Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
No. 213 — July 2015	Editor: Megan Argo (agnews@manchester.ac.uk)

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

Mining for Dust in Type 1 Quasars

Coleman M. Krawczyk[1,2], Gordon T. Richards[1,3], S. C. Gallagher[4,5], Karen M. Leighly[6], Paul C. Hewett[7], Nicholas P. Ross[1], and P. B. Hall[8]

[1] Department of Physics, Drexel University, 3141 Chestnut Street, Philadelphia, PA 19104, USA
[2] Institute for Cosmology and Gravitation, University of Portsmouth, Burnaby Road, Portsmouth, PO1 3FX, UK
[3] Max-Planck-Institut für Astronomie, Königstuhl 17, D-69117 Heidelberg, Germany
[4] Department of Physics & Astronomy, The University of Western Ontario, London, ON N6A 3K7, Canada
[5] Visiting Fellow, Yale Center for Astronomy and Astrophysics, Yale University, P.O. Box 208120, New Haven, CT 06520, USA
[6] Homer L. Dodge Dept of Physics and Astronomy, The University of Oklahoma, 440 W. Brooks Street, Norman, OK 73019, USA
[7] Institute of Astronomy, University of Cambridge, Madingley Road, Cambridge CB3 0HA, UK
[8] Department of Physics and Astronomy, York University, Toronto, ON M3J 1P3, Canada

We explore the extinction/reddening of ∼35,000 uniformly selected quasars with $0 < z \leq 5.3$ in order to better understand their *intrinsic* optical/ultraviolet (UV) spectral energy distributions. Using rest-frame optical–UV photometry taken from the Sloan Digital Sky Survey's (SDSS) 7th data release, cross-matched to *WISE* in the mid-infrared, 2MASS and UKIDSS in the near-infrared, and *GALEX* in the UV, we isolate outliers in the color distribution and find them well described by an SMC-like reddening law. A hierarchical Bayesian model with a Markov Chain Monte Carlo sampling method was used to find distributions of powerlaw indices and E(B-V) consistent with both the broad absorption line (BAL) and non-BAL samples. We find that, of the *ugriz* color-selected type 1 quasars in SDSS, 2.5% (13%) of the non-BAL (BAL) sample are consistent with E(B-V)> 0.1 and 0.1% (1.3%) with E(B-V)> 0.2. Simulations show both populations of quasars are intrinsically bluer than the mean composite, with a mean spectral index (α_λ) of -1.79 (-1.83). The emission and absorption-line properties of both samples reveal that quasars with intrinsically red continua have narrower Balmer lines and stronger high-ionization emission lines, the latter indicating a harder continuum in the extreme-UV and the former pointing to differences in black hole mass and/or orientation.

Accepted by The Astronomical Journal

E-mail contact: coleman.krawczyk@port.ac.uk
Preprint available at http://arxiv.org/abs/1412.7039, published version available at
http://iopscience.iop.org/1538-3881/149/6/203/article

Feeding versus feedback in AGN from near-infrared Integral Field Spectroscopy X: NGC5929

Rogemar A. Riffel[1], **Thaisa Storchi-Bergmann**[2] **and Rogério Riffel**[2]

[1] Universidade Federal de Santa Maria, Departamento de Física, Centro de Ciências Naturais e Exatas, 97105-900, Santa Maria, RS, Brazil

[2] Universidade Federal do Rio Grande do Sul, Departamento de Astronomia, Instituto de Física, CP 15051, 91501-970, Porto Alegre, RS, Brazil

