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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.
Matt Redman

Abstracts of recently accepted papers

The Spectral Energy Distributions of Low-Luminosity Active Galactic Nuclei

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As a step toward elucidating the physical conditions in nearby active galaxies, this paper presents spectral energy distributions (SEDs) of a sample of seven low-luminosity active galactic nuclei (AGNs). SEDs for four objects are presented for the first time (NGC 4261, NGC 4579, NGC 6251, and M84); the data for the remaining three (M81, M87, and NGC 4594) have been substantially updated compared to previous studies. The nuclear fluxes were carefully selected so as to avoid contamination by emission from the host galaxy, which can be substantial for very weak nuclei.

The present sample of low-luminosity nuclei all exhibit SEDs that look markedly different from the canonical broad-band continuum spectrum of luminous AGNs. The most striking difference is that the low-luminosity objects lack an ultraviolet excess (the "big blue bump"), a feature normally associated with emission from a standard optically thick, geometrically thin accretion disk. The weakness of the ultraviolet band leads to an unusually steep optical-ultraviolet continuum shape and a more pronounced contribution from the X-rays to the ionizing spectrum. It is argued that the absence of the big blue bump is a property intrinsic to the SEDs and not an artifact of strong dust extinction. Another notable property of the SEDs is the prominence of the compact, flat-spectrum radio component relative to the emission in other energy bands. All seven nuclei in the sample, including three hosted by spiral galaxies, technically qualify as "radio-loud" objects according to conventional criteria. Finally, the integrated spectra confirm the exceptional weakness of the nuclei: the bolometric luminosities range from 2×10^{41} to 8×10^{42} erg s^{-1}, or $\sim 10^{-6} - 10^{-3}$ times the Eddington rate for the black hole masses previously reported for these galaxies.

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Extended gas in Seyfert galaxies: Near infrared observations of NGC 2110 and Circinus

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We present results of near–IR long-slit spectroscopy in the J and K bands of the Seyfert 2 galaxies NGC 2110 and Circinus. Our goal is to investigate the gaseous distribution, excitation, reddening and kinematics, looking for signatures of the molecular torus hypothesised in unified models to both obscure and collimate the nuclear radiation. The two galaxies show extended emission in the IR emission lines [Fe II]$\lambda 1.257\mu$m, Pa β and $H_2 v$=1–0 S(1), both along the major axis of the galaxy disk and perpendicular to it. In NGC 2110, the emission line ratio [Fe II]/Pa β increases towards the nucleus, where its value is ≈ 7. Further, the nuclear [Fe II] and Pa β lines are broader (FWHM $\simeq$ 500 km s^{-1}) than the H_2 line (FWHM $\leq$ 300 km s^{-1}). Both these results suggest that shocks, driven by the radio jet, are an important source of excitation of [Fe II], while the H_2 excitation is dominated by X-rays from the nucleus. Br γ is only observed at the nucleus, where H_2/Br $\gamma \approx 3$. In the case of Circinus, both [Fe II]/Pa β and H_2/Br γ decrease from ≈ 2 at $4''$ from the nucleus to nuclear values of $\approx$0.6 and $\approx$1, respectively, suggesting that the starburst dominates the nuclear excitation, while the AGN dominates the excitation further out (r $\geq 2''$). For both galaxies, the gaseous kinematics are consistent with circular rotation in the plane of the disk. Our rotation curves suggest that the nucleus (identified with the peak of the IR continuum) is displaced from the kinematic centre of the galaxies. This effect has been observed previously in NGC 2110 based on the kinematics of optical emission lines, but the displacement is smaller in the infrared, suggesting the effect is related to obscuration. The continuum J–K colours indicate a red stellar population in NGC 2110 and a reddened young stellar population in Circinus, outside the nucleus. Right at the nucleus of both galaxies, the colours are redder, apparently a result of hot dust emission, perhaps from the inner edge of a circumnuclear torus. In NGC 2110, the signature of the hot dust emission is particularly clear in the K–band, being seen as an additional component superimposed on the continuum observed in the J–band.

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The nature of the UV-optical continuum in Seyfert 2 galaxies

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The nature of the UV-Optical continuum in Seyfert 2 galaxies is a matter of current debate, fundamental to which is the issue of characterizing and quantifying the stellar population contribution to the nuclear spectra. Using high S/N long-slit spectroscopy of a sample of 20 Seyfert 2 galaxies, we have applied a novel approach to investigate the nuclear stellar population in these galaxies. Our main results are: (1) the stellar populations in Seyfert 2 galaxies are varied, and in most cases **cannot** be adequately represented by an elliptical galaxy template, as done in previous works; (2) the central kpc of most Seyfert 2's contain substantially larger proportions of 100 Myr stars than either elliptical galaxies or normal spirals of the same Hubble type. One important consequence of our findings is that the controversial nature of the so called "second" featureless continuum (FC2) in Seyfert 2s is most likely a result of inadequate evaluation of the stellar population.

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The Radio Emission of the Seyfert Galaxy NGC 7319

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We present VLA maps of the Seyfert 2 galaxy NGC 7319 at 3.6, 6, and 20 cm. Sub-arcsecond resolution is achieved at 3.6 and 6 cm. The radio emission exhibits a triple structure on a scale of $\sim 4''$ (1.7 kpc). All three components have steep spectra, consistent with synchrotron radiation. We have also analyzed an *HST* archival, broad-band red image, which contains structure related to the radio components. In particular, a V-shaped feature in the HST image some 3."7 (1.6 kpc) southwest of the nucleus is associated with highly blueshifted emission lines seen in ground-based spectra. We interpret the V-shaped feature as

emission from gas compressed by the bow shock driven by the outwardly moving radio plasmoid.

