‘Probing AGN and their Surroundings with Ly-a’

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Lyman alpha ‘blobs’:

- spatially extended Lya emission (H Lyman alpha, E=1e-2 keV, λ=1216 Å)

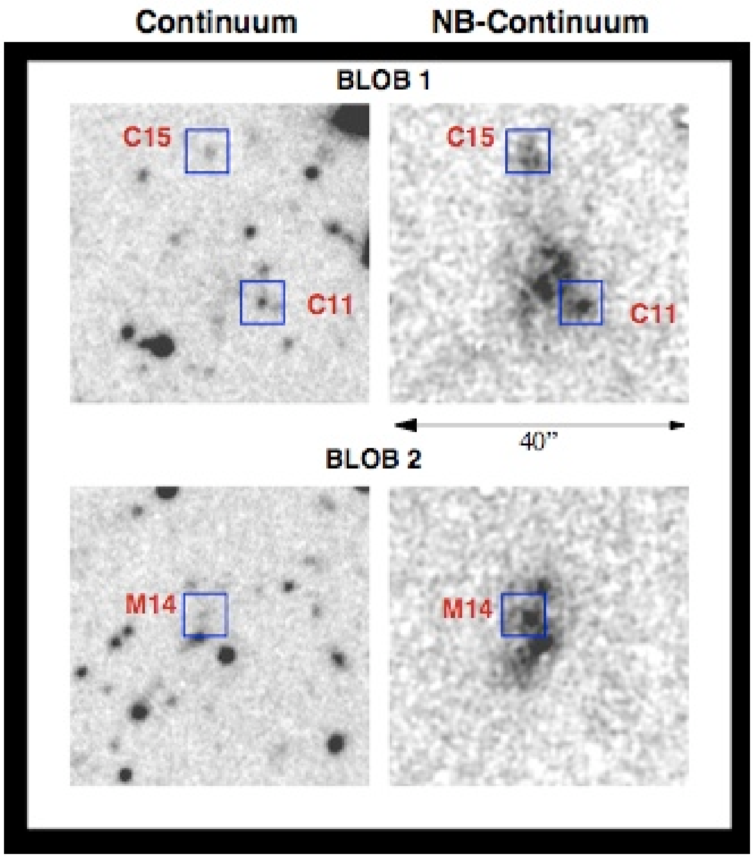
- emission- observed between z=3 to 5 often with no clear excitation mechanism.

Conclusions

- The Lyman alpha spectrum can reveal the Lya excitation mechanism, as well as the gas dynamics through which the Lya is scattering.
  - e.g. scattering of Lyman alpha through optically thick collapsing/expanding gas results in a blueshift/redshift.
- Existing Lya surveys can be used to constrain the number density of quasars at z>4.5 that are 7-12 magnitudes fainter than those discovered in the SDSS.

Lyman Alpha 'Blobs'

- Spatially extended Lya emission
  up to ~ 100-200 kpc.
- Several tens have been discovered at z=3-5. (e.g. Matsuda et al, 2004; Saito et al, 2006/2007)
- Luminosities ~ 1e42-1e44 erg/s
- What powers Lya radiation:
  - (Hidden) AGN?
  - Cooling radiation?
  - Pop III stars?

