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

From the Editor

The Active Galaxies Newsletter is produced monthly. The deadline for contributions is the last friday 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.

Janine van Eymeren

Formation of High-redshift ($z > 6$) Quasars Driven by Nuclear Starbursts

Nozomu Kawakatu[1,2] and Keiichi Wada[1,3]

[1] National Astronomical Observatory of Japan, 2-21-1 Osawa, Mitaka, Tokyo 181-8588, Japan
[2] JSPS fellow
[3] Graduate School of Science and Engineering, Kagoshima University, Kagoshima 890-8580, Japan

Based on the physical model of a supermassive black hole (SMBH) growth via gas accretion in a circumnuclear disk (CND) proposed by Kawakatu & Wada (2008), we describe the formation of high-z ($z > 6$) quasars (QSOs) whose BH masses are $M_{\rm BH} > 10^9 M_\odot$. We derive the necessary conditions to form QSOs at $z > 6$ by only gas accretion: (i) A large mass supply with $M_{\rm sup} > 10^{10} M_\odot$ from host galaxies to CNDs, because the final BH mass is only $1 - 10\%$ of the total supplied mass from QSO hosts. (ii) High star formation efficiency for a rapid BH growth which is comparable to high-z starburst galaxies such as submillimeter galaxies (SMGs). We also find that if the BH growth is limited by the Eddington accretion, the final BH mass is greatly suppressed when the period of mass-supply from hosts, $t_{\rm sup}$ is shorter than the Eddington timescale. Thus, the super-Eddington growth is required for the QSO formation as far as $t_{\rm sup}$, which is determined by the efficiency of angular momentum transfer, is shorter than $\sim 10^8$ yr. The evolution of the QSO luminosity depends on the redshift $z_{\rm i}$ at which accretion onto a seed BH is initiated. In other words, the brighter QSOs at $z > 6$ favor the late growth of SMBHs (i.e., $z_{\rm i} \approx 10$) rather than early growth (i.e., $z_{\rm i} \approx 30$). For $z_{\rm i} \approx 10$, $t_{\rm sup} \simeq 10^8$ yr is shorter than that of the star formation in the CND. Thus, the gas in the CND can accrete onto a BH more efficiently, compared with the case for $z_{\rm i} \approx 30$ (or $t_{\rm sup} \approx 10^9$ yr). Moreover, we predict the observable properties and the evolution of QSOs at $z > 6$. In a QSO phase, there should exist a stellar rich massive CND, whose gas mass is about 10% of the dynamical mass inside $\sim 0.1 - 1$ kpc. On the other hand, in a phase where the BH grows (i.e., a proto-QSO phase), the proto-QSO has a gas rich massive CNDs whose gas mass is comparable to the dynamical mass. Compared with the observed properties of the distant QSO SDSS J1148+5251 observed at $z = 6.42$, we predict that SDSS J1148+5251 corresponds to the scenario of the late growth of SMBH with $z_{\rm i} \sim 10$, which is accompanied by a massive CNDs with $M_{\rm g} \approx 5 \times 10^{10} M_\odot$ and the luminous nuclear starburst $L_{\rm SB}$ at infrared band with $L_{\rm SB} \approx 10^{47}\,{\rm erg\,s^{-1}}$. Moreover, we predict that the progenitor of SDSS J1148+5251 can be the super-Eddington object. These predictions can be verified by ALMA, SPICA and JWST.

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E-mail contact: kawakatu@th.nao.ac.jp,
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Accretion Discs in Blazars

E.J.D. Jolley[1], Z. Kuncic[1], G.V. Bicknell[2] and S. Wagner[3]

[1] School of Physics, University of Sydney, Sydney NSW 2006, Australia
[2] Research School of Astronomy and Astrophysics, Australian National University, Canberra, Australia
[3] Landessternwarte Heidelberg, Konigstuhl, Heidelberg, Germany

The characteristic properties of blazars (rapid variability, strong polarization, high brightness) are widely attributed to a powerful relativistic jet oriented close to our line of sight. Despite the spectral energy distributions (SEDs) being strongly jet-dominated, a "big blue bump" has been recently detected in sources known as flat spectrum radio quasars (FSRQs). These new data provide a unique opportunity to observationally test coupled jet-disc accretion models in these extreme sources. In particular, as energy and angular momentum can be extracted by a jet magnetically coupled to the accretion disc, the thermal disc emission spectrum may be modified from that predicted by the standard model for disc accretion. We compare the theoretically predicted jet-modified accretion disc spectra against the new observations of the "big blue bump" in FSRQs. We find mass accretion rates that are higher, typically by a factor of two, than predicted by standard accretion disc theory. Furthermore, our results predict that the high redshift blazars PKS 0836+710, PKS 2149-307, B2 0743+25 and PKS 0537-286 may be predominantly powered by a low or moderate spin ($a \lesssim 0.6$) black hole with high mass accretion rates $\dot{M}_{\rm a} \approx 50 - 200\,{\rm M}_\odot\,{\rm yr}^{-1}$, while 3C 273 harbours a rapidly spinning black hole ($a = 0.97$) with $\dot{M}_{\rm a} \approx 20\,{\rm M}_\odot\,{\rm yr}^{-1}$. We also find that the black hole masses in these high redshift sources must be $\gtrsim 5 \times 10^9\,{\rm M}_\odot$.

