Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
No. 154 — January 2010	Editor: Janine van Eymeren (agnews@manchester.ac.uk)

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

Neutral Gas Outflows and Inflows in Infrared-Faint Seyfert Galaxies

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Previous studies of the Na I D interstellar absorption line doublet have shown that galactic winds occur in most galaxies with high infrared luminosities. However, in infrared-bright composite systems where a starburst coexists with an active galactic nucleus (AGN), it is unclear whether the starburst, the AGN, or both are driving the outflows. The present paper describes the results from a search for outflows in 35 infrared-faint Seyferts with $10^{9.9} < L_{\rm IR}/L_{\odot} < 10^{11}$, or, equivalently, star formation rates (SFR) of $\sim$0.4 – 9 $M_{\odot}$ yr^{-1}, to attempt to isolate the source of the outflow. We find that the outflow detection rates for the infrared-faint Seyfert 1s (6%) and Seyfert 2s (18%) are lower than previously reported for infrared-luminous Seyfert 1s (50%) and Seyfert 2s (45%). The outflow kinematics of infrared-faint and infrared-bright Seyfert 2 galaxies resemble those of starburst galaxies, while the outflow velocities in Seyfert 1 galaxies are significantly larger. Taken together, these results suggest that the AGN does not play a significant role in driving the outflows in most infrared-faint and infrared-bright systems, except the high-velocity outflows seen in Seyfert 1 galaxies. Another striking result of this study is the high rate of detection of inflows in infrared-faint galaxies (39% of Seyfert 1s, 35% of Seyfert 2s), significantly larger than in infrared-luminous Seyferts (15%). This inflow may be contributing to the feeding of the AGN in these galaxies, and potentially provides more than enough material to power the observed nuclear activity over typical AGN lifetimes.

Accepted by Astrophysical J.

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preprint available at arXiv:0911.3897

The Geometry of Mass Outflows and Fueling Flows in the Seyfert 2 Galaxy Mrk 3

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We present a study of the resolved emission-line regions and an inner dust/gas disk in the Seyfert 2 galaxy Mrk 3, based on *Hubble Space Telescope* observations. We show that the extended narrow-line region (ENLR), spanning ∼4 kpc, is defined by the intersection of the ionizing bicone of radiation from the AGN and the inner disk, which is not coplanar with the large-scale stellar disk. This intersection leads to different position and opening angles of the ENLR compared to the narrow-line region (NLR). A number of emission-line arcs in the ENLR appear to be continuations of dust lanes in the disk, supporting this geometry. The NLR, which consists of outflowing emission-line knots spanning the central ∼650 pc, is in the shape of a backwards S. This shape may arise from rotation of the gas, or it may trace the original fueling flow close to the nucleus that was ionized after the AGN turned on.

Accepted by the Astronomical Journal

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preprint available at arXiv:0912.2420

Variability and stability in blazar jets on time scales of years: Optical polarization monitoring of OJ287 in 2005–2009

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OJ287 is a BL Lac object at redshift $z = 0.306$ that has shown double-peaked bursts at regular intervals of ~ 12 yr during the last ~ 40 yr. We analyse optical photopolarimetric monitoring data from 2005–2009, during which the latest double-peaked outburst occurred. The aim of this study is twofold: firstly, we aim to analyse variability patterns and statistical properties of the optical polarization light-curve. We find a strong preferred position angle in optical polarization. The preferred position angle can be explained by separating the jet emission into two components: an optical polarization core and chaotic jet emission. The optical polarization core is stable on time scales of years and can be explained as emission from an underlying quiescent jet component. The chaotic jet emission sometimes exhibits a circular movement in the Stokes plane. We find six such events, all on the time-scales of 10–20 days. We interpret these events as a shock front moving forwards and backwards in the jet, swiping through a helical magnetic field. Secondly, we use our data to assess different binary black hole models proposed to explain the regularly appearing double-peaked bursts in OJ287. We compose a list of requirements a model has to fulfil to explain the mysterious behaviour observed in OJ287. The list includes not only characteristics of the light-curve but also other properties of OJ287, such as the black hole mass and restrictions on accretion flow properties. We rate all existing models using this list and conclude that none of the models is able to explain all observations. We discuss possible new explanations and propose a new approach to understanding OJ287. We suggest that both the double-peaked bursts and the evolution of the optical polarization position angle could be explained as a sign of resonant accretion of magnetic field lines, a 'magnetic breathing' of the disc.

