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Jobs Adverts - Meetings Adverts - Special Announcements

From the Editor

The Active Galaxies Newsletter is produced monthly. The deadline for contributions is the last day of the month. The Latex macros for submitting abstracts and dissertation abstracts are appended to each issue of the newsletter and are also available on the web page.

As always as editor of the newsletter I am very interested to hear any suggestions or feedback regarding the newsletter. So do not hesitate in emailing me your suggestions.

Many thanks for your continued subscription.

Melanie Gendre

Abstracts of recently accepted papers

The Size, Structure and Ionization of the Broad Line Region in NGC 3227

Nick Devereux[1]

[1] Embry-Riddle Aeronautical University, Prescott, AZ

Hubble Space Telescope (*HST*) spectroscopy of the Seyfert 1.5 galaxy, NGC 3227, confirms previous reports that the broad Hα emission line flux is time variable, decreasing by a modest $\sim 13\%$ between 1999 and 2000 in response to a corresponding $\sim 40\%$ decrease in the underlying continuum. Modeling the gas distribution responsible for the broad Hα, Hβ and Hγ emission lines favors a spherically symmetric inflow as opposed to a thin disk. Adopting a central black hole mass of 7.6×10^6 M$_\odot$, determined from prior reverberation mapping, leads to the following dimensions for the size of the region emitting the broad Hα line; an outer radius ~ 60 l.d and an inner radius ~ 4 l.d. Thus, the previously determined reverberation size for the broad line region (BLR) consistently coincides with the inner radius of a much *larger* volume of ionized gas. However, the *perceived* size of the BLR is an illusion, a consequence of the fact that the emitting region is ionization bounded at the outer radius and diminished by Doppler broadening at the inner radius. The actual dimensions of the inflow remain to be determined. Nevertheless, the steady state mass inflow rate is estimated to be $\sim 1 \times 10^{-2}$ M$_\odot$ yr^{-1} which is sufficient to explain the X-ray luminosity of the AGN in terms of radiatively inefficient accretion. Collectively, the results challenge many preconceived notions concerning the nature of BLRs in active galactic nuclei.

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E-mail contact: devereux@erau.edu,
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CLaSPS: knowledge extraction from astronomical datasets

R. D'Abrusco[1], G. Fabbiano[1], G. Djorgovski[2], C. Donalek[2], O. Laurino[1], G. Longo[3]

[1] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138
[2] Department of Astronomy, California Institute of Technology, MC 249-17 1200 East California Blvd, Pasadena CA 91125
[3] Dipartimento di Scienze Fisiche, Universitá di Napoli "Federico II", Via Cinthia I-80126, Naples, Italy

In this paper we present the Clustering-Labels-Score Patterns Spotter (CLaSPS), a new methodology for the determination of correlations among astronomical observables in complex datasets, based on the application of distinct unsupervised clustering techniques. The novelty in CLaSPS is the criterion used for the selection of the optimal clusterings, based on a quantitative measure of the degree of correlation between the cluster memberships and the distribution of a set of observables, the *labels*, not employed for the clustering.CLaSPS has been primarily developed as a tool to tackle the challenging complexity of the multi-wavelength complex and massive astronomical datasets produced by the federation of the data from modern automated astronomical facilities. In this paper we discuss the applications of CLaSPS to two simple astronomical datasets, both composed of extragalactic sources with photometric observations at different wavelengths from large area surveys. The first dataset, CSC+, is composed of optical quasarsspectroscopically selected in the SDSS data, observed in the X-rays by Chandra and with multi-wavelength observations in the near-infrared, optical and ultraviolet spectral intervals. One of the results of the application of CLaSPS to the CSC+ is the re-identification of a well-known correlation between the $\alpha_{\rm OX}$ parameter and the near ultraviolet color, in a subset of CSC+ sources with relatively small values of the near-ultraviolet colors.The other dataset consists of a sample of blazars for which photometric observations in the optical, mid and near infrared are available, complemented for a subset of the sources, by Fermi γ-ray data. The main results of the application of CLaSPS to such datasets have been the discovery of a strong correlation between the multi-wavelength color distribution of blazars and their optical spectral classification in BL Lacs and Flat Spectrum Radio Quasars (FSRQs)and a peculiar pattern followed by blazars in the WISE mid-infrared colors space. This pattern and its physical interpretation have been discussed in details in other papers by one of the authors.

