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Accepted Abstracts - Submitted Abstracts - Thesis Abstracts
Jobs Adverts - Meetings Adverts - Special Announcements

From the Editor

Welcome to all the new subscribers, and thanks to everyone who contributed to this issue of the Active Galaxies Newsletter. This newsletter is intended to disseminate paper abstracts, meeting announcements, job adverts and other information which may be of interest to the active galaxies community. It is produced monthly and, whilst the deadline for contributions is the last day of the month, contributions may be submitted at any time.

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. Please note that the editor may reject submissions which do not use the template. As always, any suggestions or feedback regarding the newsletter are welcome.

Thanks for your continued subscription.

Megan Argo

Abstracts of recently accepted papers

AGN feedback in action: a new powerful wind in 1SXPS J050819.8+172149?

L. Ballo[1], P. Severgnini[1], V. Braito[2,3], S. Campana[2], R. Della Ceca[1], A. Moretti[1], C. Vignali[4,5]

[1] Osservatorio Astronomico di Brera (INAF), via Brera 28, I-20121, Milano (Italy)
[2] Osservatorio Astronomico di Brera (INAF), via E. Bianchi 46, I-23807 Merate, LC (Italy)
[3] Department of Physics, University of Maryland, Baltimore County, Baltimore, MD 21250 (USA)
[4] Dipartimento di Fisica e Astronomia, Università degli Studi di Bologna, viale Berti Pichat 6/2, I-40127, Bologna (Italy)
[5] Osservatorio Astronomico di Bologna (INAF), Via Ranzani 1, I-40127, Bologna (Italy)

Galaxy merging is widely accepted to be a key driving factor in galaxy formation and evolution, while the feedback from actively accreting nuclei is thought to regulate the black hole-bulge coevolution and the star formation process. In this context, we focused on 1SXPS J050819.8+172149, a local ($z = 0.0175$) Seyfert 1.9 galaxy ($L_{\rm bol} \sim 4 \times 10^{43}$ ergs s^{-1}). The source belongs to an infrared-luminous interacting pair of galaxies, characterized by a luminosity for the whole system (due to the combination of star formation and accretion) of $\log(L_{\rm IR}/L_{\odot}) = 11.2$. We present here the first detailed description of the $0.3 - 10$ keV spectrum of 1SXPS J050819.8+172149, monitored by *Swift* with 9 pointings performed in less than 1 month. The X-ray emission of 1SXPS J050819.8+172149 is analysed by combining all the *Swift* pointings, for a total of ~ 72 ks XRT net exposure. The averaged *Swift*-BAT spectrum from the 70-month survey is also analysed. The slope of the continuum is $\Gamma \sim 1.8$, with an intrinsic column density of $\sim 2.4 \times 10^{22}$ cm^{-2}, and a de-absorbed luminosity of $\sim 4 \times 10^{42}$ ergs s^{-1} in the $2 - 10$ keV band. Our observations provide a tentative (2.1σ) detection of a blue-shifted Fe XXVI absorption line (rest-frame $E \sim 7.8$ keV), thus suggesting the discovery for a new candidate powerful wind in 1SXPS J050819.8+172149. The physical properties of the outflow cannot be firmly assessed, due to the low statistics of the spectrum and to the observed energy of the line, too close to the higher boundary of the *Swift*-XRT bandpass. However, our analysis suggests that, if the detection is confirmed, the line could be associated with a high-velocity ($v_{\rm out} \sim 0.1c$) outflow most likely launched within $80\, r_{\rm S}$. To our knowledge this is the first detection of a previously unknown ultrafast wind with *Swift*. The high column density suggested by the observed equivalent width of the line (EW~ -230 eV, although with large uncertainties), would imply a kinetic output strong enough to be comparable to the AGN bolometric luminosity.

