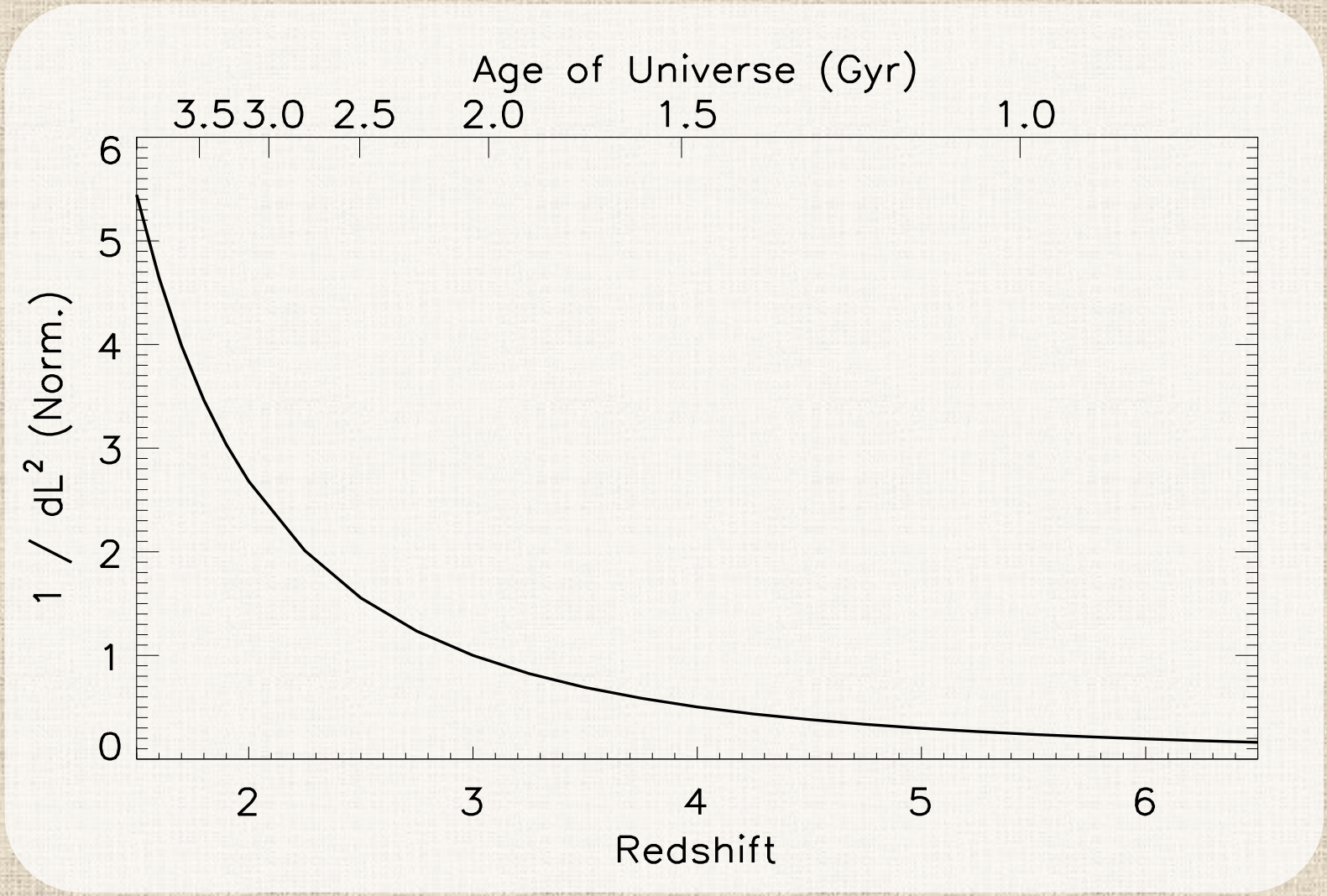
Observations of the Ly-α Universe at $z \sim 2$

