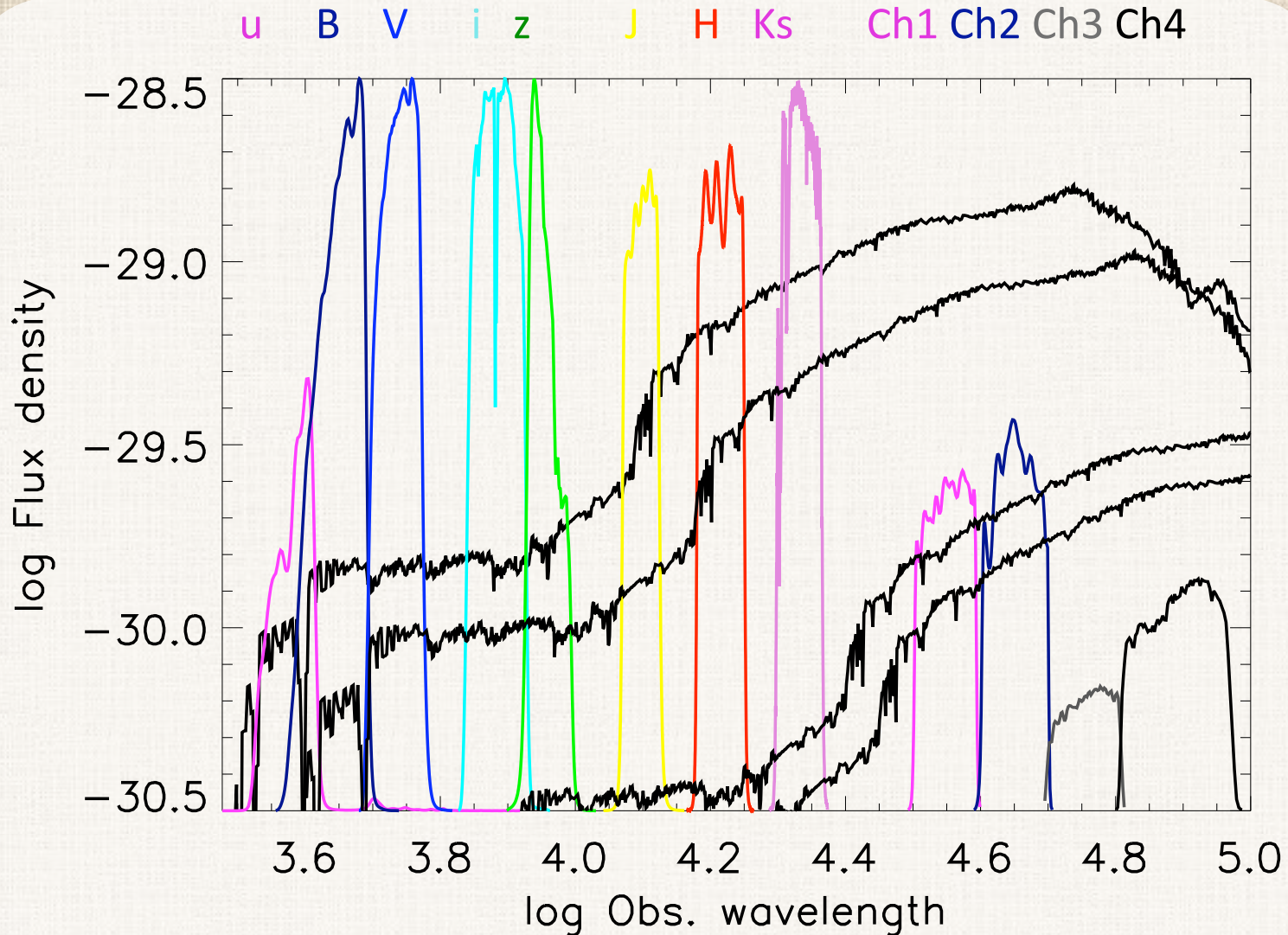
Hubble Astronomer (ST-ECF)

Christian Tapken, Ole Möller-Nilsson,
Palle Møller, Göran Östlin, Wolfram Freudling

Background: Why $z \sim 2$?



