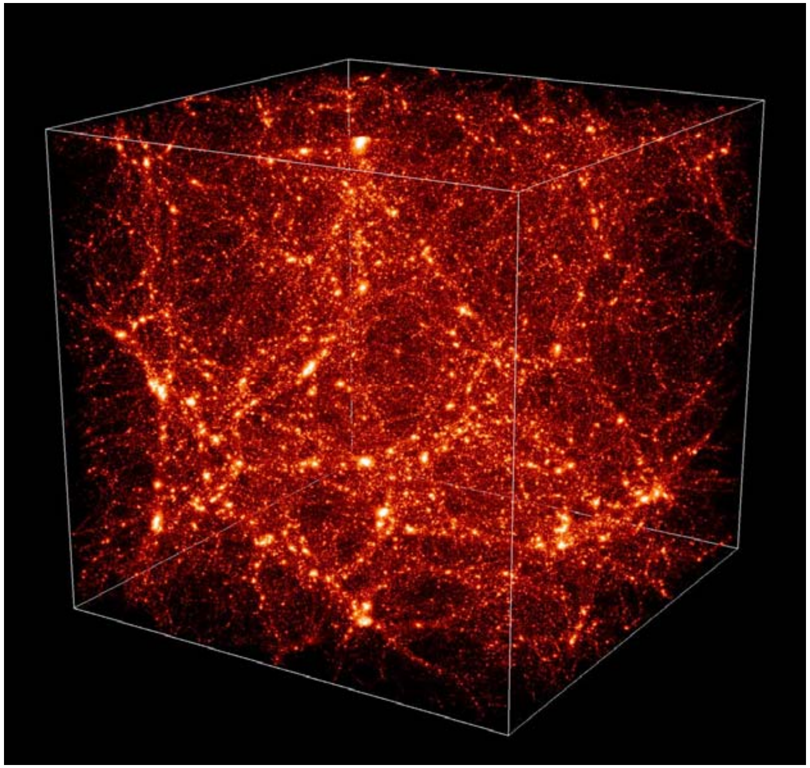
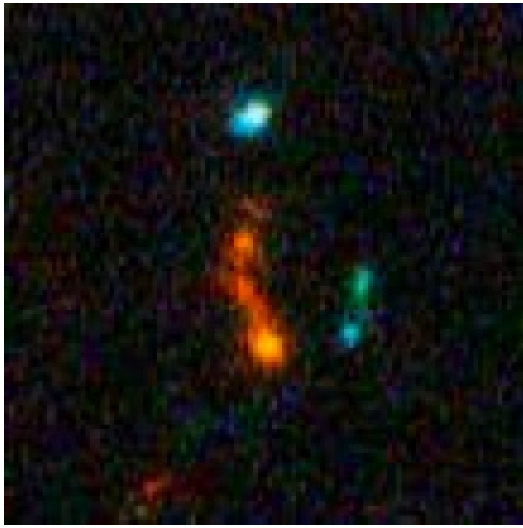
Poster Session I

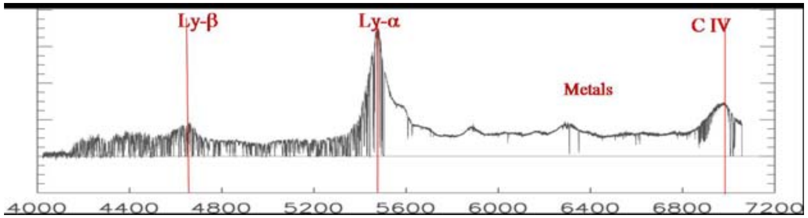
Patrick Petitjean – Institut d'Astrophysique de Paris





Low-z: the details

High-z: deep fields



Low-redshift

Measuring the Lya escape fraction -> Models : Atek Hakim P1

Continuum escape fraction in Haro 11 revisited : Leitet Elisabeth P2

From FUSE data : inbetween previous determinations: between 2 and 7 %

Detailed study : Haro 2 - Not that simple…: Oti Hector P3

Ly-alpha envelopes around 5 z=1 radio galaxies : Zirm Andrew P24

Much lower Lya luminosity than their z=3 counterpart

Empirical Estimate of Lyα Escape Fraction in a Statistical Sample of LAEs

Hakim Atek (1), Daniel Kunth (1), Daniel Schaerer (2), Matthew Hayes (2), Jean-Michel Deharveng (3), Goeran Ostlin (4), J. Miguel Mas-Hesse (5)

Atek et al. (2009b) arXiv:0906.5349

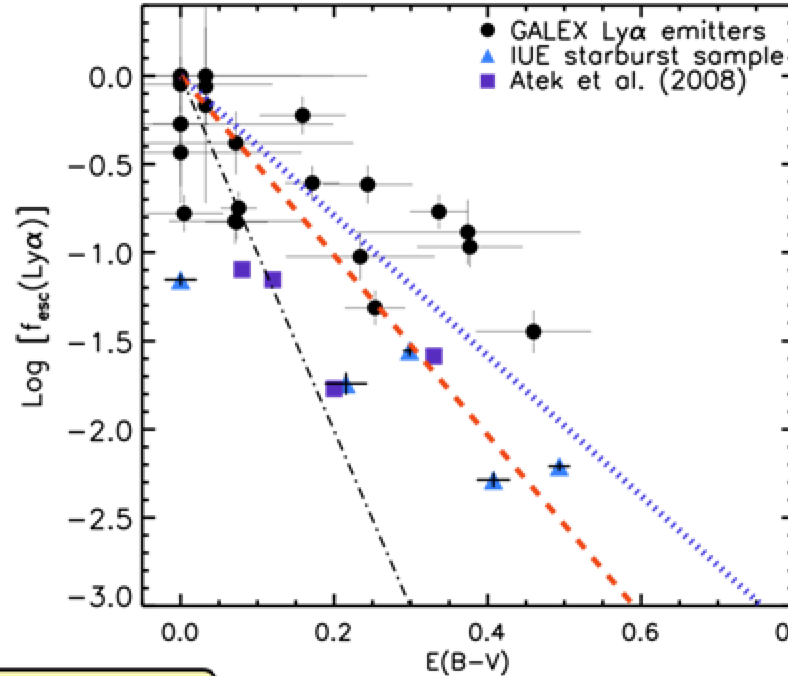
POSTER Nº 1

Lya: Galex spectra – Balmer line: NTT

24 objects at z=0.2-0.3

Why ? Calibration of high-z Ly. observations, interpretations and cosmological simulations of LAEs.

How ? fesc(Ly.) = *f (Ly.) / [8.7 x f (H.)cor]*



Blue: Continuum UV

Red : Present work

Black: Verhamme et al. (2008)

Main Results

- fesc(Lyα) is anything but constant: from 0.5% to 100%
- fesc(Lyα) clearly decreases with incresing nebular dust extinction
  Few bjects show fesc(Lyα) > fesc(continuum)
  clumpy or aspherical ISM

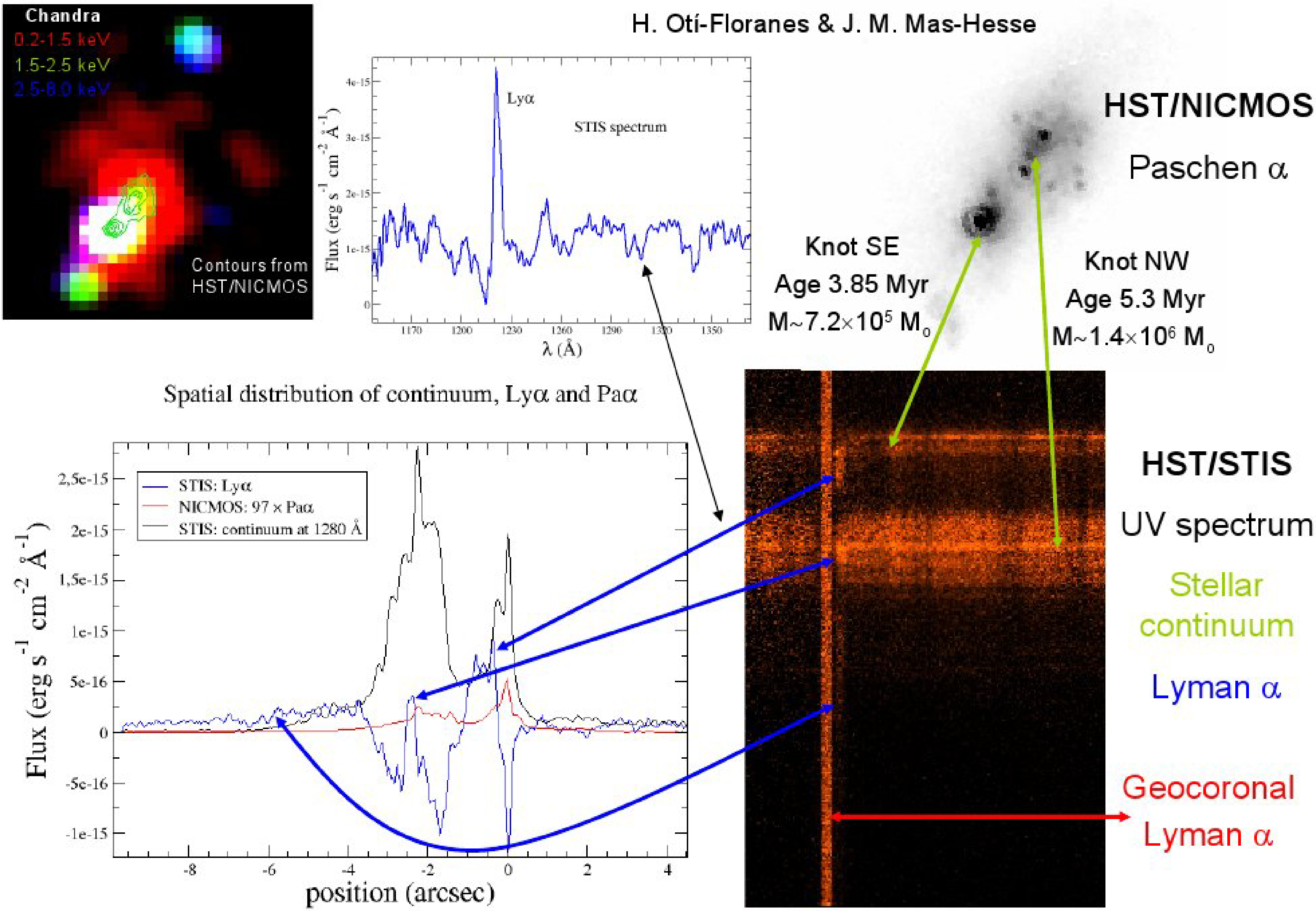
- Fiiting our data yields an extinction corefficient k(Lyα) closer than expected by models to that of the continuum