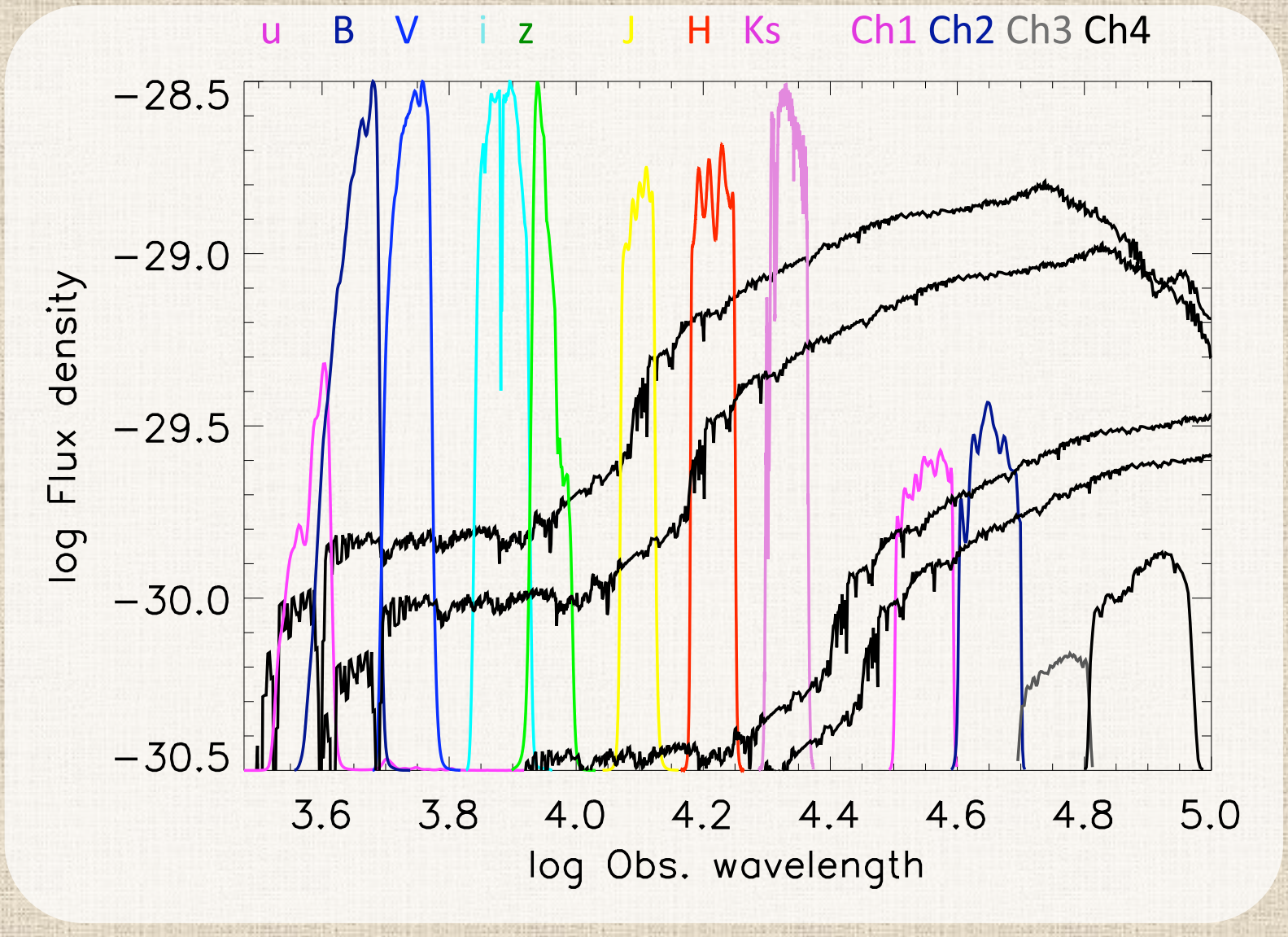
Kim K. Nilsson
Hubble Astronomer (ST-ECF)

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

Background: Why z ~ 2 ?



Background: Why z ~ 2 ?