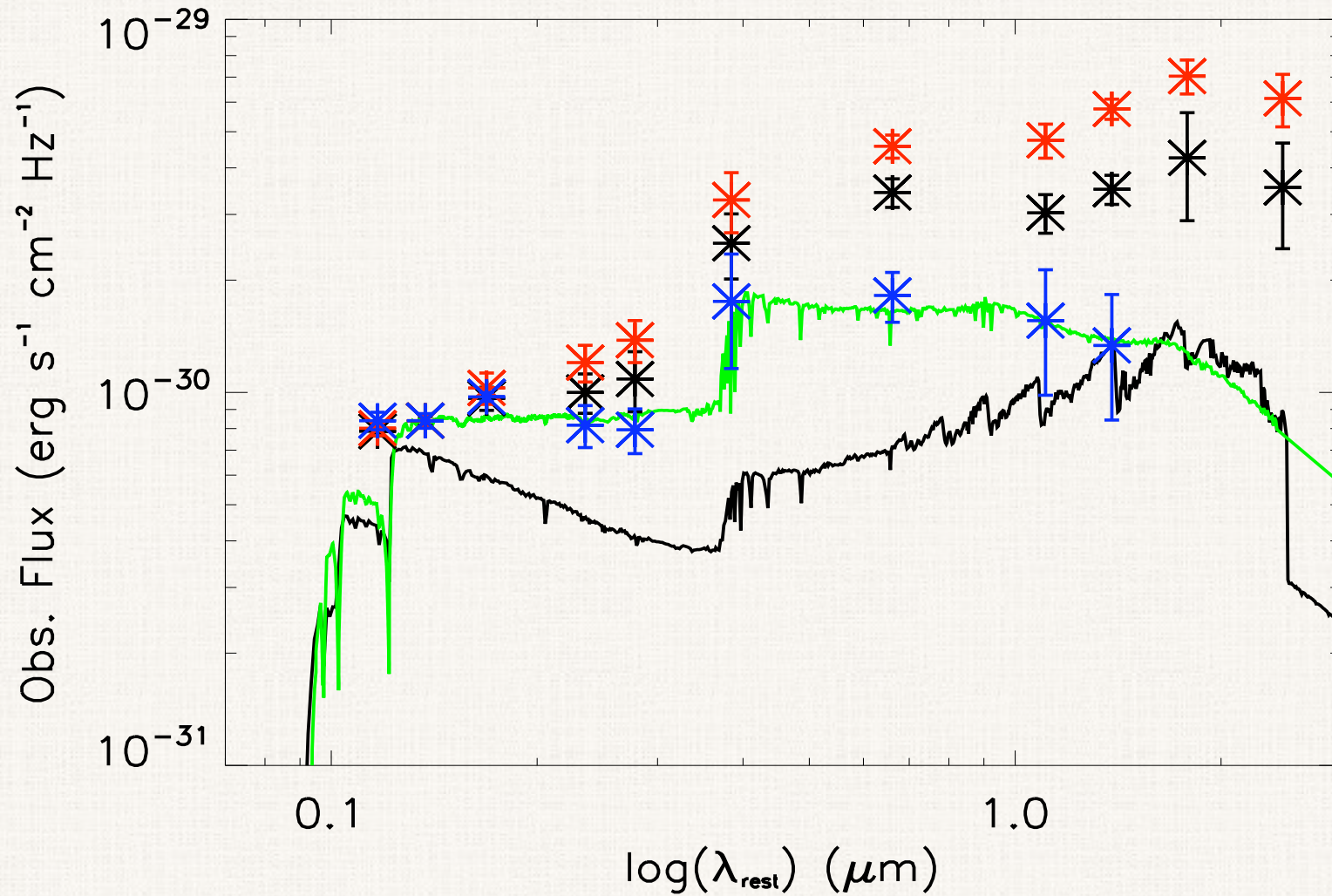
Background: Why $z \sim 2$?



WFI survey for $z = 2.3$ LAEs

- ESO2.2m/WFI observations with NB filter focused on $z = 2.3$ for Ly α
- 0.2 deg² in central COSMOS field
- 187 candidates, 17 GALEX detected, 31 AGN