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E-mail contact: lucia.ballo@brera.inaf.it (LB)
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A simplified view of blazars: the neutrino background

P. Padovani[1], **M. Petropoulou**[2], **P. Giommi**[3], **E. Resconi**[4]

[1] European Southern Observatory, Karl-Schwarzschild-Str. 2, D-85748 Garching bei München, Germany
[2] Department of Physics and Astronomy, Purdue University, 525 Northwestern Avenue, West Lafayette, IN 47907, USA
[3] ASI Science Data Center, via del Politecnico s.n.c., I-00133 Roma Italy
[4] Technische Universität München, Physik-Department, James-Frank-Str. 1, D-85748 Garching bei München, Germany

Blazars have been suggested as possible neutrino sources long before the recent IceCube discovery of high-energy neutrinos. We re-examine this possibility within a new framework built upon the *blazar simplified view* and a self-consistent modelling of neutrino emission from individual sources. The former is a recently proposed paradigm that explains the diverse statistical properties of blazars adopting minimal assumptions on blazars' physical and geometrical properties. This view, tested through detailed Monte Carlo simulations, reproduces the main features of radio, X-ray, and γ-ray blazar surveys and also the extra-galactic γ-ray background at energies > 10 GeV. Here we add a hadronic component for neutrino production and estimate the neutrino emission from BL Lacs as a class, "calibrated" by fitting the spectral energy distributions of a preselected sample of BL Lac objects and their (putative) neutrino spectra. Unlike all previous papers on this topic, the neutrino background is then derived by summing up at a given energy the fluxes of each BL Lac in the simulation, all characterised by their own redshift, synchrotron peak energy, γ-ray flux, etc. Our main result is that BL Lacs as a class can explain the neutrino background seen by IceCube above ~ 0.5 PeV while they only contribute $\sim 10\%$ at lower energies, leaving room to some other population(s)/physical mechanism. However, one cannot also exclude the possibility that individual BL Lacs still make a contribution at the $\approx 20\%$ level to the IceCube low-energy events. Our scenario makes specific predictions testable in the next few years.

MNRAS, in press

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Near-infrared polarimetric adaptive optics observations of NGC 1068: a torus created by a hydromagnetic outflow wind

E. Lopez-Rodriguez[1,2], **C. Packham**[1,3], **T. J. Jones**[4], **R. Nikutta**[5], **L. McMaster**[1], **R. E. Mason**[6], **M. Elvis**[7], **D. Shenoy**[4], **A. Alonso-Herrero**[8], **E. Ramírez**[9] **O. González Martín**[10,11,12], **S. F. Hönig**[13], **N. A. Levenson**[14], **C. Ramos Almeida**[11,12], **E. Perlman**[15]

[1]Department of Physics & Astronomy, University of Texas at San Antonio, One UTSA Circle, San Antonio, TX 78249, USA
[2]Department of Astronomy, University of Texas at Austin, 1 University Station C1400, Austin, TX 78712, USA
[3]National Astronomical Observatory of Japan, Mitaka, Tokyo 181-8588, Japan
[4]Minnesota Institute for Astrophysics, University of Minnesota, 116 Church Street SE, Minneapolis, MN 55455, USA
[5]Instituto de Astrofísica, Facultad de Física, Pontificia Universidad Católica de Chile, 306, Santiago 22, Chile
[6]Gemini Observatory, Northern Operations Center, 670 N. A'ohoku Place, Hilo, HI 96720, USA
[7]Harvard Smithsonian Center for Astrophysics, 60 Garden St., Cambridge, MA 02138, USA
[8]Instituto de Física de Cantabria, CSIC-UC, E-39005 Santander, Spain
[9]Universidade de São Paulo, IAG, Rua do Matão 1226, Cidade Universitária, São Paulo 05508-900, Brazil.
[10]Centro de Radioastronomía y Astrofísica (CRyA-UNAM), 3-72 (Xangari), 8701, Morelia, Mexico
[11]Instituto de Astrofísica de Canarias, Calle Vía Láctea s/n, 38205, Tenerife, Spain
[12]Universidad de La Laguna, Departamento de Astrofísica, E-38206 La Laguna, Tenerife, Spain
[13]School of Physics & Astronomy, University of Southampton, Southampton, SO17 1BJ, United Kingdom
[14]Gemini Observatory, Casilla 603, La Serena, Chile
[15]Department of Physics and Space Sciences, Florida Institute of Technology, Melbourne, FL 32901