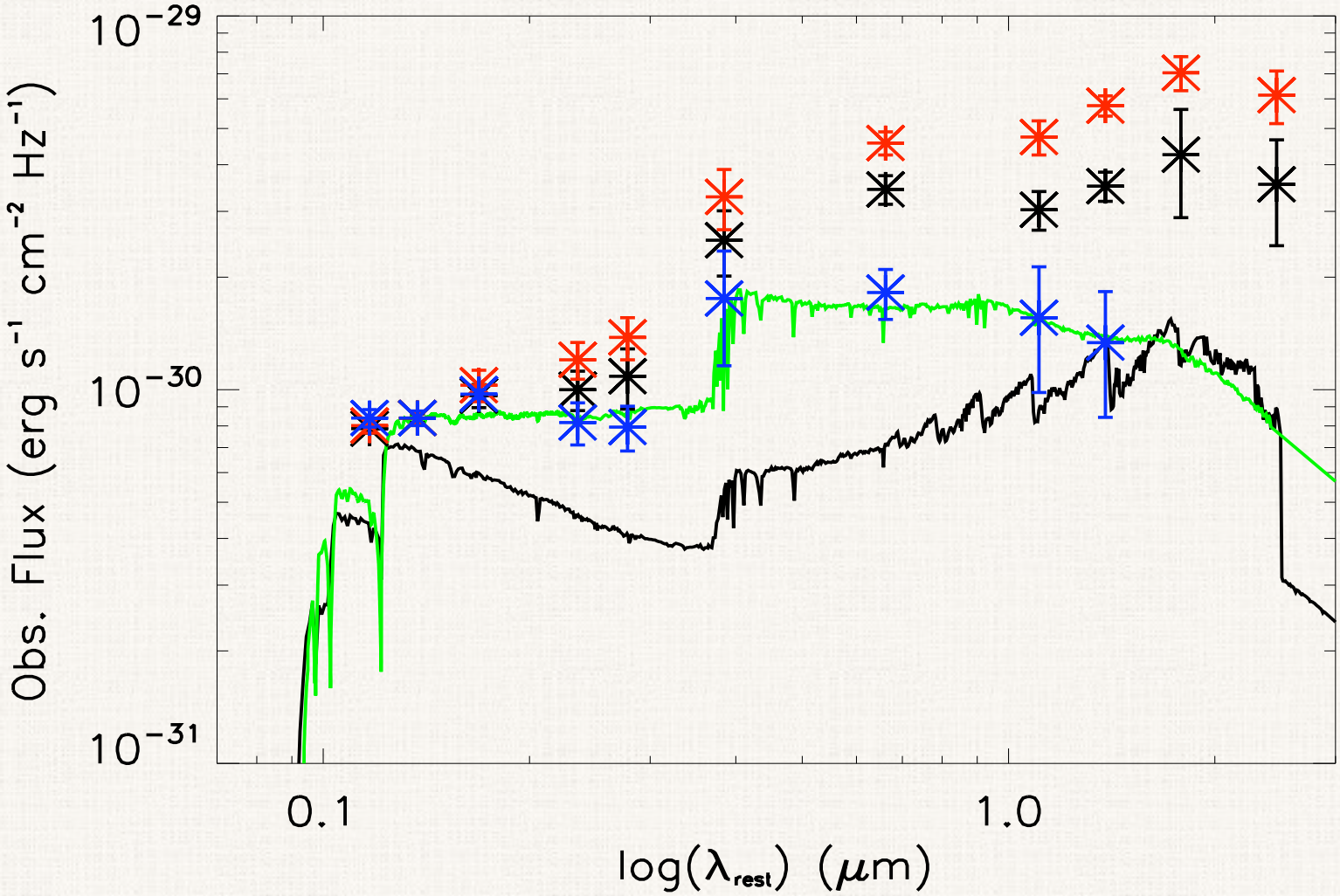


$z = 2.25$
$z = 3.0$
$z = 5.7$
$z = 6.5$

WFI survey for $z = 2.3$ LAEs

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

Early results 1: Evolution?



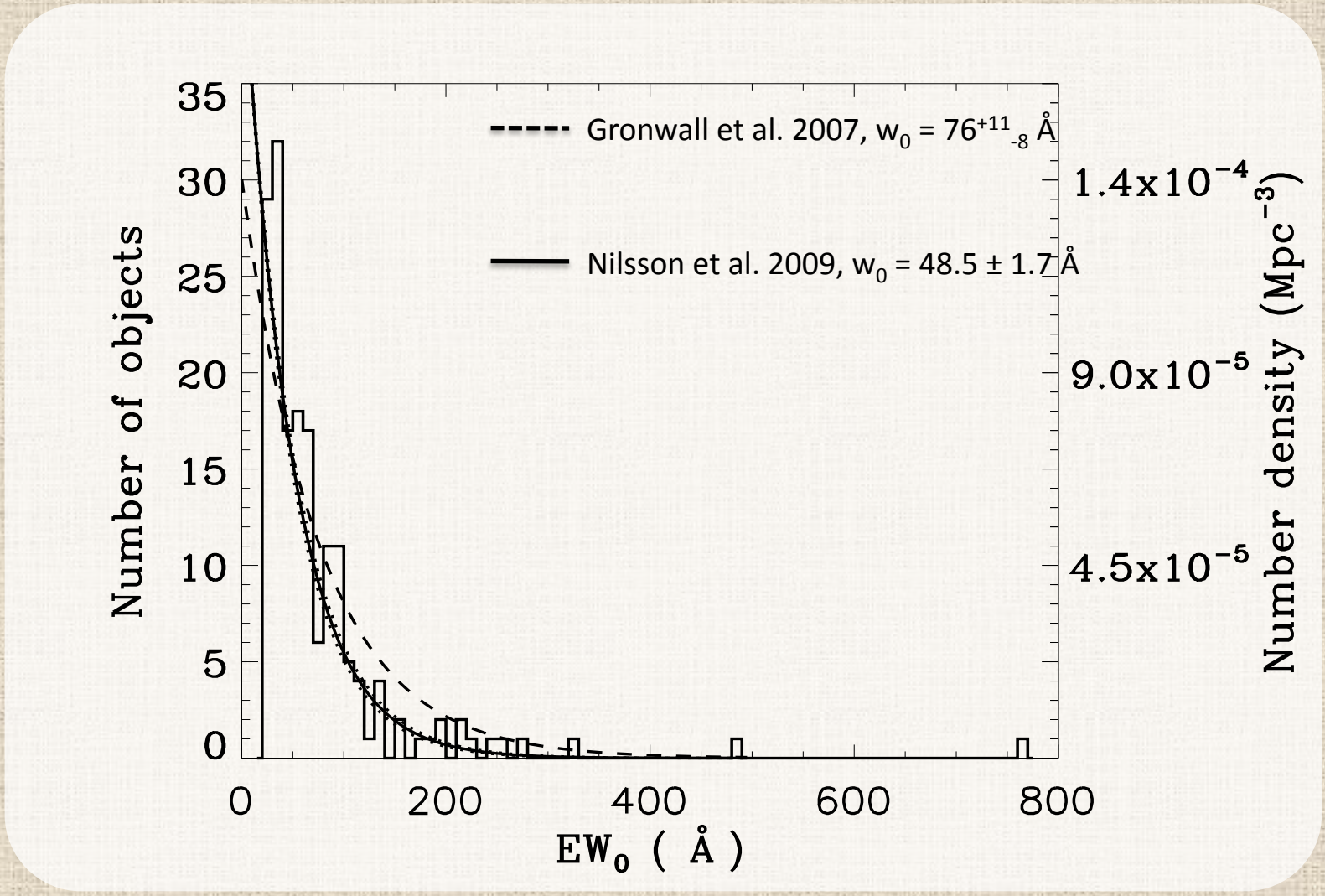
Nilsson et al., 2009, A&A, 498, 13

Early results 2: Evolution?