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E-mail contact: dabrusco@head.cfa.harvard.edu,
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The Importance of Broad Emission-Line Widths in Single Epoch Black Hole Mass Estimates

R.J. Assef[1], S. Frank[2,3], C.J. Grier[2], C.S. Kochanek[2,4], K.D. Denney[5] and B.M. Peterson[2,4]

[1] NASA Postdoctoral Program Fellow at the Jet Propulsion Laboratory, California Institute of Technology, MS 169-530, 4800 Oak Grove Drive, Pasadena, 91109, USA
[2] Department of Astronomy, The Ohio State University, 140 W. 18th Ave., Columbus, OH 43210, USA
[3] Observatoire Astronomique de Marseille-Provence, Laboratoire d'Astrophysique de Marseille/LAM, Pôle de l'Étoile Site de Château-Gombert 38, rue Frédéric Joliot-Curie 13388 Marseille, France
[4] The Center for Cosmology and Astroparticle Physics, The Ohio State University, 191 West Woodruff Avenue, Columbus, OH 43210, USA
[5] Marie Curie Fellow at the Dark Cosmology Centre, Niels Bohr Institute, University of Copenhagen, Juliane Maries Vej 30, 2100 Copenhagen, Denmark

Estimates of the mass of super-massive black holes (BHs) in distant active galactic nuclei (AGNs) can be obtained efficiently only through single-epoch spectra, using a combination of their broad emission-line widths and continuum luminosities. Yet the reliability and accuracy of the method, and the resulting mass estimates, $M_{\rm BH}$, remain uncertain. A recent study by Croom using a sample of SDSS, 2QZ and 2SLAQ quasars suggests that line widths contribute little information about the BH mass in these single-epoch estimates and can be replaced by a constant value without significant loss of accuracy. In this Letter, we use a sample of nearby reverberation-mapped AGNs to show that this conclusion is not universally applicable. We use the bulge luminosity ($L_{\rm Bulge}$) of these local objects to test how well the known $M_{\rm BH} - L_{\rm Bulge}$ correlation is recovered when using randomly assigned line widths instead of the measured ones to estimate $M_{\rm BH}$. We find that line widths provide significant information about $M_{\rm BH}$, and that for this sample, the line width information is just as significant as that provided by the continuum luminosities. We discuss the effects of observational biases upon the analysis of Croom and suggest that the results can probably be explained as a bias of flux-limited, shallow quasar samples.

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E-mail contact: roberto.j.assef@jpl.nasa.gov
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preprint available at arXiv:1203.2617

Activity restart – a key to explaining the morphology of J1211+743

Andrzej Marecki[1]

[1] Toruń Centre for Astronomy, N. Copernicus Univ., Toruń, Poland

J1211+743 is a giant radio galaxy with a one-sided jet and two asymmetric lobes, one of which is of Fanaroff-Riley (FR) type II with a hotspot and the other is a diffuse relic devoid of a hotspot. The jet points towards the latter lobe, which is difficult to explain in a standard way within the double-lobed radio source paradigm. Here, I propose to assume that the nucleus of J1211+743 has undergone a re-ignition of activity and its lobes, presumably both originally of FR II type, represent an earlier active phase, while the jet represents the current one. The asymmetry of the lobes is a consequence of the orientation of the source combined with an activity switch-off that occurred between two active periods. The relic lobe is on the near side with regard to the observer, whereas the radiation from the far-side lobe arrives significantly later owing to its longer distance to the observer. The far-side lobe is thus perceived to have not yet decayed. On the other hand, the jet behaves in a standard way, i.e. its projected orientation reflects the near side of the source. Hence, we are able to explain why the location of the relic lobe correlates with the direction of the jet.