Caution: selection and aperture size effects may lead to a significant difference between local starbursts and high-z Lyα-selected galaxies (LAEs)

3

Evolutionary state of the Lyman α emitter Haro 2

H. Otí-Floranes & J. M. Mas-Hesse



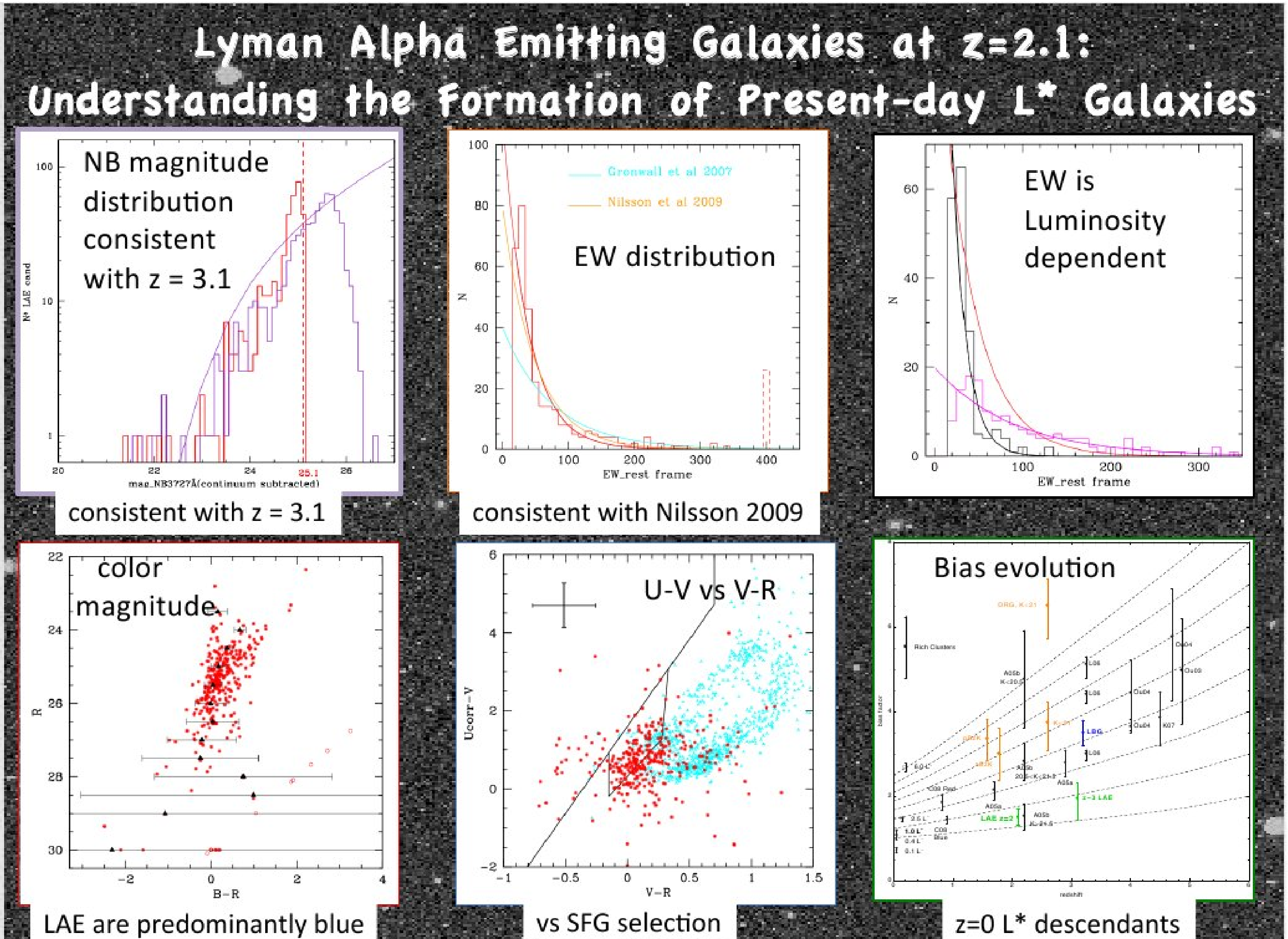
Lyα emission decoupled from stars: Outflows

Ly-alpha emitters - LBGs

z=2.1	LAE : Progenitors of today L* galaxies	: Guaita Lucia	P7
z=3.1	LAE : Large range of ages and masses	: Mc Linden Emily	P8
	: Large EW in SSA22	: Nakamura Yuki	P10
z=5	PEARS: V-drop in GOODS 4.4-5.7	: Pirzkal N.	P12
	LAE at z=4.86-5.7 in Cosmos	: Shioya Y.	P16
	130 LBGs in GOODS	: Yabe Kiyoto	P17
	increase of *-mass z=5->2 + younger at z=5		
	LAEs at z=4.86 and LBGs	: Yuma S.	P18
	LAEs at z=4.5 : X-ray observations	: Zheng Zhenya	P19
z=6	SED models of z=6 objects MUST	: de Barros Stephane	P5
	include nebular emission : galaxies younger		

P7 – Guaita Lucia et al.

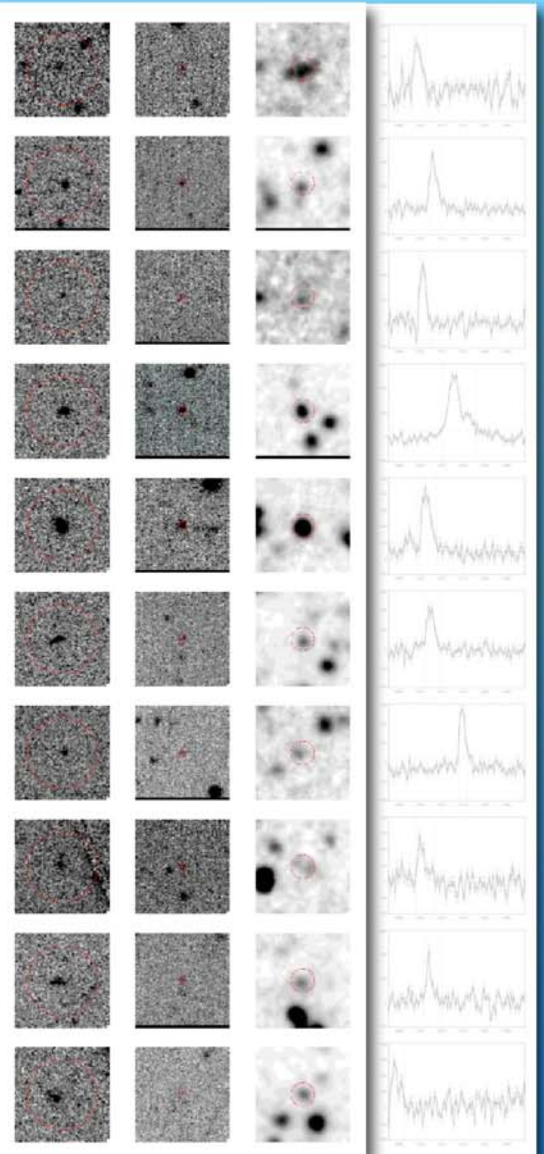
NB3727 ECDFS-> 370 LAE
SFR: 3Ms/yr   Mhalo: 10^{11}Ms low bias



Lyman alpha emitting galaxies at $z \sim 3.1$ in COSMOS

P8

Emily McLinden[1], Steven Finkelstein[2], Sangeeta Malhotra[1], James Rhoads[1]



We present a sample of 10 bright, spectroscopically confirmed Lyman alpha emitters selected from a wide area survey in COSMOS. Studying the bright end of the luminosity function allows us to characterize these objects in detail. We discuss:

- Line asymmetry
- Sizes
- Surface brightness
- SED fits yielding ages + masses

7 broad bands; ACSi

We find that the LAE surface brightness is constant with redshift, and

that the LAE population exhibits a diversity of ages and masses.

MMT

Although largely young and of moderate mass

[1]School of Earth and Space Exploration, Arizona State University

[2]Department of Physics, Texas A&M University

Properties of Large Equivalent Width Objects

Yuki Nakamura, Toru Yamada, Tomoki Hayashino, Katsuki Kousai, Nana Morimoto, Mitsunori Horie, Eri Nakamura (Tohoku University), Yuichi Matsuda (Durhum University) and Masayuki Umemura (Tsukuba University)

We study LAEs in SSA22 and general fields (SXDS, SDF, GOODSN) at z=3.1. 2.4sq deg in total

We calculated EW of our detected LAEs by two methods.