Accepted for publication in MNRAS

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preprint available at arXiv:0912.0005

Power for dry BL Lacs

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Is it significant that the intrinsic outputs of several BL Lacs are observed to level off at values of about 10^{46} erg s^{-1}? In searching for an answer, we compare γ-ray observations by the *AGILE* satellite of the BL Lac S5 0716+714 with those of Mrk 421 and Mrk 501; the former are particularly marked by intense flares up to fluxes of 2×10^{-6} photons cm^{-2} s^{-1} in the $0.1 - 10$ GeV energy range. These "dry" BL Lacs show evidence of neither thermal disk emissions nor emission lines signaling any accreting or surrounding gas; the spectral distributions of their pure non-thermal radiations are effectively represented by the synchrotron self-Compton process. With source parameters correspondingly derived and tuned with simultaneous multiwavelength observations, we find for S5 0716+714 a total jet power of about 3×10^{45} erg s^{-1}, which makes it one of the brightest dry BL Lacs so far detected in γ rays. We evaluate the mass of the associated Kerr hole to be around $5 \times 10^8 M_\odot$, implying that the source is significantly gauged in terms of the maximal power around 4×10^{45} erg s^{-1} extractable via the Blandford-Znajek electrodynamical mechanism; other dry BL Lacs observed in γ rays remain well below that threshold. These findings and those forthcoming from *Fermi*-LAT will provide a powerful test of electrodynamics in the surroundings of the hole, that are dominated by GR effects.

Accepted by A&A

E-mail contact: paggi@roma2.infn.it,
preprint available at arXix:0911.3172

Infrared Diagnostics for the Extended 12 micron Sample of Seyferts

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We present an analysis of Spitzer IRS spectroscopy of 83 active galaxies from the extended 12 micron sample. We find rank correlations between several tracers of star formation which suggest that (1) the PAH feature is a reliable tracer of star formation, (2) there is a significant contribution to the heating of the cool dust by stars, (3) the H_2 emission is also primarily excited by star formation. The 55-90 vs. 20-30 spectral index plot is also a diagnostic of the relative contribution of Starburst to AGN. We see there is a large change in spectral index across the sample. Thus, the contribution to the IR spectrum from the AGN and starburst components can be comparable in magnitude but the relative contribution also varies widely across the sample. We find rank correlations between several AGN tracers. We search for correlations between AGN and Starburst tracers and we conclude that the AGN and Starburst tracers are not correlated. This is consistent with our conclusion that the relative strength of the AGN and Starburst components varies widely across the sample. Thus, there is no simple link between AGN fueling and Black Hole Growth and star formation in these galaxies. The distribution of Sil 10 micron and 18 micron strengths is consistent with the clumpy torus models of Sirocky et al. We find a rank correlation between the [NeV] 14 micron line and the 6.7 micron continuum which may be due to an extended component of hot dust. The Sy 2s with a Hidden Broad Line Region (HBLR) have a higher ratio of AGN to Starburst contribution to the SED than Sy 2s without an HBLR. This may contribute to the detection of the HBLR in polarized light. The Sy 2s with an HBLR are more similar to the Sy 1s than they are to the Sy 2s without an HBLR.

Accepted by ApJ.

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preprint available at arXiv:0912.3545

Spectral variability and reverberation time delays in the Suzaku X-ray spectrum of NGC 4051

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Long Suzaku X-ray observations of the active galaxy NGC 4051 from 2005 and 2008 are analysed, in an attempt to reach a self-consistent understanding of the spectral variability on long timescales and at high time resolution. Principal components analysis and a maximum likelihood method of power spectrum analysis are used. In common with other type I AGN, the spectral variability is dominated by a varying-normalisation power-law component together with a quasi-steady, hard-spectrum offset component that contains Fe K atomic features. NGC 4051 displays a strong excess over a power-law at energies above 20 keV, some fraction of which also appears to vary with the power-law continuum. The power spectrum has a shape consistent with previous determinations, but significant differences are found between the low and high flux states of the source, demonstrating that the power spectrum is non-stationary. Frequency-dependent time lags between the hard and soft bands of up to 970+/-225s are measured. The existence of the observed lags excludes the possibility that the hard spectral component originates as reflection from the inner accretion disk. We instead show that the frequency- and energy-dependent time lags may be explained as reverberation, caused by reflection from a thick shell of material with maximum lags of about 10,000s. If the reflecting material surrounds the AGN, it extends to a distance about 1.5×10^{14} cm, 600 gravitational radii, from the illuminating source and the global covering factor is $C(g) > 0.4$, confirming suggestions that type I AGN have high covering factors of absorbing and reflecting material. Given the spectral and timing similarities with other type I AGN, we infer that this structure is common in the type I population.