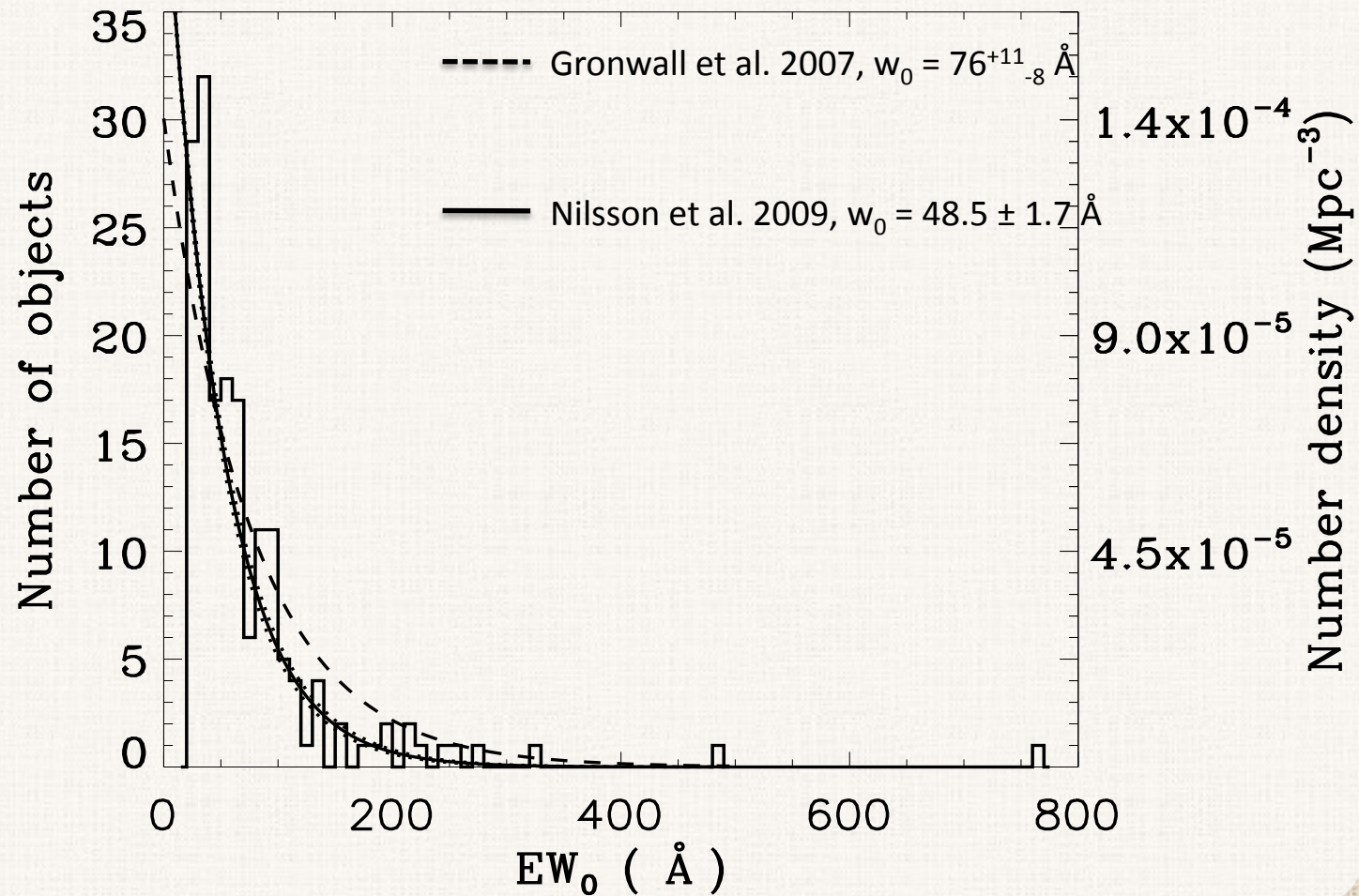
Early results 1: Evolution?



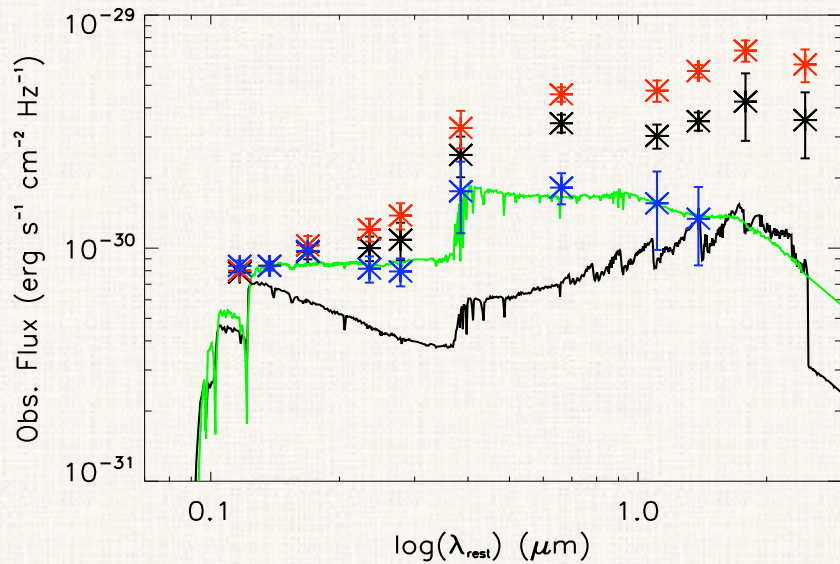
Early results 2: Evolution?

