Active Galaxies Newsletter	An electronic publication dedicated to the observation and theory of active galaxies
No. 190 — JANUARY 2013	Editor: Melanie Gendre (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 day 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.

Melanie Gendre

Abstracts of recently accepted papers

X-ray and Multiwavelength Insights into the Inner Structure of High-Luminosity Disc-Like Emitters

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We present X-ray and multiwavelength studies of a sample of eight high-luminosity active galactic nuclei (AGNs) with disc-like Hβ emission-line profiles selected from the Sloan Digital Sky Survey Data Release 7. These sources have higher redshift ($z \approx 0.6$) than the majority of the known disc-like emitters, and they occupy a largely unexplored space in the luminosity-redshift plane. Seven sources have typical AGN X-ray spectra with power-law photon indices of $\Gamma \approx 1.4$–2.0; two of them show some X-ray absorption (column density $N_{\rm H} \approx 10^{21}$–$10^{22}$ cm^{-2} for neutral gas). The other source, $J0850 + 4451$, has only three hard X-ray photons detected and is probably heavily obscured ($N_{\rm H} > 3 \times 10^{23}$ cm^{-2}). This object is also identified as a low-ionization broad absorption line (BAL) quasar based on Mg II $\lambda 2799$ absorption; it is the first disc-like emitter reported that is also a BAL quasar. The IR-to-UV spectral energy distributions (SEDs) of these eight sources are similar to the mean SEDs of typical quasars with a UV "bump", suggestive of standard accretion discs radiating with high efficiency, which differs from low-luminosity disc-like emitters. Studies of the X-ray-to-optical power-law slope parameters ($\alpha_{\rm OX}$) indicate that there is no significant excess X-ray emission in these high-luminosity disc-like emitters. Energy budget analysis suggests that for disc-like emitters in general, the inner disc must illuminate and ionize the outer disc efficiently ($\approx 15\%$ of the nuclear ionizing radiation is required on average) via direct illumination and/or scattering. Warped accretion discs are probably needed for direct illumination to work in high-luminosity objects, as their geometrically thin inner discs decrease the amount of direct illumination possible for a flat disc.

Accepted by MNRAS

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preprint available at arXiv:1211.4033

A survey for H I in the distant Universe: the detection of associated 21-cm absorption at $z = 1.28$

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We have undertaken a survey for H I 21-cm absorption within the host galaxies of $z \sim 1.2 - 1.5$ radio sources, in the search of the cool neutral gas currently "missing" at $z \gtrsim 1$. This deficit is believed to be due to the optical selection of high redshift objects biasing surveys towards sources of sufficient ultra-violet luminosity to ionise all of the gas in the surrounding galaxy. In order to avoid this bias, we have selected objects above blue magnitudes of $B \sim 20$, indicating ultra-violet luminosities below the critical value of $L_{\rm UV} \sim 10^{23}$ W Hz^{-1}, above which 21-cm has never been detected. As a secondary requirement to the radio flux and faint optical magnitude, we shortlist targets with radio spectra suggestive of compact sources, in order to maximise the coverage of background emission. From this, we obtain one detection out of ten sources searched, which at $z = 1.278$ is the third highest redshift detection of associated 21-cm absorption to date. Accounting for the spectra compromised by radio frequency interference, as well as various other possible pitfalls (reliable optical redshifts and turnover frequencies indicative of compact emission), we estimate a detection rate of $\approx 30\%$, close to that expected for $L_{\rm UV} \lesssim 10^{23}$ W Hz^{-1}W Hz^{-1} sources.

Accepted by MNRAS

E-mail contact: sjc@physics.usyd.edu.au,
preprint available at arXiv:1212.2754

Probing nuclear activity versus star formation at $z \sim 0.8$ using near-infrared multi-object spectroscopy

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We present near-infrared (NIR) spectroscopic observations of 28 X-ray and mid-infrared selected sources at a median redshift of $z \sim 0.8$ in the Extended Groth Strip (EGS). To date this is the largest compilation of NIR spectra of active galactic nuclei (AGN) at this redshift. The data were obtained using the multi-object spectroscopic mode of the Long-slit Intermediate Resolution Infrared Spectrograph (LIRIS) at the 4.2 m William Herschel Telescope (WHT). These galaxies are representative of a larger sample studied in a previous work, consisting of over a hundred X-ray selected sources with mid-infrared counterparts, which were classified either as *AGN-dominated* or *host galaxy-dominated*, depending on the shape of their spectral energy distributions (SEDs). Here we present new NIR spectra of 13 and 15 sources of each class respectively. We detect the Hα line at $> 1.5\sigma$ above the continuum for the majority of the galaxies. Using attenuation-corrected Hα luminosities and observed Spitzer/MIPS 24 μm fluxes, and after subtracting an AGN component estimated using an AGN empirical correlation and multifrequency SED fits, we obtain average star formation rates (SFRs) of 7$\pm$7 and 20$\pm$50 M$_{SUN}$ yr^{-1} respectively (median SFRs = 7 and 5

