Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
No. 110 — May 2006	Editor: Rob Beswick (rb@ast.man.ac.uk)

Abstracts - Thesis Abstracts - Jobs - Meetings

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.

Rob Beswick

4U 1344−60: a bright intermediate Seyfert galaxy at $z = 0.012$ with a relativistic Fe Kα emission line

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We present analysis of the optical and X-ray spectra of the low Galactic latitude bright ($F_{2-10} = 3.6 \times 10^{-11}$ erg cm^{-2} s^{-1}) source 4U 1344−60. On the basis of the optical data we propose to classify 4U 1344−60 as an intermediate type Seyfert galaxy and we measure a value of $z = 0.012 \pm 0.001$ for its redshift. From the XMM–Newton observation we find that the overall X–ray spectral shape of 4U 1344−60 is complex and can be described by a power-law continuum ($\Gamma \approx 1.55$) obscured by two neutral absorption components ($N_H^f \sim 10^{22}$ cm^{-2} and $N_H^p \sim 4 \times 10^{22}$ cm^{-2}), the latter covering only the $\sim 50\%$ of the primary X-ray source. The X-ray data therefore lend support to our classification of 4U 1344−60. It exhibits a broad and skewed Fe Kα line at ~ 6.4 keV, which suggests the existence of an accretion disk that is able to reprocess the primary continuum down to a few gravitational radii. Such a line represents one of the clearest examples of a relativistic line observed by XMM–Newton so far. Our analysis has also revealed the marginal presence of two narrow line-like emission features at ~ 4.9 and ~ 5.2 keV.

Accepted by A&A

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preprint available at http://arxiv.org/abs/astro-ph/0603713

The AGN Outflow in the HDFS Target QSO J2233-606 from a High-Resolution VLT/UVES Spectrum

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We present a detailed analysis of the intrinsic UV absorption in the central HDFS target QSO J2233-606, based on a high-resolution, high S/N (∼25 – 50) spectrum obtained with VLT/UVES. This spectrum samples the cluster of intrinsic absorption systems outflowing from the AGN at radial velocities $v \approx -5000 - 3800$ km s^{-1} in the key far-UV diagnostic lines - the lithium-like CNO doublets and H I Lyman series. We fit the absorption troughs using a global model of all detected lines to solve for the independent velocity-dependent covering factors of the continuum and emission-line sources and ionic column densities. This reveals increasing covering factors in components with greater outflow velocity. Narrow substructure is revealed in the optical depth profiles, suggesting the relatively broad absorption is comprised of a series of multiple components. We perform velocity-dependent photoionization modeling, which allows a full solution to the C, N, and O abundances, as well as the velocity resolved ionization parameter and total column density. The absorbers are found to have supersolar abundances, with [C/H] and [O/H] ≈0.5 – 0.9, and [N/H] ≈ 1.1 – 1.3, consistent with enhanced nitrogen production expected from secondary nucleosynthesis processes. Independent fits to each kinematic component give consistent results for the abundances. The lowest-ionization material in each of the strong absorbers is modeled with similar ionization parameters. Components of higher-ionization (indicated by stronger O VI relative to C IV and N V) are present at velocities just redward of each low-ionization absorber. We explore the implications of these results for the kinematic-geometric-ionization structure of the outflow.

Accepted by ApJ

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First Detection of Near-Infrared Intraday Variations in the Seyfert 1 Nucleus NGC4395

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We carried out a one-night optical V and near-infrared JHK monitoring observation of the least luminous Seyfert 1 galaxy, NGC4395, on 2004 May 1, and detected for the first time the intraday flux variations in the J and H bands, while such variation was not clearly seen for the K band. The detected J and H variations are synchronized with the flux variation in the V band, which indicates that the intraday-variable component of near-infrared continuum emission of the NGC4395 nucleus is an extension of power-law continuum emission to the near-infrared and originates in an outer region of the central accretion disk. On the other hand, from our regular program of long-term optical BVI and near-infrared JHK monitoring observation of NGC4395 from 2004 February 12 until 2005 January 22, we found large flux variations in all the bands on time scales of days to months. The optical BVI variations are almost synchronized with each other, but not completely with the near-infrared JHK variations. The color temperature of the near-infrared variable component is estimated to be $T = 1320 \sim 1710$ K, in agreement with thermal emission from hot dust tori in active galactic nuclei (AGNs). We therefore conclude that the near-infrared variation consists of two components having different time scales, so that a small K-flux variation on a time scale of a few hours would possibly be veiled by large variation of thermal dust emission on a time scale of days.