We present J′ and K′ imaging linear polarimetric adaptive optics observations of NGC 1068 using MMT-Pol on the 6.5-m MMT. These observations allow us to study the torus from a magnetohydrodynamical (MHD) framework. In a 0.5 arcsec (30 pc) aperture at K′, we find that polarisation arising from the passage of radiation from the inner edge of the torus through magnetically aligned dust grains in the clumps is the dominant polarisation mechanism, with an intrinsic polarisation of 7.0 $\pm$2.2 per cent. This result yields a torus magnetic field strength in the range of 4$-$82 mG through paramagnetic alignment, and 139^{+11}_{-20} mG through the Chandrasekhar-Fermi method. The measured position angle (P.A.) of polarisation at K′ is found to be similar to the P.A. of the obscuring dusty component at few parsec scales using infrared interferometric techniques. We show that the constant component of the magnetic field is responsible for the alignment of the dust grains, and aligned with the torus axis onto the plane of the sky. Adopting this magnetic field configuration and the physical conditions of the clumps in the MHD outflow wind model, we estimate a mass outflow rate $\leq$0.17 $M_\odot$ yr^{-1} at 0.4 pc from the central engine for those clumps showing near-infrared dichroism. The models used were able to create the torus in a timescale of $\geq 10^5$ yr with a rotational velocity of $\leq$1228 km s^{-1} at 0.4 pc. We conclude that the evolution, morphology and kinematics of the torus in NGC 1068 can be explained within a MHD framework.

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E-mail contact: enrique.lopezrodriguez@utsa.edu
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Multi-wavelength study of flaring activity in BL Lac object S5 0716+714 during 2015 outburst

Chandra, Sunil[1], Zhang, Haocheng[2,5], Kushwaha, Pankaj[1], Singh, K. P.[1], Bottcher, M.[3], Kaur, Navpreet[4] & Baliyan, K. S.[4]

[1] Tata Institute of Fundamental Research, Mumbai 400005, India
[2] Astrophysical Institute, Department of Physics and Astronomy, Ohio University, Athens, OH 45701, USA
[3] Centre for Space Research, North-West University, Potchefstroom 2531, South Africa
[4]Physical Research Laboratory, Ahmedabad 380009, India
[5]Theoretical Division, Los Alamos National Laboratory, Los Alamos, NM 87545, USA

We present a detailed investigation of the flaring activity observed from a BL Lac object, $S50716+714$, during its brightest ever optical state in the second half of January 2015. Observed almost simultaneously in the optical, X-rays and γ-rays, a significant change in the degree of optical polarization (PD) and a swing in the position angle (PA) of polarization were recorded. A detection in the TeV (VHE) was also reported by the MAGIC consortium during this flaring episode. Two prominent sub-flares, peaking about 5-days apart, were seen in almost all the energy bands. The multi-wavelength light-curves, spectral energy distribution (SED) and polarization are modeled using the time-dependent code developed by Zhang et al. 2014. This model assumes a straight jet threaded by large scale helical magnetic fields taking into account the light travel time effects, incorporating synchrotron flux and polarization in 3D geometry. The rapid variation in PD and rotation in PA are most likely due to re-connections happening in the emission region in the jet, as suggested by the change in the ratio of toroidal to poloidal components of magnetic field during quiescent and flaring states.

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Email contact: sunil.chandra355@gmail.com
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An Over-Massive Black Hole in a Typical Star-Forming Galaxy, 2 Billion Years After the Big Bang

Benny Trakhtenbrot[1], C. Megan Urry[2,3,4], Francesca Civano[3,5], David J. Rosario[6], Martin Elvis[5], Kevin Schawinski[1], Hyewon Suh,[5,7], Angela Bongiorno,[8], and Brooke D. Simmons[9]

[1] Department of Physics, Institute for Astronomy, ETH Zurich, Wolfgang-Pauli-Strasse 27, Zurich 8093, Switzerland
[2] Department of Physics, Yale University, PO Box 208120, New Haven, CT 06520-8120, USA
[3] Yale Center for Astronomy and Astrophysics, 260 Whitney ave., New Haven, CT 06520-8121, USA
[4] Department of Astronomy, Yale University, PO Box 208101, New Haven, CT 06520-8101, USA
[5] Harvard-Smithsonian Center for Astrophysics, 60 Garden st., Cambridge, MA 02138, USA
[6] Max-Planck-Institut für Extraterrestrische Physik (MPE), Postfach 1312, 85741 Garching, Germany
[7] Institute for Astronomy, University of Hawaii, 2680 Woodlawn Drive, Honolulu, HI 96822, USA
[8] INAF-Osservatorio Astronomico di Roma, Via di Frascati 33, I-00040 Monteporzio Catone, Rome, Italy
[9] Oxford Astrophysics, Denys Wilkinson Building, Keble Road, Oxford OX1 3RH, UK