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The Correlation between Si III] $\lambda 1892$/C III] $\lambda 1909$ and Fe II $\lambda 4500$/Hβ in low redshift QSOs

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HST archival FOS spectra of 40 QSOs with z ≤ 0.5 in the Bright Quasar Survey have been analyzed. The spectra cover the region $\lambda\lambda 1800 - 2000$ Å in the QSOs' rest frames, including the Al III $\lambda 1859$, Si III] $\lambda 1892$, C III] $\lambda 1909$, and Fe III UV34 emission-lines. We measured the flux of these UV emission-lines, and analyzed the correlations among UV and optical (Hβ, Fe II, and [O III]) emission-line properties as well as soft X-ray photon indices. We found a significant correlation between Si III]/C III] and Fe II/Hβ.

Si III and C III have similar ionization potentials, but Si III] has one order magnitude larger critical density than C III]. Si III]/C III] is thus a density indicator and becomes larger when density is higher. The correlation between Si III]/C III] and Fe II/Hβ indicates that optical Fe II becomes strong when the density of the broad line region becomes high.

Our correlation analysis shows that large Si III]/C III] associates with weak [O III] $\lambda 5007$, large soft X-ray photon index, and narrow Hβ width as well as with large Fe II/Hβ. Our results support the previous suggestions that the density of the broad line region gas and the mass accretion rate govern this correlation.

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Gas Dynamics in the Barred Seyfert Galaxy NGC4151 - I. HI Streaming Shocks and Inflow Along the Bar

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We present sensitive, high resolution observations of neutral hydrogen (HI) in the unusually gas-rich, oval distortion of the Seyfert galaxy NGC4151. The gas dynamics of the oval are found to be consistent with those of a kinematically weak bar, fully confirming previous suggestions for the presence of a fat bar, and, for the first time, individual gaseous features in the bar are spatially resolved. In particular, the two bright regions close to the leading edges of the bar in NGC4151 exhibit kinematics strikingly similar to the signature of bar shocks seen in gas-dynamical simulations, and demonstrate how strong the gaseous response may be even in such a weak bar potential. The residual velocity field, showing deviations from circular motion, is largely consistent with streaming in a bar potential, and, in addition, clearly shows that inflow is concentrated in narrow regions originating in the shocks. This inflow may represent an early stage in the fuelling process of the AGN.

The presence and properties of the shocks in NGC4151 indicate that, in addition to the x_1 orbits, the family of x_2 orbits exist and are of significant extent in the bar of NGC4151, with gas streaming from the shocks making the transition between the two families. We therefore suggest that the circumnuclear ellipse, identified optically by previous authors and associated with gas flowing in x_2 orbits, has formed as a natural consequence of the gas flows in the bar without the requirement for a second, inner bar.

Observations of HI were previously thought to be ill-suited to the study of bar shocks due to limitations in angular resolution and sensitivity. However, our observations show that, following recent instrumental enhancements, such measurements are now feasible, albeit at the limits of instrumental capability.

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Gas Dynamics in the Barred Seyfert Galaxy NGC4151 - II. High Resolution HI Study

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We present sensitive, high angular resolution ($6'' \times 5''$) λ21-cm observations of the neutral hydrogen in the nearby barred Seyfert galaxy, NGC4151. These HI observations, obtained using the VLA in B-configuration, are the highest resolution to date of this galaxy, and reveal hitherto unprecedented detail in the distribution and kinematics of the HI on sub-kiloparsec scales. A complete analysis and discussion of the HI data are presented and the global properties of the galaxy are related to the bar dynamics presented in Paper I.

HI absorption, consistent with previous studies, is detected against the radio continuum nucleus and shows two components – a deep absorption component, centred at 987 $\pm$ 1 km s^{-1} and width 87 $\pm$ 3 km s^{-1}, and a weaker component, redshifted to 1096 $\pm$ 6 km s^{-1} with a width of 35 $\pm$ 15 km s^{-1}. An alternative fit is also presented. In addition to the absorption, a high velocity cloud is detected in emission, coincident with the nucleus. This cloud is red-shifted by 260 km s^{-1} from systemic, has an HI mass of 2.3×10^7 M$_\odot$, and corresponds to outflow on the far side of the nucleus.

Contrary to previous studies, no HI bridge is detected reaching from the shocks directly across the nucleus. Instead, the gas streams from the shocks onto smaller orbits and forms fingers of HI which wind *around* the nucleus, consistent with predictions from general numerical simulations of bars. These fingers correspond closely with dust arcs seen in optical studies and resemble nuclear features seen by others in weak barred galaxies such as M100.

A new rotation curve is presented, extending to within $8''$ of the nucleus and showing a turnover at a radius of $\sim 35''$, which was previously undetected in lower resolution studies. The corresponding resonance curve and the properties of the shocks (Paper I) yield a bar pattern speed of 24.5 $\pm$ 3.7 km s^{-1} and one Inner Lindblad Resonance (ILR) at a radius of 2.8 $\pm$0.6 kpc. Our observations, however, do not rule out the possibility of an Inner ILR.

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