Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
No. 60 — March 2002	Editor: Rob Beswick (rb@ast.man.ac.uk)

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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

Abstracts of recently accepted papers

The structure and radiation spectra of illuminated accretion discs in AGN. I. Moderate illumination

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We present detailed computations of the vertical structure of an accretion disc illuminated by hard X-ray radiation with the code TITAN-NOAR suitable for Compton thick media. The energy generated via accretion is dissipated partially in the cold disc as well as in the X-ray source. We study the differences between the case where the X-ray source is in the form of a lamp post above the accretion disc and the case of a heavy corona. We consider radiative heating via Comptonization together with heating via photo-absorption on numerous heavy elements as carbon, oxygen, silicon, iron. The transfer in lines is precisely calculated. A better description of the heating/cooling through the inclusion of line transfer, a correct description of the temperature in the deeper layers, a correct description of the entire disc vertical structure, as well as the study of the possible coronal pressure effect, constitute an improvement in comparison to previous works. We show that exact calculations of hydrostatic equilibrium and determination of the disc thickness has a crucial impact on the optical depth of the hot illuminated zone. We study the lamp post model for a low ($\dot{m} = 0.03$) and high ($\dot{m} = 0.3$) accretion rate. In both cases we assume a moderate illumination where the viscous flux equals the X-ray radiation flux. A highly ionized skin is created in the lamp post model, with the outgoing spectrum containing many emission lines and ionization edges in emission or absorption in the soft X-ray domain, as well as an iron line at ~ 7 keV consisting of a blend of low ionization line from the deepest layers and hydrogen and helium like resonance line from the upper layers, and almost no absorption edge, contrary to the case of a slab of constant density. A full heavy corona completely suppresses the highly ionized zone on the top of the accretion disc and in such case the spectrum is featureless.

Accepted by MNRAS on Jan 17 2002

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preprint available at http://arXiv.org/abs/astro-ph/0202069

Cygnus A

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We report Chandra imaging-spectroscopy and RXTE spectroscopy of the nearby, powerful radio galaxy Cygnus A. Various aspects of the results are discussed, including the X-ray properties of the nucleus, the radio hot spots, the cluster of galaxies, the prolate cavity in the ICM inflated by the radio jets and "bands" of thermal gas which encircle the cavity in its equatorial plane. The hard X-ray emission of the nucleus extends to 100 keV and originates from an unresolved source absorbed by a large column density ($N_H \simeq 2 \times 10^{23}$ cm^{-2}) of gas. The soft (< 2 keV) nuclear emission exhibits a bi-polar structure which extends $\simeq 2$ kpc from the nucleus and is strongly correlated with both optical continuum and emission-line morphologies. It is suggested that this nebulosity is photoionized by the nucleus and that the extended X-rays are electron-scattered nuclear radiation. All four radio hot spots are detected in X-rays, with the emission resulting from synchrotron self-Compton radiation in an approximately equipartition field. The temperature of the X-ray emitting intracluster gas drops from $\simeq 8$ keV more than 100 kpc from the center to $\simeq 5$ keV some 80 kpc from the center, with the coolest gas immediately adjacent to the radio galaxy. There is a metallicity gradient in the X-ray emitting gas, with the highest metallicities ($\sim$ solar) found close to the center, decreasing to ~ 0.3 solar in the outer parts. We have used the assumption of hydrostatic equilibrium to derive a total cluster mass within 500 kpc of $2.0 \times 10^{14}\ M_\odot$ and $2.8 \times 10^{14}\ M_\odot$, and a gas fraction in the cluster within 500 kpc of 0.055 and 0.039 for a constant and centrally decreasing temperature profile, respectively. We show that the limb-brightened edge of the cavity is hotter than the nearby, innermost region of the cluster gas, indicating heating by the expanding, jet-driven cavity. Conversely, the "bands", interpreted as gas being accreted onto the galaxy, are cooler. Within the cavity, there is evidence for diffuse X-ray emission, in addition to the X-ray emissions related to the jets and hot spots.

To be published in "New Visions of the Universe in the XMM-Newton and Chandra Era", Ed. F. Jansen (in press) (2002) (European Space Agency ESA SP-488)

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preprint available at astro-ph/0202319

Ice features in the mid-IR spectra of galactic nuclei

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Mid infrared spectra provide a powerful probe of the conditions in dusty galactic nuclei. They variously contain emission features associated with star forming regions and absorptions by circumnuclear silicate dust plus ices in cold molecular cloud material. Here we report the detection of 6–8 μm water ice absorption in 18 galaxies observed by ISO. While the mid-IR spectra of some of these galaxies show a strong resemblance to the heavily absorbed spectrum of NGC 4418, other galaxies in this sample also show weak to strong PAH emission. The 18 ice galaxies are part of a sample of 103 galaxies with good S/N mid-IR ISO spectra. Based on our sample we find that ice is present in most of the ULIRGs, whereas it is weak or absent in the large majority of Seyferts and starburst galaxies. This result is consistent with the presence of larger quantities of molecular material in ULIRGs as opposed to other galaxy types.
Like NGC 4418, several of our ice galaxy spectra show a maximum near 8 μm that is not or only partly due to PAH emission. While this affects only a small part of the galaxy population studied by ISO, it stresses the need for high S/N data and refined diagnostic methods, to properly discriminate spectra dominated by PAH emission and spectra dominated by heavy obscuration. The spectral variation from PAH emission to absorbed continuum emission near 8 μm shows strong similarities with Galactic star forming clouds. This leads us to believe that our classification of ice galaxy spectra might reflect an evolutionary sequence from strongly obscured beginnings of star formation (and AGN activity) to a less enshrouded stage of advanced star formation (and AGN activity), as the PAHs get stronger and the broad 8 μm feature weakens.

