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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

Optical Monitoring of BL Lac Object S5 0716+714 with High Temporal Resolution

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Optical monitoring of S5 0716+714 was performed with a 60/90 Schmidt telescope in 2003 November and December and 2004 January for studying the variability of the object on short timescales. Due to the high brightness of the source we could carry out quasi-simultaneous measurements in three bands with a temporal resolution of about 20 minutes by using one single telescope. Intraday and intranight variations were observed with an overall change of ∼0.9 mag during the whole campaign. Two outbursts were recorded on JD 2 453 005 and JD 2 453 009. Minimum timescales of a few hours were derived from the light curves of individual nights but were different from night to night. A bluer-when-brighter chromatism was present when the object was in fast flare, but was absent when it was in a relatively quiescent state. Our results are basically consistent with the shock-in-jet model and demonstrate that the geometrical effects can sometimes play an important role in the variability of blazars.

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E-mail contact: jhwu@bao.ac.cn, preprint available at http://arxiv.org/abs/astro-ph/0501184

The far-infrared emission line and continuum spectrum of the Seyfert galaxy NGC 1068

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We report on the analysis of the first complete far-infrared spectrum (43-197μm) of the Seyfert 2 galaxy NGC 1068 as observed with the *Long Wavelength Spectrometer* (LWS) onboard the *Infrared Space Observatory* (ISO). In addition to the 7 expected ionic fine structure emission lines, the OH rotational lines at 79, 119 and 163μm were all detected in emission, which is unique

among galaxies with full LWS spectra, where the 119μm line, when detected, is always in absorption. The observed line intensities were modelled together with ISO *Short Wavelength Spectrometer* (SWS) and optical and ultraviolet line intensities from the literature, considering two independent emission components: the AGN component and the starburst component in the circumnuclear ring of $\sim$ 3 kpc in size. Using the UV to mid-IR emission line spectrum to constrain the nuclear ionizing continuum, we have confirmed previous results: a canonical power-law ionizing spectrum is a poorer fit than one with a deep absorption trough, while the presence of a *big blue bump* is ruled out. Based on the instantaneous starburst age of 5 Myr constrained by the Br γ equivalent width in the starburst ring, and starburst synthesis models of the mid- and far-infrared fine-structure line emission, a low ionization parameter (U=$10^{-3.5}$) and low densities (n=100 cm^{-3}) are derived. Combining the AGN and starburst components, we succeeded in modeling the overall UV to far-IR atomic spectrum of NGC 1068, reproducing the line fluxes to within a factor 2.0 on average with a standard deviation of 1.3, and the overall continuum as the sum of the contribution of the thermal dust emission in the ionized and neutral components. The OH 119 μm emission indicates that the line is collisionally excited, and arises in a warm and dense region. The OH emission has been modeled using spherically symmetric, non-local, non-LTE radiative transfer models. The models indicate that the bulk of the emission arises from the nuclear region, although some extended contribution from the starburst is not ruled out. The OH abundance in the nuclear region is expected to be $\sim 10^{-5}$, characteristic of X-ray dominated regions.

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E-mail contact: luigi@ifsi.rm.cnr.it, preprint available at http://arxiv.org/abs/astro-ph/0501024

Starbursts and the triggering of the activity in nearby powerful radio galaxies

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We present high quality long-slit spectra for three nearby powerful radio galaxies – 3C293, 3C305, PKS1345+12. These were taken with the aim of characterising the young stellar populations (YSP), and thereby investigating the evolution of the host galaxies, as well as the events that triggered the activity. Isochrone spectral synthesis modelling of the wide wavelength coverage spectra of nuclear and off-nuclear continuum-emitting regions have been used to estimate the ages, masses and luminosities of the YSP component, taking full account of reddening effects and potential contamination by activity-related components. We find that the YSP make a substantial contribution to the continuum flux in the off-nuclear regions on a radial scale of 1 – 20 kpc in all three objects. Moreover, in two objects we find evidence for reddened post-starburst stellar populations in the near-nuclear regions of the host galaxies. The YSP are relatively old (0.1 – 2 Gyr), massive ($10^9 < M_{YSP} < 2 \times 10^{10}$ M$_\odot$) and make up a large proportion ($\sim$1 – 50%) of the total stellar mass in the regions of galaxies sampled by the observations. Overall, these results are consistent with the idea that AGN activity in some radio galaxies is triggered by major gas-rich mergers. Therefore, these radio galaxies form part of the subset of early-type galaxies that is evolving most rapidly in the local universe. Intriguingly, the results also suggest that the radio jets are triggered relatively late in the merger sequence, and that there is an evolutionary link between radio galaxies and luminous/ultra-luminous infrared galaxies.

