Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
No. 209 — March 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

Photohadronic origin of γ-ray BL Lac emission: implications for IceCube neutrinos

M. Petropoulou[1], S. Dimitrakoudis[2], P. Padovani[3], A. Mastichiadis[4] and E. Resconi[5]

[1] Department of Physics and Astronomy, Purdue University, 525 Northwestern Avenue, West Lafayette, IN 47907, USA
[2] Institute for Astronomy, Astrophysics, Space Applications & Remote Sensing, National Observatory of Athens, 15236 Penteli, Greece
[3] European Southern Observatory, Karl-Schwarzschild-Str. 2, D-85748 Garching bei München, Germany
[4] Department of Physics, University of Athens, Panepistimiopolis, GR 15783 Zografos, Greece
[5] Technische Universität München, James-Frank-Str. 1, D-85748 Garching bei München, Germany

The recent IceCube discovery of 0.1-1 PeV neutrinos of astrophysical origin opens up a new era for high-energy astrophysics. Although there are various astrophysical candidate sources, a firm association of the detected neutrinos with one (or more) of them is still lacking. A recent analysis of plausible astrophysical counterparts within the error circles of IceCube events showed that likely counterparts for nine of the IceCube neutrinos include mostly BL Lacs, among which Mrk 421. Motivated by this result and a previous independent analysis on the neutrino emission from Mrk 421, we test the BL Lac-neutrino connection in the context of a specific theoretical model for BL Lac emission. We model the spectral energy distribution (SED) of the BL Lacs selected as counterparts of the IceCube neutrinos using a one-zone leptohadronic model and mostly nearly simultaneous data. The neutrino flux for each BL Lac is self-consistently calculated, using photon and proton distributions specifically derived for every individual source. We find that the SEDs of the sample, although different in shape and flux, are all well fitted by the model using reasonable parameter values. Moreover, the model-predicted neutrino flux and energy for these sources are of the same order of magnitude as those of the IceCube neutrinos. In two cases, namely Mrk 421 and H 1914-194, we find a suggestively good agreement between the model prediction and the detected neutrino flux. Our predictions for all the BL Lacs of the sample are in the range to be confirmed or disputed by IceCube in the next few years of data sampling.

Accepted by MNRAS

E-mail contact: mpetropo@purdue.edu
Preprint available at http://arxiv.org/abs/1501.07115

Evolution in the Black Hole - Galaxy Scaling Relations and the Duty Cycle of Nuclear Activity in Star-Forming Galaxies

Mouyuan Sun[1,2], Jonathan R. Trump[1,7], W. N. Brandt[1], B. Luo[1], David M. Alexander[3], Knud Jahnke[4], D. J. Rosario[5], Sharon X. Wang[1] and Y. Q. Xue[6]

[1] Department of Astronomy & Astrophysics and Institute for Gravitation and the Cosmos, 525 Davey Lab, The Pennsylvania State University, University Park, PA 16802, USA
[2] Department of Astronomy and Institute of Theoretical Physics and Astrophysics, Xiamen University, Xiamen, Fujian 361005, China
[3] Institute for Computational Cosmology, Durham University, South Road, Durham, DH1 3LE, UK
[4] Max Planck Institute for Astronomy, Königstuhl 17, D-69117 Heidelberg, Germany
[5] Max-Planck-Institut für extraterrestrische Physik (MPE), Giessenbachstrasse 1, D-85748 Garching bei München, Germany
[6] Key Laboratory for Research in Galaxies and Cosmology, Center for Astrophysics, Department of Astronomy, University of Science and Technology of China, Chinese Academy of Sciences, Hefei, Anhui 230026, China
[7] Hubble Fellow