More AGN!
> 5 % in sample
(now > 13 % with
deeper *Chandra* data)

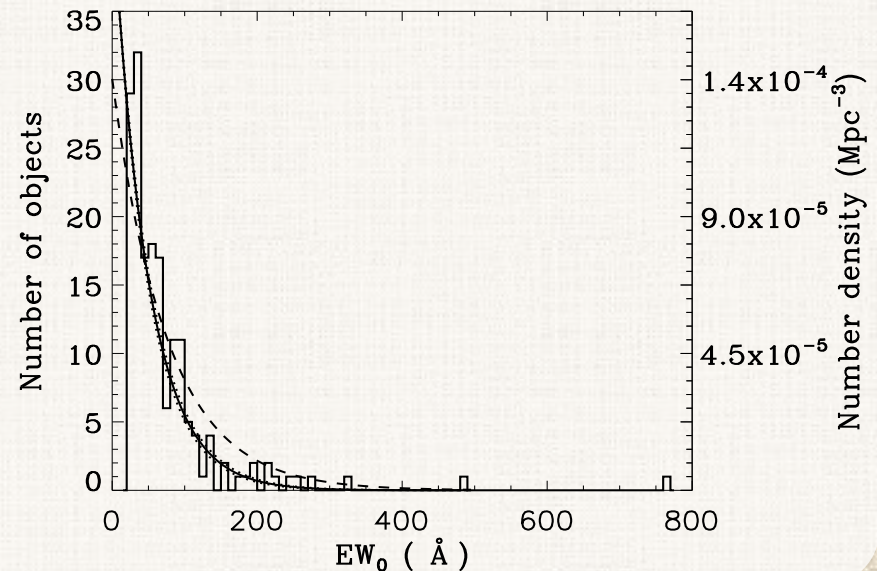
Early results 3: Evolution?



Early results : Evolution!



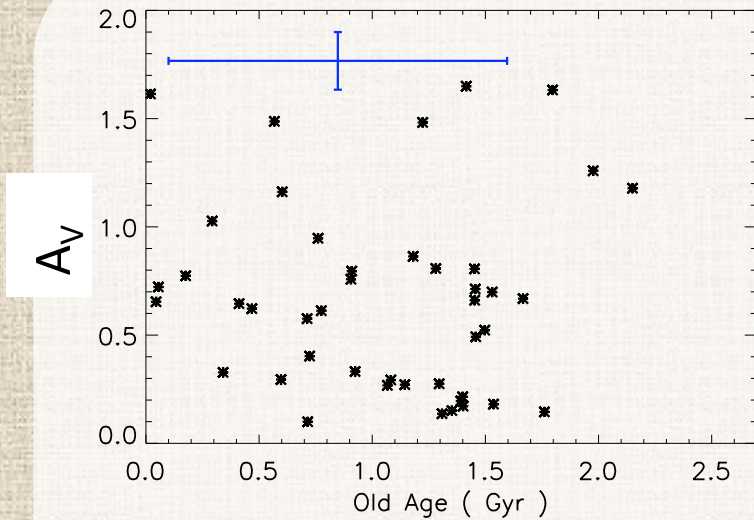
More AGN!
> 5 % in sample
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SED fitting

- MCMC-code, updated version from Nilsson et al. 2007
- Includes nebular emission (continuum + lines)
- Fit in 10 bands (B_j , V_j , i^+ , z^+ , J , K_s , Ch1-4)
- Two-population SSP, dust, metallicity
- Fit **93** galaxies with individual detections in K_s and/or *Spitzer* bands

SED fitting results

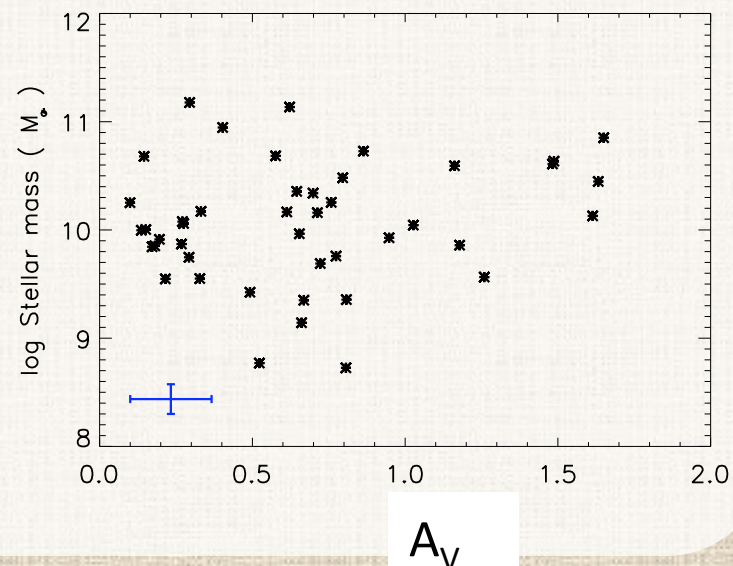
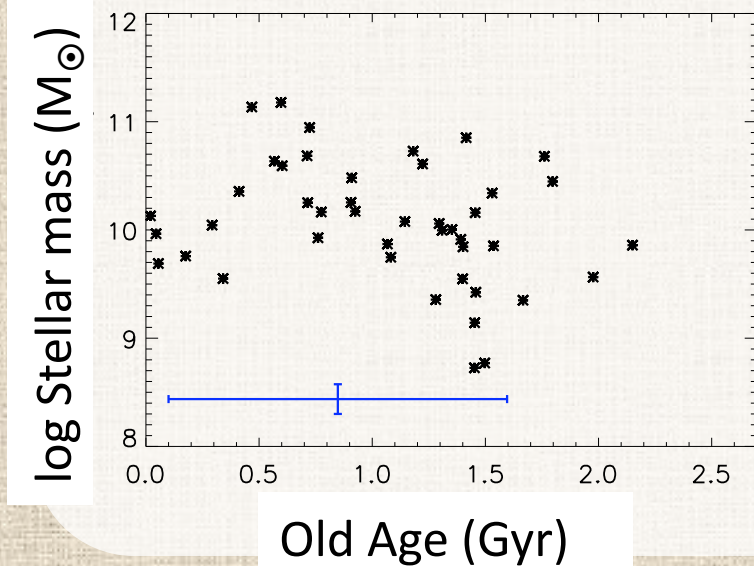