Supermassive black holes (SMBHs) and their host galaxies are generally thought to coevolve, so that the SMBH achieves up to about 0.2 to 0.5% of the host galaxy mass in the present day. The radiation emitted from the growing SMBH is expected to affect star formation throughout the host galaxy. The relevance of this scenario at early cosmic epochs is not yet established. We present spectroscopic observations of a galaxy at redshift $z = 3.328$, which hosts an actively accreting, extremely massive BH, in its final stages of growth. The SMBH mass is roughly one-tenth the mass of the entire host galaxy, suggesting that it has grown much more efficiently than the host, contrary to models of synchronized coevolution. The host galaxy is forming stars at an intense rate, despite the presence of a SMBH-driven gas outflow.

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E-mail contact: benny.trakhtenbrot@phys.ethz.ch
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Constraining FeLoBAL outflows from absorption line variability

S. M. McGraw[1], J. C. Shields[1], F. W. Hamann[2], D. M. Capellupo[3], S. C. Gallagher[4,5] and W. N. Brandt[6,7,8]

[1] Department of Physics and Astronomy, Ohio University, Athens, Ohio 45701, USA
[2] Department of Astronomy, University of Florida, Gainesville, Florida 32611, USA
[3] Department of Astrophysics, Tel Aviv University, Tel Aviv 69978, Israel
[4] Department of Physics and Astronomy, University of Western Ontario, London, Ontario N6A 3K7, Canada
[5] Yale Center for Astronomy and Astrophysics, Department of Physics, Yale University, New Haven, Connecticut 06520, USA
[6] Department of Astronomy & Astrophysics, The Pennsylvania State University, University Park, Pennsylvania 16802, USA
[7] Institute for Gravitation and the Cosmos, The Pennsylvania State University, University Park, Pennsylvania 16802, USA
[8] Department of Physics, The Pennsylvania State University, University Park, Pennsylvania 16802, USA

FeLoBALs are a rare class of quasar outflows with low-ionization broad absorption lines (BALs), large column densities, and potentially large kinetic energies that might be important for 'feedback' to galaxy evolution. In order to probe the physical properties of these outflows, we conducted a multiple-epoch, absorption line variability study of 12 FeLoBAL quasars spanning a redshift range of $0.7 \leq z \leq 1.9$ over rest frame time-scales of $\sim$10 d to 7.6 yr. We detect absorption line variability with $\geq 8\sigma$ confidence in 3 out of the 12 sources in our sample over time-scales of $\sim$0.6 to 7.6 yr. Variable wavelength intervals are associated with ground and excited state Fe II multiplets, the Mg II $\lambda\lambda$2796, 2803 doublet, Mg I λ2852, and excited state Ni II multiplets. The observed variability along with evidence of saturation in the absorption lines favors transverse motions of gas across the line of sight (LOS) as the preferred scenario, and allows us to constrain the outflow distance from the supermassive black hole (SMBH) to be less than 69, 7, and 60 pc for our three variable sources. In combination with other studies, these results suggest that the outflowing gas in FeLoBAL quasars resides on a range of scales and includes matter within tens of parsecs of the central source.

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E-mail contact: sm324510@ohio.edu
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A new search for variability-selected active galaxies within the VST SUDARE-VOICE survey: the Chandra Deep Field South and the SERVS-SWIRE area

S. Falocco[1,2], D. De Cicco [1], M. Paolillo[1,2,3], G. Covone[1,2], G. Longo[1,2], A. Grado[4], L. Limatola[4], M. Vaccari[8,14], M.T. Botticella[4], G. Pignata[5,6], E. Cappellaro[7], D. Trevese[9], F. Vagnetti[10] , M. Salvato[11] , M. Radovich[7] , L. Hsu[11], W. N. Brandt[12,13] M. Capaccioli[1,2,4] , N. Napolitano[4] , A. Baruffolo[7] , E. Cascone[4], P. Schipani[4]