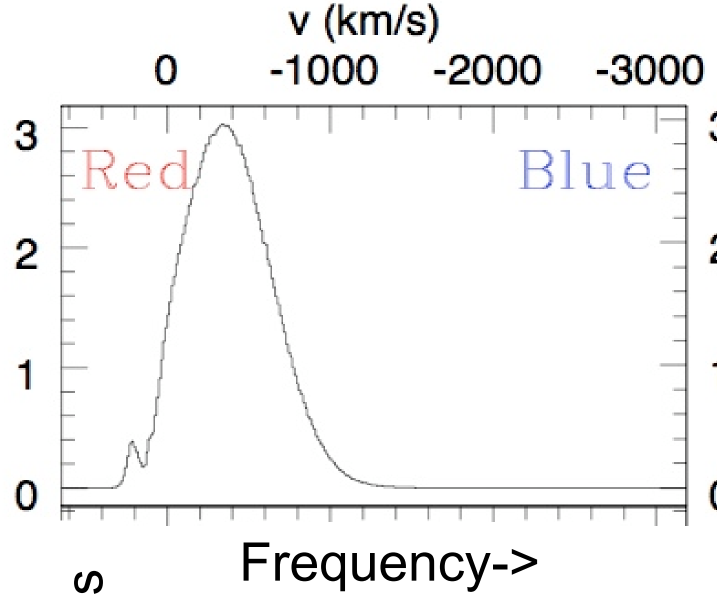


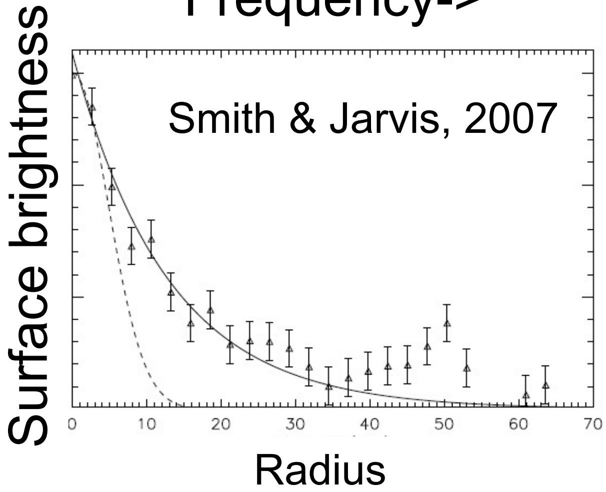
Steidel et al. (2000)

Lyman Alpha 'Blobs'

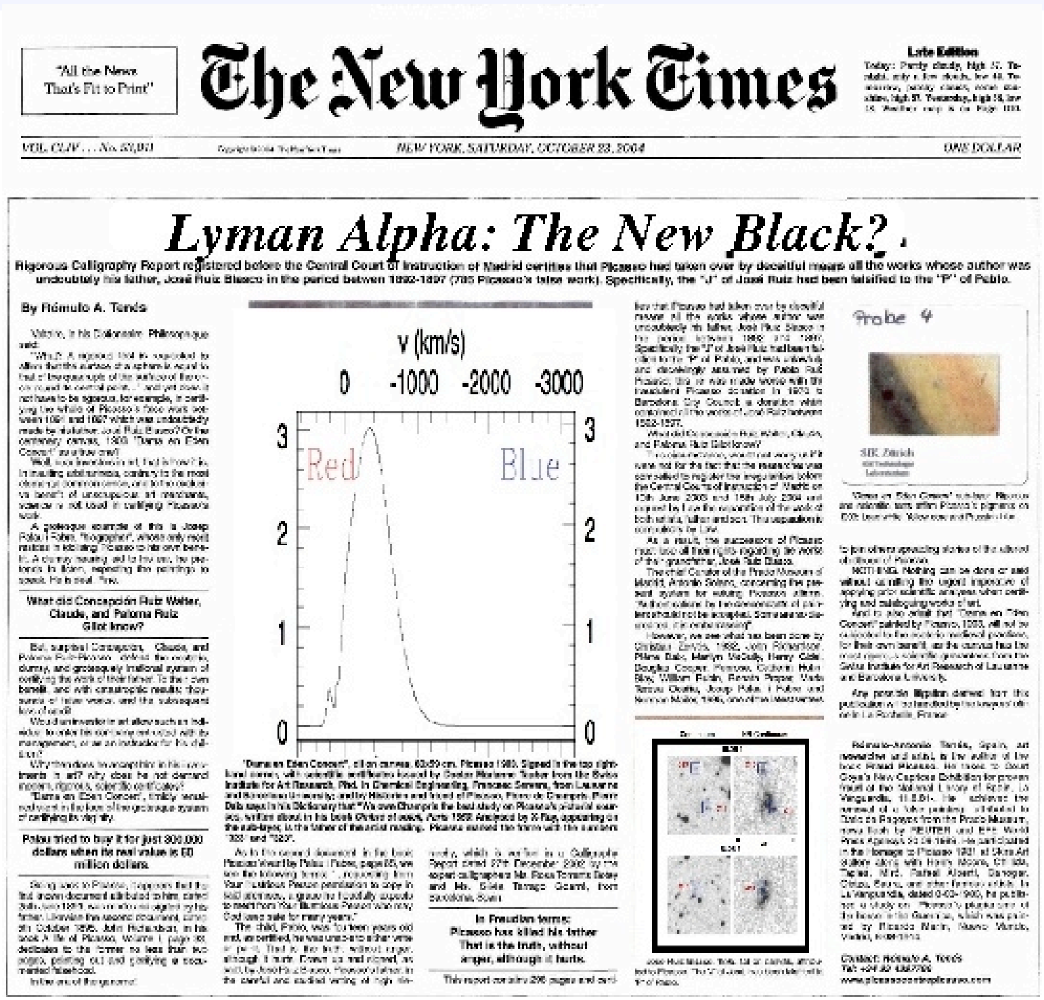
- Understand some basic Lya radiative transfer.
- Use Monte-Carlo method: Follow individual photons through gas cloud with user-specified density+velocity field
- Calculate emerging Lya spectrum +surface brightness profiles
- Results: Radiative Transfer of Lya through collapsing (optically thick) gas results in a blueshift of the line. The opposite is true for outflows.
- ***Frequency off-set of Lya-line constrains gas motion.***

  BLUE = collapse





Part II: Constraints on the Faint End of the Quasar LF



"All the News That's Fit to Print"

The New York Times

Late Edition

NEW YORK, SATURDAY, OCTOBER 23, 2004 — ONE DOLLAR

Lyman Alpha: The New Black?