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

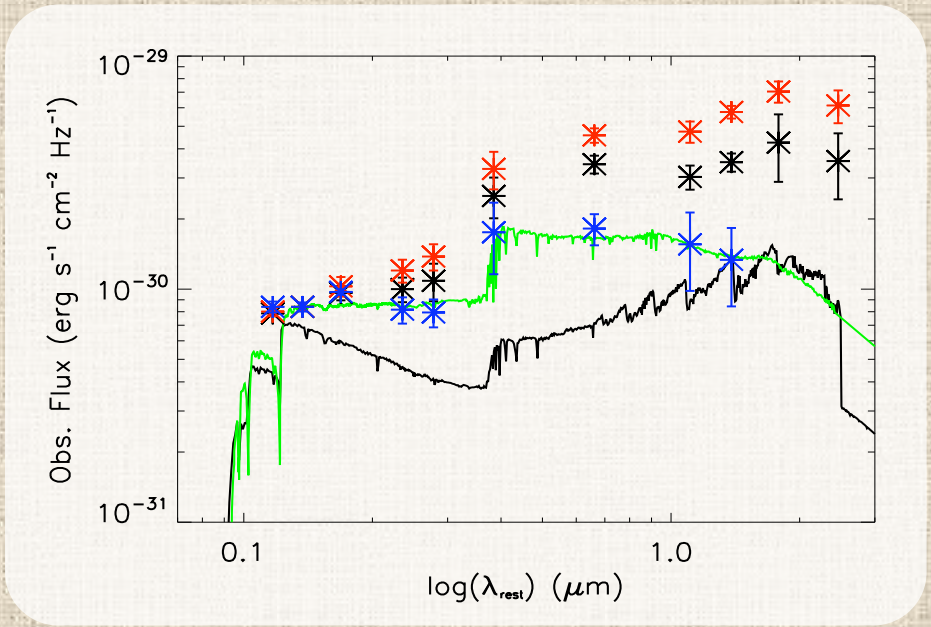
Nilsson et al., 2009, A&A, 498, 13

Early results 3: Evolution?

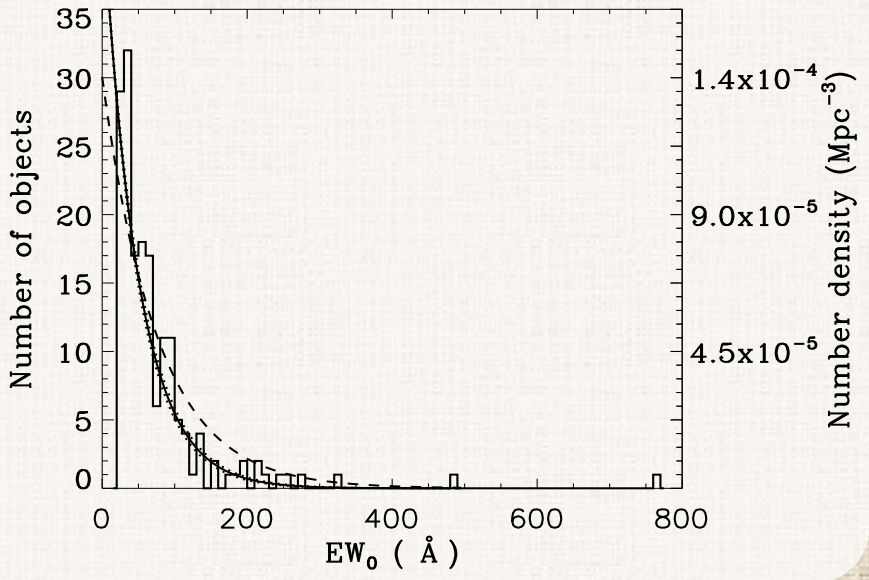


Nilsson et al., 2009, A&A, 498, 13

Early results : Evolution!