We measure the location and evolutionary vectors of 69 *Herschel*-detected broad-line active galactic nuclei (BLAGNs) in the $M_{\rm BH} - M_*$ plane. BLAGNs are selected from the COSMOS and CDF-S fields, and span the redshift range $0.2 \leq z < 2.1$. Black-hole masses are calculated using archival spectroscopy and single-epoch virial mass estimators, and galaxy total stellar masses are calculated by fitting the spectral energy distribution (subtracting the BLAGN component). The mass-growth rates of both the black hole and galaxy are calculated using *Chandra/XMM-Newton* X-ray and *Herschel* far-infrared data, reliable measures of the BLAGN accretion and galaxy star formation rates, respectively. We use Monte Carlo simulations to account for biases in our sample, due to both selection limits and the steep slope of the massive end of the galaxy stellar-mass distribution. We find our sample is consistent with no evolution in the $M_{\rm BH} - M_*$ relation from $z \sim 2$ to $z \sim 0$. BLAGNs and their host galaxies which lie off the black hole mass $-$ galaxy total stellar mass relation tend to have evolutionary vectors anti-correlated with their mass ratios: that is, galaxies with over-massive (under-massive) black holes tend to have a low (high) ratio of the specific accretion rate to the specific star formation rate. We also use the measured growth rates to estimate the preferred AGN duty cycle for our galaxies to evolve most consistently onto the local $M_{\rm BH} - M_{\rm Bul}$ relation. Under reasonable assumptions of exponentially declining star formation histories, the data suggest a non-evolving (no more than a factor of a few) BLAGN duty cycle among star-forming galaxies of $\sim 10\%$ (1σ range of $1 - 42\%$ at $z < 1$ and $2 - 34\%$ at $z > 1$).

Accepted by ApJ

E-mail contact: mus66@psu.edu
Preprint available at http://arxiv.org/abs/1502.01025

Compact object mergers: Observations of supermassive binary black holes and stellar tidal disruption events

S. Komossa[1] and J.A. Zensus[1]

[1] Max-Planck-Institut für Radioastronomie, Auf dem Hügel 69, 53121 Bonn, Germany

The capture and disruption of stars by supermassive black holes (SMBHs), and the formation and coalescence of binaries, are inevitable consequences of the presence of SMBHs at the cores of galaxies. Pairs of active galactic nuclei (AGN) and binary SMBHs are important stages in the evolution of galaxy mergers, and an intense search for these systems is currently ongoing. In the early and advanced stages of galaxy merging, observations of the triggering of accretion onto one or both BHs inform us about feedback processes and BH growth. Identification of the compact binary SMBHs at parsec and sub-parsec scales provides us with important constraints on the interaction processes that govern the shrinkage of the binary beyond the "final parsec". Coalescing binary SMBHs are among the most powerful sources of gravitational waves (GWs) in the universe. Stellar tidal disruption events (TDEs) appear as luminous, transient, accretion flares when part of the stellar material is accreted by the SMBH. About 30 events have been identified by multi-wavelength observations by now, and they will be detected in the thousands in future ground-based or space-based transient surveys. The study of TDEs provides us with a variety of new astrophysical tools and applications, related to fundamental physics or astrophysics. Here, we provide a review of the current status of observations of SMBH pairs and binaries, and TDEs, and discuss astrophysical implications.

Review, to appear in Proceedings of IAU Symp. 312 (Star clusters and black holes in galaxies across cosmic time), R. Spurzem et al. (eds)

E-mail contact: skomossa@mpifr.de
Preprint available at http://arxiv.org/abs/1502.05720

What powers the radio-loud narrow-line Seyfert 1 galaxy RX J2314.9+2243? A view onto its central engine from radio to X-rays

S. Komossa[1], D. Xu[2], L Fuhrmann[1], D. Grupe[3,4], S. Yao[2], Z. Fan[2], I. Myserlis[1], E. Angelakis[1], V. Karamanavis[1], W. Yuan[2], and J.A. Zensus[1]

[1] Max-Planck-Institut für Radioastronomie, Auf dem Hügel 69, 53121 Bonn, Germany
[2] National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China
[3] Space Science Center, Morehead State University, 235 Martindale Dr., Morehead, KY 40351, USA
[4] Swift Mission Operation Center, 2582 Gateway Dr., State College, PA 16801, USA

Radio-loud narrow-line type 1 galaxies provide us with a fresh look at the blazar phenomenon, the causes of radio loudness, and the physics of jet formation. We present a multi-wavelength study of the radio-loud narrow-line type 1 quasar RX J2314.9+2243, which exhibits some remarkable multi-wavelength properties. It is among the few radio-loud narrow-line type 1 galaxies, with a tentative γ-ray detection, is luminous in the infrared, and shows an exceptionally broad and blueshifted [OIII]λ5007 emission-line component. In order to understand the nature of this source, we have obtained optical, UV, X-ray and radio observations of RX J2314.9+2243. Its spectral energy distribution (SED) shows a broad hump extending between the IR and FUV, a steep radio spectrum and flat X-ray spectrum. Its IR to FUV SED is consistent with a scenario, in which synchrotron emission from a jet dominates the broad-band emission, even though an absorption scenario cannot yet be fully excluded. The high blueshift of its very broad [OIII] component, 1260 km/s, is consistent with a face-on view, with the jet (and outflow) pointing towards us. RXJ2314.9+2243 likely represents an extreme case of AGN induced feedback in the local universe.