M_{SUN} yr^{-1}). These values are lower than the SFRs reported in the literature for different samples of non-active star-forming galaxies of similar stellar masses and redshifts ($M_* \sim 10^{11} M_{SUN}$ and $z \sim 1$). In spite of the small size of the sample studied here, as well as the uncertainty affecting the AGN-corrected SFRs, we speculate with the possibility of AGN quenching the star formation in galaxies at $z \sim 0.8$. Alternatively, we might be seeing a delay between the offset of the star formation and AGN activity, as observed in the local universe.

Accepted by MNRAS

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Variability and the X-ray/UV ratio of active galactic nuclei. II. Analysis of a low-redshift Swift sample

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Variability, both in X-ray and optical/UV, affects the well-known anti-correlation between the α_{ox} spectral index and the UV luminosity of active galactic nuclei, contributing part of the dispersion around the average correlation ("intra-source dispersion"), in addition to the differences among the time-average α_{ox} values from source to source ("inter-source dispersion"). We want to evaluate the intrinsic α_{ox} variations in individual objects, and their effect on the dispersion of the $\alpha_{ox} - L_{UV}$ anti-correlation. We use simultaneous UV/X-ray data from Swift observations of a low-redshift sample, to derive the epoch-dependent $\alpha_{ox}(t)$ indices. We correct for the host galaxy contribution by a spectral fit of the optical/UV data. We compute ensemble structure functions to analyse variability of multi-epoch data. We find a strong "intrinsic α_{ox} variability", which makes an important contribution ($\sim$ 40% of the total variance) to the dispersion of the $\alpha_{ox} - L_{UV}$ anti-correlation ("intra-source dispersion"). The strong X-ray variability and weaker UV variability of this sample are comparable to other samples of low-z AGNs, and are neither due to the high fraction of strongly variable NLS1s, nor to dilution of the optical variability by the host galaxies. Dilution affects instead the slope of the anti-correlation, which steepens, once corrected, becoming similar to higher luminosity sources. The structure function of α_{ox} increases with the time lag up to $\sim$1 month. This indicates the important contribution of the intermediate-long timescale variations, possibly generated in the outer parts of the accretion disk.

Accepted by A&A

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preprint available at arXiv:1212.3432

Polycyclic Aromatic Hydrocarbon in the Central Region of the Seyfert 2 Galaxy NGC 1808.

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We present mid infrared (MIR) spectra of the Seyfert 2 (Sy 2) galaxy NGC 1808, obtained with the Gemini's Thermal-Region Camera Spectrograph (T-ReCS) at a spatial resolution of $\sim$26 pc. The high spatial resolution allowed us to detect bright polycyclic aromatic hydrocarbons (PAHs) emissions at 8.6μm and 11.3μm in the galaxy centre ($\sim$26 pc) up to a radius of 70 pc from the nucleus. The spectra also present [Ne II]12.8μm ionic lines, and H_2 $S(2)$12.27μm molecular gas line. We found that the PAHs profiles are similar to Peeters's A class, with the line peak shifted towards the blue. The differences in the PAH line profiles also suggests that the molecules in the region located 26 pc NE of the nucleus are more in the neutral than in the ionised state, while at 26 pc SW of the nucleus, the molecules are mainly in ionised state. After removal of the underlying galaxy contribution, the nuclear spectrum can be represented by a Nenkova's clumpy torus model, indicating that the nucleus of NGC 1808 hosts a dusty toroidal structure with an angular cloud distribution of $\sigma = 70^\circ$, observer's view angle $i = 90^\circ$, and an outer radius of R_0 $\sim$0.55 pc. The derived column density along the line of sight is $N_H = 1.5 \times 10^{24}$ cm^2, which is sufficient to block the hard radiation from the active nucleus, and would explain the presence of PAH molecules near to the NGC 1808's active nucleus.