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

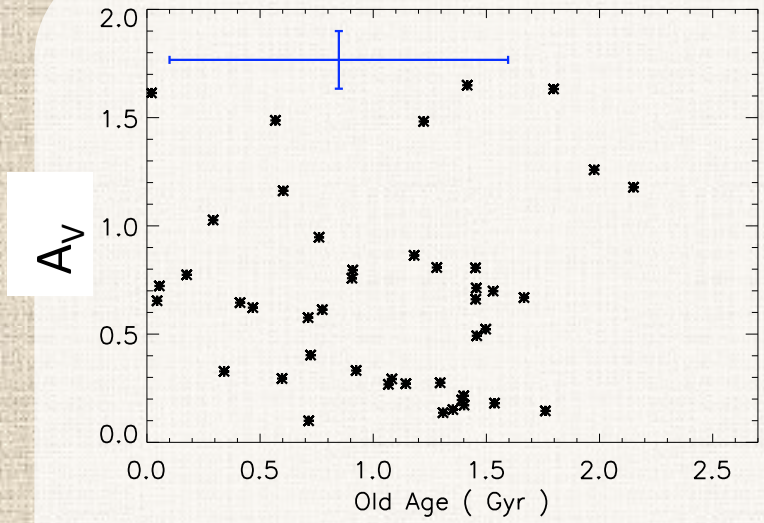


Nilsson et al., 2009, A&A, 498, 13

SED fitting

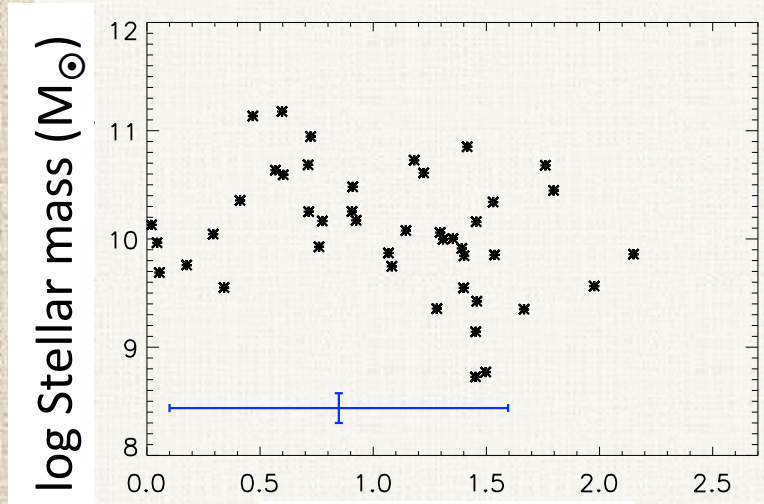
- MCMC-code, updated version from Nilsson et al. 2007
- Includes nebular emission (continuum + lines)
- Fit in 10 bands (Bj, Vj, i^+, z^+, J, K_s, Ch1-4)
- Two-population SSP, dust, metallicity
- Fit 93 galaxies with individual detections in K_s and/or *Spitzer* bands