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preprint available at http://www.shef.ac.uk/physics/research/agn/agn2.html, http://arxiv.org/abs/astro-ph/0410108

Polarimetry of powerful radio galaxies from $z = 0$ to $z = 4$

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The advent of sensitive polarimeters on large telescopes has led to a revolution in our understanding of active galaxies over the last 20 years. In the case of powerful radio galaxies the deep polarimetric measurements made possible by the new technology have: (a) provided the most direct evidence to support the unified schemes for powerful radio galaxies; (b) enhanced our understanding of the colours and morphologies of radio source host galaxies at all redshifts; and (c) provided key information about the kinematics and geometries of the scattering regions on a sub-kpc scale.

Review article to be published in the Proceedings of Astronomical Polarimetry 2004 Conference, Waikaloa, Hawaii

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The giant star forming halo associated with the radio galaxy PKS1932-46

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We report the discovery of a giant (∼160 kpc) knotty extended emission line nebula associated with the radio galaxy PKS1932-46 at z =0.23. The 2-d long slit spectra, obtained with VLT-FORS2 at a large angle (∼63°) to the radio source axis, shows that the nebula extends well beyond the radio structure and the ionization cones of the active nucleus. This is one of the largest ionized nebulae yet detected around a radio galaxy at any redshift. The analysis of the ionization, morphological and kinematic properties of the knots suggests that these are star forming objects, probably compact HII galaxies. We propose that the giant structure is a star forming halo associated with the debris of the merger that triggered the activity. This study reinforces the view that radio galaxies are activated by major mergers which also trigger substantial star formation. The star formation activity can extend on the scale of a galaxy group, beyond the old stellar halo of the host galaxy.

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Probing the Ionizing Continuum of Narrow-Line Seyfert 1 Galaxies. I. Observational Results

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We present optical spectra and emission-line ratios of 12 Narrow-Line Seyfert 1 (NLS1) galaxies that we observed to study the ionizing EUV continuum. A common feature in the EUV continuum of active galactic nuclei is the big blue bump (BBB), generally associated with thermal accretion disk emission. While Galactic absorption prevents direct access to the EUV range, it can be mapped by measuring the strength of a variety of forbidden optical emission lines that respond to different EUV continuum regions. We find that narrow emission-line ratios involving [OII] λ3727, Hβ, [OIII] λ5007, [OI] λ6300, Hα, [NII] λ6583, and [SII] λ6716, 6731 indicate no significant difference between NLS1s and Broad-line Seyfert 1 (BLS1) galaxies, which suggests that the spectral energy distributions of their ionizing EUV – soft X-ray continua are similar. The relative strength of important forbidden high ionization lines like [NeV] λ3426 compared to HeII λ4686 and the relative strength of [FeX] λ6374 appear to show the same range as in BLS1 galaxies. However, a trend of weaker F([OI] λ6300)/F(Hα) emission-line ratios is indicated for NLS1s compared to BLS1s. To recover the broad emission-line profiles we used Gaussian components. This approach indicates that the broad Hβ profile can be well described with a broad component (FWHM $\simeq 3275 \pm 800$ km s^{-1}) and an intermediate broad component (FWHM $\simeq 1200 \pm 300$ km s^{-1}). The width of the broad component is in the typical range of normal BLS1s. The emission-line flux that is associated with the broad component in these NLS1s amounts to at least 60% of the total flux. Thus it dominates the total line flux, similar to BLS1 galaxies.

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CO(1-0) & CO(5-4) observations of the most distant known radio galaxy at $z = 5.2$

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Using the Australia Telescope Compact Array we have detected CO (1-0) and CO (5-4) from TN J0924–2201 at $z = 5.2$, the most distant radio galaxy known to date. This is the second highest redshift detection of CO published so far. The CO (1-0) is $250-400$km s^{-1} wide with a peak flux density of 520 ± 115 μJy beam^{-1} whilst the CO (5-4) line emission is $200-300$km s^{-1} wide with a peak flux density of 7.8 ± 2.7 mJy beam^{-1}. Both transitions are spatially unresolved but there is marginal evidence for spatial offsets between the CO and the host galaxy; the CO (1-0) is located 28 ± 11 kpc ($4''.5 \pm 1''.7$) north of the radio galaxy whilst the CO (5-4) is located 18 ± 8 kpc ($2''.8 \pm 1''.2$) south of the radio galaxy. Higher spatial resolution observations are

required to determine the reality of these offsets. Our result is the second detection of CO in a high redshift galaxy without pre-selection based on a massive dust content.