Accepted by ApJ Letters

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preprint available at http://arxiv.org/abs/astro-ph/0604183

The structure and X-ray radiation spectra of illuminated accretion disks in AGN. III. Modeling fractional variability

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Random magnetic flares above the accretion disks of Active Galactic Nuclei can account for the production of the primary radiation and for rapid X-ray variability that have been frequently observed in these objects. The primary component is partly reprocessed in the disk atmosphere forming a hot spot underneath the flare source and giving rise to distinct spectral features. Extending the work of Czerny et al. (2004), we model the fractional variability amplitude due to distributions of hot spots co-orbiting on the accretion disk around a supermassive black hole. We compare our results to the observed fractional variability spectrum of the Seyfert galaxy MCG -6-30-15. According to defined radial distributions, our code samples random positions for the hot spots across the disk. The local spot emission is computed as reprocessed radiation coming from a compact primary source above the disk. The structure of the hot spot and the anisotropy of the re-emission are taken into account. We compute the fractional variability spectra expected from such spot ensembles and investigate dependencies on the parameters describing the radial spot distribution. We consider the fractional variability $F_{\rm var}$ with respect to the spectral mean and also the so-called point-to-point definition $F_{\rm pp}$. Our method includes relativistic corrections due to the curved space-time in the vicinity of a rotating supermassive black hole at the disk center; the black hole angular momentum is a free parameter and subject to the fitting procedure. We confirm that the rms-variability spectra involve intrinsic randomness at a significant level when the number of flares appearing during the total observation time is too small. Furthermore, the fractional variability expressed by $F_{\rm var}$ is not always compatible with $F_{\rm pp}$. In the special case of MCG -6-30-15, we can reproduce the short-timescale variability and model the suppressed variability in the energy range of the Kα line without any need to postulate reprocessing farther away from the center. The presence of the dip in the variability spectrum requires an increasing rate of energy production by the flares toward the center of the disk. The depth of the feature is well represented only if we assume a fast rotation of the central black hole and allow for considerable suppression of the primary flare emission. The modeled line remains consistent with the measured equivalent width of the iron Kα line complex. The model can reproduce the frequently observed suppression of the variability in the spectral range around 6.5 keV, thereby setting constraints on the black hole spin and on the disk inclination.

Accepted by Astronomy & Astrophysics

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O VI Asymmetry and an Accelerated Outflow in an Obscured Seyfert: *FUSE* and *HST STIS* Spectroscopy of Markarian 533

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We present far-ultraviolet spectra of the Seyfert 2 galaxy Mrk 533 obtained with *FUSE* . These spectra show narrow asymmetrical O VI $\lambda\lambda$1032,1038 emission lines with stronger wings shortward of the peak wavelength, but the degree of asymmetry of these wings in velocity is much lower than that of the wings of the lines of lower ionization. In the combined O VI profile there are marginal indications of local absorptions in the outflow. The C III λ977 line is seen weakly with a similar profile, but with very low signal to noise. These *FUV* spectra are among the first for a Seyfert of type 2, *i.e.*, a purportedly obscured Seyfert. The *HST STIS* spectral image of Mrk 533 allows delineation of the various components of the outflow, and we infer that the outflow is accelerated. We discuss the results in terms of nuclear geometry and kinematics.

Accepted by Astrophys. J.

E-mail contact: pshastri@iiap.res.in, preprint available at http://arxiv.org/abs/astro-ph/0603842