Accepted by Astronomy & Astrophysics

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The origin of the UV excess in powerful radio galaxies: spectroscopy and polarimetry of a complete sample of intermediate redshift radio galaxies

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We present spectroscopic and polarimetric observations of a complete, optically unbiased sample of 2Jy radio galaxies at intermediate redshifts ($0.15 < z < 0.7$). The data — which cover the nuclear regions of the target galaxies — allow us to quantify for the first time the various components that contribute to the UV excess in the population of powerful, intermediate redshift radio galaxies. We find that, contrary to the results of previous surveys — which have tended to be biased towards the most luminous and spectacular objects in any redshift range — the contribution of scattered quasar light to the UV excess is relatively minor in most of the objects in our sample. Only 7 objects (32% of the complete sample) show significant polarization in the rest-frame UV, and none of the objects in our sample is polarized in the near-UV at the $P > 10\%$ level. Careful measurement and modelling of our spectra have allowed us to quantify the contributions of other components to the UV excess. We show that nebular continuum (present in all objects at the 3 — 40% level), direct AGN light (significant in 40% of objects), and young stellar populations (significant in 15 — 50% of objects) all make important contributions to the UV continuum in the population of powerful radio galaxies. These results serve to emphasise the multi-component nature of the UV continuum in radio galaxies. The results also point to an interesting link betweeen the optical/UV and far-IR properties of our sample objects, in the sense that the objects with the clearest evidence for optical/UV starburst activity are also the most luminous at far-IR wavelengths. This supports the idea that the cooler dust components in radio galaxies are heated by starbursts rather than by AGN.

Accepted by MNRAS

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The Mass of the Central Black Hole in the Seyfert Galaxy NGC 3783

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Improved analysis of ultraviolet and optical monitoring data on the Seyfert 1 galaxy NGC 3783 provides evidence for the existence of a supermassive, $(8.7\pm1.1)\times10^{6}$ $M_{\odot}$, black hole in this galaxy. By using recalibrated spectra from the *International Ultraviolet Explorer* satellite and ground-based optical data, as well as refined techniques of reverberation mapping analysis, we have reduced the statistical uncertainties in the response of the emission lines to variations in the ionizing continuum. The different time lags in the emission line responses indicate a stratification in the ionization structure of the broad-line region and are consistent with the virial relationship suggested by the analysis of similar active galaxies.

Accepted by Astrophys. J.

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X-rays from the jet in 3C 273: clues from the radio–optical spectra

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Using new deep VLA and HST observations of the large-scale jet in 3C 273 matched to $0\farcs3$ resolution, we have detected excess near-ultraviolet emission (λ 300 nm a synchrotron cutoff spectrum accounting for the emission from radio through optical ($\lambda\lambda$3.6 cm–620 nm) necessitates a two-component model for the emission. The radio–optical–X-ray spectral energy distributions suggest a common origin for the UV excess and the X-rays from the jet.

Accepted by A&A Letters

X-ray Properties of LINERs and Low-luminosity Seyfert Galaxies Observed with *ASCA*. I. Observations and Results

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This paper presents a comprehensive study of the X-ray properties of low-ionization nuclear emission-line regions (LINERs) and low-luminosity Seyfert galaxies based on observations obtained with the *ASCA* satellite. We analyzed data of 53 observations of 21 LINERs and 17 low-luminosity Seyferts. X-ray emission has been detected in all but one object. The X-ray luminosities in the 2–10 keV band range from 4×10^{39} ergs s^{-1} to 5×10^{41} ergs s^{-1}, which are 1–3 orders of magnitude smaller than in classical Seyfert galaxies. The X-ray spectra of most objects are well described by a canonical model which consists of (1) a soft component from a thermal plasma with $kT < 1$ keV and (2) a hard component represented by a power law with a photon index of $\Gamma \approx 1.8$ or thermal bremsstrahlung emission with $kT \approx 10$ keV. Several objects do not require the soft thermal component, and their continua are well fitted by a single power-law model. Some objects show heavy absorption with column densities in excess of 10^{23} cm^{-2}. We detect in several objects Fe K line emission with equivalent widths ranging from 50 eV to 2 keV.

Variability on timescales less than a day is uncommon in our sample. By comparing multiple observations made with *ASCA* or with published 2–10 keV observations from other satellites, we show that at least eight objects are variable on timescales of a week to several years. We find that the morphologies of many objects, both in the soft and hard bands, are consistent with being pointlike relative to the telescope point-spread function; a few are clearly extended in either or both energy bands.

The second paper of this series will discuss the physical interpretation of the X-ray emission and its implications for low-luminosity active galactic nuclei.

To appear in The Astrophysical Journal Supplements., v139

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