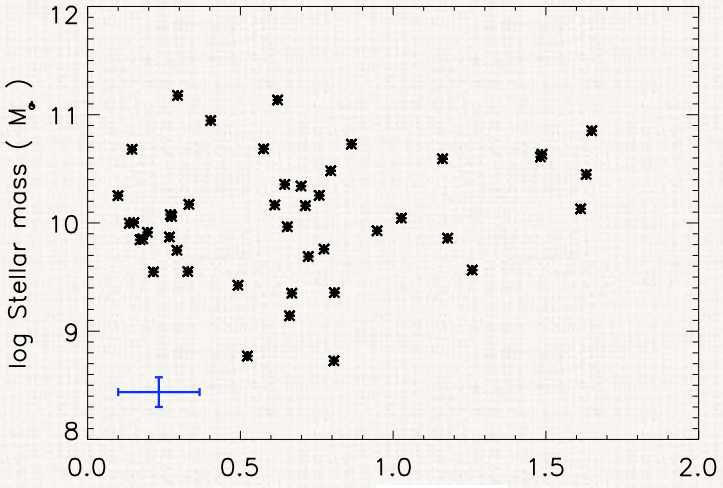
SED fitting results



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

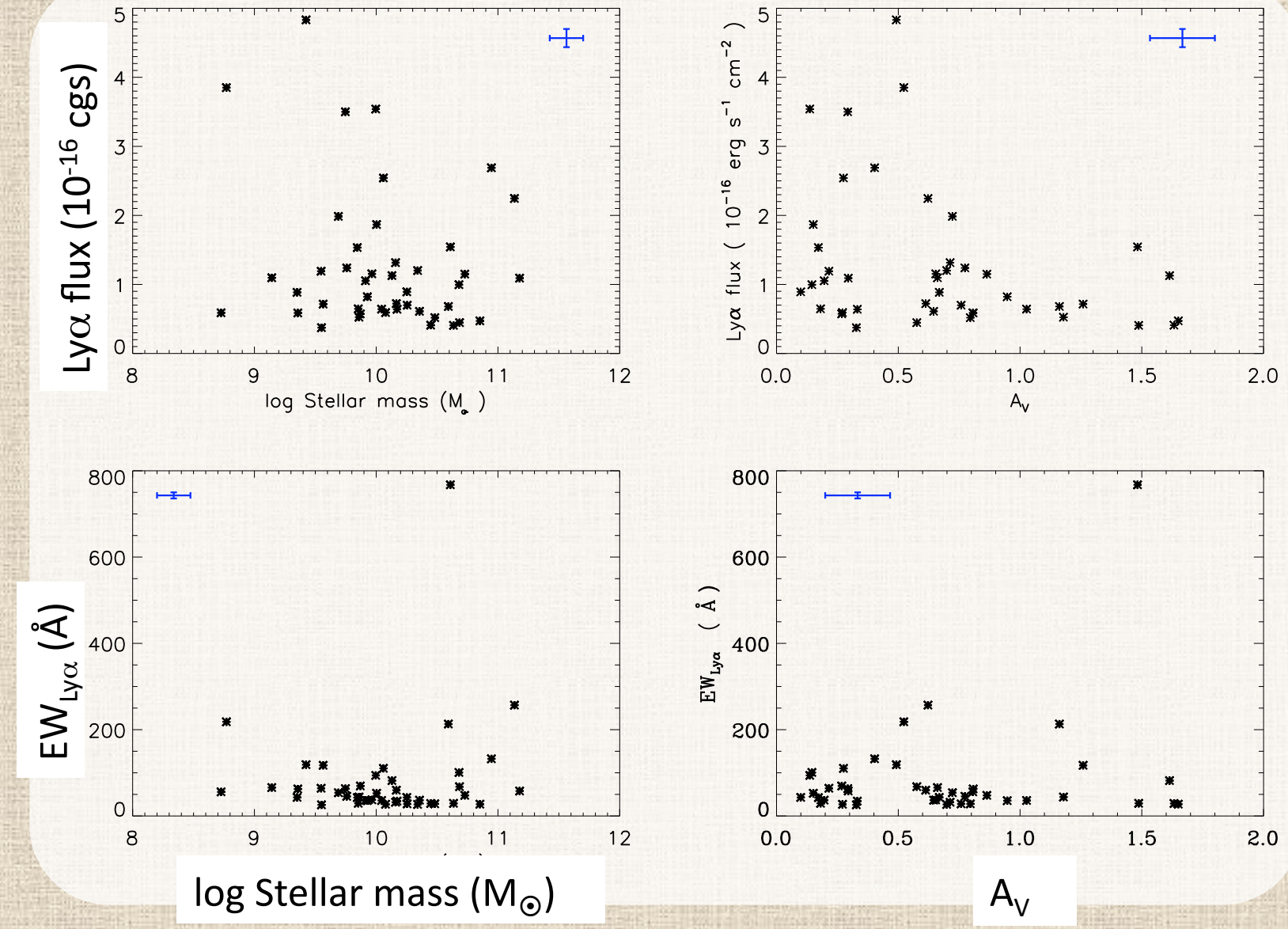
log Stellar mass $10.1^{+0.5}_{-0.4}$ $M_\odot$
$A_V = 0.65^{+0.5}_{-0.5}$
Old age $1.2^{+0.4}_{-0.6}$ Gyrs





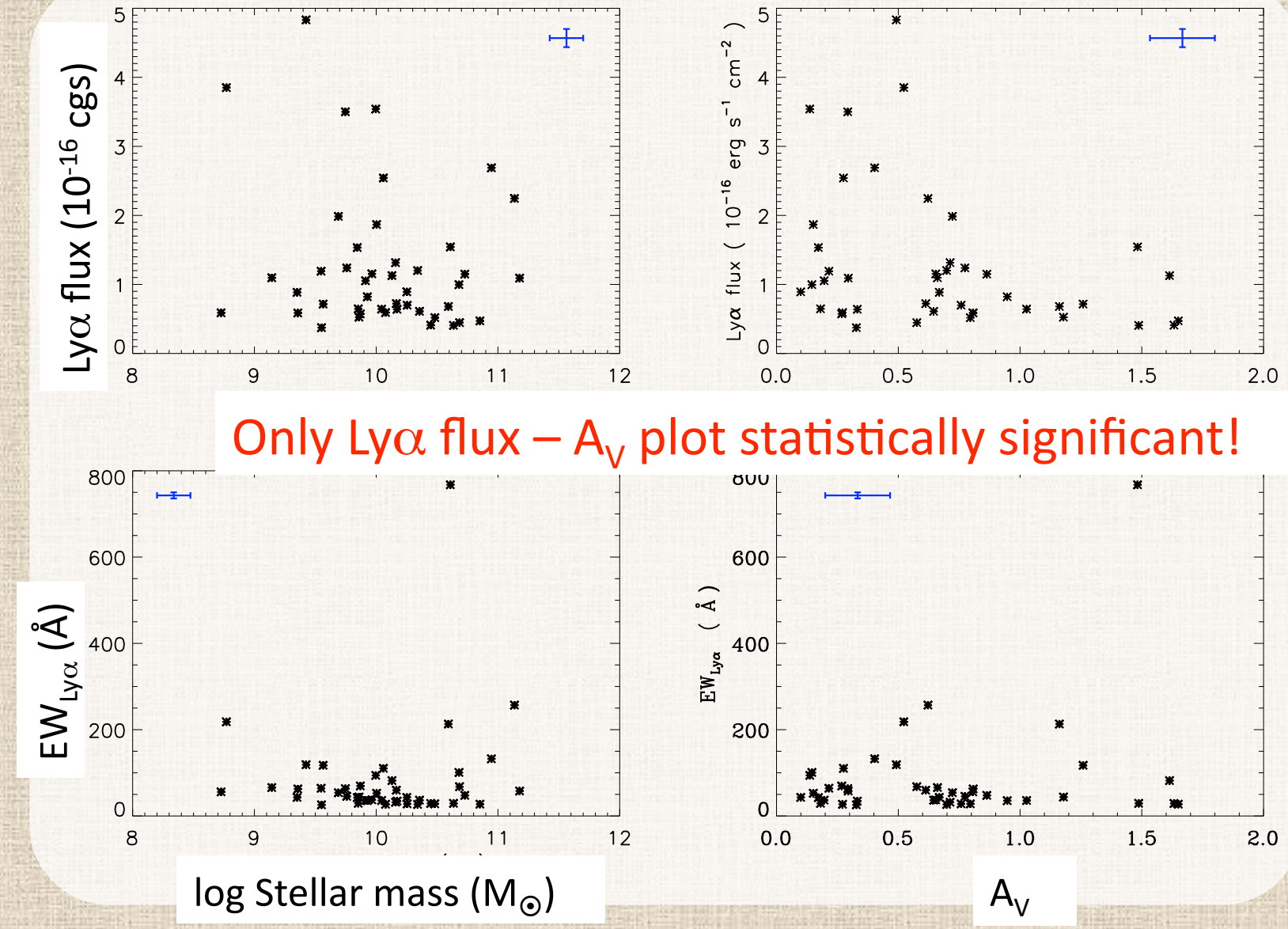
Nilsson et al., 2009, in prep.