If Lyα photons emitted from star-forming regions are scattered by neutral hydrogen gas and the emission regions are extended,

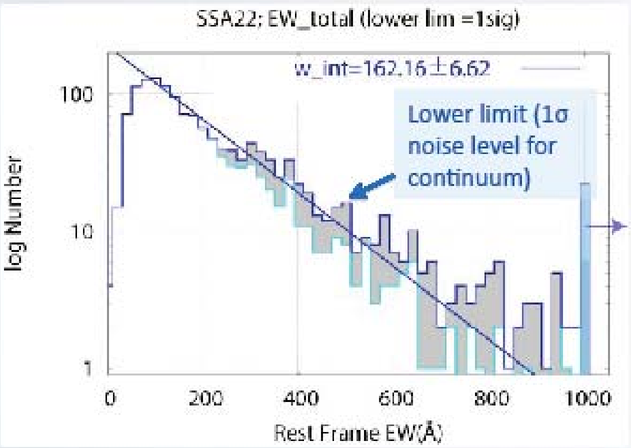
A) focus on the EW of the exact position where star-formation occurs to know the stellar age

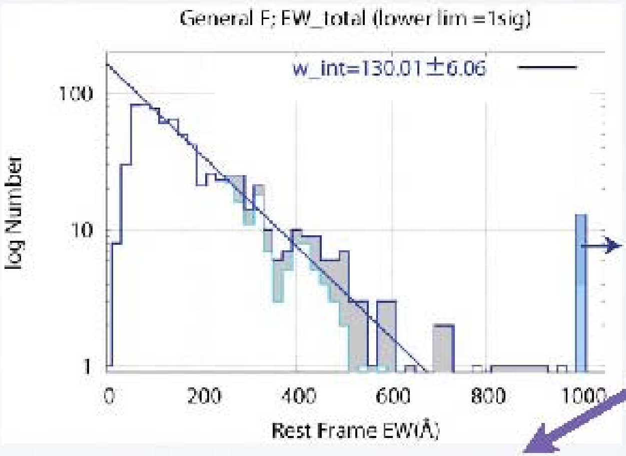
"EWap": EW measured by Lyα emission and continuum fluxes within aperture=2"φ (psf=1".0 at SSA22)

B) include objects enhanced for EW by mechanism of Lyα scattering and/or galactic superwind

"EWto": EW measured by pseudo total magnitudes (2.5*kron radius of SExtractor software) of Lyα emission and continuum as the Lyα emission of objects have extended shape

The EWto distribution, 240 and 95 LAEs





exponential fitting to EWto distribution

$N = C*\exp(-EW/w_0)$:

SSA22 w_0=**162.16**±6.62

General Fields w_0=**130.01**±6.06

Larger ratio of high EWto objects in SSA22 region than general fields !!!

Is the EWto distribution a function of surface density of LAEs?

or

Is it an unique characteristic of LAEs in SSA22?

We consider this question in our poster.

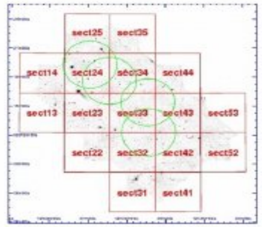
Large objects

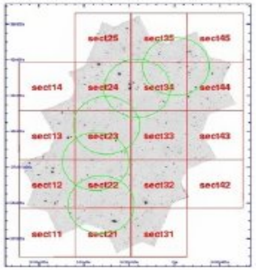
Mass Estimates of high redshift emission lines and V drops in the PEARS-N and PEARS-S fields

Pirzkal, N., Malhotra, S., Rhoads, J. and the PEARS team

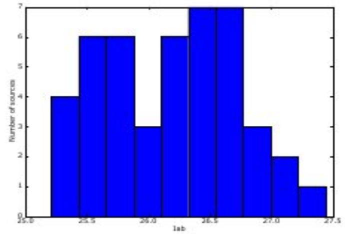
Probing Evolution

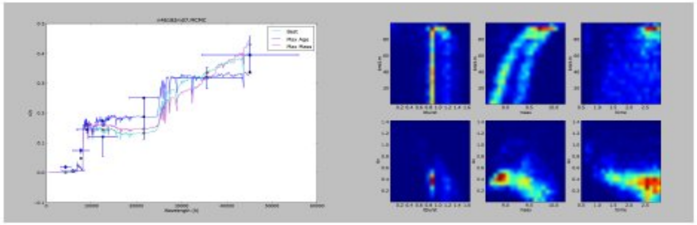
And Reionization Spectroscopically

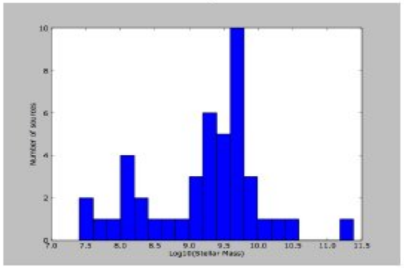




- HST Slitless spectroscopy of 9 fields in GOODS-N and GOODS-S
- 48 LBG selected spectroscopically from PEARS-N and PEARS-S
- $4.4 < z < 5.6$
- Preliminary result show up to two sources with Ly-α emission lines with fluxes $>10^{-17}$ erg/s with masses $> 10^{9.5}$ Msun. Higher masses than in Pirzkal et al. 2007.
- MCMC method to derive masses using 2 stellar population models using ACS BViz, ground based JHK, and IRAC 3.6 and 4.5μm
- This methods allows for determination of the parameters of the best fits as well as maximum mass and maximum age estimates at the 95% confidence level.
- Take non-detections into account
- We examined the systematics of using BC03, CB07 and M07 models. M07 lead to ~5% lower stellar mass estimates.
- Range of best-fit stellar masses ranging from $\sim 10^8$ to 10^{10} M_{sun}
- Full morphological analysis and analysis of emission line selected sample to follow







18. Stellar populations of LAEs at z = 4.86: A comparison to z~5 LBGs

See also P17

S. Yuma et al. (Kyoto U., Japan)

Target: 8 LAEs at z = 4.86

Field: GOODS-N and its flanking fields (~400 arcmin^2)

Optical data: Subaru Suprime-Cam

Mid-infrared data: Spitzer IRAC

SED fitting: BC03 with Salpeter IMF, constant SFH, etc

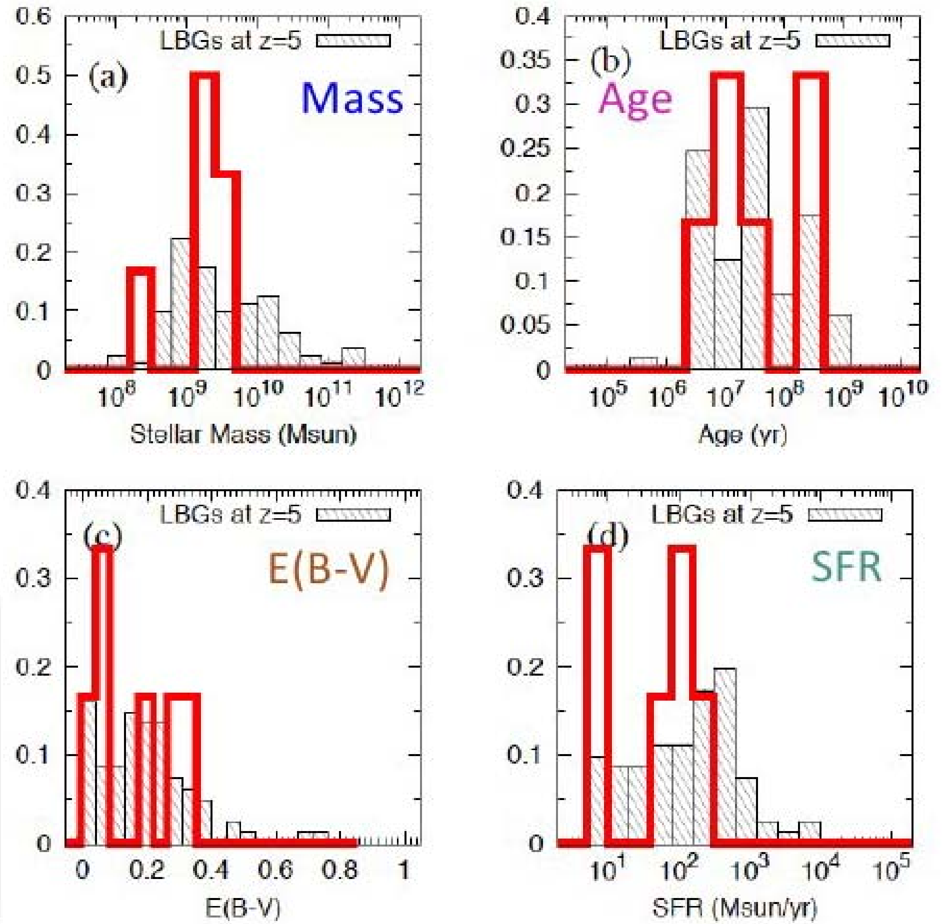
From 31 candidates select objects detected in the IR

Median value: Mass = $2.1\times10^9\ M_\odot$

Age = 20 Myr

E(B-V) = 0.24 mag

SFR = 148 $M_\odot$/yr



A comparison to LBGs at the same redshift and in the same field selected by using the same data

Using the same model, we found that LAEs have

- Smaller stellar masses
- probably smaller ages and SFRs?
  - More details in the poster!

Low end of the UV luminosity distribution

X-ray properties of the z ~ 4.5 Lya Emitters in CDF-S and ECDF-S

Z. Y. Zheng *(USTC)*, J. X. Wang *(USTC)*,
S. L. Finkelstein *(ASU, Texas A&M U.)*, S. Malhotra *(ASU)*, J. E. Rhoads *(ASU)*

Data

Optical: 113 LAEs (Finkelstein08,09) (NB665, NB656 and NB673) of GOODS-CDFS
X-ray: 2 Ms CDF-S (0.1 deg^2) + 240ks E-CDF-S (0.3 deg ^2) See the background fig.