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E-mail contact: amr@astro.uni.torun.pl,
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The Mean Star Formation Rate of X-ray selected Active Galaxies and its Evolution from $z \sim 2.5$: Results from PEP-Herschel

David J. Rosario[1], **P. Santini**[2], **D. Lutz**[1], **L. Shao**[1], **R. Maiolino**[2], **D. M. Alexander**[3], **B. Altieri**[4], **P. Andreani**[5,6], **H. Aussel**[7], **F. E. Bauer**[8,9], **S. Berta**[1], **A. Bongiovanni**[9,10], **W. N. Brandt**[11], **M. Brusa**[1], **J. Cepa**[10,12], **A. Cimatti**[13], **T. J. Cox**[14], **E. Daddi**[7], **D. Elbaz**[7], **A. Fontana**[2], **N. M. Förster Schreiber**[1], **R. Genzel**[1], **A. Grazian**[2], **E. Le Floch**[7], **B. Magnelli**[1], **V. Mainieri**[5], **H. Netzer**[15], **R. Nordon**[1], **I. Pérez Garcia**[10,12], **A. Poglitsch**[1], **P. Popesso**[1], **F. Pozzi**[12], **L. Riguccini**[7], **G. Rodighiero**[16], **M. Salvato**[17,1], **M. Sanchez-Portal**[4], **E. Sturm**[1], **L. J. Tacconi**[1], **I. Valtchanov**[4] **& S. Wuyts**[1]

[1] Max-Planck-Institut für Extraterrestrische Physik (MPE), Postfach 1312, 85741 Garching, Germany.
[2] INAF - Osservatorio Astronomico di Roma, via di Frascati 33, 00040 Monte Porzio Catone, Italy.
[3] Department of Physics, Durham University, South Road, Durham, DH1 3LE, UK.
[4] European Space Astronomy Centre, Villafranca del Castillo, Spain.
[5] ESO, Karl-Schwarzschild-Str. 2, D-85748 Garching, Germany.
[6] INAF-Osservatorio Astronomico di Trieste, via Tiepolo 11, 34131 Trieste, Italy.
[7] Laboratoire AIM, CEA/DSM-CNRS-Université Paris Diderot, IRFU/Service d'Astrophysique, Bât.709, CEA-Saclay, 91191 Gif-sur-Yvette Cedex, France.
[8] Pontificia Universidad Católica de Chile, Departamento de Astronomía y Astrofísica, Casilla 306, Santiago 22, Chile.
[9] Space Science Institute, 4750 Walnut Street, Suite 205, Boulder, CO 80301, USA
[10] Instituto de Astrofísica de Canarias, 38205 La Laguna, Spain.
[11] Department of Astronomy and Astrophysics, 525 Davey Lab, Pennsylvania State University, University Park, PA 16802, USA.
[12] Departamento de Astrofísica, Universidad de La Laguna, Spain.
[13] Dipartimento di Astronomia, Università di Bologna, Via Ranzani 1, 40127 Bologna, Italy.
[14] Carnegie Observatories, 813 Santa Barbara Street, Pasadena, CA, 91101, USA
[15] School of Physics and Astronomy, Tel Aviv University, 69978 Tel Aviv, Israel.
[16] Dipartimento di Astronomia, Università di Padova, Vicolo dell'Osservatorio 3, 35122 Padova, Italy.
[17] IPP-Max-Planck-Institut für Plasmaphysik, Boltzmannstrasse 2, D-85748, Garching, Germany.

We study relationships between star-formation rate (SFR) and the accretion luminosity and nuclear obscuration of X-ray selected Active Galactic Nuclei (AGNs) using a combination of deep far-infrared (FIR) and X-ray data in three key extragalactic survey fields (GOODS-South, GOODS-North and COSMOS), as part of the PACS Evolutionary Probe (PEP) program. The use of three fields with differing areas and depths enables us to explore trends between the global FIR luminosity of the AGN hosts