Accepted by MNRAS

Preprint available at arXiv:0912.0456

Cosmic Ray Spallation in Radio-Quiet Active Galactic Nuclei: A Case Study of NGC 4051

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We investigate conditions for and consequences of spallation in radio-quiet Seyfert galaxies. The work is motivated by the recent discovery of significant line emission at 5.44 keV in Suzaku data from NGC 4051. The energy of the new line suggests an identification as Cr I Kα emission, however the line is much stronger than would be expected from material with cosmic abundances, leading to a suggestion of enhancement owing to nuclear spallation of Fe by low energy cosmic rays from the active nucleus. We find that the highest abundance enhancements are likely to take place in gas out of the plane of the accretion disk and that timescales for spalla tion could be as short as a few years. The suggestion of a strong nuclear flux of cosmi c rays in a radio-quiet Seyfert galaxy is of particular interest in light of the recent suggestion from *Pierre Auger Observatory* data that ultra-high-energy cosmic rays may originate in such sources.

Accepted by Astrophysical Journal

Preprint available at arXiv:0912.3479

The XMM-*Newton* Wide Angle Survey (XWAS): the X-ray spectrum of type-1 AGN

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We discuss the broad band X-ray properties of one of the largest samples of X-ray selected type-1 AGN to date (487 objects in total), drawn from the XMM-*Newton* Wide Angle Survey (XWAS). The objects presented in this work cover 2-10 keV (rest-frame) luminosities from $\sim 10^{42} - 10^{45}\,\mathrm{erg\,s^{-1}}$ and are detected up to redshift $\sim$4. We constrain the overall properties of the broad band continuum, soft excess and X-ray absorption, along with their dependence on the X-ray luminosity and redshift. We discuss the implications for models of AGN emission. We fitted the observed 0.2-12 keV broad band spectra with various models to search for X-ray absorption and soft excess. The F-test was used with a significance threshold of 99% to statistically accept the detection of additional spectral components. We constrained the mean spectral index of the broad band X-ray continuum to $\langle\Gamma\rangle = 1.96 \pm 0.02$ with intrinsic dispersion $\sigma_{\langle\Gamma\rangle} = 0.27^{+0.01}_{-0.02}$. The continuum becomes harder at faint fluxes and at higher redshifts and hard (2-10 keV) luminosities. The dependence of Γ with flux is likely due to undetected absorption rather than to spectral variation. We found a strong dependence of the detection efficiency of objects on the spectral shape. We expect this effect to have an impact on the measured mean continuum shapes of sources at different redshifts and luminosities. We detected excess absorption in >3% of our objects, with rest-frame column densities $\sim$a few $\times 10^{22}\,\mathrm{cm^{-2}}$. The apparent mismatch between the optical classification and X-ray properties of these objects is a challenge for the standard orientation-based AGN unification model. We found that the fraction of objects with detected soft excess is $\sim$36%. Using a thermal model, we constrained the soft excess mean rest-frame temperature and intrinsic dispersion to $kT\sim$100 eV and $\sigma_{kT} \sim$34 eV. The origin of the soft excess as thermal emission from the accretion disk or Compton scattered disk emission is ruled out on the basis of the temperatures detected and the lack of correlation of the soft excess temperature with the hard X-ray luminosity over more than 2 orders of magnitude in luminosity. Furthermore, the high luminosities of the soft excess rule out an origin in the host galaxy.

Accepted by Astronomy and Astrophysics

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preprint available at http://arxiv.org/abs/0912.2965