To appear in Astronomy & Astrophysics (Feb. 2015)

E-mail contact: skomossa@mpifr.de
Paper available at http://dx.doi.org/10.1051/0004-6361/201424814

Revealing a hard X-ray spectral component that reverberates within one light hour of the central supermassive black hole in Ark 564

M. Giustini[1,2,3], T. J. Turner[4], J. N. Reeves[5,4], L. Miller[6], E. Legg[6], S. B. Kraemer[7] and I. M. George[4]

[1] SRON Netherlands Institute for Space Research, Sorbonnelaan 2, 3584 CA Utrecht, the Netherlands
[2] XMM-Newton Science Operations Centre, ESA/ESAC, Villafranca del Castillo, Apartado 78, 28692 Villanueva de la Cañada, Spain
[3] Center for Space Science and Technology, University of Maryland, Baltimore County, 1000 Hilltop Circle, Baltimore, MD 21250, USA
[4]Department of Physics, University of Maryland Baltimore County, Baltimore, MD 21250, USA
[5]Astrophysics Group, School of Physical and Geographical Sciences, Keele University, Keele, Staffordshire ST5 5BG, UK
[6]Department of Physics, University of Oxford, Denys Wilkinson Building, Keble Road, Oxford, OX1 3RH, UK
[7]Institute for Astrophysics and Computational Sciences, Department of Physics, The Catholic University of America, Washington, DC 20064, USA

Arakelian 564 (Ark 564, $z = 0.0247$) is an X-ray-bright narrow-line Seyfert 1 galaxy. By using advanced X-ray timing techniques, an excess of "delayed" emission in the hard X-ray band ($4 - 7.5$ keV) following about 1000 seconds after "flaring" light in the soft X-ray band ($0.4 - 1$ keV) was recently detected. We report on the X-ray spectral analysis of eight XMM-Newton and one Suzaku observation of Ark 564. Our aim is to characterise the X-ray spectral properties of the source in the light of these recently reported results. High-resolution spectroscopy was performed with the RGS in the soft X-ray band, while broad-band spectroscopy was performed with the EPIC-pn and XIS/PIN instruments. We analysed time-averaged, flux-selected, and time-resolved spectra. Despite the strong variability in flux during our observational campaign, the broad-band spectral shape of Ark 564 does not vary dramatically and can be reproduced either by a superposition of a power law and a blackbody emission or by a Comptonized power-law emission model. High-resolution spectroscopy revealed ionised gas along the line of sight at the systemic redshift of the source, with a low column density ($N_H \sim 10^{21}$ cm^{-2}) and a range of ionisation states ($-0.8 < \log(\xi/\mathrm{erg\ cm\ s^{-1}}) < 2.4$). Broad-band spectroscopy revealed a very steep intrinsic continuum (photon index $\Gamma \sim 2.6$) and a rather weak emission feature in the iron K band (EW ~ 150 eV); modelling this feature with a reflection component requires highly ionised gas, $\log(\xi/\mathrm{erg\ cm\ s^{-1}}) > 3.5$. A reflection-dominated or an absorption-dominated model are similarly able to well reproduce the time-averaged data from a statistical point of view, in both cases requiring contrived geometries and/or unlikely physical parameters. Finally, through time-resolved analysis we spectroscopically identified the "delayed" emission as a spectral hardening above ~ 4 keV; the most likely interpretation for this component is a reprocessing of the "flaring" light by gas located at 10-100 r_g from the central supermassive black hole that is so hot that it can Compton-upscatter the flaring intrinsic continuum emission.

Accepted by Astronomy & Astrophysics

E-mail contact: m.giustini@sron.nl
Preprint available at http://arxiv.org/abs/1502.01338

Resolving the AGN and host emission in the mid-infrared using a model-independent spectral decomposition

Antonio Hernán-Caballero[1], Almudena Alonso-Herrero[1], Evanthia Hatziminaoglou[2], Henrik W. W. Spoon[3], Cristina Ramos Almeida[4,5], Tanio Díaz Santos[6,7], Sebastian F. Hönig[8], Omaira González-Martín[9] and Pilar Esquej[10]