Accepted by MNRAS 2012

E-mail contact: dassps@rit.edu,
DRAFT is available at arXiv:1212.1357

An X-ray and Multiwavelength Survey of Highly Radio-Loud Quasars at $z > 4$: Jet-Linked Emission in the Brightest Radio Beacons of the Early Universe

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We present a systematic study of the X-ray and multiwavelength properties of a sample of 17 highly radio-loud quasars (HRLQs) at $z > 4$ with sensitive X-ray coverage from new *Chandra* and archival *Chandra*, *XMM-Newton*, and *Swift* observations. Eight of the new and archival observations are reported in this work for the first time. New *Chandra* observations of two moderately radio-loud and highly optically luminous quasars at $z \gtrsim 4$ are also reported. Our HRLQ sample represents the top $\sim 5\%$ of radio-loud quasars in terms of radio loudness. We found that our HRLQs have an X-ray emission enhancement over HRLQs at lower redshifts (by a typical factor of ≈ 3), and this effect, after controlling for several factors which may introduce biases, has been solidly estimated to be significant at the 3–4σ level. HRLQs at $z = 3$–4 are also found to have a similar X-ray emission enhancement over $z < 3$ HRLQs, which supports further the robustness of our results. We discuss models for the X-ray enhancement's origin including a fractional contribution from inverse Compton scattering of cosmic microwave background photons. No strong correlations are found between the relative X-ray brightness and optical/UV emission-line rest-frame equivalent widths (REWs) for radio-loud quasars. However, the line REWs are positively correlated with radio loudness, which suggests that relativistic jets make a negligible contribution to the optical/UV continua of these HRLQs (contrary to the case where the emission lines are diluted by the relativistically boosted continuum). Our HRLQs are generally consistent with the known anti-correlation between radio loudness and X-ray power-law photon index. We also found that the two moderately radio-loud quasars appear to have the hardest X-ray spectra among our objects, suggesting that intrinsic X-ray absorption ($N_{\rm H} \sim 10^{23}$ cm^{-2}) may be present. Our $z > 4$ HRLQs generally have higher X-ray luminosities than those for the composite broad-band spectral energy distributions (SEDs) of HRLQs at lower redshift, which further illustrates and supports the X-ray emission enhancement of $z > 4$ HRLQs. Some of our HRLQs also show an excess of mid-infrared emission which may originate from the synchrotron emission of the relativistic jets. None of our $z > 4$ HRLQs is detected by the *Fermi* LAT two-year survey, which provides constraints on jet-emission models.

ApJ in press

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preprint available on the arXiv

Fundamental parameters of FR II radio galaxies and their impact on groups and clusters environments

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Radio galaxies are among the largest and most powerful single objects known and are found at variety of redshifts, hence they are believed to have had a significant impact on the evolving Universe. Their relativistic jets inject considerable amounts of energy into the environments in which the sources reside; thus the knowledge of the fundamental properties (such as kinetic luminosities, lifetimes and ambient gas densities) of these sources is crucial for understanding AGN feedback in galaxy clusters. In this work, we explore the intrinsic and extrinsic fundamental properties of Fanaroff-Riley II (FR II) objects through the construction of multidimensional Monte Carlo simulations which use complete, flux limited radio catalogues and semi-analytical

models of FR IIs' time evolution to create artificial samples of radio galaxies. This method allows us to set better limits on the confidence intervals of the intrinsic and extrinsic fundamental parameters and to investigate the total energy produced and injected to the clusters' environments by populations of FR IIs at various cosmological epochs ($0.0 < z < 2.0$). We find the latter estimates to be strikingly robust despite the strong degeneracy between the fundamental parameters – such a result points to a conclusive indicator of the scale of AGN feedback in clusters of galaxies.

Accepted by Astronomische Nachrichten (AN) as refereed conference proceedings of XMM-Newton 2012 Workshop Science Workshop: "Galaxy Clusters as Giant Cosmic Laboratories", ESAC, Madrid, Spain, 21-23 May 2012

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preprint available at arXiv:1210.7901

ASPECT: A spectra clustering tool for exploration of large spectral surveys

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We present the novel, semi-automated clustering tool ASPECT for analysing voluminous archives of spectra. The heart of the program is a neural network in form of Kohonen's self-organizing map. The resulting map is designed as an icon map suitable for the inspection by eye. The visual analysis is supported by the option to blend in individual object properties such as redshift, apparent magnitude, or signal-to-noise ratio. In addition, the package provides several tools for the selection of special spectral types, e.g. local difference maps which reflect the deviations of all spectra from one given input spectrum (real or artificial). ASPECT is able to produce a two-dimensional topological map of a huge number of spectra. The software package enables the user to browse and navigate through a huge data pool and helps him to gain an insight into underlying relationships between the spectra and other physical properties and to get the big picture of the entire data set. We demonstrate the capability of ASPECT by clustering the entire data pool of 0.6 million spectra from the Data Release 4 of the Sloan Digital Sky Survey (SDSS). To illustrate the power of the ASPECT maps we track objects from catalogues of quasars and carbon stars, respectively, and blend in morphological type classifications for galaxies from the GalaxyZoo project.