XMM–Newton observations of a sample of $\gamma-$ray loud active galactic nuclei

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Aim: To understand the nature of $\gamma-$ray loud active galactic nuclei (AGN) and the mechanisms for the generation of high-energy $\gamma-$rays.
Methods: We performed a homogeneous and systematic analysis of simultaneous X-ray and optical/UV properties of a group of 15 $\gamma-$ray loud AGN, using observations performed with *XMM-Newton.* The sample is composed of 13 blazars (6 BL Lac and 7 Flat-Spectrum Radio Quasar) and 2 radio galaxies that are associated with detections at energies > 100 MeV. The data for 7 of them are analyzed here for the first time, including the first X-ray observation of PKS $1406-706$. The spectral characteristics of the sources in the present sample were compared with those in previous catalogs of blazars and other AGN, to search for difference or long term changes.
Results: All the selected sources appear to follow the classic "blazar sequence" and the spectral energy distributions (SED) built with the present X-ray and optical/UV data and completed with historical data, confirm the findings of previous studies on this type of source. Some sources display interesting features: four of them, namely AO $0235+164$, PKS $1127-145$, S5 $0836+710$ and PKS $1830-211$ show the presence of an intervening absorption system along the line of sight, but only the last is known to be gravitationally lensed. AO $0235+164$ was detected during an outburst and its SED shows a clear shift of the synchrotron peak. 3C 273 shows a change in state with respect to the previous *BeppoSAX* observations that can be interpreted as an increase of the Seyfert-like component and a corresponding decline of the jet emission. This is consistent with the monitoring at radio wavelengths performed during the same period. PKS $1406-706$ is detected with a flux higher than in the past, but with a corresponding low optical flux. Although it is classified as FSRQ, the SED can be modelled with a simple synchrotron self-Compton model.

Accepted by Astronomy & Astrophysics

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preprint available at http://arxiv.org/abs/astro-ph/0603268

Spectral line variability amplitudes in AGNs

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We present the results of a long-term variability campaign of very broad-line AGNs with line widths broader than FWHM > 5000 kms^{-1}. The main goal of our investigation was to study whether the widths of the optical broad emission lines are correlated with the optical intensity variations on timescales of years. Our AGN sample consisted of 10 objects. We detected a significant correlation between optical continuum variability amplitudes and Hβ emission line widths (FWHM) and, to a lesser degree, between Hβ line intensity variations and Hβ equivalent widths. We add the spectroscopic data of variable AGNs from the literature to supplement our sample. The AGNs from other optical variability campaigns with different line-widths helped to improve the statistical significance of our very broad-line AGN sample. After including the data on 35 additional galaxies, the correlation between optical continuum variability amplitudes and Hβ emission line widths becomes even more significant and the probability that this is a random correlation drops to 0.7 percent.

Accepted by Astronomy & Astrophysics

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preprint available at http://arxiv.org/abs/astro-ph/0604468

Quasars and Galactic Nuclei, a Half-Century Agitated Story

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I recall how the discovery of quasars occurred more than forty years ago, and the strong debates marking out their story. It led to the discovery of Massive Black Holes, which are now known to be present in almost all galaxies, and it opened on a coherent physical model and on a new vision of galaxy evolution.

talk given at the Albert Einstein Century International Conference, held in Paris, France, July 18-22, 2005, submitted to publication in AIP, Eds J.-M. Alimi and A. Fuzfa

preprint available at http://arxiv.org/abs/astro-ph/0604560

New Jobs

Permanent and Post-Doctoral Positions in the X-ray Astronomy Group of TIFR (India)

The X-ray Astronomy Group (Department of Astronomy and Astrophysics, DAA) of Tata Institute of Fundamental Research, Mumbai (Bombay), India, is looking for bright young scientists for permanent academic and post-doctoral positions. The programmes of the group include X-ray, UV, Optical and Infrared studies of Active Galactic Nuclei, Galaxies, and Clusters of Galaxies. The research programmes with satellite-based, and other national and international observatories are also being actively pursued. Three X-ray payloads covering the energy range of 0.3 - 100 keV are being built in DAA for India's first multi-wavelength Astronomy satellite - ASTROSAT. The DAA also has a vibrant program of research in infrared astronomy, as well as various branches of theoretical astrophysics.

Candidates with a Ph.D. and $\sim 1-3$ years of post-doctoral experience with excellent academic record are encouraged to apply for permanent academic positions. Candidates with more experience can also be considered for senior positions. Fresh Ph.D.'s will also be considered for a Post-doctoral appointment. Post-doctoral appointments are on yearly basis and renewable for a maximum of three years. The institute offers competitive academic environment, career profiles, on-campus accommodation and health and other family welfare benefits. Interested persons may contact the department's chairperson (E-mail: daa@tifr.res.in). Further details can also be seen by visiting DAA's webpage: http://www.tifr.res.in/scripts/sitemap.php?id=5.

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