Lyα vs. galaxy properties



Nilsson et al., 2009, in prep.

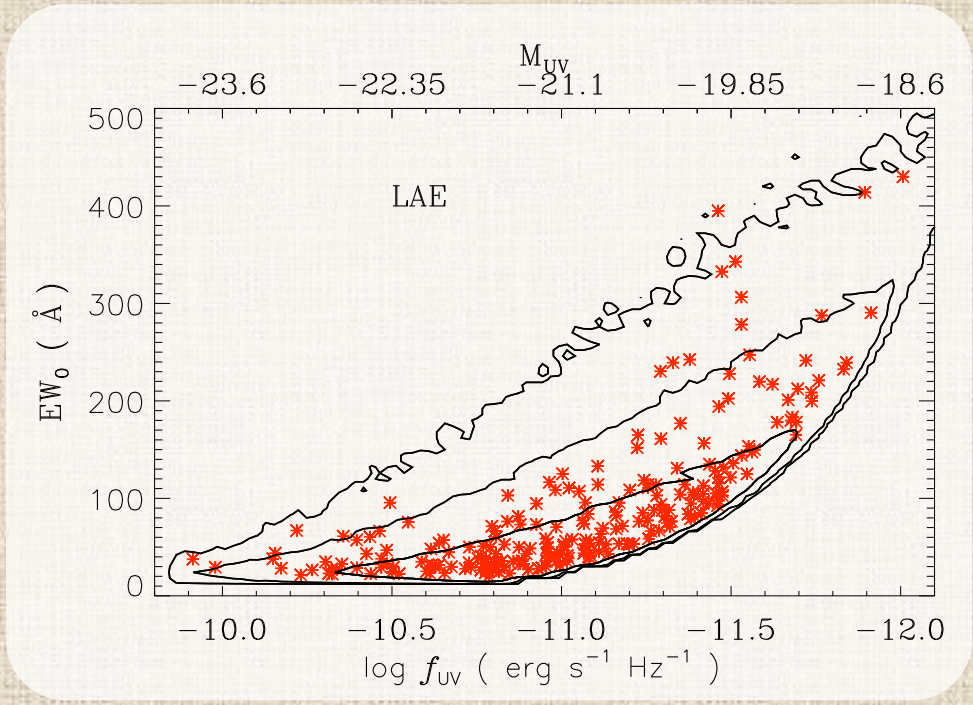
Lyα vs. galaxy properties

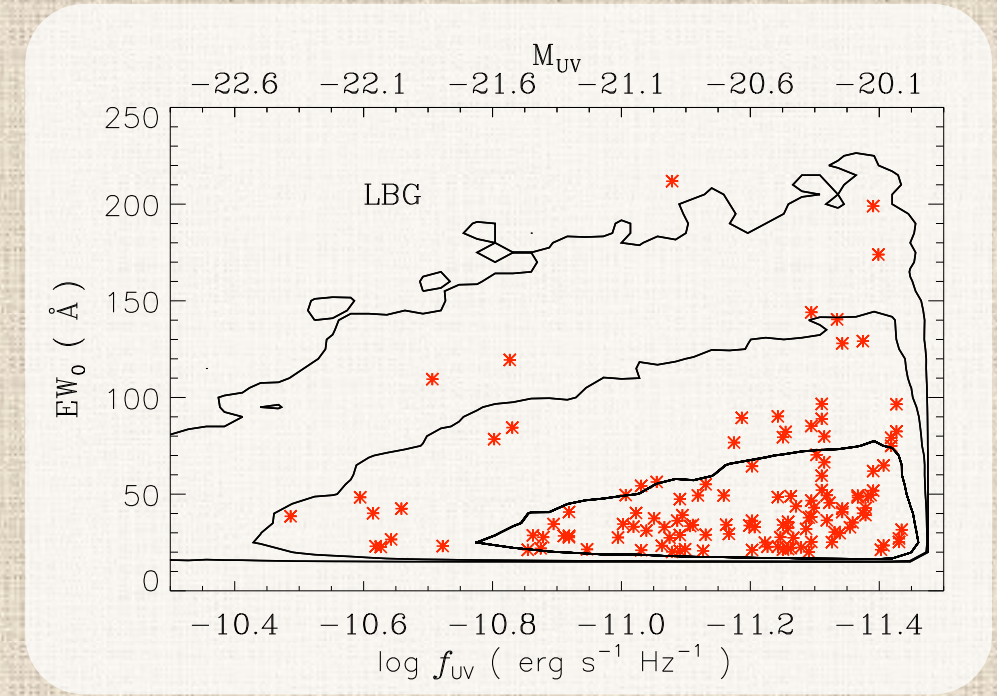


Only Lyα flux – A_V plot statistically significant!