and the luminosity of the active nucleus across 4.5 orders of magnitude in AGN luminosity (L_{AGN}) and spanning redshifts from the Local Universe to $z = 2.5$. Using imaging from the Herschel/PACS instrument in 2-3 bands, we combine FIR detections and stacks of undetected objects to arrive at mean fluxes for subsamples in bins of redshift and X-ray luminosity. We constrain the importance of AGN-heated dust emission in the FIR and confirm that the majority of the FIR emission of AGNs is produced by cold dust heated by star-formation in their host galaxies. We uncover characteristic trends between the mean FIR luminosity (L_{60}) and accretion luminosity of AGNs, which depend both on L_{AGN} and redshift. At low AGN luminosities, accretion and SFR are uncorrelated at all redshifts, consistent with a scenario where most low-luminosity AGNs are primarily fueled by secular processes in their host galaxies. At high AGN luminosities, a significant correlation is observed between L_{60} and L_{AGN}, but only among AGNs at low and moderate redshifts ($z < 1$). We interpret this observation as a sign of the increasing importance of major-mergers in driving both the growth of super-massive black holes (SMBHs) and global star-formation in their hosts at high AGN luminosities. We also find evidence that the enhancement of SFR in luminous AGNs weakens or disappears at high redshifts ($z > 1$) suggesting that the role of mergers is less important at these epochs. At all redshifts, we find essentially no relationship between L_{60} and nuclear obscuration across five orders of magnitude in obscuring Hydrogen column density (N_H), suggesting that various mechanisms are likely to be responsible for obscuring X-rays in active galaxies. We discuss a broad scenario which can account for these trends: one in which two different modes of AGN fueling operate in the low- and high-luminosity regimes of SMBH accretion. We postulate that the dominant mode of accretion among high-luminosity AGNs evolves with redshift. Our study, as well as a body of evidence from the literature and emerging knowledge about the properties of high redshift galaxies, supports this scenario.

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E-mail contact: rosario@mpe.mpg.de,
preprint available at arXiv:1203.6069

HS 1700+6416: the first high redshift unlensed NAL-QSO showing variable high velocity outflows

G. Lanzuisi[1,2]; M. Giustini[1,3]; M. Cappi[1]; M. Dadina[1]; G. Malaguti[1]; C. Vignali[4,5]; G. Chartas[6]

[1] INAF - Istituto di Astrofisica Spaziale e Fisica cosmica di Bologna, via Gobetti 101, 40129 Bologna, Italy
[2]Max-Planck-Institut für extraterrestrische Physik, Giessenbachstrasse 85748 Garching, Germany
[3]Center for Space Science and Technology, University of Maryland, Baltimore County, 1000 Hilltop Circle, Baltimore MD 21155, USA
[4]Dipartimento di Astronomia, Universit degli Studi di Bologna, via Ranzani 1, 40127 Bologna, Italy
[5]INAF - Osservatorio Astronomico di Bologna, via Ranzani 1, 40127 Bologna, Italy
[6]Department of Physics and Astronomy, College of Charleston, Charleston, SC 29424, USA

We present a detailed analysis of the X-ray emission of HS 1700+6416, a high-redshift ($z = 2.7348$) luminous quasar classified as a narrow absorption line (NAL) quasar on the basis of its SDSS spectrum.The source has been observed nine times by *Chandra* and once by XMM-*Newton* from 2000 to 2007.Long-term variability is clearly detected between the observations in the 2-10 keV flux where it varies by a factor of three ($\sim 3 - 9 \times 10^{-14}$ erg s^{-1} cm^{-2}), and in the amount of neutral absorption ($N_H < 10^{22}$ cm^{-2} in 2000 and 2002 and $N_H = 4.4 \pm 1.2 \times 10^{22}$ cm^{-2} in 2007).Most interestingly, one broad absorption feature is clearly detected at 10.3 ± 0.7 keV (rest frame) in the 2000 *Chandra* observation, while two similar features at 8.9 ± 0.4 and at 12.5 ± 0.7 keV are visible when the eight contiguous *Chandra* observations of 2007 are stacked together. In the XMM-*Newton* observation of 2002, which is strongly affected by background flares, there is a hint of a similar feature at 8.0 ± 0.3 keV.We interpreted these features as absorption lines from a high-velocity highly ionized (i.e. Fe XXV, FeXXVI) outflowing gas.In this scenario, the outflow velocities inferred are in the range $v = 0.12 - 0.59c$.To reproduce the observed features, the gas must have a high column density ($N_H > 3 \times 10^{23}$ cm^{-2}),high ionization parameter ($\log\xi > 3.3$ erg cm s^{-1}) and a wide range of velocities ($\Delta V \sim 10^4$ km s^{-1}).This absorption line quasar is the fourth high-z quasar that displays X-ray signatures of variable high-velocity outflows, and among these, it is the only one that is not lensed.A rough estimate of the minimum kinetic energy carried by the wind of up to 18% L_{bol}, based on a biconical geometry of the wind, implies that the amount of energy injected into the outflow environment is large enough to produce effective mechanical feedback.

