'Probing AGN and their Surroundings with Ly-a'

Mark Dijkstra (University of Melbourne) Collaborators: S. Wyithe, Z. Haiman & M.Spaans

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?



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"

VOL CLIV No. 52.971

Supplying the loss of the Hard Server Trans-

HEW YORK SATURDAY, OCTORER 22, 2004

ONE DOLLAR

Late Edition

Lyman Alpha: The New Black?

The New Hork Times

Rigorous Caligraphy Report registered before the Central Court of Instruction of Nedrid certifies that Picaseo had taken over by decelulul means all the works whose author was undoubtely his father, José Ruiz Blasco in the period betwen 1892-1807 (785 Picasso's take work). Specifically, the "J" of José Ruiz had bee in falsified to the "P" of Peblo.

By Rómulo A. Tends

Valctice, in his Distionanter: Philosophique.

said "Whith A report that is required to allow that the surface of a sphere is equal to that of the guarantee of the surface of flavoron mand to central point..." and yet costs it not have to be agreed, for example, in perifying the while of Piccoso's face work between 1001 and 1007 which was understedy made by riskshin, José Pala Baseo? Or the centenery centrals, 1800 "Dana en Eden. Concert' as a face of the face of the face of the face of the second of the face of the fa

In insuling additioning is, contrary to the most characterization controls, controls (15 Per Host) characterization monosciente anti-conclusi-val beant's di uncomparisati atti mantanta, sciance e not used in cartifying Prevents work.

A polesque source of this is Josep. Fatoui-Sohn, "hogopher", whose only result raidous in biology "Desause to his our bene-hi, A during housing and to hav one he pre-tions in later, expecting the polytoph to specie he is soul, "the

What did Concepción Ruiz Welter, Claude, and Paloma Ruiz

Glint know?

Bet, surplies Consequent, Charles, and Potonia Pale-Pleason, defined the exotinies during, and grotosquark insiderial system of configure the west of their father. To their own barrell, and with construction results theysurely of false works, and the subsequent lass closed?

Would uninvestorin art allow such an individeor to order his company enhanced with the management, or as an instructor for his chil-

Exercit Why then does, he acceptition in his inverse Why then does, he acceptition in his inverse. trents is ad7 why does he not demand norem, righted, scientific centrates? Tame en Eten Concert, traitig verai-red vicit in the fact of the geometry system of certifying its viej sty.

Palau tried to buy it for just 300,000

dollars when its real value is ED million dollars.

Going wass to Plaatee, Toppeors that the Indiacove document all balant shire, dailed 30h Jano 1891, wax an allowed object synta-father. Livewige the second objects, carbofather Lincoles has assore obtaining, times the Oddeer SNE, John Holandson in his back A life of Plantos, waitre it page sto declasies to the former no less than two pages, pointing 0.1 and genitying a toco-mented historical. arted felsehood. In the end of the general



"Durne en Eden Concert", all an canves, 60,69 cm. Picerso 1980, Signed in the top right-land correr, with selectific perfiberant issued by Contex Restern Stater from the State radius for All Research, Pick in Correlation Coglessific, Processe Staters, from Lawyre and the contrast is evening, and by Neterina and Interd of Praceso, Prane de Casargelo, Prane Data angel in the Deckmany that "Als over Champelia the based study on Praceso by Sciencel scar-bolic written details in the based of others of constraints from 1992 Analysis to 32 Neg, appending on the sub-types is the tables of the actist making. Praceso ansisted the home-set the sub-types is 323" and "523".