[1] Physics department, University Federico II, Via Cintia, 80126, Naples, Italy
[2] INFN Napoli, Via Cintia, 80126, Naples, Italy
[3] Agenzia Spaziale Italiana Science Data Center, Via del Politecnico snc, I-00133 Roma, Italy
[4] INAF Osservatorio Di Capodimonte Naples, Italy
[5] Departamento de Ciencias Fisicas, Universidad Andres Bello, Santiago, Chile
[6] Millennium Institute of Astrophysics, Santiago, Chile
[7] INAF- Osservatorio di Padova, Italy
[8] Astrophysics Group, Physics Department, University of the Western Cape, Private Bag X17, 7535, Bellville, Cape Town, South Africa
[9] Department of Physics University La Sapienza Roma, Italy
[10] Department of Physics University Tor Vergata Roma, Italy
[11] Max Plank Institute fur Extraterrestrische Physik, Garching, Germany
[12] Department of Astronomy and Astrophysics, The Pennsylvania State University, University Park, PA 16802, USA
[13] Institute for Gravitation and the Cosmos, The Pennsylvania State University, University Park, PA 16802, USA
[14] INAF - Istituto di Radioastronomia, via Gobetti 101, 40129 Bologna, Italy

This work makes use of the VST observations to select variable sources. We use also the IR photometry, SED fitting and X-ray information where available to confirm the nature of the AGN candidates. The IR data, available over the full survey area, allow to confirm the consistency of the variability selection with the IR color selection method, while the detection of variability may prove useful to detect the presence of an AGN in IR selected starburst galaxies.

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E-mail contact: falocco@fisica.unina.it
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A remarkably flat relationship between the average star formation rate and AGN luminosity for distant X-ray AGN

F. Stanley[1], C. M. Harrison[1], D. M. Alexander[1], A. M. Swinbank[1], J. A. Aird[1,2], A. Del Moro[1], R. C. Hickox[3], and J. R. Mullaney[4]

[1]Centre for Extragalactic Astronomy, Department of Physics, Durham University, South Road, Durham, DH1 3LE, UK
[2]Institute of Astronomy, University of Cambridge, Madingley Road, Cambridge, CB3 0HA, UK
[3]Department of Physics and Astronomy, Dartmouth College, 6127 Wilder Laboratory, Hanover, NH 03755, USA
[4]Department of Physics & Astronomy, University of Sheffield, Hounsfield Road, Sheffield, S3 7RH, UK

In this study we investigate the relationship between the star formation rate (SFR) and AGN luminosity (L_{AGN}) for ∼2000 X-ray detected AGN. The AGN span over three orders of magnitude in X-ray luminosity ($10^{42} < L_{2-8keV} < 10^{45.5}$ erg s^{-1}) and are in the redshift range $z = 0.2 - 2.5$. Using infrared (IR) photometry (8 – 500 μm), including deblended *Spitzer* and *Herschel* images and taking into account photometric upper limits, we decompose the IR spectral energy distributions into AGN and star formation components. Using the IR luminosities due to star formation, we investigate the average SFRs as a function of redshift and AGN luminosity. In agreement with previous studies, we find a strong evolution of the average SFR with redshift, tracking the observed evolution of the overall star forming galaxy population. However, we find that the relationship between the average SFR and AGN luminosity is broadly flat at all redshifts and across all the AGN luminosities investigated; in comparison to previous studies, we find less scatter amongst the average SFRs across the wide range of AGN luminosities investigated. By comparing to empirical models, we argue that the observed flat relationship is due to short timescale variations in AGN luminosity, driven by changes in the mass accretion rate, which wash out any underlying correlations between SFR and L_{AGN}. Furthermore, we show that the exact form of the predicted relationship between SFR and AGN luminosity (and its normalisation) is highly sensitive to the assumed intrinsic Eddington ratio distribution.

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Herschel-ATLAS:the connection between star formation and AGN activity in radio-loud and radio-quiet active galaxies

G. Gürkan[1], M.J. Hardcastle[1], M.J. Jarvis [2,3], D.J.B Smith [1], N. Bourne [4], L. Dunne [4,5], S. Maddox [4,5], R.J. Ivison [4,6] and J. Fritz [7]