Rigorous Calligraphy Report registered before the Central Court of Instruction of Madrid certifies that Picasso had taken over by deceitful means all the works whose author was undoubtely his father, José Ruiz Blasco in the period betwen 1892-1897 (785 Picasso's false work). Specifically, the "J" of José Ruiz had been falsified to the "P" of Pablo.

By Rómulo A. Tenés

What did Concepción Ruiz Walter, Claude, and Paloma Ruiz Gilot know?

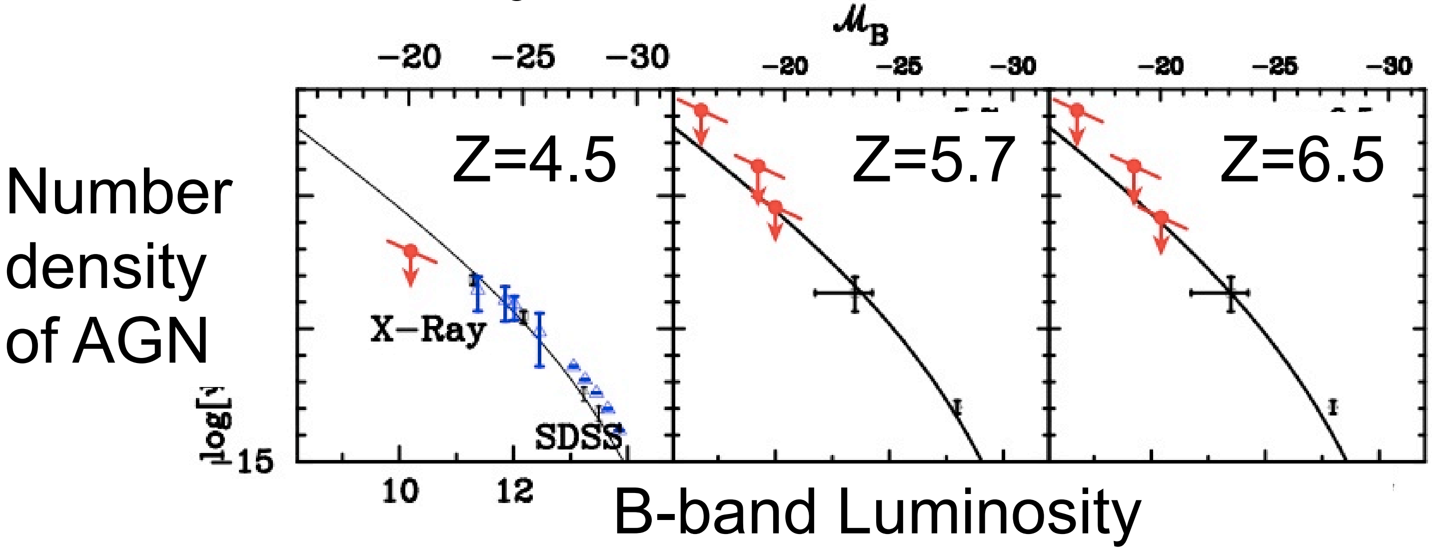
Palau tried to buy it for just 300.000 dollars when its real value is 60 million dollars

In Freudian terms: Picasso has killed his father That is the truth, without anger, although it hurts.

Is it?

Constraints on the Faint End of the Quasar LF

- Empirically for z~4.5 AGN (Fan et al, 2001) $\frac{L_{Ly\alpha}}{L_B} = 0.7^{+1.2}_{-0.4} \quad (2\sigma - error)$
- Narrowband widefield surveys for high-z Lya emitting galaxies on performed on 8 m telescopes (e.g. Hu et al.; Rhoads et al; Taniguchi et al.).
- No AGN have been found. Put upper limit on number density of AGN.
- *Results*: Constrain QLF at M_B > -20 ! Faintest constraints to date. Some evidence for a flattening of the QLF at z=4.5.



Conclusions

- The spectral shape of the Lya line in 'LAB's can reveal the mechanism powering the emission, as well as the gas dynamics through which the Lya is scattering.
  - E.g. scattering of Lyman alpha through optically thick collapsing/expanding gas results in a blueshift/redshift.
- Existing Lya surveys could be used to constrain the number density of quasars at $z>4.5$ that are 7-12 magnitudes fainter than those discovered in the SDSS.
  - Faintest constraints to date
  - Some indication for a flattening B-band Quasar Luminosity Function at $z=4.5$ at low luminosities.