[1]Instituto de Física de Cantabria, CSIC-UC, Avenida de los Castros s/n, 39005, Santander, Spain
[2]European Southern Observatory, Karl-Schwarzschild-Str. 2, 85748 Garching bei München, Germany
[3]Cornell University, CRSR, Space Sciences Building, Ithaca, NY 14853, USA
[4]Instituto de Astrofísica de Canarias, Vía Láctea s/n, E-38205 La Laguna, Tenerife, Spain
[5]Departamento de Astrofísica, Universidad de La Laguna, E-38206 La Laguna, Tenerife, Spain
[6]Núcleo de Astronomía de la Facultad de Ingeniería, Universidad Diego Portales, Av. Ejército Libertador 441, Santiago, Chile
[7]Spitzer Science Center, California Institute of Technology, MS 220-6, Pasadena, CA 91125, USA
[8]School of Physics & Astronomy, University of Southampton, Southampton SO18 1BJ, United Kingdom
[9]Centro de Radioastronomía y Astrofísica (CRyA-UNAM), 3-72 (Xangari), 8701, Morelia, Mexico
[10]Departamento de Astrofísica, Facultad de CC. Físicas, Universidad Complutense de Madrid, E-28040 Madrid, Spain

We present results on the spectral decomposition of 118 *Spitzer* Infrared Spectrograph (IRS) spectra from local active galactic nuclei (AGN) using a large set of *Spitzer*/IRS spectra as templates. The templates are themselves IRS spectra from extreme cases where a single physical component (stellar, interstellar, or AGN) completely dominates the integrated mid-infrared emission. We show that a linear combination of one template for each physical component reproduces the observed IRS spectra of AGN hosts with unprecedented fidelity for a template fitting method, with no need to model extinction separately. We use full probability distribution functions to estimate expectation values and uncertainties for observables, and find that the decomposition results are robust against degeneracies. Furthermore, we compare the AGN spectra derived from the spectral decomposition with sub-arcsecond resolution nuclear photometry and spectroscopy from ground-based observations. We find that the AGN component derived from the decomposition closely matches the nuclear spectrum, with a 1-σ dispersion of 0.12 dex in luminosity and typical uncertainties of $\sim$0.19 in the spectral index and $\sim$0.1 in the silicate strength. We conclude that the emission from the host galaxy can be reliably removed from the IRS spectra of AGN. This allows for unbiased studies of the AGN emission in intermediate and high redshift galaxies –currently inaccesible to ground-based observations– with archival *Spitzer*/IRS data and in the future with the Mid-InfraRed Instrument of the James Webb Space Telescope. The decomposition code and templates are available at http://www.denebola.org/ahc/deblendIRS.

Accepted by ApJ

E-mail contact: ahernan@ifca.unican.es
Preprint available at http://arxiv.org/abs/1502.05820

Reaching the Peak of the Quasar Spectral Energy Distribution I: Observations and Models

James S. Collinson[1], Martin J. Ward[1], Chris Done[1], Hermine Landt[1], Martin Elvis[2] and Jonathan C. McDowell[2]

[1] Department of Physics, University of Durham, South Road, Durham, DH1 3LE, UK
[2] Harvard-Smithsonian Center for Astrophysics, 60 Garden St., Cambridge, MA 02138, USA

We perform a spectral analysis of a sample of 11 medium redshift ($1.5 < z < 2.2$) quasars. Our sample all have optical spectra from the SDSS, infrared spectra from GNIRS and TSPEC, and X-ray spectra from *XMM-Newton*. We first analyse the Balmer broad emission line profiles which are shifted into the IR spectra to constrain black hole masses. Then we fit an energy-conserving, three component accretion model of the broadband spectral energy distribution (SED) to our multiwavelength data. Five out of the 11 quasars show evidence of an SED peak, allowing us to constrain their bolometric luminosity from these models and estimate their mass accretion rates. Based on our limited sample, we suggest that estimating bolometric luminosities from $L_{5100\text{Å}}$ and $L_{2-10\,\mathrm{keV}}$ may be unreliable, as has been also noted for a low-redshift, X-ray selected AGN sample.

Accepted by MNRAS

E-mail contact: j.s.collinson@durham.ac.uk¡mailto:j.s.collinson@durham.ac.uk¿
Preprint available at http://arxiv.org/abs/1502.05850

The nuclear and extended infrared emission of the Seyfert galaxy NGC 2992 and the interacting system Arp 245

I. García-Bernete[1,2], C. Ramos Almeida[1,2], J. A. Acosta-Pulido[1,2], A. Alonso-Herrero[3,4], M. Sánchez-Portal[5], M. Castillo[5], M. Pereira-Santaella[6], P. Esquej[7], O. González-Martín[1,2,8], T. Díaz-Santos[9,10], P. Roche[11], S. Fisher[12], M. Pović[13], A. M. Pérez García[1,2], I. Valtchanov[5], C. Packham[4] and N. A. Levenson[14].