44 galaxies with good fits, no AGN, no GALEX-detection
Median results:

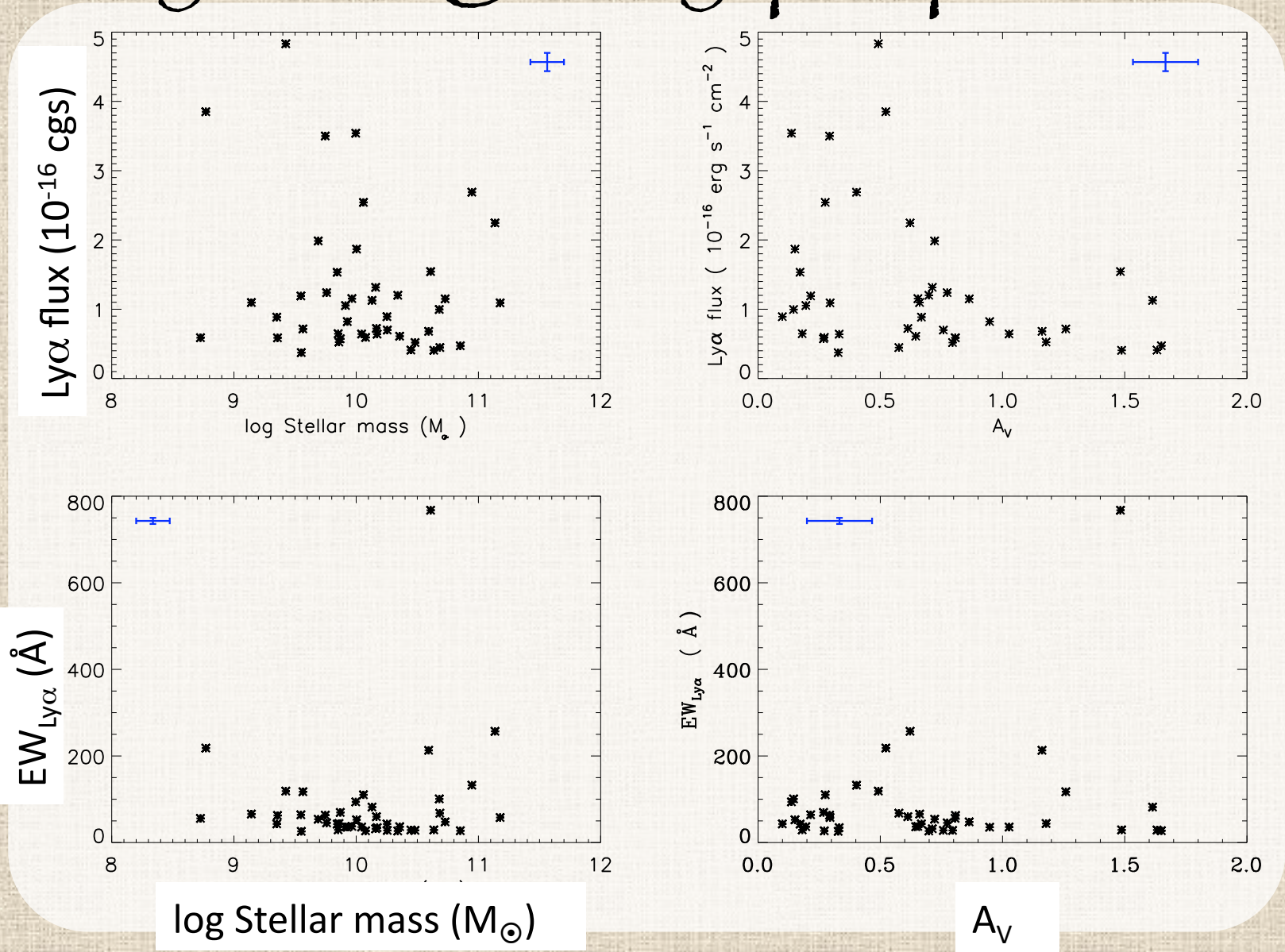
$$\log \text{Stellar mass } 10.1^{+0.5}_{-0.4} M_{\odot}$$