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E-mail contact: lanzuisi@iasfbo.inaf.it
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Heavily Obscured Quasar Host Galaxies at $z \sim 2$ are Disks, Not Major Mergers[1]

Kevin Schawinski[2,3,6], Brooke D. Simmons[3,4], C. Megan Urry[2,3,4], Ezequiel Treister[5] and Eilat Glikman[3,4,7]

[1]This work is based on observations taken by the CANDELS Multi-Cycle Treasury Program with the NASA/ESA HST, which is operated by the
Association of Universities for Research in Astronomy, Inc., under NASA contract NAS5-26555.
[2]Department of Physics, Yale University, New Haven, CT 06520, U.S.A.
[3]Yale Center for Astronomy and Astrophysics, Yale University, P.O. Box 208121, New Haven, CT 06520, U.S.A.
[4]Department of Astronomy, Yale University, New Haven, CT 06520, U.S.A.
[5]Universidad de Concepción, Departamento de Astronomía, Casilla 160-C, Concepción, Chile
[6]Einstein Fellow
[7]NSF Fellow

We explore the nature of heavily obscured quasar host galaxies at $z \sim 2$ using deep *Hubble Space Telescope* WFC3/IR imaging of 28 Dust Obscured Galaxies (DOGs) to investigate the role of major mergers in driving black hole growth. The high levels of obscuration of the quasars selected for this study act as a natural coronagraph, blocking the quasar light and allowing a clear view of the underlying host galaxy. The sample of heavily obscured quasars represents a significant fraction of the cosmic mass accretion on supermassive black holes as the quasars have inferred bolometric luminosities around the break of the quasar luminosity function. We find that only a small fraction (4%, at most 11-25%) of the quasar host galaxies are major mergers. Fits to their surface brightness profiles indicate that 90% of the host galaxies are either disk dominated, or have a significant disk. This disk-like host morphology, and the corresponding weakness of bulges, is evidence against major mergers and suggests that secular processes are the predominant driver of massive black hole growth. Finally, we suggest that the co-incidence of mergers and AGN activity is luminosity dependent, with only the most luminous quasars being triggered mostly by major mergers.

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E-mail contact: agnews@manchester.ac.uk,
preprint available at arXiv:1206.4063

Two-dimensional mapping of young stars in the inner 180 pc of NGC 1068: correlation with molecular gas ring and stellar kinematics

Thaisa Storchi-Bergmann[1], Rogemar A. Riffel[2], Rogério Riffel[1], Marlon R. Diniz[2], Tibério Borges Vale[1,3] and Peter J. McGregor[4]

[1] Instituto de Física, Universidade Federal do Rio Grande do Sul, IF, CP 15051, 91501-970, Porto Alegre, RS, Brazil
[2] Departamento de Física, Centro de Ciências Naturais e Exatas, Universidade Federal de Santa Maria, 97105-900, Santa Maria, RS, Brazil
[3] Instituto do Noroeste Fluminense de Ensino Superior, Universidade Federal Fluminense, 28470-000, Santo Antônio de Pádua, RJ, Brazil
[4] Research School of Astronomy and Astrophysics, Australian National University, Cotter Road, Weston Creek, ACT 2611, Australia

We report the first two-dimensional mapping of the stellar population and non-stellar continua within the inner 180 pc (radius) of NGC 1068 at a spatial resolution of 8 pc, using integral field spectroscopy in the near-infrared. We have applied the technique of spectral synthesis to data obtained with the instrument NIFS and the adaptive optics module ALTAIR at the Gemini North Telescope. Two episodes of recent star formation are found to dominate the stellar population contribution: the first occurred 300 Myr ago, extending over most of the nuclear region; the second occurred just 30 Myr ago, in a ring-like structure at ≈ 100 pc from the nucleus, where it is coincident with an expanding ring of H_2 emission. Inside the ring, where a decrease in the stellar velocity dispersion is observed, the stellar population is dominated by the 300 Myr age component. In the inner 35 pc, the oldest age component (age ≥ 2 Gyr) dominates the mass, while the flux is dominated by black-body components with temperatures in the range $700 \leq T \leq 800$ K which we attribute to the dusty torus. We also find some contribution from black-body and power-law components beyond the nucleus which we attribute to dust emission and scattered light.

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E-mail contact: thaisa@ufrgs.br,
preprint available at arXiv:1206.4014