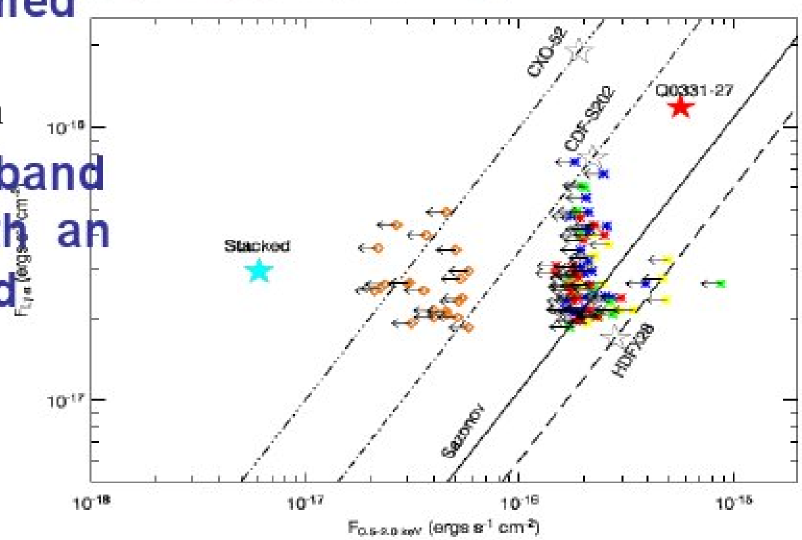
Results

1. One X-ray detection (spectroscopically confirmed as a quasar J033127.2-274247)

   Z=4.48 Type 1 AGN L(2-10keV)=44.89 – 1% population

2. The rest 88 LAEs detected in the stacked soft band image (52-Ms effective Chandra exposure), with an average L(2.75-11 keV)=1.2*10^42 ergs/s, could mainly be due to a small fraction of AGN

   SNR=3.4 SFR=113Ms/yr (a little higher SFR from UV and Lya) – 3 to 6% could be type 1 or 2 AGNs

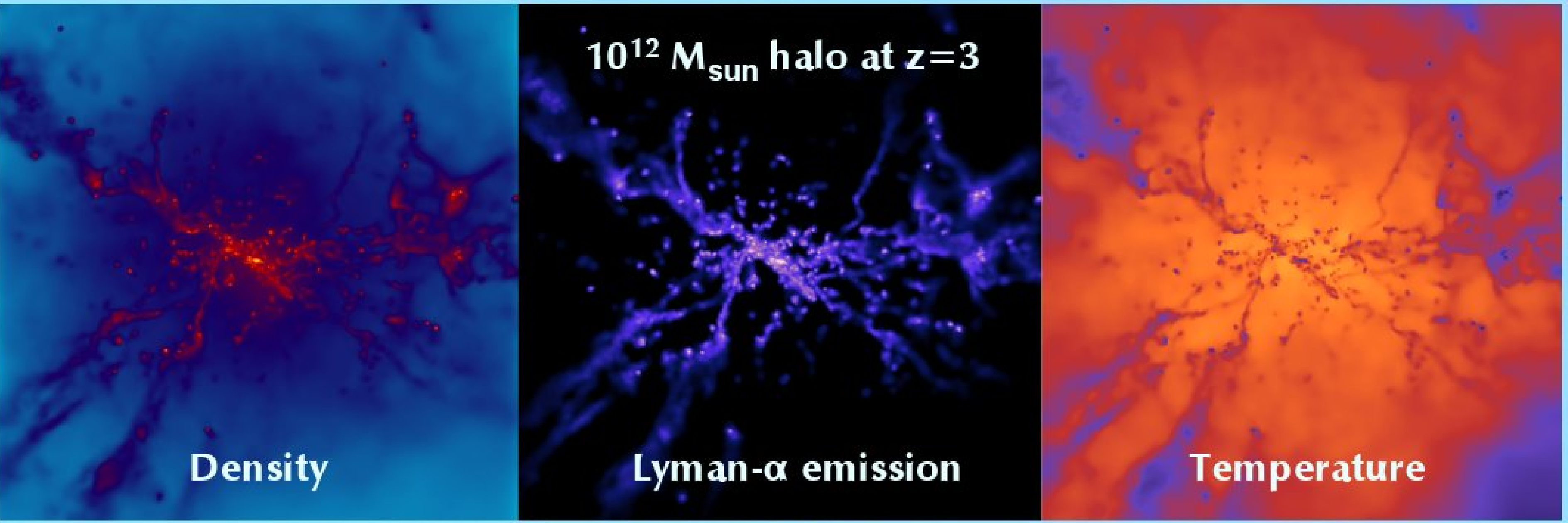


Other Ly-alpha emitters

Cosmological simulations : blobs	: Van de Voort Freeke	P23
Ly-alpha envelops around 5 RQ quasars at z=4.5:	North Pierre	P20
Hidden AGNs in Type 2 LAEs	: Shimizu Ikko	P22
Ly-alpha emitters and SN at z=3	: Morimoto Nana	P9

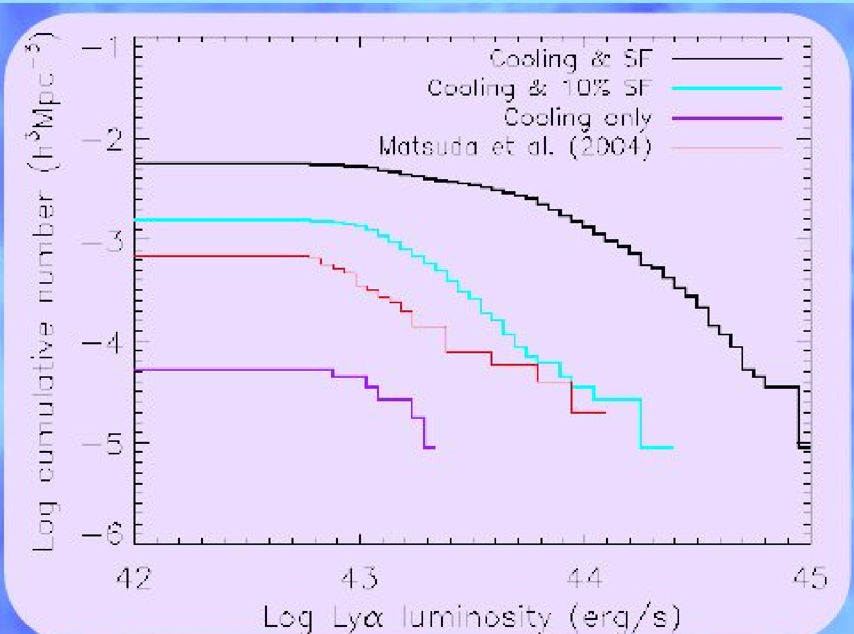
P23 # Lyman-α emission in cosmological simulations

FREEKE VAN DE VOORT



Cooling radiation alone cannot explain extended Lyman-α blobs

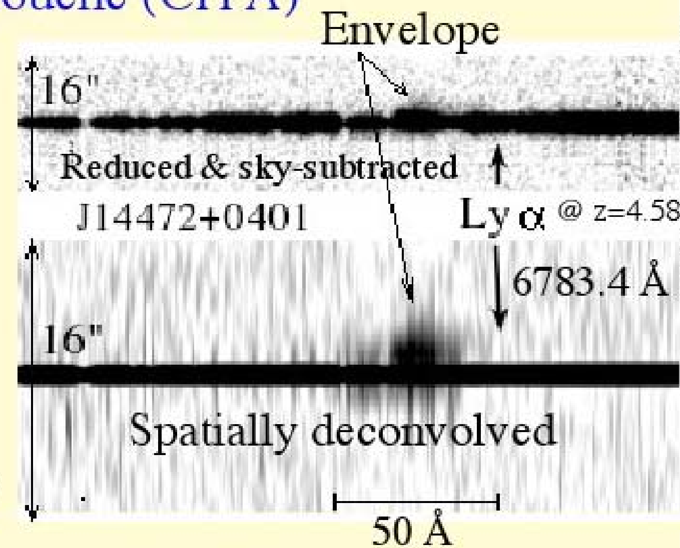
We can match observed luminosities & sizes by including 10% of the Lyman-α emission from star forming regions

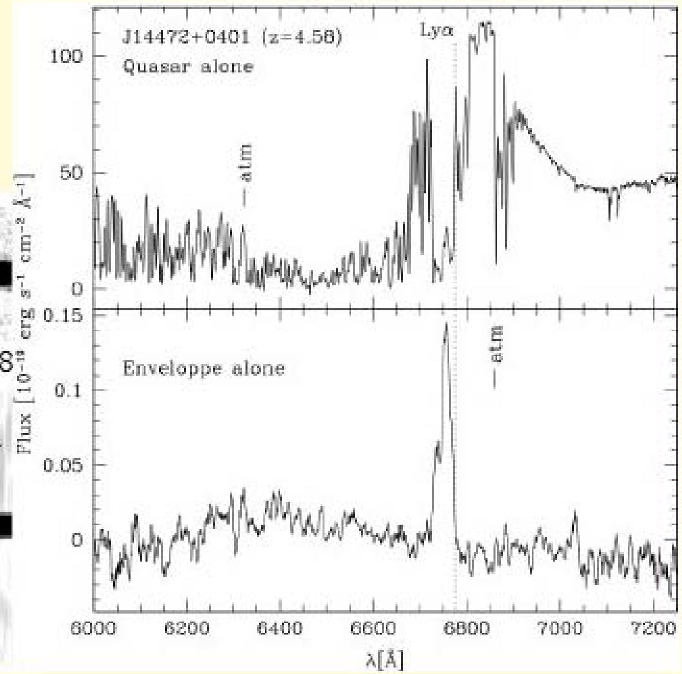


P20

Lyα envelopes of z = 4.5 quasars

P. North, F. Courbin, A. Eigenbrod (EPFL) &
D. Chelouche (CITA)



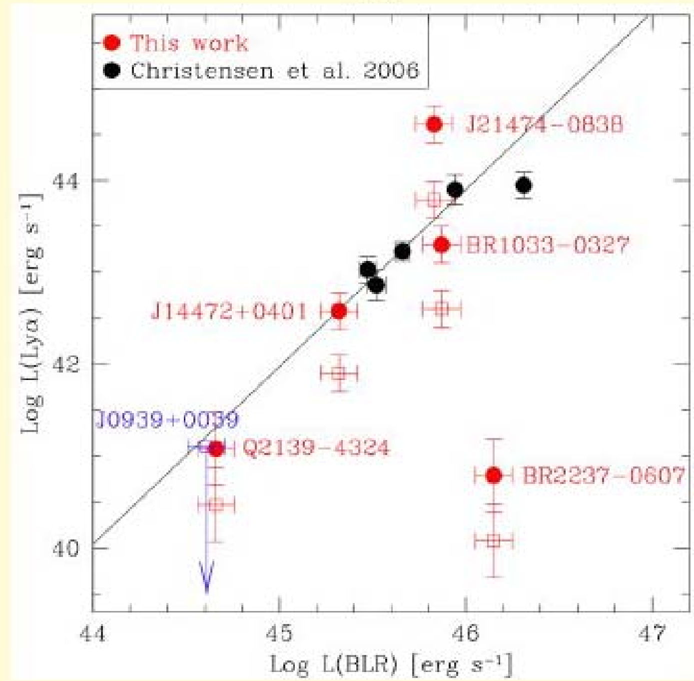


Purpose: Explore the properties of Lyα envelopes around high-z radio quiet QSOs:

- Frequency?
- Size? Surface brightness? Kinematics?
- L(envelope) vs L(BLR)?