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Dust emission from a parsec-scale structure in the Seyfert 1 nucleus of NGC 4151

L. Burtscher[1,2], W. Jaffe[3], D. Raban[3], K. Meisenheimer[1], K. R. W. Tristram[4], H. Röttgering[3]

[1] Max-Planck-Institut für Astronomie, Königstuhl 17, 69217 Heidelberg, Germany
[2] Fellow of the International Max Planck Research School (IMPRS) for Astronomy and Cosmic Physics, Heidelberg, Germany
[3] Sterrewacht Leiden, Leiden University, Niels-Bohr-Weg 2, 2300 CA Leiden, The Netherlands
[4] Max-Planck-Institut für Radioastronomie, Auf dem Hügel 69, 53121 Bonn, Germany

We report mid-IR interferometric measurements with ~ 10 mas resolution, which resolve the warm (T = 285^{+25}_{-50} K) thermal emission at the center of NGC 4151. Using pairs of VLT 8.2 m telescopes with MIDI and by comparing the data to a Gaussian model, we determined the diameter of the dust emission region, albeit only along one position angle, to be (2.0 ± 0.4) pc (FWHM). This is the first size and temperature estimate for the nuclear warm dust distribution in a Seyfert 1 galaxy. The parameters found are comparable to those in Seyfert 2 galaxies, thus providing direct support for the unified model. Using simple analytic temperature distributions, we find that the mid-infrared emission is probably not the smooth continuation of the hot nuclear source that is marginally resolved with K band interferometry. We also detected weak excess emission around 10.5 μm in our shorter baseline observation, possibly indicating that silicate emission is extended to the parsec scale.

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Cen A as TeV γ-ray and possible UHE cosmic-ray source

Frank M. Rieger[1] and Felix Aharonian[1,2]

[1] Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg, Germany
[2] Dublin Institute for Advanced Studies, 31 Fitzwilliam Place, Dublin 2, Ireland

The most nearby active galaxy Cen A has attracted considerable attention as a detected TeV gamma-ray and possible ultra-high energy (UHE) cosmic-ray emitter. We investigate the efficiency of particle acceleration close to the supermassive black hole (BH) horizon assuming that accretion in the innermost part of the disk occurs in an advection-dominated (ADAF) mode. We analyze the constraints on the achievable particle energies imposed by radiative losses and corotation for conditions inferred from observations. We show that for an underluminous source such as Cen A, centrifugally accelerated electrons may reach Lorentz factors of up to $\gamma \sim (10^7 - 10^8)$, allowing inverse Compton (Thomson) upscattering of ADAF sub-mm disk photons into the TeV regime with an associated maximum (isotropic) luminosity of the order of a few times 10^{39} erg/s. Upscattering of Comptonized disk photons is expected to lead to a TeV spectrum $L_\nu \propto \nu^{-\alpha_c}$ with a spectral index $\alpha_c \simeq (1.5 - 1.9)$, consistent with H.E.S.S. results. The corresponding minimum variability timescale could be as low as $r_{\rm L}/c \sim 1$ hr for a typical light cylinder radius

of $r_L \simeq 5\,r_s$. While efficient electron acceleration appears to be well possible, protons are unlikely to be accelerated into the extreme UHECR regime close to the central black hole. We argue that if Cen A is indeed an extreme UHECR emitting source, then shear acceleration along the kpc-scale jet could represent one of the most promising mechanisms capable of pushing protons up to energies beyond 50 EeV.

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E-mail contact: frank.rieger@mpi-hd.mpg.de,
preprint available at http://arxiv.org/abs/0910.2327

The Gemini spectral library of near-IR late type stellar templates and its application for velocity dispersion measurements.