[1] Instituto de Astrofísica de Canarias, Calle Vía Láctea, s/n, E-38205, La Laguna, Tenerife, Spain
[2]Departamento de Astrofísica, Universidad de La Laguna, E-38206, La Laguna, Tenerife, Spain
[3]Instituto de Física de Cantabria, CSIC-Universidad de Cantabria, E-39005, Santander, Spain
[4]Department of Physics and Astronomy, University of Texas at San Antonio, One UTSA Circle, San Antonio, TX 78249, USA
[5]Heschel Science Centre, ESAC, E-28691, Villanueva de la Cañada, Madrid, Spain
[6]Centro de Astrobiología, CSIC-INTA, E-28850, Torrejón de Ardoz, Madrid, Spain
[7]Departamento de Astrofísica, Facultad de CC. Físicas, Universidad Complutense de Madrid, E-28040, Madrid, Spain
[8]Centro de Radioastronomía y Astrofísica (CRyA-UNAM), 3-72 (Xangari), 8701, Morelia, Mexico
[9]Spitzer Science Center, California Institute of Technology, MS 220-6, Pasadena, CA 91125, USA
[10]Núcleo de Astronomía de la Facultad de Ingeniería, Universidad Diego Portales, Av. Ejército Libertador 441, Santiago, Chile
[11]Department of Physics, University of Oxford, Oxford OX1 3RH, UK
[12]Department of Physics, University of Oregon, Eugene, OR 97401, USA
[13]Instituto de Astrofísica de Andalucía (IAA-CSIC), E-18008, Granada, Spain
[14]Gemini Observatory, Casilla 603, La Serena, Chile

We present subarcsecond resolution infrared (IR) imaging and mid-IR spectroscopic observations of the Seyfert 1.9 galaxy NGC 2992, obtained with the Gemini North Telescope and the Gran Telescopio CANARIAS (GTC). The N-band image reveals faint extended emission out to ∼3 kpc, and the PAH features detected in the GTC/CanariCam 7.5–13 μm spectrum indicate that the bulk of this extended emission is dust heated by star formation. We also report arcsecond resolution MIR and far-IR imaging of the interacting system Arp 245, taken with the Spitzer Space Telescope and the Herschel Space Observatory. Using these data, we obtain nuclear fluxes using different methods and find that we can only recover the nuclear fluxes obtained from the subarcsecond data at 20-25 μm, where the AGN emission dominates. We fitted the nuclear IR spectral energy distribution of NGC 2992, including the GTC/CanariCam nuclear spectrum (∼50 pc), with clumpy torus models. We then used the best-fitting torus model to decompose the Spitzer/IRS 5–30 μm spectrum (∼630 pc) in AGN and starburst components, using different starburst templates. We find that, whereas at shorter mid-IR wavelengths the starburst component dominates (64% at 6 μm), the AGN component reaches 90% at 20 μm. We finally obtained dust masses, temperatures and star formation rates for the different components of the Arp 245 system and find similar values for NGC 2992 and NGC 2993. These measurements are within those reported for other interacting systems in the first stages of the interaction.

Accepted by MNRAS.

E-mail contact: igarcia@iac.es
Preprint available at http://arxiv.org/abs/1502.04501

Tracing Quasar Narrow-Line Regions Across Redshift: A Library of High S/N Optical Spectra

A. Tammour[1], S. C. Gallagher[1] and G. T. Richards[2]

[1] Western University, London, ON N6A 3K7, Canada
[2] Drexel University, Philadelphia, PA 19104, USA