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The relationship between X-ray variability amplitude and black hole mass in active galactic nuclei

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We have investigated the relationship between the X-ray variability amplitude and black hole mass for a sample of 46 radio-quiet active galactic nuclei observed by *ASCA*. Thirty-three of the objects in our sample exhibited significant variability over a time-scale of $\sim$40 ks. We determined the normalised excess variance in the 2–10 keV light curves of these objects and found a significant anti-correlation between excess variance and black hole mass. Unlike most previous studies, we have quantified the variability using nearly the same time-scale for all objects. Moreover, we provide a prescription for estimating the uncertainties in variance which accounts both for measurement uncertainties and for the stochastic nature of the variability. We also present an analytical method to predict the excess variance from a model power spectrum accounting for binning, sampling and windowing effects. Using this, we modelled the variance–mass relation assuming all objects have a universal twice-broken power spectrum, with the position of the breaks being dependent on mass. This accounts for the general form of the variance–mass relationship but is formally a poor fit and there is considerable scatter. We investigated this scatter as a function of the X-ray photon index, luminosity and Eddington ratio. After accounting for the primary dependence of excess variance on mass, we find no significant correlation with either luminosity or X-ray spectral slope. We do find an *anti-correlation* between excess variance and the Eddington ratio, although this relation might be an artifact owing to the uncertainties in the mass measurements. It remains to be established that enhanced X-ray variability is a property of objects with steep X-ray slopes or large Eddington ratios. Narrow-line Seyfert 1 galaxies, in particular, are consistent with being more variable than their broad line counterparts solely because they tend to have smaller masses.

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X-ray/UV Observing Campaign on the Mrk 279 AGN Outflow: A Global Fitting Analysis of the UV Absorption

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We present an analysis of the intrinsic UV absorption in the Seyfert 1 galaxy Mrk 279 based on simultaneous long observations with the *Hubble Space Telescope* (41 ks) and the *Far Ultraviolet Spectroscopic Explorer* (91 ks). To extract the line-of-sight covering factors and ionic column densities, we separately fit two groups of absorption lines: the Lyman series and the CNO lithium-like doublets. For the CNO doublets we assume that all three ions share the same covering factors. The fitting method applied here overcomes some limitations of the traditional method using individual doublet pairs; it allows for the treatment of more complex, physically realistic scenarios for the absorption-emission geometry and eliminates systematic errors that we show are introduced by spectral noise. We derive velocity-dependent solutions based on two models of geometrical covering – a single covering factor for all background emission sources, and separate covering factors for the continuum and emission lines. Although both models give good statistical fits to the observed absorption, we favor the model with two covering factors because: (a) the best-fit covering factors for both emission sources are similar for the independent Lyman series and CNO doublet fits; (b) the fits are consistent with full coverage of the continuum source and partial coverage of the emission lines by the absorbers, as expected from the relative sizes of the nuclear emission components; and (c) it provides a natural explanation for variability in the Lyα absorption detected in an earlier epoch. We also explore physical and geometrical constraints on the outflow from these results.

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Equatorial scattering and the structure of the broad-line region in Seyfert nuclei: evidence for a rotating disc

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We present detailed scattering models confirming that distinctive variations in polarization across the broad Hα line, which are observed in a significant fraction of Seyfert 1 galaxies, can be understood in terms of a rotating line-emitting disc surrounded by a co-planar scattering region (the equatorial scattering region). The predicted polarization properties are: (i) averaged over wavelength, the position angle of polarization is aligned with the projected disc rotation axis and hence also with the radio source axis; (ii) the polarization PA rotates across the line profile, reaching equal but opposite (relative to the continuum PA) rotations in the blue and red wings; (iii) the degree of polarization peaks in the line wings and passes through a minimum in the line core. We identify 11 objects which exhibit these features to different degrees. In order to reproduce the large amplitude PA rotations observed in some cases, the scattering region must closely surround the emission disc and the latter must itself be a relatively narrow annulus – presumably the Hα-emitting zone of a larger accretion disc. Asymmetries in the polarization spectra may be attributable to several possible causes, including bulk radial infall in the equatorial scattering region, or contamination by polar scattered light. The broad Hα lines do not, in general, exhibit double-peaked profiles, suggesting that a second Hα-emitting component of the broad-line region is present, in addition to the disc.

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Announcements

Version 3.0 of the Tartarus Database is Released

Version 3.0 of the Tartarus database of Advanced Satellite for Cosmology and Astrophysics (ASCA) observations of AGN has been released. This database provides products for 611 AGN observations, and comprises events files, images, spectra and light curves. The results from simple spectral fits are also provided.

Tartarus products are of publishable quality, allowing users to skip many stages of data reduction. This is particularly valuable to astronomers with little direct experience in the reduction of X-ray data.

Tartarus (Version 3.0) is maintained by Paul O'Neill and Kirpal Nandra at Imperial College London, and Jane Turner at Goddard Space Flight Center and University of Maryland, Baltimore County. The database can be accessed at `http://astro.imperial.ac.uk/Research/Tartarus` .

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