Tools:

- FORS2@VLT in MOS MXU mode
- R=1000, t_{exp}=10400 s
- Spectral range 600-720 nm
- MCS spatial deconvolution



Results: Envelopes are ubiquitous and varied:

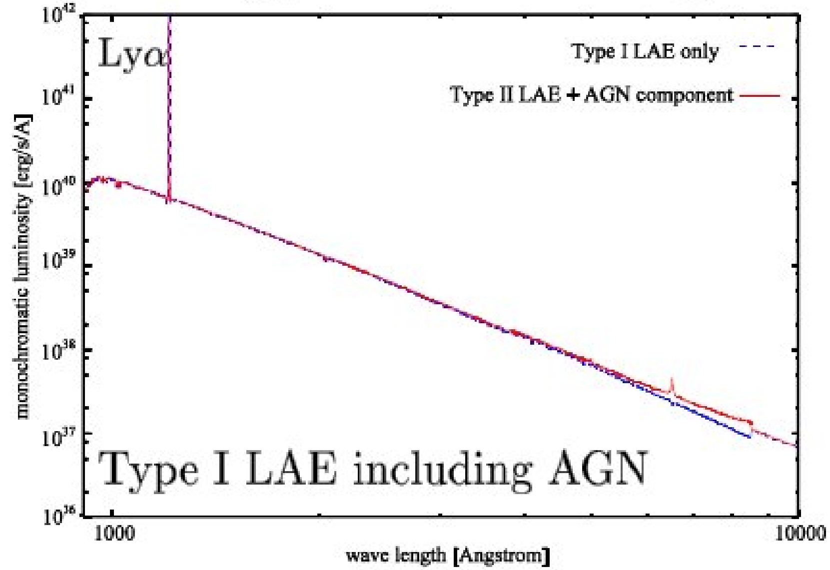
- 5 found around 6 QSOs
- Surface brightnesses from $5 \cdot 10^{-21}$ to $2 \cdot 10^{-17}$ erg s^{-1} cm^{-2} ''$^{-2}$
- Sizes from 38 to 86 kpc, asymmetric shapes
- FWHM=21 to 50 Å, or 900 to 2200 km/s
- L(envelope) roughly ∝ L(BLR), but 1 exception

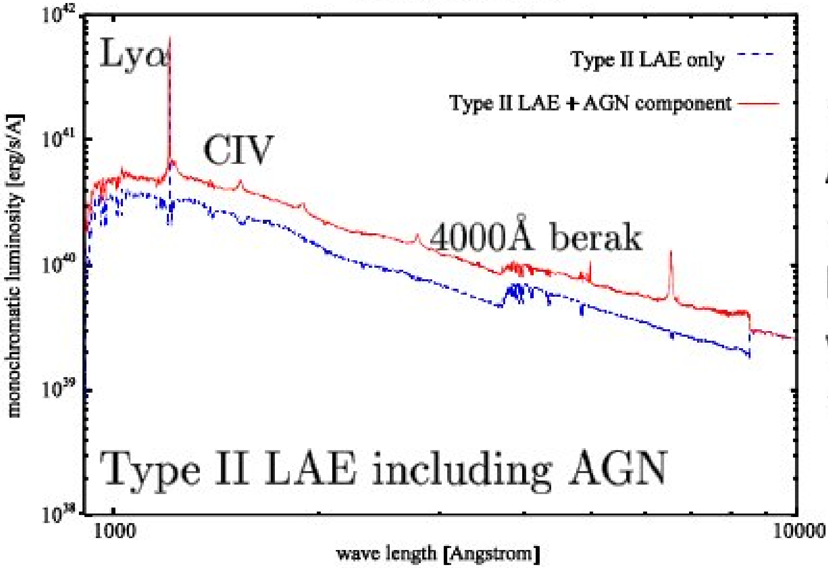
P22

Hidden AGNs in Type II LAEs

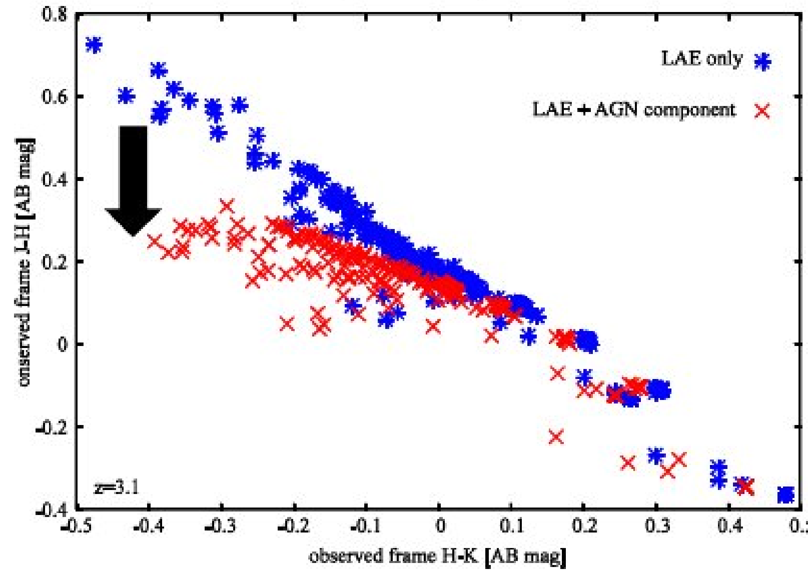
Ikko Shimizu (The University of Tokyo, IPMU), Umemura Masayuki (The University of Tsukuba)

SED of 2 type LAEs including AGN





Color-color diagram (J - H & H - K)



✓Type II LAEs exhibit detectable features of AGNs such as board LyA lines and broad CIV lines

✓LyA consists two component. One is LyA line with board FWHM by a SMBH, the other is a component with narrower FWHM by a starburst.

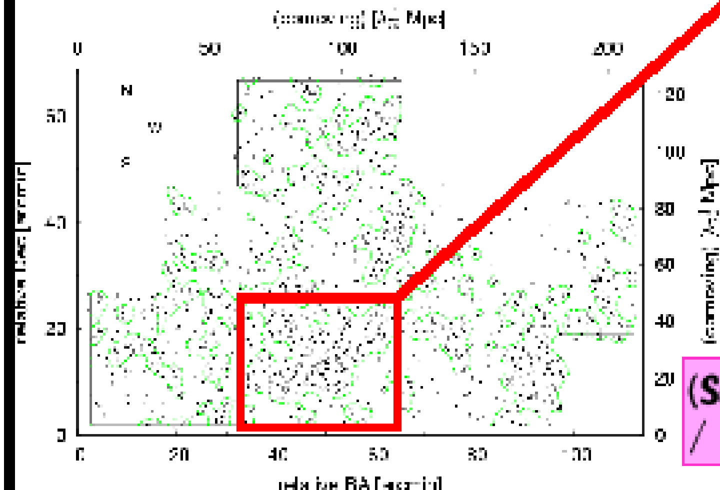
✓Target small value of J-H and H-K for seeking AGN!

P9

Searching for Luminous Core-Collapsed Supernovae in a High-z Proto-Cluster

Nana Morimoto, Toru Yamada, T.Hayashino, Y.Nakamura, K.Kousai (Tohoku Univ.), Y.Matsuda (Durham Univ.)

z=3.1 The SSA22 field (R.A.=22^h17^m,Dec=+00°15′)



There are LAEs with large Equivalent Width.

↓

Probability of the star formation biased to very large mass

↓

Searching for SNe in the SSA22 field at z=3.1

A proto-cluster of star-forming galaxies

LAE sample : 614 obj.
(1) NB497 < 26.0
(2) BV−NB497 > 0.8

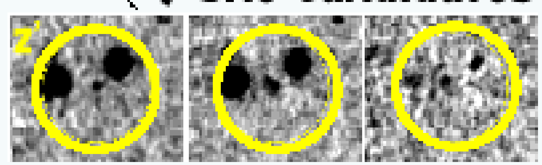
LBG sample : 985 obj.
(1)U−V−2×(V−i′)≧1.0
(2)U−V ≧ 0.5 (3)V−i′ ≦ 0.6
(4)24 ≦ R ≦ 25.5

(Subaru Telescope / Suprime-Cam)

Variability survey
(Relative photometry)
Δflux≧3σ

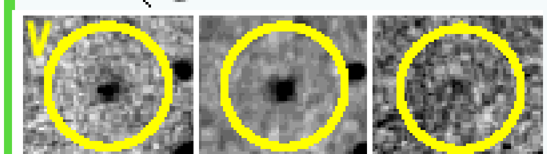
V:3epochs
z′:2epochs

LAE sample { 3 AGN, 9 SNe candidates



epoch1 epoch2 epoch2−1

LBG sample { 2 AGN, 8 SNe candidates



epoch1 epoch2 epoch2−1

There is possibility of detecting high-z SNe !!