Feeding versus Feedback in NGC4151 probed with Gemini NIFS. II. Kinematics

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We have used the Gemini Near-infrared Integral Field Spectrograph (NIFS) to map the gas kinematics of the inner ∼200×500 pc of the Seyfert galaxy NGC 4151 in the Z, J, H and K bands at a resolving power 5000 and spatial resolution of ∼8 pc. The ionised gas emission is most extended along the known ionisation bi-cone at position angle PA=60–240°, but is observed also along its equatorial plane. This indicates that the AGN ionizes gas beyond the borders of the bi-cone, within a sphere with $\approx 1''$ radius around the nucleus. The ionised gas has three kinematic components: (1) one observed at the systemic velocity and interpreted as originating in the galaxy disk; (2) one outflowing along the bi-cone, with line-of-sight velocities between –600 and 600 km s^{-1} and strongest emission at ±(100–300) km s^{-1}; (3) and another component due to the interaction of the radio jet with ambient gas. The radio jet (at PA=75–255°) is not aligned with the NLR, and produces flux enhancements mostly observed at the systemic velocity, suggesting that the jet is launched close to the plane of the galaxy (∼plane of the sky). The mass outflow rate, estimated to be ≈1 M yr^{-1} along each cone, exceeds the inferred black hole accretion rate by a factor of ∼100. This can be understood if the Narrow-Line-Region (NLR) is formed mostly by entrained gas from the circumnuclear interstellar medium by an outflow probably originating in the accretion disk. This flow represents feedback from the AGN, estimated to release a kinetic power of $\dot{E} \approx 2.4 \times 10^{41} erg\, s^{-1}$, which is only ∼0.3 % of the bolometric luminosity of the AGN.

There is no evidence in our data for the gradual acceleration followed by gradual deceleration proposed by previous modelling of the [O III] emitting gas. Our data allow the possibility that the NLR clouds are accelerated close to the nucleus after which the flow moves at essentially constant velocity (∼600 km s^{-1}), being consistent with NIR emission arising predominantly from the interaction of the outflow with gas in the galactic disk.

The molecular gas exhiibits distinct kinematics relative to the ionised gas. Its emission arises in extended regions approximately perpendicular to the axis of the bi-cone and along the axis of the galaxy's stellar bar, avoiding the innermost ionised regions. It does not show an outflowing component, being observed only at velocities very close to systemic, and is thus consistent with an origin in the galaxy plane. This hot molecular gas may only be the tracer of a larger reservoir of colder gas which represents the AGN feeding.

Accepted by MNRAS

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preprint available at arXiv:0911.2212

A long hard look at the minimum state of PG 2112+059 with XMM-Newton

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Our observational aim is to perform a long X-ray observation of the quasar PG 2112+059 in its low or minimum state. Starting form this very peculiar emission state, we intend to constrain the intrinsic emission mechanism by comparing new and old data, corresponding to different source states.

XMM-Newton successfully detected the minimum state of PG 2112+059 during a short snapshot observation and performed a long follow-up observation. The high signal-to-noise spectra are modelled assuming different emission scenarios and compared with archival spectra taken by XMM-Newton and Chandra.

The PG 2112+059 X-ray spectra acquired in May 2007 allowed the detection of a weak iron fluorescent line, which is interpreted as being caused by reflection from neutral material at some distance from the primary X-ray emitting source. The X-ray spectra of PG 2112+059 taken at five different epochs during different flux states can be interpreted within two different scenarios. The first consists of two layers of ionised material with column densities of $N_H \sim 5 \times 10^{22} cm^{-2}$ and $N_H \sim 3.5 \times 10^{23} cm^{-2}$, respectively. The first layer is moderately ionised and its ionisation levels follow the flux changes, while the other layer is highly ionised and does not show any correlation with the flux of the source. The spectra can also be interpreted assuming reflection by an ionised accretion disk seen behind a warm absorber. The warm absorber ionisation is consistent with being correlated with the flux of the source, which provides an additional degree of self-consistency with the overall reflection-based model. We explain the spectral variability with light bending according to the models of Miniutti and Fabian and constrain the black hole

spin to be $a/M > 0.86$. Both scenarios also assume that a distant cold reflector is responsible for the Fe K α emission line.

Light bending provides an attractive explanation of the different states of PG 2112+059 and may also describe the physical cause of the observed properties of other X-ray weak quasars. The observations of PG 2112+059 in different states provide valuable constraints, although are unable to break the degeneracy between complex absorption scenarios and reflection from an ionised disk.

Accepted by Astronomy & Astrophysics,
preprint available at arXiv:0912.4456

Meetings

460th WE-Heraeus Seminar: Black Holes

Bad Honnef, Germany
June 6-11, 2010

Webpage: http://www.xray.mpe.mpg.de/ skomossa/Heraeus460/index.html
Email: skomossa@mpe.mpg.de

The last decade has witnessed rapid progress in the astrophysical study of black holes. Observations have shown that many nearby galaxies host supermassive black holes at their centers, and have established an intimate link between the masses of the black holes and the properties of their host galaxies. Measurements in the high-energy X-ray regime have allowed us to study the conditions of matter in the immediate vicinity of black holes, and to probe down to scales very close to the actual event horizon of black holes. Breakthroughs in numerical relativity have made it possible, for the first time, to compute the merging of two supermassive black holes. Within the next ten years, ground-based gravitational wave detectors like LIGO and VIRGO will begin making regular observations of merging stellar-mass black holes out to redshifts of $\sim$0.3. Future space-based observatories like IXO will measure X-rays from the first accreting massive black holes in the Universe, while LISA will detect gravitational waves from coalescing supermassive black hole binaries throughout the Universe. Gravitational wave and electromagnetic astronomy have previously been rather disjoint fields of research. A key goal of this seminar is to bring together researchers in these two fields, and to provide a forum for lively discussions, with an emphasis on the electromagnetic and gravitational wave signatures of strong gravity.