Published in A&A 547, A115 (2012)

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preprint available at arXiv:1209.3615

Herschel-ATLAS/GAMA: a difference between star-formation rates in strong-line and weak-line radio galaxies

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We have constructed a sample of radio-loud objects with optical spectroscopy from the Galaxy and Mass Assembly (GAMA) project over the *Herschel*-ATLAS Phase 1 fields. Classifying the radio sources in terms of their optical spectra, we find that strong-emission-line sources ('high-excitation radio galaxies') have, on average, a factor ~ 4 higher 250-μm *Herschel* luminosity than weak-line ('low-excitation') radio galaxies and are also more luminous than magnitude-matched radio-quiet galaxies at the same redshift. Using all five H-ATLAS bands, we show that this difference in luminosity between the emission-line classes arises mostly from a difference in the average dust temperature; strong-emission-line sources tend to have comparable dust masses to, but higher dust temperatures than, radio galaxies with weak emission lines. We interpret this as showing that radio galaxies with strong nuclear emission lines are much more likely to be associated with star formation in their host galaxy, although there is certainly not a one-to-one relationship between star formation and strong-line AGN activity. The strong-line sources are estimated to have star-formation rates at least a factor 3-4 higher than those in the weak-line objects. Our conclusion is consistent with earlier work, generally carried out using much smaller samples, and reinforces the general picture of high-excitation radio galaxies as being located in lower-mass, less evolved host galaxies than their low-excitation counterparts.

Accepted by MNRAS

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preprint available at arXiv:1211.6440

2D stellar population and gas kinematics of the inner 1.5 kpc of the post-starburst quasar SDSS J0210-0903

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Post-Starburst Quasars (PSQs) are hypothesized to represent a stage in the evolution of massive galaxies in which the star formation has been recently quenched due to the feedback of the nuclear activity. In this paper our goal is to test this scenario with a resolved stellar population study of the PSQ J0210-0903 ,as well as of its emitting gas kinematics and excitation. We have used optical Integral Field Spectroscopy obtained with the Gemini GMOS instrument at a velocity resolution of $\approx 120\,\mathrm{km\,s^{-1}}$ and spatial resolution of ≈ 0.5 kpc. We find that old stars dominate the luminosity (at 4700 Å) in the inner 0.3 kpc (radius), while beyond this region (at ≈ 0.8 kpc) the stellar population is dominated by both intermediate age and young ionizing stars. The gas emission-line ratios are typical of Seyfert nuclei in the inner 0.3 kpc, where an outflow is observed. Beyond this region the line ratios are typical of LINERs and may result from the combination of diluted radiation from the nucleus and ionization from young stars. The gas kinematics show a combination of rotation in the plane of the galaxy and outflows, observed with a maximum blueshift of -670 km s^{-1}. We have estimated a mass outflow rate in ionized gas in the range $0.3 - 1.1\,\mathrm{M_\odot\,yr^{-1}}$ and a kinetic power for the outflow of $\dot{E}_{\rm out} \approx 1.4 - 5.0 \times 10^{40}\,\mathrm{erg\,s^{-1}} \approx 0.03 - 0.1$ per cent $\times$ $\mathrm{L_{bol}}$. This outflow rate is two orders of magnitude higher than the nuclear accretion rate of $\approx 8.7 \times 10^{-3}\,\mathrm{M_\odot\,yr^{-1}}$, thus being the result of mass loading of the nuclear outflow by circumnuclear galactic gas. Our observations support an evolutionary scenario in which the feeding of gas to the nuclear region has triggered a circumnuclear starburst 100's Myr ago, followed by the triggering of the nuclear activity, producing the observed gas outflow which may have quenched further star formation in the inner 0.3 kpc.

Published by MNRAS

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available at http://mnras.oxfordjournals.org/content/428/1/867.full and arXiv:1210.1208