Cláudia Winge[1], Rogemar A. Riffel[2] and Thaisa Storchi-Bergmann[2]

[1] Gemini Observatory, c/o Aura, Inc., Casilla 603, La Serena, Chile
[2] Universidade Federal do Rio Grande do Sul, IF, CP 15051, Porto Alegre 91501-970, RS, Brazil

We present a spectroscopic library of late spectral type stellar templates in the near-IR range 2.15–2.42μm, at R=5300–5900 resolution, oriented to support stellar kinematics studies in external galaxies, such as the direct determination of the masses of supermassive black-holes in nearby active (or non-active) galaxies. The combination of high spectral resolution and state-of-the-art instrumentation available in 8-m class telescopes has made the analysis of circumnuclear stellar kinematics using the near-IR CO band heads one of the most used techniques for such studies, and this library aims to provide the supporting datasets required by the higher spectral resolution and larger spectral coverage currently achieved with modern near-IR spectrographs. Examples of the application for kinematical analysis are given for data obtained with two Gemini instruments, but the templates can be easily adjusted for use with other near-IR spectrographs at similar or lower resolution. The example datasets are also used to revisit the "template mismatch" effect and the dependence of the velocity dispersion values obtained from the fitting process with the characteristics of the stellar templates. The library is available in electronic form from the Gemini web pages at http://www.gemini.edu/sciops/instruments/nearir-resources/?q=node/10167

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E-mail contact: cwinge@gemini.edu,
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The line parameters and ratios as the physical probe of the line emitting regions in AGN

D. Ilić[1], J. Kovačević[2] and L. Č. Popović[2]

[1] Department of Astronomy, Faculty of Mathematics, University of Belgrade, Studentski trg 16, 11000 Belgrade, Serbia
[2] Astronomical Observatory, Volgina 7, 11060 Belgrade, Serbia

Here we discuss the physical conditions in the emission line regions (ELR) of active galactic nuclei (AGN), with the special emphasize on the unresolved problems, e.g. the stratification of the Broad Line Region (BLR) or the failure of the photoionization to explain the strong observed optical Fe II emission. We use here different line fluxes in order to probe the properties of the ELR, such as the hydrogen Balmer lines (Hα to Hε), the helium lines from two subsequent ionization levels (He II λ4686 and He I λ5876) and the strongest Fe II lines in the wavelength interval $\lambda\lambda 4400 - 5400\,\mathring{A}$. We found that the hydrogen Balmer and helium lines can be used for the estimates of the physical parameters of the BLR, and we show that the Fe II emission is mostly emitted from an intermediate line region (ILR), that is located further away from the central continuum source than the BLR.

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Confirmation of and Variable Energy Injection by a Near-Relativistic Outflow in APM 08279+5255

G. Chartas[1,2], C. Saez[2], W. N. Brandt[2], M. Giustini[2,3,4], and G. P. Garmire[2]

[1] Department of Physics and Astronomy, College of Charleston, Charleston, SC, 29424, USA, chartasg@cofc.edu
[2] Department of Astronomy & Astrophysics, Pennsylvania State University, University Park, PA 16802, chartas@astro.psu.edu, saez@astro.psu.edu, niel@astro.psu.edu, giustini@astro.psu.edu, garmire@astro.psu.edu
[3] Dipartimento di Astronomia, Universita degli Studi di Bologna, via Ranzani 1, 40127 Bologna, Italy, margharita.giustini2@iasfbo.inaf.it
[4] INAF/Istituto di Astrofisica Spaziale e Fisica Cosmica di Bologna, via Gobetti 101, 40129 Bologna, Italy, margherita.giustini@unibo.it

We present results from multi-epoch spectral analysis of *XMM-Newton* and *Chandra* observations of the broad absorption line (BAL) quasar APM 08279+5255. Our analysis shows significant X-ray BALs in all epochs with rest-frame energies lying in the range of $\sim$ 6.7–18 keV. The X-ray BALs and 0.2–10 keV continuum show significant variability on timescales as short as 3.3 days (proper time) implying a source size-scale of $\sim 10\ r_{\rm g}$, where $r_{\rm g}$ is the gravitational radius. We find a large gradient in the outflow velocity of the X-ray absorbers with projected outflow velocities of up to 0.76 c. The maximum outflow velocity constrains the angle between the wind velocity and our line of sight to be less than $\sim 22^{\circ}$. Based on our spectral analysis we identify the following components of the outflow: (a) Highly ionized X-ray absorbing material with an ionization parameter in the range of $2.9 < \log \xi < 3.9$ (the units of ξ are erg cm s^{-1}) and a column density of $\log N_{\rm H} \sim 23$ (the units of $N_{\rm H}$ are cm^{-2}) outflowing at velocities of up to 0.76 c. (b) Low-ionization X-ray absorbing gas with $\log N_{\rm H} \sim 22.8$. We find a possible trend between the X-ray photon index and the maximum outflow velocity of the ionized absorber in the sense that flatter spectra appear to result in lower outflow velocities. Based on our spectral analysis of observations of APM 08279+5255 over a period of 1.2 years (proper time) we estimate the mass-outflow rate and efficiency of the outflow to have varied between $16^{+12}_{-8}\ M_{\odot}$ yr^{-1} and $64^{+66}_{-40}\ M_{\odot}$ yr^{-1} and $0.18^{+0.15}_{-0.11}$ to $1.7^{+1.9}_{-1.2}$, respectively. Assuming that the outflow properties of APM 08279+5255 are a common property of most quasars at similar redshifts, our results then imply that quasar winds are massive and energetic enough to influence significantly the formation of the host galaxy, provide significant metal enrichment to the interstellar medium (ISM) and intergalactic medium (IGM), and are a viable mechanism for feedback at redshifts near the peak in the number density of galaxy mergers.