We present near-infrared emission-line flux distributions, excitation and kinematics, as well as stellar kinematics, of the inner 520×520 pc^2 of the Seyfert 2 galaxy NGC 5929. The observations were performed with the Gemini's Near-Infrared Integral Field Spectrograph (NIFS) at a spatial resolution of $\sim$ 20 pc and spectral resolution of 40 km s^{-1} in the J- and K$_l$-bands. The flux distributions of H_2, [Fe II], [P II], and H recombination lines are extended over most of the field of view, with the highest intensity levels observed along $PA = 60/240°$, and well correlated with the radio emission. The H_2 and [Fe II] line emission are originated in thermal processes, mainly due to heating of the gas by X-rays from the central Active Galactic Nucleus (AGN). Contribution of shocks due to the radio jet is observed at locations co-spatial with the radio hotspots at 0.5$''$ northeast and 0.6$''$ southwest of the nucleus, as evidenced by the emission-line ratio and gas kinematics. The stellar kinematics shows rotation with an amplitude at 250pc from the nucleus of $\sim$200 km s^{-1} after corrected for the inferred inclination of 18.3°. The stellar velocity dispersion obtained from the integrated K-band spectrum is $\sigma_* = 133 \pm 8$ km s^{-1}, which implying on a mass for the supermassive black hole of $M_\bullet = 5.2^{1.6}_{-1.2} \times 10^7$ M$_\odot$, using the $M_\bullet - \sigma_*$ relation. The gas kinematics present three components: (1) gas in the plane of the galaxy in counter-rotation relative to the stars; (2) an outflow perpendicular to the radio jet that seems to be due to an equatorial AGN outflow; (3) turbulence of the gas observed in association with the radio hot spots, supporting an interaction of the radio jet with the gas of the disk. We estimated the mass of ionized and warm molecular gas of $\sim 1.3 \times 10^6$ M$_\odot$ and $\sim$ 470 M$_\odot$, respectively.

Accepted by MNRAS

E-mail contact: rogemar@ufsm.br
Preprint available at arXiv1505.04052

Radio faint AGN: a tale of two populations

P. Padovani[1], **M. Bonzini**[1], **K. I. Kellermann**[2], **N. Miller**[3], **V. Mainieri**[1], **P. Tozzi**[4]

[1] European Southern Observatory, Karl-Schwarzschild-Str. 2, D-85748 Garching bei München, Germany

[2] National Radio Astronomy Observatory, 520 Edgemont Road, Charlottesville, VA 22903-2475, USA

[3] Department of Mathematics and Physical Sciences, Stevenson University, 1525 Greenspring Valley Road, Stevenson, MD 21153-0641, USA

[4] INAF - Osservatorio Astrofisico di Arcetri, Largo E. Fermi, I-50125, Firenze, Italy

We study the Extended *Chandra* Deep Field South (E-CDFS) Very Large Array sample, which reaches a flux density limit at 1.4 GHz of 32.5 μJy at the field centre and redshift $\sim$ 4, and covers $\sim$ 0.3 deg^2. Number counts are presented for the whole sample while the evolutionary properties and luminosity functions are derived for active galactic nuclei (AGN). The faint radio sky contains two totally distinct AGN populations, characterised by very different evolutions, luminosity functions, and Eddington ratios: radio-quiet (RQ)/radiative-mode, and radio-loud/jet-mode AGN. The radio power of RQ AGN evolves $\propto (1 + z)^{2.5}$, similarly to star-forming galaxies, while the number density of radio-loud ones has a peak at $z \sim 0.5$ and then declines at higher redshifts. The number density of radio-selected RQ AGN is consistent with that of X-ray selected AGN, which shows that we are sampling the same population. The unbiased fraction of radiative-mode RL AGN, derived from our own and previously published data, is a strong function of radio power, decreasing from $\sim$ 0.5 at $P_{1.4\rm GHz} \sim 10^{24}$ W Hz^{-1} to $\sim$ 0.04 at $P_{1.4\rm GHz} \sim 10^{22}$ W Hz^{-1}. Thanks to our enlarged sample, which now includes $\sim$ 700 radio sources, we also confirm and strengthen our previous results on the source population of the faint radio sky: star-forming galaxies start to dominate the radio sky only below $\sim$ 0.1 mJy, which is also where radio-quiet AGN overtake radio-loud ones.