In Freudian terms:

That is the truth, without

anger, although it hurts.

andy, which is writed in a Collegepte Separt and 27th December (2020 by the separt collegepters Mr. Ross Torrans Deby and Mo. Side Torrago Goard, Fort As in the second domented in the basis Plaster WearRig Palas, Public, page 25, we see the following terrors: ", respecting terri-Year Plasticus Person pendiation to copy in Sald promote, a grade he headfully expects to meet hom that fluctuicas Person who rang sacodona, Spain Cod land sale for many years." The shild, Pablo, was fourteen years old Picasso has killed his father

and, as perified, he was unable to a ther write ir print, Test is the list?: wellset experi-alizing it must. Even up and righed, as well by JeroPausBases. Provide Infer. In the careful and matical writing of righ fer-time. This report contains 296 pages and certi-

hey that Pleasan had taken over by decellful Fey this Process had been care by develop investment if the works of ones without want concelledly the latter. Josh Phase States in the provide indicates the Phase Process of Spacification for the "The States" had the class to the "The Phase Indicates a Workshop and Activities and works on Phase Face Process, this is not in case works with the "wand being manufacture in 1970 to Provide The Concess States Intelligence Stat Barcelona City Council: a detailion which contained all the works of upset Raiz holwers. contention at the vector of able is all network (502-1597). White did Concession Hub White, Clayda, and Paloma Rule Dide forwi? The elevent of ence, we of the vector of Vector.

where not for the fact that the respective was considered to register the imputations before the Central Courts of Instruction of Wastie on

Without endoted by the developments of an in-

NI College

軍

氟

....

-

0.007

dent

4 1.

Venue en Edus Conces' sub-baur Reportes ant relevable surs after Pictura's pignents en 10th June 2005 and 15th July 2004 and support by Law the expandice of the web str both strinin, full-strand sort. This separation is computers by Low. As a result, the successors of Picasio E02: Loue while 'Allow some and Presslers into

SIK Zurich

lators

Probe 4

As a relative the independent of industries relations of their regions regarding the verte-of their graneficities, José Sale Blasse. The other Canade of the Prese Massimum of Martik, Anonia Solence, concerning the se-sent solence for webing. Presents solence. to join offers speaking states of the advied MCTI-ING. Nothing can be done or said

which use rearing an or done of and which acreting the organi importance of appying protocological analysis when certi-ying and maintiguing works plant, and to also arised that "Dama en Telen." lensity difference accepted. Some service so de-sources, discontenessing? However, we see what has been done by

Concert' satisfield by Fouries, 1993, will not be concerted to the model or medieval practices, for helt own barrelit, as the curves has be must operate scientific generation. From the Setue Institute for Art Research of Lauranne. and Barbalona University. Any possible Mighton derived har this

publication will be her died by the known of other on in La Pachelle, France

Rémeto-Antonio Tanés, Spain, art newsche ard anbi, 5 Tw adhe of tw back Fraud Pleases. He more to Dourt have Pendad Pleases. He have to Deart Graysh New Carpices Debilish for provem frank on the Stational L have of Spith, Lo Verganetic, III 2014, the artificient the extranal of a Verg parking, all fielded for Data da Rappers from the Parket Manager, news Black by TRUTEH and EH+ World Prace Agrees 52 of 1984. The artification of the Internet Science (2014) of Science Art stations and the Hamiltonian (2014) of Science Art stations and the Hamiltonian (2014) of Science Art stations and and Hamiltonian (2014) of Science Art stations and and Hamiltonian (2014) of Science Art Sulley Jerry win Hairy Moore, Childa, Tagina, Mirz, Rateal Alberti, Danogar, Cistos, Serva, and sher ferrora criste in La Vanguarda, dated 3-03-1900, he public ter a study on Pleasan's planta and of terfaces in the Galernica, which was painad by Ricardo Marin, Naswo Muricio, Vietnia, Reserviena

CONSIGN: HORINO A. TODOS Tel: +04 80 4367700 one Multilation Total tol of Children, alticu-India Planas. The Viol And, not the defined in Profitation. www.picessocontropicesso.com

ls it?

Constraints on the Faint End of the Quasar LF

- Empirically for z~4.5 AGN (Fan et al, 2001) $\frac{L_{Ly\alpha}}{L_{r}} = 0.7^{+1.2}_{-0.4}$ (2 σ 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.



'Probing AGN and their Surroundings with Ly-a'

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.