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Contribution of a Disk Component to Single Peaked Broad Lines of Active Galactic Nuclei

E. Bon[1,2], L. Č. Popović[1,2], N. Gavrilović[1,2,3], G. La Mura[4], E. Mediavilla[5]

[1]Astronomical Observatory, Volgina 7, 11160 Belgrade 74, Serbia, email: ebon@aob.bg.ac.yu
[2]Isaac Newton Institute of Chile, Yugoslavia Branch, Serbia
[3]Observatoire de Lyon, 9 Avenue Charles André, Saint-Genis Laval Cedex, F-69561, France
[4]Department of Astronomy, University of Padova, Vicolo dell'Osservatorio, I-35122 Padova, Italy
[5]Instituto de Astrofisica de Canarias, Tenerife, Spain

We study the disk emission component hidden in the single-peaked Broad Emission Lines (BELs) of Active Galactic Nuclei (AGN). We compare the observed broad lines from a sample of 90 Seyfert 1 spectra taken from the Sloan Digital Sky Survey with simulated line profiles. We consider a two-component Broad Line Region (BLR) model where an accretion disk and a surrounding non-disk region with isotropic cloud velocities generate the simulated BEL profiles. The analysis is mainly based in measurements of the full widths (at 10%, 20% and 30% of the maximum intensity) and of the asymmetries of the line profiles. Comparing these parameters for the simulated and observed Hα broad lines, we found that the hidden disk emission may be present in BELs even if the characteristic of two peaked line profiles is absent. For the available sample of objects (Seyfert 1 galaxies with single-peaked BELs), our study indicates that, in the case of the hidden disk emission in single peaked broad line profiles, the disk inclination tends to be small (mostly $i < 25^{\circ}$) and that the contribution of the disk emission to the total flux should be smaller than the contribution of the surrounding region.

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Complex Broad Emission Line Profiles of AGN - Geometry of the Broad Line Region

E. Bon[1], N. Gavrilović[1,2], G. La Mura[3] and L. Č. Popović[1]

[1] Astronomical Observatory, Volgina7, 11060 Belgrade, Serbia
[2] Observatoire de Lyon, 9 avenue Charles André, Saint-Genis Laval cedex, F-69561, France ; CNRS, UMR 5574
[3] Department of Astronomy, University of Padova, Vicolo dell'Osservatorio, I-35122 Padova, Italy

The Broad Emission Lines (BELs) in spectra of type 1 Active Galactic Nuclei (AGN) can be very complex, indicating a complex Broad Line Region (BLR) geometry. According to the standard unification model one can expect an accretion disk around a supermassive black hole in all AGN. Therefore, a disk geometry is expected in the BLR. However, a small fraction of BELs show double-peaked profiles which indicate the disk geometry. Here, we discuss a two-component model, assuming an emission from the accretion disk and one additional emission from surrounding region. We compared the modeled BELs with observed ones (mostly broad Hα and Hβ profiles) finding that the model can well describe single-peaked and double-peaked observed broad line profiles.

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E-mail contact: ebon@aob.bg.ac.rs,
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The Mid-Infrared Continua of Seyfert Galaxies

Rajesh P. Deo[1], Gordon T. Richards[1], D. M. Crenshaw[2], S. B. Kraemer[3]

[1] Department of Physics, Drexel University, 3141, Chestnut Street, Philadelphia, PA 19104-2816, USA; rpd@physics.drexel.edu
[2] Department of Physics and Astronomy, Georgia State University, Atlanta, GA 30303, USA
[3] Catholic University of America, and the Exploration of the Universe Division, NASA's Goddard Space Flight Center, Code 667, Greenbelt, MD 20771, USA