In a single optical spectrum, the quasar narrow-line region (NLR) reveals low density, photoionized gas in the host galaxy interstellar medium, while the immediate vicinity of the central engine generates the accretion disk continuum and broad emission lines. To isolate these two components, we construct a library of high S/N optical composite spectra created from the Sloan Digital Sky Survey (SDSS-DR7). We divide the sample into bins of continuum luminosity and Hβ FWHM that are used to construct median composites at different redshift steps up to 0.75. We measure the luminosities of the narrow-emission lines [Ne V]λ3427, [Ne III]λ3870, [O III]λ5007, and [O II]λ3728 with ionization potentials (IPs) of 97, 40, 35, and 13.6 eV respectively. The high IP lines' luminosities show no evidence of increase with redshift consistent with no evolution in the AGN SED or the host galaxy ISM illuminated by the continuum. In contrast, we find that the [O II] line becomes stronger at higher redshifts, and we interpret this as a consequence of enhanced star formation contributing to the [O II] emission in host galaxies at higher redshifts. The SFRs estimated from the [O II] luminosities show a flatter increase with z than non-AGN galaxies given our assumed AGN contribution to the [O II] luminosity. Finally, we confirm an inverse correlation between the strength of the Fe IIλ4570 complex and both the [O III] EW (though not the luminosity) and the width of the Hβ line as known from the eigenvector 1 correlations.

Accepted by MNRAS

E-mail contact: atammour@uwo.ca
Preprint available at http://arxiv.org/abs/1502.00735

Coronal Properties of the Seyfert 1.9 Galaxy MCG –05-23-016 Determined from Hard X-ray Spectroscopy with *NuSTAR*

M. Baloković[1], G. Matt[2], F. A. Harrison[1], A. Zoghbi[3,4], D. R. Ballantyne[5], S. E. Boggs[6], F. E. Christensen[7], W. W. Craig[6,8], C. J. Esmerian[1], A. C. Fabian[9], F. Fürst[1], C. J. Hailey[10], A. Marinucci[2], M. L. Parker[9], C. S. Reynolds[3,4], D. Stern[11], D. J. Walton[1], W. W. Zhang[12]

[1] Cahill Center for Astronomy and Astrophysics, Caltech, Pasadena, CA 91125, USA
[2] Dipartimento di Matematica e Fisica, Università degli Studi Roma Tre, via della Vasca Navale 84, I-00146 Roma, Italy
[3] Department of Astronomy, University of Maryland, College Park, MD 20742-2421, USA
[4] Joint Space-Science Institute (JSI), College Park, MD 20742-2421, USA
[5] Center for Relativistic Astrophysics, School of Physics, Georgia Institute of Technology, Atlanta, GA 30332
[6] Space Science Laboratory, University of California, Berkeley, CA 94720, USA
[7] DTU Space National Space Institute, Technical University of Denmark, Elektrovej 327, 2800 Lyngby, Denmark
[8] Lawrence Livermore National Laboratory, Livermore, CA 94550, USA
[9] Institute of Astronomy, Madingley Road, Cambridge CB3 0HA, UK
[10] Columbia Astrophysics Laboratory, Columbia University, New York, NY 10027, USA
[11] Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109, USA
[12] NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA

Measurements of the high-energy cut-off in the coronal continuum of active galactic nuclei have long been elusive for all but a small number of the brightest examples. We present a direct measurement of the cut-off energy in the nuclear continuum of the nearby Seyfert 1.9 galaxy MCG –05-23-016 with unprecedented precision. The high sensitivity of *NuSTAR* up to 79 keV allows us to clearly disentangle the spectral curvature of the primary continuum from that of its reflection component. Using a simple phenomenological model for the hard X-ray spectrum, we constrain the cut-off energy to 116^{+6}_{-5} keV with 90% confidence. Testing for more complex models and nuisance parameters that could potentially influence the measurement, we find that the cut-off is detected robustly. We further use simple Comptonized plasma models to provide independent constraints for both the kinetic temperature of the electrons in the corona and its optical depth. At the 90% confidence level, we find $kT_e = 29 \pm 2$ keV and $\tau_e = 1.23 \pm 0.08$ assuming a slab (disk-like) geometry, and $kT_e = 25 \pm 2$ keV and $\tau_e = 3.5 \pm 0.2$ assuming a spherical geometry. Both geometries are found to fit the data equally well and their two principal physical parameters are correlated in both cases. With the optical depth in the $\tau_e \gtrsim 1$ regime, the data are pushing the currently available theoretical models of the Comptonized plasma to the limits of their validity. Since the spectral features and variability arising from the inner accretion disk have been observed previously in MCG –05-23-016, the inferred high optical depth implies that a spherical or disk-like corona cannot be homogeneous.