$$A_V = 0.65^{+0.5}_{-0.5}$$

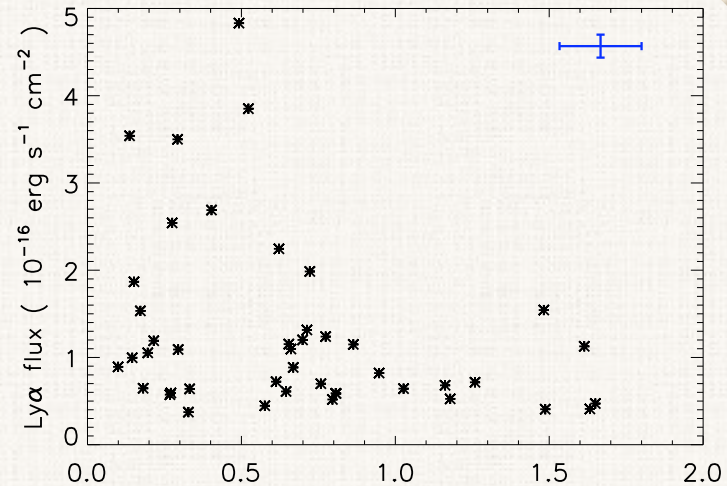
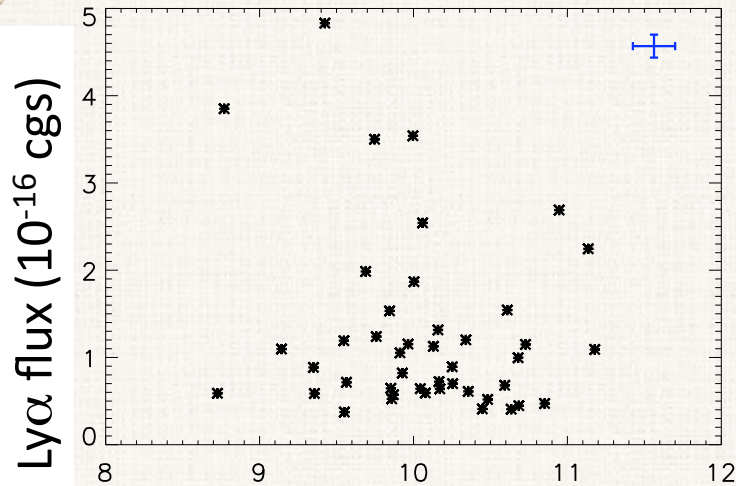
$$\text{Old age } 1.2^{+0.4}_{-0.6} \text{ Gyrs}$$



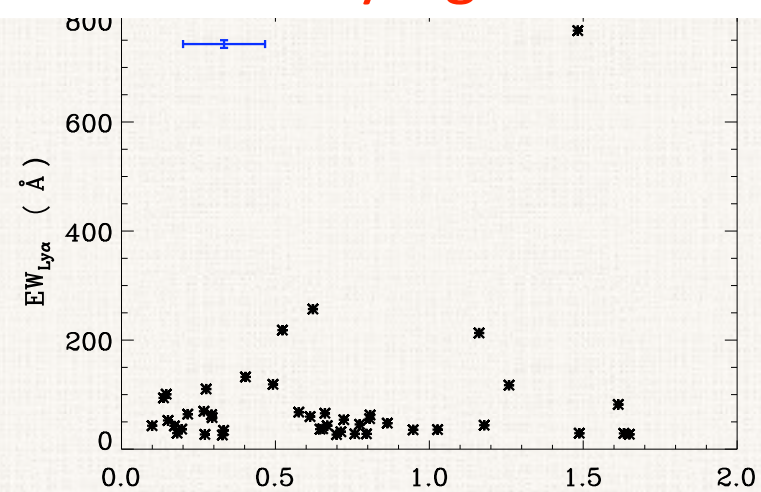
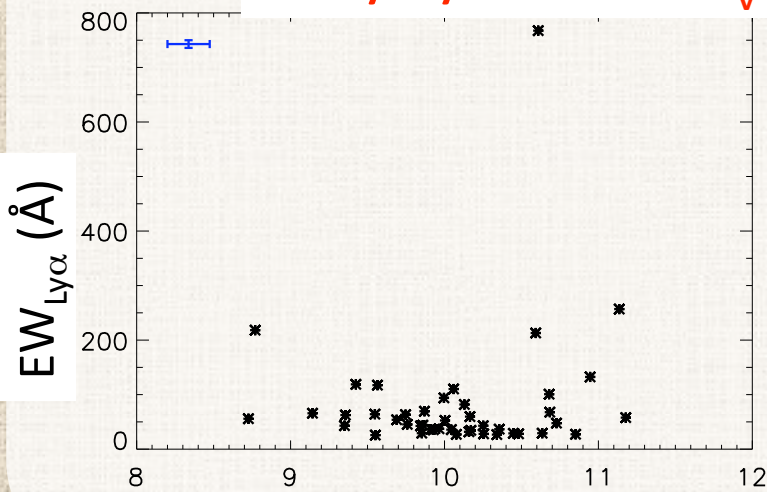
Ly α vs. galaxy properties