[1] School of Physics, Astronomy and Mathematics, University of Hertfordshire, College Lane, Hatfield AL10 9AB, UK
[2] Astrophysics, Department of Physics, Keble Road, Oxford, OX1 3RH, UK
[3] Physics Department, University of the Western Cape, Private Bag X17, Bellville 7535, South Africa
[4] Institute for Astronomy, University of Edinburgh, Royal Observatory, Blackford Hill, Edinburgh, EH9 3HJ, UK
[5] Department of Physics and Astronomy, University of Canterbury, Private Bag 4800, Christchurch, 8140, New Zealand
[6] European Southern Observatory, Karl Schwarzschild Strasse 2, Garching bei Munchen, Germany
[7] Centro de Radioastronomía y Astrofísica, CRyA, UNAM, Campus Morelia, A.P. 3-72, C.P. 58089, Michoacán, Mexico

We examine the relationship between star formation and AGN activity by constructing matched samples of local ($0 < z < 0.6$) radio-loud and radio-quiet AGN in the *Herschel*-ATLAS fields. Radio-loud AGN are classified as high-excitation and low-excitation radio galaxies (HERGs, LERGs) using their emission lines and *WISE* 22-μm luminosity. AGN accretion and jet powers in these active galaxies are traced by [OIII] emission-line and radio luminosity, respectively. Star formation rates (SFRs) and specific star formation rates (SSFRs) were derived using *Herschel* 250-μm luminosity and stellar mass measurements from the SDSS−MPA-JHU catalogue. In the past, star formation studies of AGN have mostly focused on high-redshift sources to observe the thermal dust emission that peaks in the far-infrared, which limited the samples to powerful objects. However, with *Herschel* we can expand this to low redshifts. Our stacking analyses show that SFRs and SSFRs of both radio-loud and radio-quiet AGN increase with increasing AGN power but that radio-loud AGN tend to have lower SFR. Additionally, radio-quiet AGN are found to have approximately an order of magnitude higher SSFRs than radio-loud AGN for a given level of AGN power. The difference between the star formation properties of radio-loud and -quiet AGN is also seen in samples matched in stellar mass.

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E-mail contact: g.gurkan-uygun@herts.ac.uk
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Ionised outflows in $z \sim 2.4$ quasar host galaxies

S. Carniani, A. Marconi, R. Maiolino, B. Balmaverde, M. Brusa, M. Cano-Díaz, C. Cicone, A. Comastri, G. Cresci, F. Fiore, C. Feruglio, F. La Franca, V. Mainieri, F. Mannucci, T. Nagao, H. Netzer, E. Piconcelli, G. Risaliti R. Schneider, O. Shemmer

[Affiliations not provided]

Outflows driven by active galactic nuclei (AGN) are invoked by galaxy evolutionary models to quench star formation and to explain the origin of the relations observed locally between super-massive black holes and their host galaxies. We here aim to detect extended ionised outflows in luminous quasars, where we expect the highest activity both in star formation and in black-hole accretion. Currently, there are only a few studies based on spatially resolved observations of outflows at high redshift, $z > 2$.
We analysed a sample of six luminous (L > 10^{47} erg/s) quasars at $z \sim 2.4$, observed in H band using the near-IR integral field spectrometer SINFONI at the VLT. We performed a kinematic analysis of the [OIII] emission line at $\lambda = 5007\AA$.
We detect fast, spatially extended outflows in five out of six targets. [OIII] has a complex gas kinematic, with blue-shifted velocities of a few hundreds of km/s and line widths up to 1500 km/s. Using the spectroastrometric method, we infer a size of the ionised outflows of up to ∼2 kpc. The properties of the ionised outflows, mass outflow rate, momentum rate, and kinetic power, are correlated with the AGN luminosity. The increase in outflow rate with increasing AGN luminosity is consistent with the idea that a luminous AGN pushes away the surrounding gas through fast outflows that are driven by radiation pressure, which depends on the emitted luminosity.
We derive mass outflow rates of about 6-700 $M_\odot$/yr for our sample, which are lower than those observed in molecular outflows. The physical properties of ionised outflows show dependences on AGN luminosity that are similar to those of molecular outflows, but indicate that the mass of ionised gas is lower than that of molecular outflows. Alternatively, this discrepancy between ionised and molecular outflows could be explained with different acceleration mechanisms.