Nilsson et al., 2009, in prep.

Interlude…

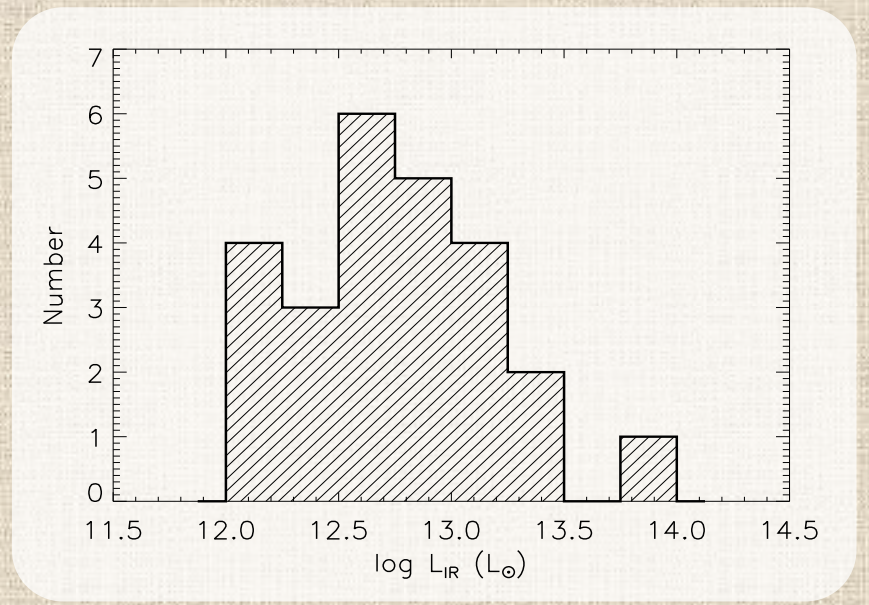




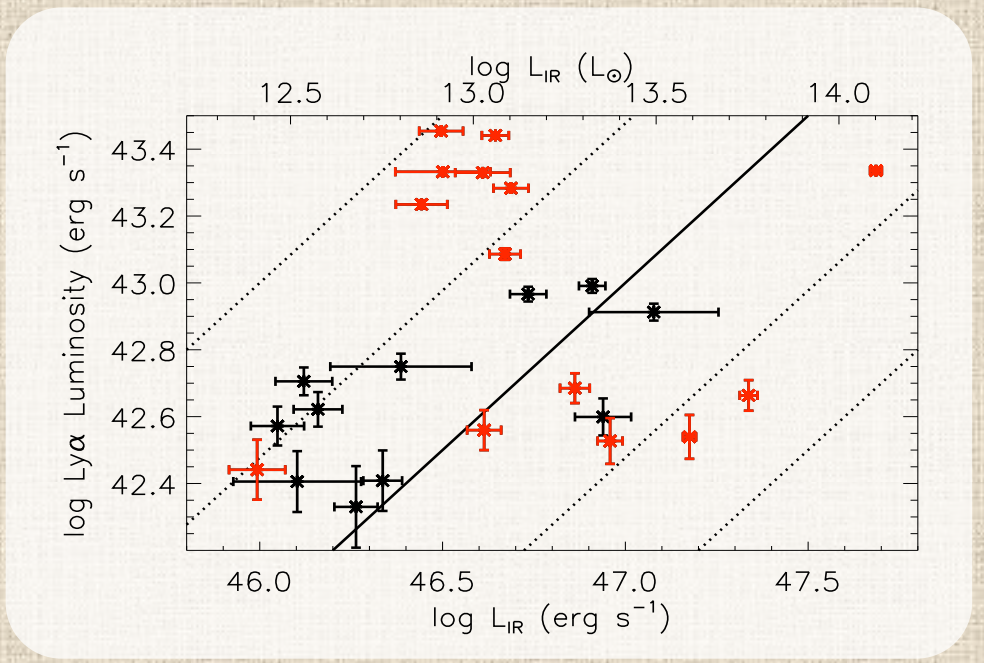
Points data samples, contours Monte Carlo simulations, consistent with no correlation between Lyα EW – Lyα flux for LAEs and Lyα EW – M_{UV} for LBGs

Nilsson et al., 2009, MNRAS submitted

Dusty Lyα galaxies



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



Lyα luminosity vs. total IR luminosity. Black are "best" LAEs. Red are AGN. Solid line indicates 0.03% of the IR luminosity in the Lyα luminosity.

Nilsson et al., 2009, in prep.

Conclusions

- Galaxies with Lyα 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 Lyα flux/EW and stellar mass/A_V
- Lyα emitters at $z = 2$ contain more AGN and more ULIRGs
- At lower redshifts starbursts emitting Lyα occur in all types of galaxies.