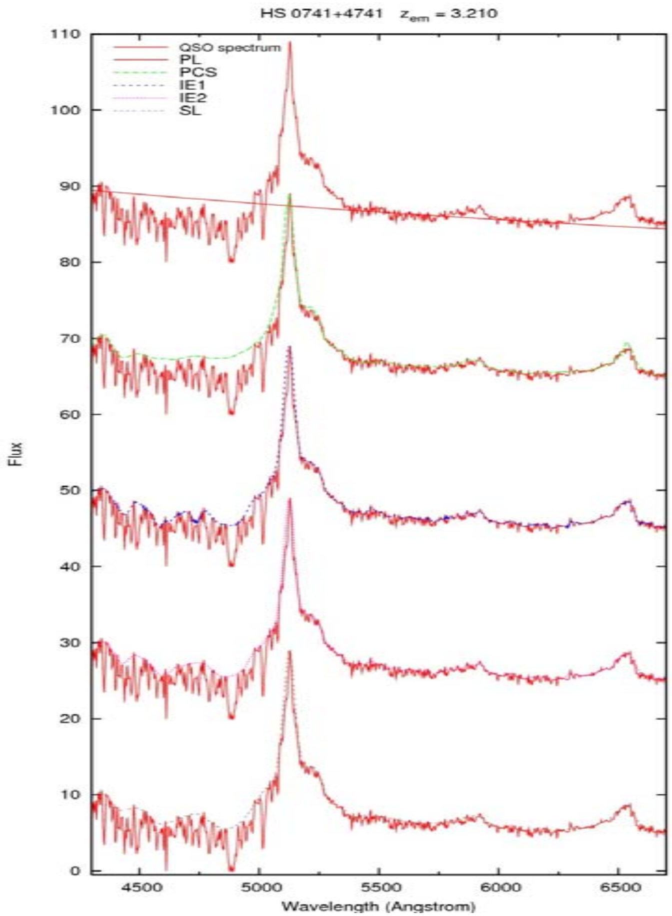
Ly-alpha absorbers

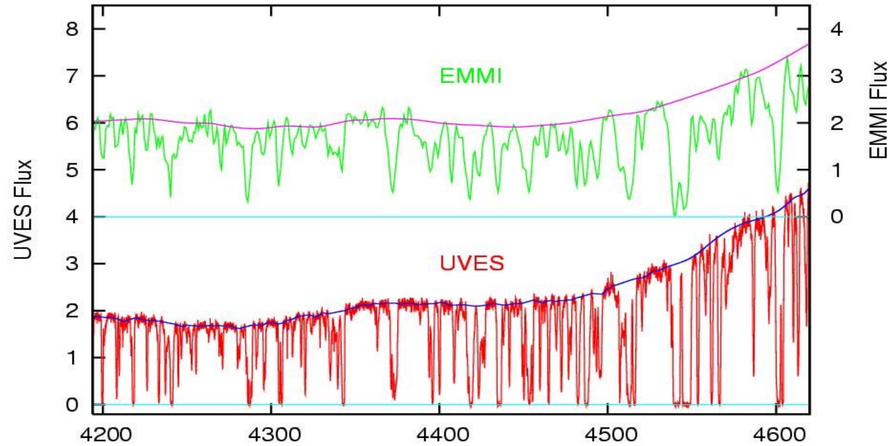
Continuum of quasars in the Lya forest:	Aghaee Ali	P25
Correlation between IGM and LBGs: Proximity effect:	Bielby R.M.	P15
DLAs : ISM of High redshift galaxies	Guimaraes Rodney	P27
Ly-alpha emission from DLAs:	Christensen Lise	P26
HI selected galaxies :	Okoshi Katsuya	P28
What about GRBs ?	Susanna Vergani	P29

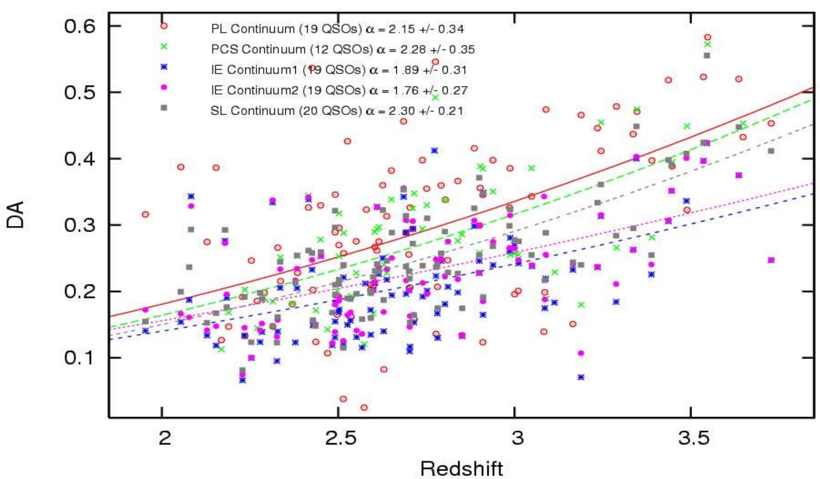
The continuum of quasars in the Lyman-alpha forest

P25

A. Aghaee, P. Petitjean, R. Srianand, R. Guimaraes and C. S. Stalin







We discuss different methods to derive the continuum of quasar spectra in the Lyman-alpha forest. This is a crucial step toward deriving the mean absorption of the IGM and its evolution with redshift and therefore toward normalization of N-body simulations.

P15

Interactions between galaxies and the IGM at z~3: the VLT VIMOS LBG Survey

R.M. Bielby (IAP), N. Crighton (Durham), L. Infante (Cattolica) ,T. Shanks (Durham),
P. Tummuangpak (Durham) and others

Introduction: Observations of the z~3 Lyman-break galaxy(LBG) population represent an important tool in the study of galaxy evolution. Based on the Adelberger et al. (2003, 2005) observations, the lack of Lyα absorption near LBGs is still an unsettled issue, since it is still unclear whether galactic winds have effects on the galaxy surroundings. These results from Adelberger et al motivate us to make a further study of the correlation between QSO absorption line systems and LBGs at high redshift.

Observational Data

We have measured VLT VIMOS redshifts for ~1100 LBGs in the fields of 6 bright QSOs Q0042-2627, Q0043-26, SDSS J0124+0044, HE0940-1050, PKS2126-158

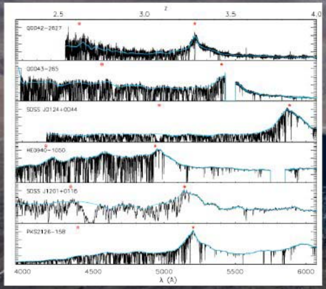


Figure 1. QSO spectra from VLT UVES, Keck HIRES and SDSS. Wavelengths of the intrinsic QSO Lyα are shown by the filled stars and intrinsic Lyβ are shown by the open stars.

Evidence of outflows

Velocity differences between Lyα emission and ISM absorption lines in the LBG spectra confirms the evidence from Adelberger et al of outflow due to star formation.

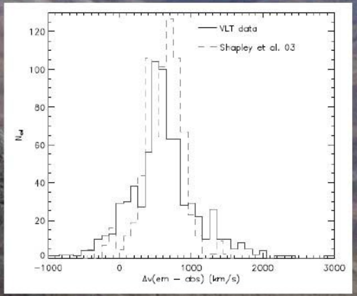


Figure 2. Distribution of velocity offsets between ISM absorption lines and the Lyα emission line in individual galaxies from our LBG survey (solid histogram). We measure a mean velocity offset between Lyα emission and the ISM lines of $\Delta V = 570 \pm 310$ kms^{-1}. The dashed histogram shows the result of Shapley et al. (2003).

Lyman α transmissivity - LBG correlation

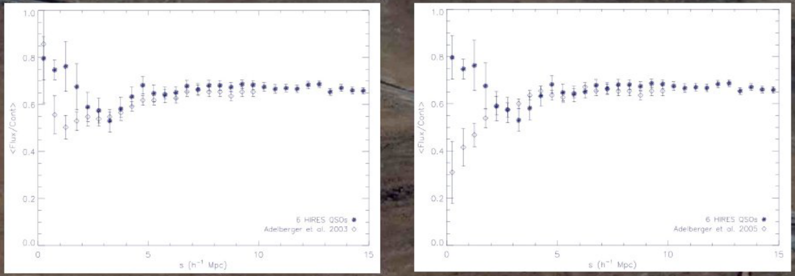
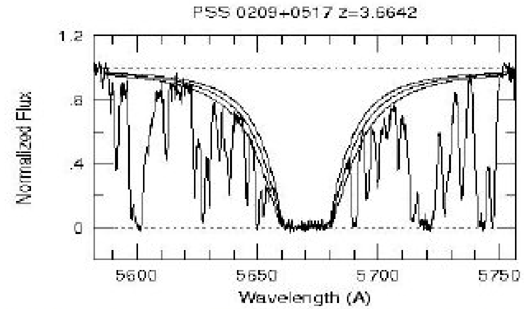


Figure 3. Our cross-correlation of LBG positions with the transmissivity in the Lyα forest from high resolution QSO spectra has produced some interesting results. The data appear to show a fall in the transmissivity in the Lyα forest at scales of ~ 5 h^{-1} Mpc away from LBGs. This is in agreement with previous results from Adelberger et al. (2003, 2005) and indicates an increase in gas densities at these scales. At smaller scales, our result shows better agreement with the Adelberger et al. (2003) result which showed a peak in the transmissivity at scales of $s < 2h^{-1}$ Mpc, potentially signifying the presence of low density holes in the IGM close to LBGs, perhaps due to star-formation feedback.