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E-mail contact: carniani@arcetri.astro.it, marconi@arcetri.astro.it
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Bayesian High-Redshift Quasar Classification from Optical and Mid-IR Photometry

Gordon T. Richards[1], Adam D. Myers[2], Christina M. Peters[1], Coleman M. Krawczyk[1], Greg Chase[1], Nicholas P. Ross[1], Xiaohui Fan[4], Linhua Jiang[5], Mark Lacy[6], Ian D. McGreer[4], Jonathan R. Trump[6] and Ryan N. Riegel[7]

[1] Department of Physics, Drexel University, 3141 Chestnut Street, Philadelphia, PA 19104, USA.
[2] Department of Physics and Astronomy, University of Wyoming, Laramie, WY 82071, USA.
[3] Steward Observatory, University of Arizona, Tucson, AZ 85721, USA.
[4] Kavli Institute for Astronomy and Astrophysics, Peking University, Beijing 100871, P. R. China.
[5] National Radio Astronomy Observatory, 520 Edgemont Road, Charlottesville, VA 22903, USA.
[6] Department of Astronomy and Astrophysics, 525 Davey Lab, The Pennsylvania State University, University Park, PA 16802, USA.
[7] Skytree, Inc., 1731 Technology Drive, Suite 700, San Jose, CA 95110, USA.

We identify 885,503 type 1 quasar candidates to $i \lesssim 22$ using the combination of optical and mid-IR photometry. Optical photometry is taken from the Sloan Digital Sky Survey-III: Baryon Oscillation Spectroscopic Survey (SDSS-III/BOSS), while mid-IR photometry comes from a combination of data from the Wide-Field Infrared Survey Explorer (*WISE*) "ALLWISE" data release and several large-area *Spitzer Space Telescope* fields. Selection is based on a Bayesian kernel density algorithm with a training sample of 157,701 spectroscopically-confirmed type-1 quasars with both optical and mid-IR data. Of the quasar candidates, 733,713 lack spectroscopic confirmation (and 305,623 are objects that we have not previously classified as photometric quasar candidates). These candidates include 7874 objects targeted as high probability potential quasars with $3.5 < z < 5$ (of which 6779 are new photometric candidates). Our algorithm is more complete to $z > 3.5$ than the traditional mid-IR selection "wedges" and to $2.2 < z < 3.5$ quasars than the SDSS-III/BOSS project. Number counts and luminosity function analysis suggests that the resulting catalog is relatively complete to known quasars and is identifying new high-z quasars at $z > 3$. This catalog paves the way for luminosity-dependent clustering investigations of large numbers of faint, high-redshift quasars and for further machine learning quasar selection using *Spitzer* and *WISE* data combined with other large-area optical imaging surveys.

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E-mail contact: gtr@physics.drexel.edu
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http://www.physics.drexel.edu/~gtr/outgoing/optirqsos/data/master_quasar_catalogs.011414.fits.bz2 and
http://www.physics.drexel.edu/~gtr/outgoing/optirqsos/data/optical_ir_quasar_candidates.052015.fits.bz2

A new period of activity in the core of NGC 660

Megan K. Argo[1], Ilse M. van Bemmel[2,3], Sam D. Connolly[4] and Robert J. Beswick[1]

[1] Jodrell Bank Centre for Astrophysics, School of Physics and Astronomy, The University of Manchester, Oxford Road, Manchester M13 9PL, UK

[2] Netherlands Institute for Radio Astronomy (ASTRON), Postbus 2, NL-7990 AA Dwingeloo, the Netherlands

[3] Joint Institute for VLBI ERIC (JIVE), Postbus 2, NL-7990 AA Dwingeloo, the Netherlands

[4] School of Physics and Astronomy, University of Southampton, Highfield, Southampton SO17 1BJ, UK

The core of the nearby galaxy NGC 660 has recently undergone a spectacular radio outburst; using a combination of archival radio and Chandra X-ray data, together with new observations, the nature of this event is investigated. Radio observations made using e-MERLIN in mid-2013 show a new compact and extremely bright continuum source at the centre of the galaxy. High angular resolution observations carried out with the European VLBI Network show an obvious jet-like feature to the north-east and evidence of a weak extension to the west, possibly a counter-jet. We also examine high angular resolution H i spectra of these new sources, and the radio spectral energy distribution using the new wide-band capabilities of e-MERLIN. We compare the properties of the new object with possible explanations, concluding that we are seeing a period of new active galactic nuclei (AGN) activity in the core of this polar ring galaxy.

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E-mail contact: mkargo@manchester.ac.uk
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