An analysis of archival mid-infrared (mid-IR) spectra of Seyfert galaxies from the *Spitzer Space Telescope* observations is presented. We characterize the nature of the mid-IR active nuclear continuum by subtracting a template starburst spectrum from the Seyfert spectra. The long wavelength part of the spectrum contains a strong contribution from the starburst-heated cool dust; this is used to effectively separate starburst-dominated Seyferts from those dominated by the active nuclear continuum. Within the latter category, the strength of the active nuclear continuum drops rapidly beyond ~ 20 μm. On average, type 2 Seyferts have weaker short-wavelength active nuclear continua as compared to type 1 Seyferts. Type 2 Seyferts can be divided into two types, those with strong poly-cyclic aromatic hydrocarbon (PAH) bands and those without. The latter type show polarized broad emission lines in their optical spectra. The PAH-dominated type 2 Seyferts and Seyfert 1.8/1.9s show very similar mid-IR spectra. However, after the subtraction of the starburst component, there is a striking similarity in the active nuclear continuum of all Seyfert optical types. PAH-dominated Seyfert 2s and Seyfert 1.8/1.9s tend to show weak active nuclear continua in general. A few type 2 Seyferts with weak/absent PAH bands show a bump in the spectrum between 15 and 20 μm. We suggest that this bump is the peak of a warm ($\sim$200 K) blackbody dust emission, which becomes clearly visible when the short-wavelength continuum is weaker. This warm blackbody emission is also observed in other Seyfert optical sub-types, suggesting a common origin in these active galactic nuclei.

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E-mail contact: rpd@physics.drexel.edu,
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New searches for H I 21-cm in damped Lyman-α absorption systems

S. J. Curran[1],P. Tzanavaris[2,3,4], J. K. Darling[5], M. T. Whiting[6], J. K. Webb[1], C. Bignell[7], R. Athreya[8] and M. T. Murphy[9]

[1]School of Physics, University of New South Wales, Sydney NSW 2052, Australia
[2]Institute of Astronomy and Astrophysics, National Observatory of Athens, I. Metaxa & V. Paulou 152 36 Penteli, Greece
[3]Department of Physics and Astronomy, Johns Hopkins University, Baltimore, MD 21218, USA
[4]Laboratory for X-Ray Astrophysics, NASA Goddard Space Flight Center, Code 662, Greenbelt, MD 20771, USA
[5]Department of Astrophysical and Planetary Sciences, University of Colorado at Boulder, Boulder, Colorado 80309, USA
[6]CSIRO Australia Telescope National Facility, PO Box 76, Epping NSW 1710, Australia
[7]National Radio Astronomy Observatory, P.O. Box 2, Rt. 28/92 Green Bank, WV 24944-0002, USA
[8]National Centre for Radio Astrophysics, Pune 411 007, Maharashtra, India
[9]Centre for Astrophysics and Supercomputing, Swinburne University of Technology, PO Box 218, Hawthorn, VIC 3122, Australia

We present the results of three separate searches for H I 21-cm absorption in a total of twelve damped Lyman-α absorption systems (DLAs) and sub-DLAs over the redshift range $z_{\rm abs} = 0.86 - 3.37$. We find no absorption in the five systems for which we obtain reasonable sensitivities and add the results to those of other recent surveys in order to investigate factors which could have an effect on the detection rate: We provide evidence that the mix of spin temperature/covering factor ratios seen at low redshift may also exist at high redshift, with a correlation between the 21-cm line strength and the total neutral hydrogen column density, indicating a roughly constant spin temperature/covering factor ratio for all of the DLAs searched. Also, by considering the geometry of a flat expanding Universe together with the projected sizes of the background radio emission regions, we find, for the detections, that the 21-cm line strength is correlated with the size of the absorber. For the non-detections it is apparent that larger absorbers (covering factors) are required in order to exhibit 21-cm absorption, particularly if these DLAs do not arise in spiral galaxies. We also suggest that the recent $z_{\rm abs} = 2.3$ detection towards TXS 0311+430 arises in a spiral galaxy, but on the basis of a large absorption cross-section and high metallicity, rather than a low spin temperature.

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Blind Wide Area Surveys: Where will we find redshifted atomic and molecular absorption?

S. J. Curran[1], M. T. Whiting[2] and J. K. Webb[1]

[1]School of Physics, University of New South Wales, Sydney NSW 2052, Australia
[2]CSIRO Australia Telescope National Facility, PO Box 76, Epping NSW 1710, Australia

Spectroscopy of redshifted radio absorption of atomic and molecular species provide excellent probes of the cold component of the gas in the early Universe which can be used to address many important issues, such as measuring baryonic content, probing large-scale structure and galaxy evolution, as well as obtaining independent measurements of various combinations of fundamental constants at large look-back times. However, such systems are currently very rare with only 80 detected in H I 21-cm and five in OH and millimetre-band species. Here we summarise the main selection criteria responsible for this and how the next generation of radio telescopes are expected to circumvent these through their wide instantaneous bandwidths and fields-of-view. Specifically:

1. *H I in absorbers occulting distant quasars:* These are usually found in known optical absorbers and wideband radio surveys could reveal a much fainter population. However, the 21-cm absorption strength may be correlated with the width of the singly ionised metal species, suggesting that these may be weak, and due to the effects of a flat expanding Universe on the covering factor, we expect the highest detection rates at $z < 1$.
2. *H I absorption associated with the host galaxy/quasar:* Due to high degrees of ionisation/excitation rendering 21-cm undetectable near active nuclei with ultra-violet luminosities of $L_{\rm UV} \gtrsim 10^{23}$ W Hz^{-1}, future searches should be magnitude limited, e.g. at $z > 1$, blue magnitudes should be $B \gtrsim 19$ with $z > 2 \Rightarrow B \gtrsim 21$ and $z > 3 \Rightarrow B \gtrsim 22$.
3. *OH (and millimetre-band) absorption:* For all of the known redshifted molecular absorption systems a correlation is found between the molecular fraction and the optical–near-infrared colour $(V-K)$, with the five known OH absorbers all having $V-K \gtrsim 5$. Therefore spectral scans towards extremely red radio sources are expected to uncover any dusty intervening, molecular rich absorbers reponsible for the obscuration of the optical light.

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Long-term variability of the optical spectra of NGC 4151: II. Evolution of the broad Hα and Hβ emission-line profiles

A.I. Shapovalova[1], L.Č. Popović[2,3], A.N.Burenkov[1], V.H. Chavushyan[4], D.Ilić[3,5], A. Kovačević[3,5], N.G. Bochkarev[6], J. León-Tavares[4,7]

[1] Special Astrophysical Observatory of the Russian AS, Nizhnij Arkhyz, Karachaevo-Cherkesia 369167, Russia
[2] Astronomical Observatory, Volgina 7, 11060 Belgrade, Serbia
[3]Isaac Newton Institute, Yugoslav branch
[4]Instituto Nacional de Astrofísica, Óptica y Electrónica, Apartado Postal 51, CP 72000, Puebla, Pue. México
[5] Department of Astronomy, Faculty of Mathematics, University of Belgrade, Studentski trg 16, 11000 Belgrade, Serbia
[6] Sternberg Astronomical Institute, Moscow, Russia
[7] Metsähovi Radio Observatory, Helsinki University of Technology TKK, Metsähovintie 114, FIN-02540 Kylmälä, Finland

Results of the long-term (11 years, from 1996 to 2006) Hα and Hβ line variations of the active galactic nucleus of NGC 4151 are presented. High quality spectra (S/N$>$ 50 and R$\approx$8 Å) of Hα and Hβ were investigated. We analyzed line profile variations during monitoring period. Comparing the line profiles of Hα and Hβ, we studied different details (bumps, absorbtion features) in the line profiles. The variations of the different Hα and Hβ line profile segments have been investigated. Also, we analyzed the Balmer decrement for whole line and for line segments. We found that the line profiles were strongly changing during the monitoring period, showing blue and red asymmetries. This indicates a complex BLR geometry of NGC 4151 with, at least, three kinematically distinct regions: one that contributes to the blue line wing, one to the line core and one to the red line wing. Such variation can be caused by an accelerating outflow starting very close to the black hole, where the red part may come from the region closer to the black hole than the blue part, which is coming from the region having the highest outflow velocities. Taking into account the fact that the BLR of NGC 4151 has a complex geometry (probably affected by an outflow) and that a portion of the broad line emission seems to have not a pure photoionization origin, one can ask the question whether the study of the BLR by reverberation mapping may be valid in the case of this galaxy.

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E-mail contact: dilic@matf.bg.ac.rs,
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Narrow Double-Peaked Emission Lines of SDSS J131642.90+175332.5: Signature of a Single or a Binary AGN in a Merger, Jet-Cloud Interaction, or Unusual Narrow-Line Region Geometry

Dawei Xu[1] and S. Komossa[2]

[1] National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China
[2] Max-Planck-Institut für extraterrestrische Physik, Postfach 1312, 85741 Garching, Germany

We present an analysis of the active galaxy SDSS J131642.90+175332.5, which is remarkable because all of its narrow emission lines are double-peaked, and because it additionally shows an extra broad component (FWHM $\sim$1400 km s^{-1}) in most of its forbidden lines, peaking in between the two narrow systems. The peaks of the two narrow systems are separated by 400–500 km s^{-1} in velocity space. The spectral characteristics of double-peaked [O III] emission have previously been interpreted as a signature of dual or binary active galactic nuclei (AGNs), among other models. In the context of the binary scenario, SDSS J131642.90+175332.5 is a particularly good candidate because not just one line but all of its emission lines are double-peaked. However, we also discuss a number of other scenarios which can potentially account for double-peaked narrow emission lines, including projection effects, a two-sided outflow, jet-cloud interactions, special narrow-line region (NLR) geometries (disks, bars, or inner spirals), and a galaxy merger with only *one* AGN illuminating *two* NLRs. We argue that the similarity of the emission-line ratios in both systems, and the presence of the very unusual broad component at intermediate velocity, makes a close pair of unrelated AGNs unlikely, and rather argues for processes in a single galaxy or merger. We describe future observations that can distinguish between these remaining possibilities.