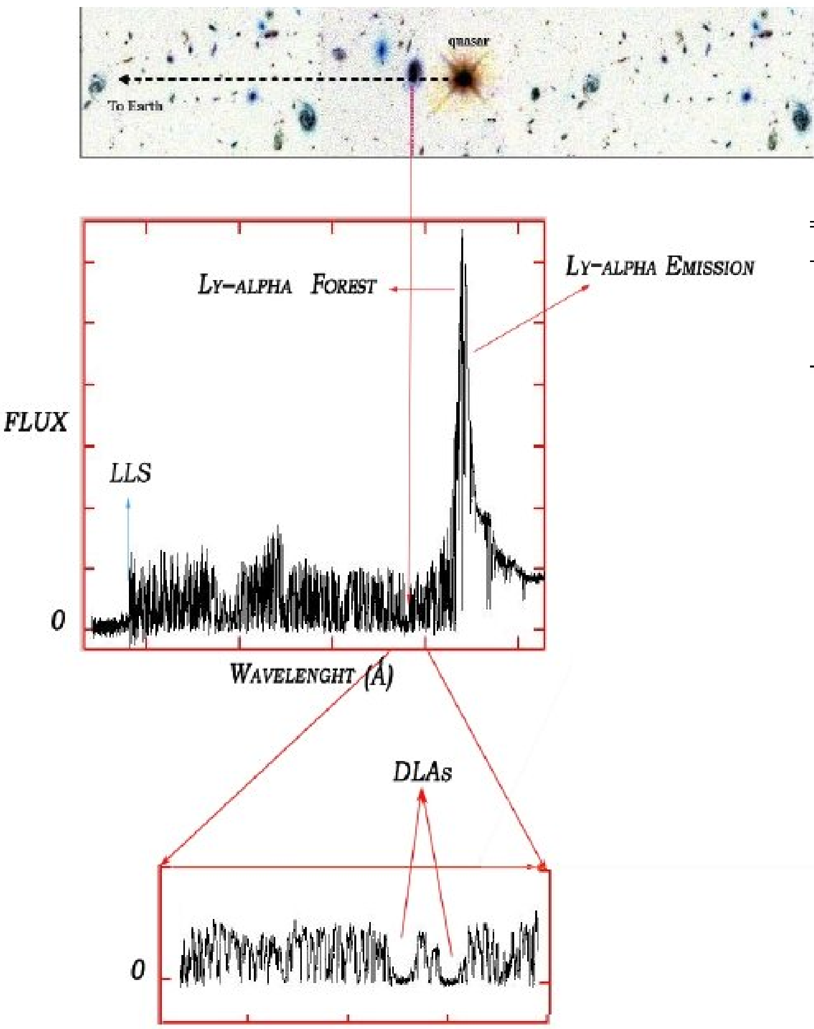
Conclusions: There is evidence of outflow due to star formation from the velocity offsets between Lyα emission and ISM absorption lines in the LBGs. We also detect the effect of feedback from these outflows on the Lyα forest, more in agreement with the result of Adelberger et al (2003) rather than Adelberger et al (2005).

27 - Damped and sub-Damped Ly-α Absorbers in z > 4 QSOs

R. Guimarães

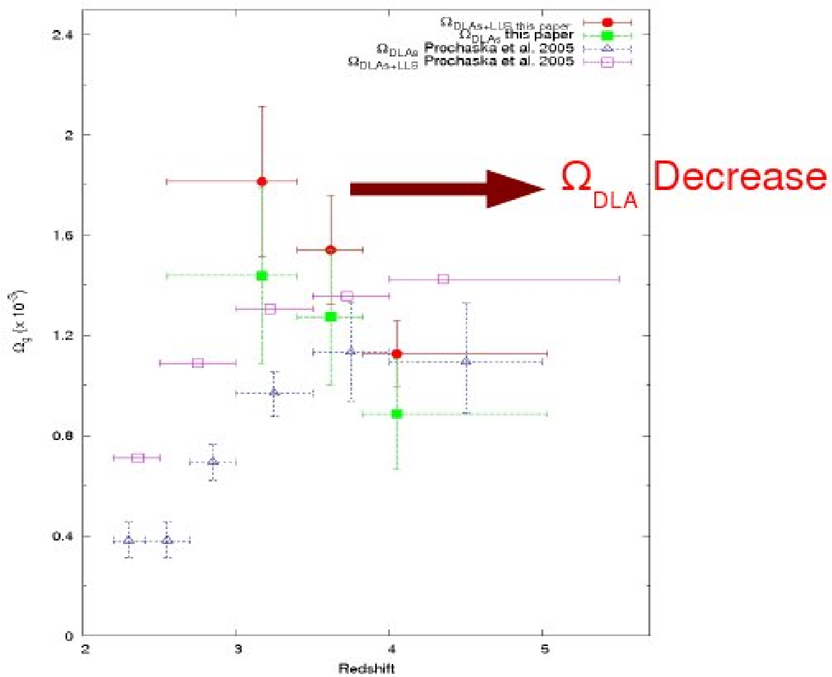


Intervening Absorption-Line Systems



Neutral Hydrogen Cosmological Mass Density

z_{range}	$<z>$	N_{QSO}	N_{DLA}	N_{subDLA}	ΔX	Ω_{DLA}	$\Omega_{DLA+subDLA}$
2.55 - 3.40	3.168	77	12	23	125.922	1.43 ± 0.33	1.71 ± 0.33
3.40 - 3.83	3.618	78	17	19	125.922	1.41 ± 0.26	1.65 ± 0.26
3.83 - 5.03	4.048	77	11	18	125.922	0.97 ± 0.22	1.21 ± 0.22



P26

Lyα emission from DLA galaxies

Lise Christensen (ESO)

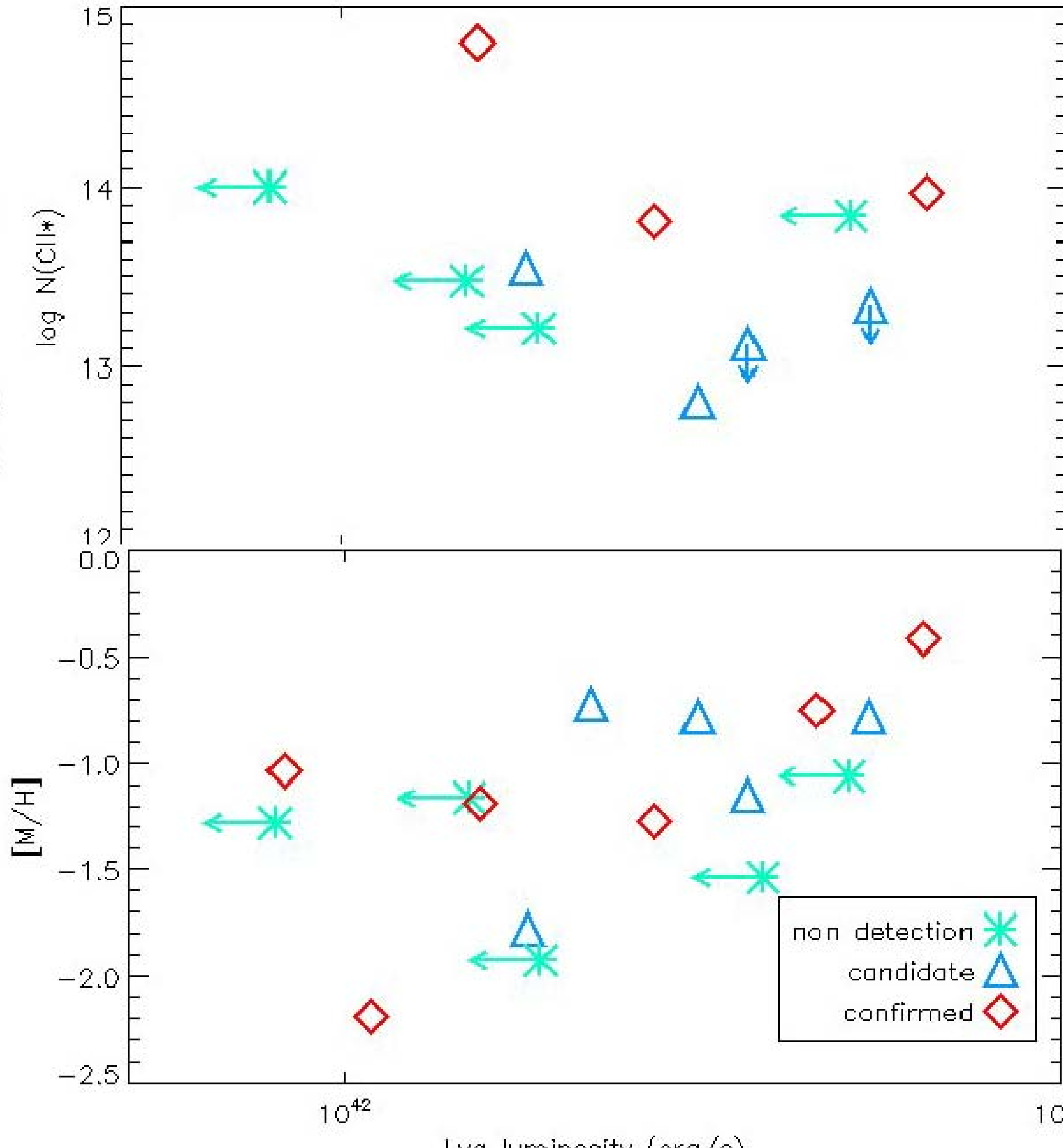
We have searched for Lyα emission associated with ~40 DLAs at z>2 using integral field spectroscopy with VIMOS, GMOS, FLAMES, and PMAS.

10 Lyα emitting galaxies are found. The rest have upper limits. We compare the luminosities with absorption properties for the DLAs reported in the literature.

Which DLA galaxies are most likely to be found in emission?

- Metal rich DLAs?
- CII* rich DLAs?