MNRAS, in press

E-mail contact: ppadovan@eso.org
Preprint available at http://arxiv.org/abs/1506.06554

High-resolution imaging of the molecular outflows in two mergers: IRAS 17208-0014 and NGC 1614

S. García-Burillo[1], F. Combes[2], A. Usero[1], S. Aalto[3], L. Colina[4,5], A. Alonso-Herrero[6], L. K. Hunt[7], S. Arribas[4,5], F. Costagliola[8], A. Labiano[9], R. Neri[10], M. Pereira-Santaella[4], L. J. Tacconi[11], P. P. van der Werf[12]

[1]Observatorio Astronómico Nacional (OAN-IGN)-Observatorio de Madrid, Alfonso XII, 3, 28014-Madrid, Spain
[2]Observatoire de Paris, LERMA, CNRS, 61 Av. de l'Observatoire, 75014-Paris, France
[3]Department of Earth and Space Sciences, Chalmers University of Technology, Onsala Observatory, 439 94-Onsala, Sweden
[4]Centro de Astrobiología (CSIC-INTA), Ctra de Torrejón a Ajalvir, km 4, 28850 Torrejón de Ardoz, Madrid, Spain
[5]ASTRO-UAM, Universidad Autónoma de Madrid (UAM), Unidad Asociada CSIC, Madrid, Spain
[6]Instituto de Física de Cantabria, CSIC-UC, E-39005 Santander, Spain
[7]INAF-Osservatorio Astrofisico di Arcetri, Largo Enrico Fermi 5, 50125-Firenze, Italy
[8]Instituto de Astrofísica de Andalucía (CSIC), Apdo 3004, 18080-Granada, Spain
[9]Institute for Astronomy, Department of Physics, ETH Zurich, CH-8093 Zurich, Switzerland
[10]Institut de Radio Astronomie Millimétrique (IRAM), 300 rue de la Piscine, Domaine Universitaire de Grenoble, 38406-St.Martin d'Hères, France
[11]Max-Planck-Institut für extraterrestrische Physik, Postfach 1312, 85741-Garching, Germany
[12]Leiden Observatory, Leiden University, PO Box 9513, 2300 RA Leiden, Netherlands

Galaxy evolution scenarios predict that the feedback of star formation and nuclear activity (AGN) can drive the transformation of gas-rich spiral mergers into (ultra) luminous infrared galaxies and, eventually, lead to the build-up of QSO/elliptical hosts. We study the role that star formation and AGN feedback have in launching and maintaining the molecular outflows in two starburst-dominated advanced mergers, NGC 1614 ($D_{\rm L}$ = 66 Mpc) and IRAS 17208-0014 ($D_{\rm L}$ = 181 Mpc), by analyzing the distribution and kinematics of their molecular gas reservoirs. Both galaxies present evidence of outflows in other phases of their ISM. We used the Plateau de Bure interferometer (PdBI) to image the CO(1–0) and CO(2–1) line emissions in NGC 1614 and IRAS 17208-0014, respectively, with high spatial resolution (0.5"–1.2"). The velocity fields of the gas were analyzed and modeled to find the evidence of molecular outflows in these sources and characterize the mass, momentum, and energy of these components. While most ($\geq$ 95%) of the CO emission stems from spatially resolved ($\sim 2-3$ kpc-diameter) rotating disks, we also detect in both mergers the emission from high-velocity line wings that extend up to $\pm$500–700 km s^{-1}, well beyond the estimated virial range associated with rotation and turbulence. The kinematic major axis of the line-wing emission is tilted by $\sim 90^\circ$ in NGC 1614 and by $\sim 180^\circ$ in IRAS 17208-0014 relative to the major axes of their respective rotating disks. These results can be explained by the existence of non-coplanar molecular outflows in both systems: the outflow axis is nearly perpendicular to the rotating disk in NGC 1614, but it is tilted relative to the angular momentum axis of the rotating disk in IRAS 17208-0014. In stark contrast to NGC 1614, where star formation alone can drive its molecular outflow, the mass, energy, and momentum budget requirements of the molecular outflow in IRAS 17208-0014 can be best accounted for by the existence of a so far undetected (hidden) AGN of $L_{\rm AGN} \sim 7 \times 10^{11}$ L$_\odot$. The geometry of the molecular outflow in IRAS 17208-0014 suggests that the outflow is launched by a non-coplanar disk that may be associated with a buried AGN in the western nucleus.