Ly α vs. galaxy properties



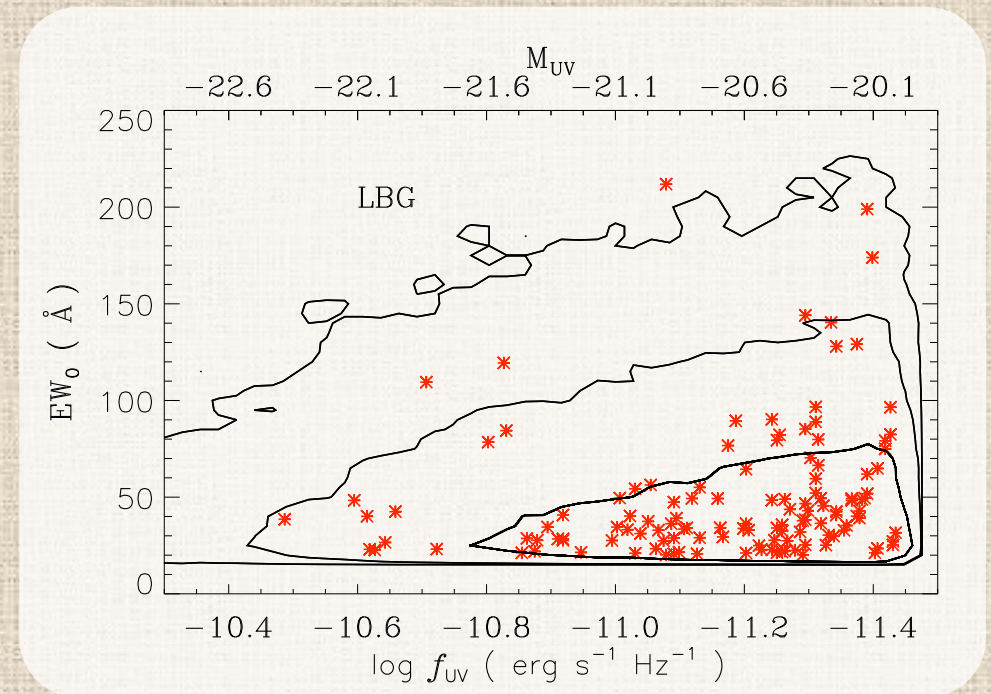
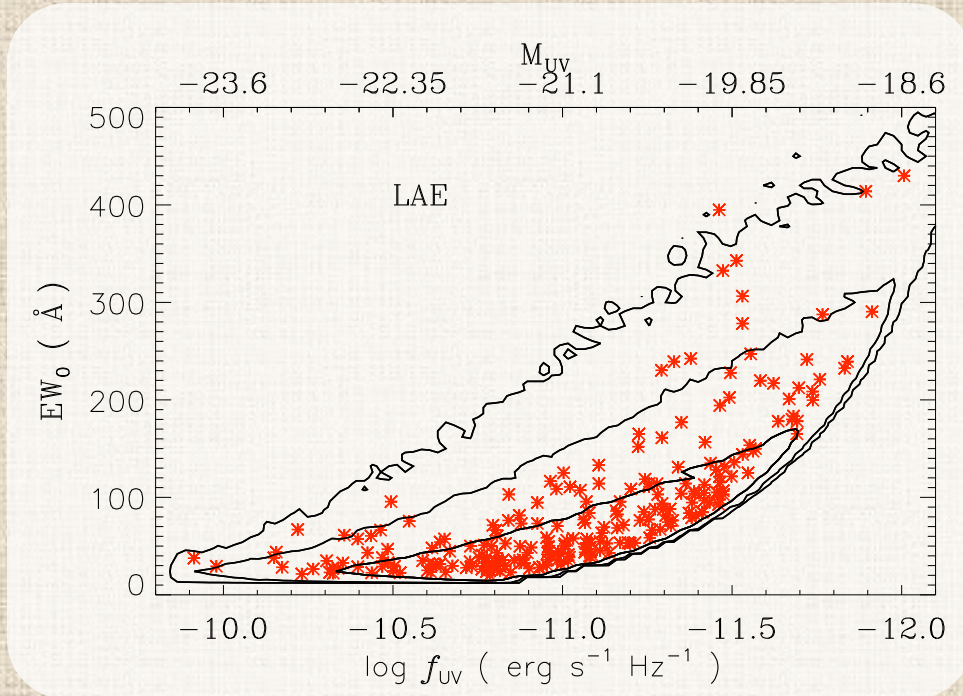
Only Ly α flux – A_V plot statistically significant!