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E-mail contact: dwxu@bao.ac.cn,
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On the 10-micron silicate feature in Active Galactic Nuclei

Robert Nikutta[1], Moshe Elitzur[1] and Mark Lacy[2]

[1] Department of Physics and Astronomy, University of Kentucky, Lexington, KY 40506-0055
[2] Spitzer Science Center, California Institute of Technology, Pasadena, CA 91125, USA

The 10μm silicate feature observed with Spitzer in active galactic nuclei (AGN) reveals some puzzling behavior. It (1) has been detected in emission in type 2 sources, (2) shows broad, flat-topped emission peaks shifted toward long wavelengths in several type 1 sources, and (3) is not seen in deep absorption in any source observed so far. We solve all three puzzles with our clumpy dust radiative transfer formalism. Addressing (1), we present the spectral energy distribution (SED) of SST1721+6012, the first type 2 quasar observed to show a clear 10μm silicate feature in emission. Such emission arises in models of the AGN torus only when its clumpy nature is taken into account. We constructed a large database of clumpy torus models and performed extensive fitting of the observed SED. We find that the cloud radial distribution varies as $r^{-1.5}$ and the torus contains 2–4 clouds along radial equatorial rays, each with optical depth at visual $\sim 60-80$. The source bolometric luminosity is $\sim 3\cdot10^{12}$ $L_{\odot}$. Our modeling suggests that $\leq$ 35% of objects with tori sharing these characteristics and geometry would have their central engines obscured. This relatively low obscuration probability can explain the clear appearance of the 10μm emission feature in SST1721+6012 together with its rarity among other QSO2. Investigating (2) we also fitted the SED of PG1211+143, one of the first type 1 QSOs with a 10μm silicate feature detected in emission. Together with other similar sources, this QSO appears to display an unusually broadened feature whose peak is shifted toward longer wavelengths. Although this led to suggestions of non-standard dust chemistry in these sources, our analysis fits such SEDs with standard galactic dust; the apparent peak shifts arise from simple radiative transfer effects. Regarding (3) we find additionally that the distribution of silicate feature strengths among clumpy torus models closely resembles the observed distribution, and the feature never occurs deeply absorbed. Comparing such distributions in several AGN samples we also show that the silicate emission feature becomes stronger in the transition from Seyfert to quasar luminosities.

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X-ray emission from the extended emission-line region of the powerful radio galaxy 3C 171

M.J. Hardcastle[1], F. Massaro[2] and D.E. Harris[2]

[1] School of Physics, Astronomy & Mathematics, University of Hertfordshire, College Lane, Hatfield AL10 9AB, UK
[2] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA

We present *Chandra* X-ray observations of the powerful radio galaxy 3C 171, which reveal an extended region of X-ray emission spatially associated with the well-known 10-kpc scale optical emission-line region around the radio jets. We argue that the X-ray emission comes from collisionally ionized material, originally cold gas that has been shock-heated by the passage of the radio jet, rather than being photoionized by nuclear radiation. This hot plasma is also responsible for the depolarization at low frequencies of the radio emission from the jet and hotspots, which allows us to estimate the magnetic field strength in the external medium. We show that it is likely that both the cold emission-line gas and the hot plasma in which it is embedded are being driven out of the host galaxy of 3C 171 at supersonic speeds. A significant fraction of the total energy budget of the central AGN must have been expended in driving this massive outflow. We argue that 3C 171, with its unusual radio morphology and the strong relation between the jet and large amounts of outflowing material, is a member of a class of radio galaxies in which there is strong interaction between the radio jets and cold material in the host galaxy; such objects may have been very much more common in the early universe.

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Heavily Obscured AGN in Star-Forming Galaxies at $z\simeq 2$

E. Treister[1,2], Carolin N. Cardamone[3,4], Kevin Schawinski[2,3,4], C. Megan Urry[3,4,5], Eric Gawiser[6], Shanil Virani[3,4], Paulina Lira[7], Jeyhan Kartaltepe[1], Maaike Damen[8], Edward N. Taylor[8], Emeric Le Floc'h[1], Stephen Justham[9], Anton M. Koekemoer[10]