Published in ApJ (2015), 800, 62

E-mail contact: mislavb@astro.caltech.edu
Preprint: http://arxiv.org/abs/1412.5978
Published article: http://iopscience.iop.org/0004-637X/800/1/62/

Spatially Extended Na I D Resonant Emission and Absorption in the Galactic Wind of the Nearby Infrared-Luminous Quasar F05189−2524

David Rupke[1] and Sylvain Veilleux[2]

[1] Department of Physics, Rhodes College, Memphis, TN 38112, USA
[2] Department of Astronomy and Joint Space-Science Institute, University of Maryland, College Park, MD 20742, USA

Emission from metal resonant lines has recently emerged as a potentially powerful probe of the structure of galactic winds at low and high redshift. In this work, we present only the second example of spatially resolved observations of Na I D emission from a galactic wind in a nearby galaxy (and the first 3D observations at any redshift). F05189−2524, a nearby (z = 0.0428) ultraluminous infrared galaxy powered by a quasar, was observed with the integral field unit on the Gemini Multi-Object Spectrograph (GMOS) at Gemini South. Na I D absorption in the system traces dusty filaments on the near side of an extended, AGN-driven galactic wind (with projected velocities up to 2000 km s^{-1}). These filaments ($A_V < 4$ and $N(H) < 10^{22}$ cm^{-2}) simultaneously obscure the stellar continuum and Na I D emission lines. The Na I D emission lines serve as a complementary probe of the wind: they are strongest in regions of low foreground obscuration and extend up to the limits of the field of view (galactocentric radii of 3 kpc). An azimuthally symmetric Sérsic model extincted by the same foreground screen as the stellar continuum reproduces the Na I D emission line surface brightness distribution except in the inner regions of the wind, where some emission-line filling of absorption lines may occur. The presence of detectable Na I D emission in F05189−2524 may be due to its high continuum surface brightness at the rest wavelength of Na I D. These data uniquely constrain current models of cool gas in galactic winds and serve as a benchmark for future observations and models.

Accepted by the Astrophysical Journal

E-mail contact: drupke@gmail.com
Preprint available at http://arxiv.org/abs/1411.3744

Seyfert galaxies with *Swift*: giant flares, rapid drops, and other surprises

S. Komossa[1], D. Grupe[2], R. Saxton[3], L. Gallo[4]

[1] Max-Planck-Institut für Radioastronomie, Auf dem Hügel 69, 53121 Bonn, Germany
[2] Space Science Center, Morehead State University, 235 Martindale Dr., Morehead, KY 40351, USA
[3] XMM SOC, ESAC, Apartado 78, 28691 Villanueva de la Cañada, Madrid, Spain
[4] Department of Astronomy and Physics, Saint Mary's University, 923 Robie Street, Halifax, NS B3H 3C3, Canada

Swift has initiated a new era of understanding the extremes of active galactic nuclei (AGN) variability, their drivers and underlying physics. This is based on its rapid response, high sensitivity, good spatial resolution, and its ability to collect simultaneously X–ray-to-optical SEDs. Here, we present results from our recent monitoring campaigns with *Swift* of highly variable AGN, including outbursts, deep low states, and unusual long-term trends in several Seyfert galaxies including Mrk 335, WPVS 007, and RXJ2314.9+2243. We also report detection of a new X-ray and optical outburst of IC 3599 and our *Swift* follow-ups. IC 3599 was previously known as one of the AGN with the highest-amplitude outbursts. We briefly discuss implications of this second outburst of IC 3599 for emission scenarios including accretion-disk variability, repeat tidal disruption events, and the presence of a binary supermassive black hole.

Contribution to *Swift: 10 years of discovery*, to appear in Proceedings of Science (PoS):
http://pos.sissa.it/cgi-bin/reader/conf.cgi?confid=233

E-mail contact: skomossa@mpifr.de
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Are many radio-selected BL Lacs radio quasars in disguise?

V. D'Elia[1,2], P. Padovani[3,4], P. Giommi[1], S. Turriziani[5]

[1] INAF-Osservatorio Astronomico di Roma, Via Frascati 33, I-00040 Monteporzio Catone, Italy
[2] ASI-Science Data Centre, Via del Politecnico snc, I-00133 Rome, Italy
[3] European Southern Observatory, Karl-Schwarzschild-Strasse 2, D-85748 Garching, Germany
[4] Associated to INAF - Osservatorio Astronomico di Roma, via Frascati 33, I-00040 Monteporzio Catone, Italy
[5] University of Rome Tor Vergata, via della Ricerca Scientifica 1, I-00133, Roma, Italy