log Stellar mass (M_{\odot})

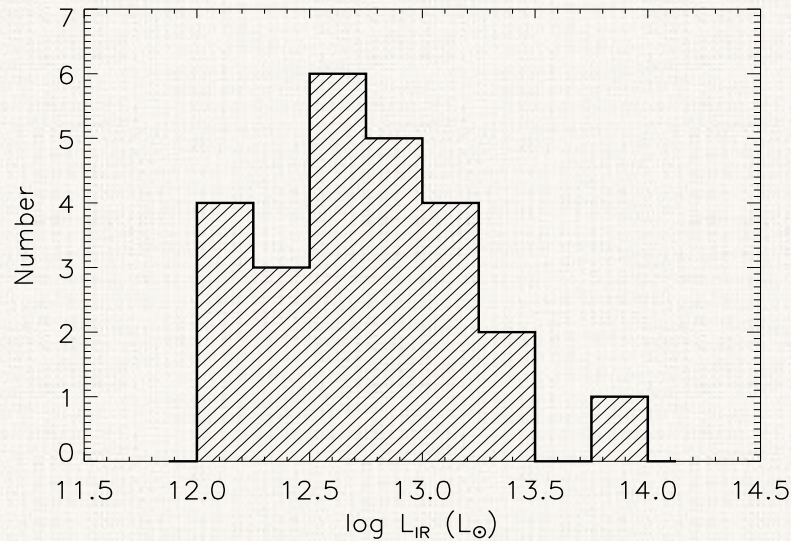
A_V

Interlude...



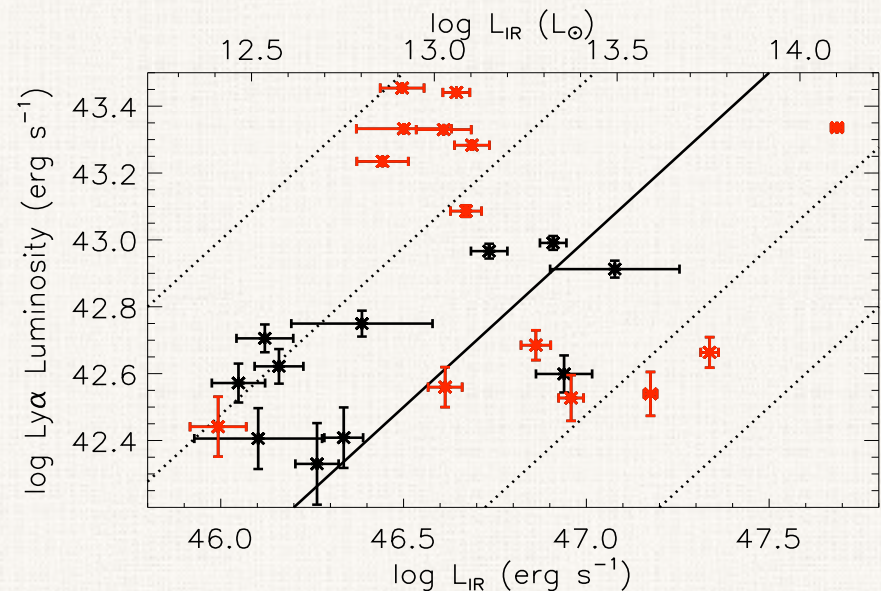
Points data samples, contours Monte Carlo simulations, consistent with no correlation between Ly α EW – Ly α flux for LAEs and Ly α EW – M_{UV} for LBGs

Dusty Ly α galaxies



Ly α luminosity vs. total IR luminosity. Black are “best” LAEs. Red are AGN. Solid line indicates 0.03% of the IR luminosity in the Ly α luminosity.

25 galaxies MIPS detected (13%) – all with ULIRG luminosities if at $z = 2.3$
10 are not AGN, nor GALEX detected



Conclusions

- Galaxies with Ly α emission have widely different properties at $z = 2$ than at $z = 3$
- At $z = 2$ they are more massive and more dusty, but have also a large spread
- There are few correlations between Ly α flux/EW and stellar mass/ A_V
- Ly α emitters at $z = 2$ contain more AGN and more ULIRGs
- At lower redshifts starbursts emitting Ly α occur in all types of galaxies.