The plots show no clear correlations: A possible reason is dust extinction of Lyα photons.



Kinematics and impact parameter

P28 ***HI Selected Galaxies As a Probe of Lyα Absorption Systems***

Katsuya Okoshi (Tokyo University of Science, Japan)

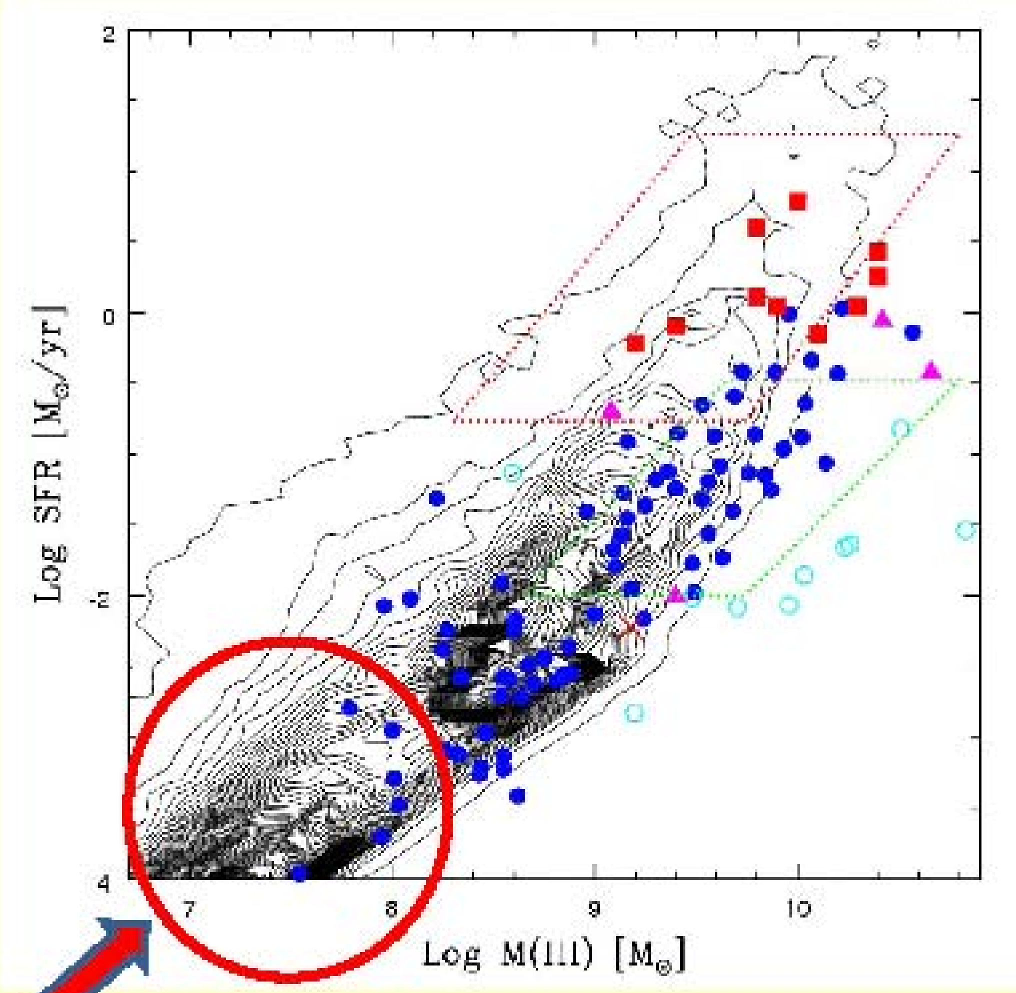
We investigate the properties of HI-selected galaxies and Ly α absorption systems using a semi-analytic model.

At low redshift (z<1) , DLA systems ($N(HI)>10^{20.3}cm^{-2}$) consist of the HI-selected galaxies at $M(HI)>10^8 M_\odot$.

Small impact parameters: 3-4 kpc

By contrast,

Sub-DLA systems ($10^{20.3}>N(HI)>10^{19}cm^{-2}$) would replace DLA systems as the galaxy population at $M(HI)\sim10^7 M_\odot$.



What about metallicities ?

Sub−DLAs = LSB dwarf galaxies

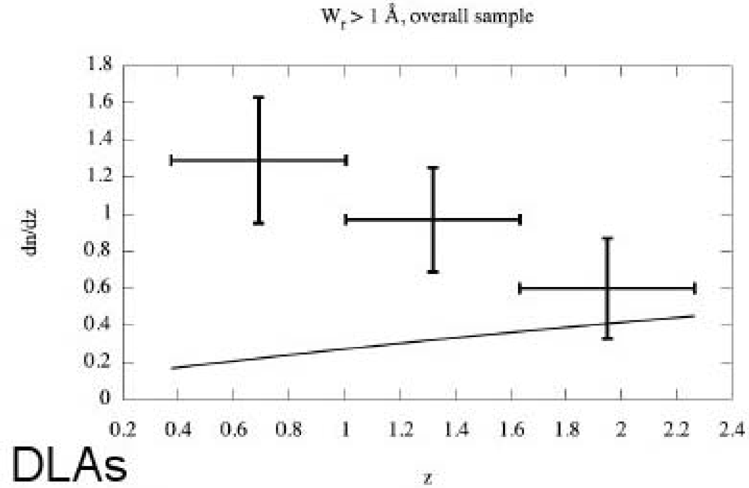
N. 29 : Excess of MgII and DLA systems along GRB lines of sight

Vergani S.D. et al.

trong MgII systems along GRB lines of sight are **twice more** than towards QSO lines of sig

Analysis of VLT-**UVES GRB afterglow spectra** to charcterize these systems:

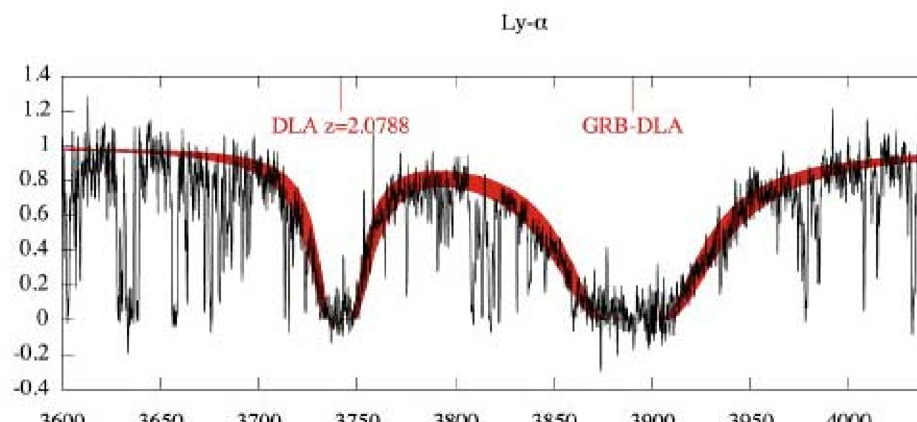
- Equivalent width and velocity distributions similar to the absorbers along QSO lines of sig
- Very **low dust extinction**
- Number density vs redshift distribution :
  strong MgII system **excess at low redshift**
  ----> Lensing bias affecting GRBlines of sight?



- Estimate of HI content : about half of them could be DLAs
  -----> **possible excess of DLA systems along GRB lines of sight**

ssible **(sub-)DLA excess** shown also from
rect detection of Ly-α absorption

ways quite close (< 25000km/s) to the GRB



The pb with GRBs is… statistics…

Room de l’Atelier, just go right when going out the seminar room and go downstairs…….

What else ?....

Pvituel

Unbiased survey for Lyα blobs

--Direct probes for galaxy formation--

Tom Saito (Ehime Univ.)

SXDS team (Y.Ono, K.Shimasaku, S.Okamura, M.Ouchi, M.Akiyama, M.Yoshida, Y.Ueda et al.)

COSMOS team(Y.Taniguchi, T.Murayama, T.Nagao, Y.Shioya, K.Matsuoka, K.Sumikawa,Y.Ideue et al.)

SXDS

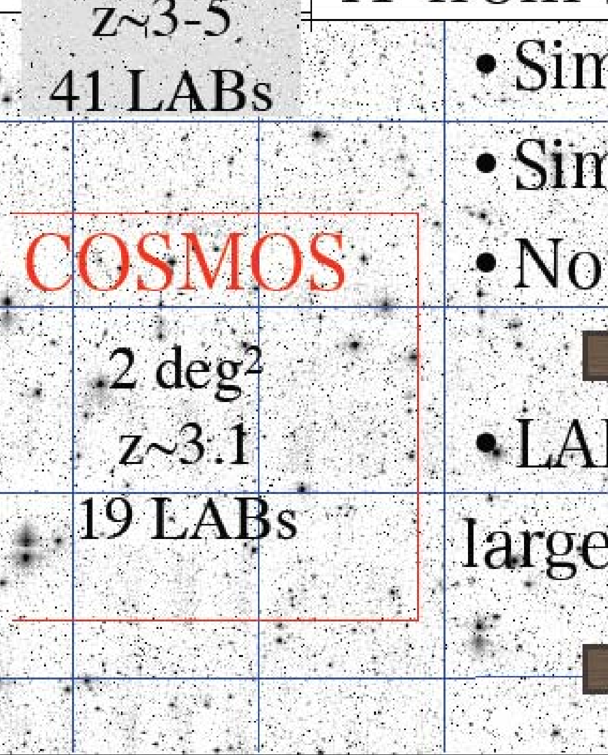
$0.25 deg^2$

z~3-5

41 LABs

Unbiased sample of LABs:

41 from SXDS, 19 from COSMOS



COSMOS

$2 deg^2$

z~3.1

19 LABs

- Similar Luminosity function
- Similar sizes
- No X-ray counterparts

⇒ Tracing similar population

- LABs in overdensity have larger stellar masses

⇒ Superwinds are likely in overdensity

Protogalaxies are likely in isolation