[1]Institute for Astronomy, 2680 Woodlawn Drive, University of Hawaii, Honolulu, HI 96822; treister@ifa.hawaii.edu
[2]Chandra/Einstein Fellow
[3]Department of Astronomy, Yale University, PO Box 208101, New Haven, CT 06520.
[4]Yale Center for Astronomy and Astrophysics, P.O. Box 208121, New Haven, CT 06520.
[5]Department of Physics, Yale University, P.O. Box 208121, New Haven, CT 06520.
[6]Department of Physics and Astronomy, Rutgers University, 136 Frelinghuysen Road, Piscataway, NJ 08854-8019.
[7]Departamento de Astronomía, Universidad de Chile, Casilla 36-D, Santiago, Chile.
[8]Sterrewacht Leiden, Leiden University, NL-2300 RA Leiden, Netherlands.
[9]Kavli Institute for Astronomy and Astrophysics, Peking University, Beijing, China.
[10]Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, USA

We study the properties of a sample of 211 heavily-obscured Active Galactic Nucleus (AGN) candidates in the Extended Chandra Deep Field-South selecting objects with $f_{24\mu m}/f_R$>1000 and R-K>4.5. Of these, 18 were detected in X-rays and found to be obscured AGN with neutral hydrogen column densities of $\sim 10^{23}$ cm^{-2}. In the X-ray undetected sample, the following evidence suggests a large fraction of heavily-obscured (Compton Thick) AGN: (i) The stacked X-ray signal of the sample is strong, with an observed ratio of soft to hard X-ray counts consistent with a population of ~90% heavily obscured AGN combined with 10% star-forming galaxies. (ii) The X-ray to mid-IR ratios for these sources are significantly larger than that of star-forming galaxies and ~2 orders of magnitude smaller than for the general AGN population, suggesting column densities of $N_H > 5\times 10^{24}$ cm^{-2}. (iii) The Spitzer near- and mid-IR colors of these sources are consistent with those of the X-ray-detected sample if the effects of dust self-absorption are considered. Spectral fitting to the rest-frame UV/optical light (dominated by the host galaxy) returns stellar masses of $\sim 10^{11} M_\odot$ and <E(B-V)>=0.5, and reveals evidence for a significant young stellar population, indicating that these sources are experiencing considerable star-formation. This sample of heavily-obscured AGN candidates implies a space density at $z\sim 2$ of $\sim 10^{-5}$Mpc^{-3}, finding a strong evolution in the number of $L_X > 10^{44}$ erg/s sources from z=1.5 to 2.5, possibly consistent with a short-lived heavily-obscured phase before an unobscured quasar is visible.

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Jobs

Postdoctoral Research Position, University of Kentucky

Prof. Moshe Elitzur
Physics & Astronomy Department, University of Kentucky
Lexington, KY 40506-0055, USA

Applications are invited for a postdoctoral research position in theoretical astrophysics to work with Prof. Moshe Elitzur at the University of Kentucky, Lexington, KY, USA. The start date is around September 2010, although an earlier start is possible. Interest in radiative processes, AGN and starburt galaxies is advantageous. The successful applicant will be able to join the science team of CanariCam, the mid-IR imager on the 10.4m GTC telescope. Applicants should send curriculum vita, bibliography and a statement of research interests by e-mail to moshe@pa.uky.edu and arrange for three letters of recommendation to be sent the same way. The initial appointment is for one year, with an expected extension for another year. The review of applications will start at the end of December, and will continue until the position is filled

E-mail contact: moshe@pa.uky.edu

Postdoctoral Research Position, Landessternwarte, University of Heidelberg

Prof. Stefan Wagner
Landessternwarte, Königstuhl 12
69117 Heidelberg, Germany

The Landessternwarte Heidelberg (LSW) offers one postdoctoral position on AGN in its High-Energy Astrophysics group. We are looking for a postdoctoral researcher interested in AGN research, preferably involving studies at gamma-ray energies. Our team is involved in the Very High Energy Gamma-ray Experiment H.E.S.S., and AGN observing programs with Fermi, INTEGRAL, SUZAKU, XMM, Chandra, as well as ground-based optical and radio telescopes.
Candidates are invited to participate in multifrequency projects involving access to dedicated telescopes (eg LBT, HESS), and are encouraged to contribute to the multifrequency programme with own research projects.
Heidelberg is one of the main astrophysics centres in Germany with five institutes involved in most fields of astrophysics and particle-astrophysics.

The current postdoctoral opening is for an initial period of 18 months with the possibility of an extension of up to four years.

More information about these positions can be obtained from Stefan Wagner, swagner@lsw.uni-heidelberg.de.
The review of applications will begin on December 15, 2009 and will continue until the position is filled. Applications (including a CV, list of publication, description of accomplishments and research interests, as well as contact information for 3 references) should be sent to Prof. S. Wagner, Landessternwarte Heidelberg.

E-mail contact: swagner@lsw.uni-heidelberg.de

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