The seminar will focus on the following key topics: (1) Astrophysical observations and physics of black holes, and probes of strong gravity.
(2) Formation and growth of supermassive black holes across cosmic times, co-evolution of galaxies and black holes.
(3) Galaxy mergers, formation and coalescence of binary supermassive black holes.
(4) Gravitational wave emission from compact objects.
(5) Current and future ground- and space-based missions which are devoted to the study of gravitational waves and electromagnetic radiation from (the environment of) black holes.
(6) Electromagnetic signatures of black hole binaries and recoiling black holes.

The seminar will consist of invited review talks (35+5min), contributed talks (15+5 min), and posters. The number of participants is limited to 70. Selection will be made on a "first come, first serve basis. There is no conference fee. Deadline for registration is March 10, 2010.

10th EVN Symposium 2010: VLBI and the new generation of radio arrays

Manchester, UK
September 20th-24th, 2010

Webpage: http://www.jodrellbank.manchester.ac.uk/meetings/evn2010
Email: evnsymp2010@jb.man.ac.uk

SCIENTIFIC RATIONALE: Jodrell Bank Centre for Astrophysics and the University of Manchester, on behalf of the European VLBI Consortium, will host the 10th European VLBI Network Symposium from September 20th to 24th, 2010. The Symposium will be held at the University of Manchester, UK.

At this conference the latest scientific results and technical developments from VLBI and e-VLBI results will be reported. The timing of this meeting coincides with the development of, and first results from a number of new and upgraded radio facilities around the globe, such as e-MERLIN, LOFAR, EVLA, ALMA, and the SKA pathfinders ASKAP and MeerKAT. This meeting will incorporate some of the firs results from these new instruments, in addition to the unique scientific and technical contribution of VLBI in this new era of radio astronomy.

PLANNED SCIENCE SESSIONS will include: Life cycle of matter in stars and galaxies; AGN and cosmic star-formation; Extreme Astrophysics; Astrometry, Geodesy, space and planetary science; and Techniques & developments.

VENUE: The conference will be held in the University of Manchester's conference venue, the Weston Building, which is situated in city centre of Manchester. Manchester itself is a vibrant city with ample attractions and amenities for all visitors. Block

bookings of rooms for the duration of the meeting at the conference venue itself. Further information regarding this conference as well as specific details regarding the venue and accommodation will available shortly on the conference website and in subsequent announcements. This meeting will also incorporate the EVN Users meeting and a trip to Jodrell Bank Observatory.

Jobs

Assistant Professor of Astronomy

Department of Physics and Astronomy
Georgia State University

The Department of Physics and Astronomy anticipates filling a tenure track position in extragalactic astronomy at the rank of Assistant Professor for the 2010-11 academic year. The department presently includes 9 faculty members in astronomy with 3 in the extragalactic field (Dick Miller, Paul Wiita, and Mike Crenshaw). The successful applicant should have the following minimum requirements: (1) Ph.D. degree in astronomy, astrophysics or related field; (2) post-doctoral and research/teaching experience commensurate with rank; and (3) evidence of the ability to establish and maintain a successful research program in extragalactic astronomy which complements existing research programs in the department. In order to receive full consideration, applications should be received by Jan 31, 2010 and should include a cover letter, CV, the names of three references, statements of the candidate's teaching philosophy, research interests, and a description of how their research program would complement existing research programs in astronomy at GSU. These materials should be sent to the attention of H. Richard Miller, Dept. of Physics and Astronomy, Georgia State University, University Plaza, Atlanta, GA 30303. The email submission address is miller@chara.gsu.edu. This position will remain open until filled. For more information on the astronomy program at GSU, see http://www.chara.gsu.edu/. An offer of employment will be conditional on background verification. Georgia State University, a unit of the University System of Georgia, is an equal opportunity educational institution, and an EEO/AA employer.

E-mail contact: miller@chara.gsu.edu