We show that a blazar classification in BL Lacs and Flat Spectrum Radio Quasars may not be adequate when it relies solely on the equivalent widths (EWs) of optical lines. In fact, depending on redshift, some strong emission lines can fall in the infrared window and be missed. We selected a sample of BL Lacs with firm redshift identification and good visibility from Paranal. We targeted with the X-shooter spectrograph the five BL Lacs with $z > 0.7$, i.e., those for which the Hα line, one of the strongest among blazars, falls outside the optical window and determined the EW of emission lines in both the infrared and optical bands. Two out of five sources show an observed Hα EW > 5Å (one has rest frame EW > 5Å) and could be classified as FSRQs by one of the classification schemes used in the literature. A third object is border-line with an observed EW of 4.4 ± 0.5Å. In all these cases Hα is the strongest emission line detected. The Hα line of the other two blazars is not detected, but in one case it falls in a region strongly contaminated by sky lines and in the other one the spectrum is featureless. We conclude that a blazar classification based on EW width only can be inaccurate and may lead to an erroneous determination of blazar evolution. This effect is more severe for the BL Lac class, since FSRQs can be misclassified as BL Lacs especially at high redshifts ($z > 0.7$), where the latter are extremely rare.

Accepted by MNRAS

E-mail contact: delia@asdc.asi.it
Preprint available at http://arxiv.org/abs/1502.07121

Special Announcements

Fizeau exchange visitors program - call for applications

2015-02-13

The Fizeau exchange visitors program in optical interferometry funds (travel and accommodation) visits of researchers to an institute of his/her choice (within the European Community) to perform collaborative work and training on one of the active topics of the European Interferometry Initiative. The visits will typically last for one month, and strengthen the network of astronomers engaged in technical, scientific and training work on optical/infrared interferometry. The program is open for all levels of astronomers (Ph.D. students to tenured staff). non-EU based missions will only be funded if considered essential by the Fizeau Committee. Applicants are strongly encouraged to seek also partial support from their home or host institutions.

The **deadline for applications is March 15**. Fellowships can be awarded for missions starting in May.

NOTE: a special Fizeau call will be issued in late April for financial support requests for the VLTI school 2015 in Cologne: http://www.astro.uni-koeln.de/vltischool2015 (and see below).

Further information and application forms can be found at http://www.european-interferometry.eu

The program is funded by OPTICON/FP7.

Please distribute this message also to potentially interested colleagues outside of your community!

Looking forward to your applications,
Josef Hron & Laszlo Mosoni
(for the European Interferometry Initiative)

E-mail contact: fizeau@european-interferometry.eu

8th VLTI Summer School Cologne
High angular resolution in astrophysics: optical interferometry from theory to observations

6-13 September 2015

In the last decade, optical/infrared long-baseline interferometry has reached a new stage with the advent of multi-telescope arrays accessible to a broad community of astronomers. The Very Large Telescope Interferometer (VLTI) built in Chile and operated by the European Southern Observatory (ESO) is a good example of a fully open and operational interferometric facility. The next two years will see the second generation instruments, GRAVITY and MATISSE, commissioned on the VLTI. They will operate in interferometric mode with the four Unit (8-m) or Auxiliary (1.8-m) telescopes in the near- and mid-infrared spectral range (H-, K-, L-, M-, and N-bands). With the increasing number of telescopes that can be combined, interferometers are on the verge to reconstruct complex images at an unprecedented angular resolution. Interferometric techniques are useful for studies of a wide range of astrophysical objects such as young and evolved stars, and active galactic nuclei. The community has to prepare for the best possible exploitation of the second-generation instruments in a way that astronomers from a broad range of topics learn how to use interferometric data for their science.

With this objective in mind, we organize a summer school to train astronomers interested in optical interferometry. The prime objective of the school is to initiate astronomers to the use of VLTI by 1) showcasing some applications of VLTI in the field of young stellar objects, evolved stars and active galactic nuclei, 2) teaching the fundamentals of optical interferometry techniques and 3) organizing practical sessions with the software tools that will be used in this research field. The school is addressed to a wide public of persons involved into astronomical research, including undergraduate students, PhDs, postdocs or confirmed astronomers willing to exploit long baseline interferometry. The topics will include an introduction to the technique of long-baseline optical/infrared interferometry, and will cover the various steps of data reduction, basic modeling of interferometric data, as well as proposal writing and preparation of observing runs.

The VLTI school will take place from the 6th to the 13th of September in the city center of Cologne. Participants will be expected to pay a conference fee of 200 Euro, in which accomodation is included. A limited financial support will be available via the Fizeau Program. More information will be available at the time of registration.

For further questions please contact vlti2015-info@ph1.uni-koeln.de or see the website at
http://www.astro.uni-koeln.de/vltischool2015