Accepted by Astronomy & Astrophysics 2015/05/19

E-mail contact: s.gburillo@oan.es
Preprint available at http://arxiv.org/abs/1505.04705

NuSTAR Reveals Extreme Absorption in $z < 0.5$ Type 2 Quasars

G. B. Lansbury[1], P. Gandhi[1,2], D. M. Alexander[1], R. J. Assef[3], J. Aird[4], A. Annuar[1], D. R. Ballantyne[5], M. Baloković[6], F. E. Bauer[7,8,9], S. E. Boggs[10], W. N. Brandt[11,12], M. Brightman[6], F. E. Christensen[13], F. Civano[14,15,16], A. Comastri[17], W. W. Craig[13,18], A. Del Moro[1], B. W. Grefenstette[6], C. J. Hailey[19], F. A. Harrison[6], R. C. Hickox[16], M. Koss[20], S. M. LaMassa[14], B. Luo[11,12], S. Puccetti[21,22], D. Stern[23], E. Treister[24], C. Vignali[17,25], L. Zappacosta[22] and W. W. Zhang[26]

[1] Centre for Extragalactic Astronomy, Department of Physics, University of Durham, South Road, Durham DH1 3LE, UK
[2] School of Physics and Astronomy, University of Southampton, Highfield, Southampton SO17 1BJ, UK
[3] Núcleo de Astronomía de la Facultad de Ingeniería, Universidad Diego Portales, Av. Ejército Libertador 441, Santiago, Chile
[4] Institute of Astronomy, University of Cambridge, Madingley Road, Cambridge, CB3 0HA, UK
[5] Center for Relativistic Astrophysics, School of Physics, Georgia Institute of Technology, Atlanta, GA 30332, USA
[6] Cahill Center for Astrophysics, 1216 East California Boulevard, California Institute of Technology, Pasadena, CA 91125, USA
[7] Instituto de Astrofísica, Facultad de Física, Pontificia Universidad Católica de Chile, 306, Santiago 22, Chile
[8] Millennium Institute of Astrophysics, Vicuña Mackenna 4860, 7820436 Macul, Santiago, Chile
[9] Space Science Institute, 4750 Walnut Street, Suite 205, Boulder, Colorado 80301, USA
[10] Space Sciences Laboratory, University of California, Berkeley, CA 94720, USA
[11] Department of Astronomy and Astrophysics, 525 Davey Lab, The Pennsylvania State University, University Park, PA 16802, USA
[12] Institute for Gravitation and the Cosmos, The Pennsylvania State University, University Park, PA 16802, USA
[13] DTU Space-National Space Institute, Technical University of Denmark, Elektrovej 327, DK-2800 Lyngby, Denmark
[14] Yale Center for Astronomy and Astrophysics, Physics Department, Yale University, PO Box 208120, New Haven, CT 06520-8120, USA
[15] Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, MA 02138, USA
[16] Department of Physics and Astronomy, Dartmouth College, 6127 Wilder Laboratory, Hanover, NH 03755, USA
[17] INAF Osservatorio Astronomico di Bologna, via Ranzani 1, 40127 Bologna, Italy
[18] Lawrence Livermore National Laboratory, Livermore, CA 94550, USA
[19] Columbia Astrophysics Laboratory, 550 W 120th Street, Columbia University, NY 10027, USA
[20] Institute for Astronomy, Department of Physics, ETH Zurich, Wolfgang-Pauli-Strasse 27, CH-8093 Zurich, Switzerland
[21] ASDC-ASI, Via del Politecnico, 00133 Roma, Italy
[22] INAF Osservatorio Astronomico di Roma, via Frascati 33, 00040 Monte Porzio Catone (RM), Italy
[23] Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Mail Stop 169-221, Pasadena, CA 91109, USA
[24] Universidad de Concepción, Departamento de Astronomía, Casilla 160-C, Concepción, Chile
[25] Dipartimento di Fisica e Astronomia, Università degli Studi di Bologna, Viale Berti Pichat 6/2, 40127 Bologna, Italy
[26] NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA

The intrinsic column density ($N_{\rm H}$) distribution of quasars is poorly known. At the high obscuration end of the quasar population and for redshifts $z < 1$, the X-ray spectra can only be reliably characterized using broad-band measurements which extend to energies above 10 keV. Using the hard X-ray observatory *NuSTAR*, along with archival *Chandra* and *XMM-Newton* data, we study the broad-band X-ray spectra of nine optically selected (from the SDSS), candidate Compton-thick ($N_{\rm H} > 1.5\times10^{24}$ cm^{-2}) type 2 quasars (CTQSO2s); five new *NuSTAR* observations are reported herein, and four have been previously published. The candidate CTQSO2s lie at $z < 0.5$, have observed [OIII] luminosities in the range $8.4 < \log(L_{[\rm O\ III]}/L_{\odot}) < 9.6$, and show evidence for extreme, Compton-thick absorption when indirect absorption diagnostics are considered. Amongst the nine candidate CTQSO2s, five are detected by *NuSTAR* in the high energy (8–24 keV) band: two are weakly detected at the $\approx 3\sigma$ confidence level and three are strongly detected with sufficient counts for spectral modeling (≥ 90 net source counts at 8–24 keV). For these *NuSTAR*-detected sources *direct* (i.e., X-ray spectral) constraints on the intrinsic AGN properties are feasible, and we measure column densities ≈ 2.5–1600 times higher and intrinsic (unabsorbed) X-ray luminosities ≈ 10–70 times higher than pre-*NuSTAR* constraints from *Chandra* and *XMM-Newton*. Assuming the *NuSTAR*-detected type 2 quasars are representative of other Compton-thick candidates, we make a correction to the $N_{\rm H}$ distribution for optically selected type 2 quasars as measured by *Chandra* and *XMM-Newton* for 39 objects. With this approach, we predict a Compton-thick fraction of $f_{\rm CT} = 36^{+14}_{-12}$ %, although higher fractions (up to 76%) are possible if indirect absorption diagnostics are assumed to be reliable.

Accepted for publication in ApJ

E-mail contact: g.b.lansbury@durham.ac.uk
Preprint available at http://arxiv.org/abs/1506.05120

Jobs

ESA Reserach Fellowship in Space Science
Noordwijk (NL) and Madrid (E)
Deadline: 1 October 2015

Email contact: fellowship@cosmos.esa.int
Further Information: http://cosmos.esa.int/fellowship

The European Space Agency awards several postdoctoral fellowships each year.

The aim of these fellowships is to provide young scientists, holding a PhD or the equivalent degree, with the means of performing space science research in fields related to the ESA Science and Robotic Exploration Programmes. Areas of research include planetary science, astronomy and astrophysics, solar and solar-terrestrial science, plasma physics and fundamental physics. The fellowships have a duration of two years and are tenable at the European Space Research and Technology Centre (ESTEC) in Noordwijk, Netherlands, or at the European Space Astronomy Centre (ESAC) in Villafranca del Castillo, near Madrid, Spain.

Applications are now solicited for fellowships in space science to begin in the fall of 2016. Preference will be given to applications submitted by candidates within five years of receiving their PhD. Candidates not holding a PhD yet are encouraged to apply, but they must provide evidence of receiving their degree before starting the fellowship.

ESA fellows are enrolled in ESA's Social Security Scheme, which covers medical expenses, invalidity and death benefits. A monthly deduction covers these short-term and long-term risks.

The deadline for applications is 1 October 2015.

More information on the ESA Research Fellowship programme in Space Science, on the conditions and eligibility, as well as the application form can retrieved from http://cosmos.esa.int/fellowship.

Questions on the scientific aspects of the ESA Fellowship in Space Science not answered in the above pages can be sent by e-mail to the fellowship coordinators, Dr.Oliver Jennrich or Dr.Bruno Altieri at the address fellowship@cosmos.esa.int