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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 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.

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.

Rob Beswick

Probing the near infrared stellar population of Seyfert galaxies

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We employ IRTF SpeX NIR (0.8μm—2.4μm) spectra to investigate the stellar population (SP), active galactic nuclei (AGN) featureless continuum (FC) and hot dust properties in 9 Sy 1 and 15 Sy 2 galaxies. Both the STARLIGHT code and the hot dust as an additional base element were used for the first time in this spectral range. We found evidence of correlation among the equivalent widths (W_λ) Si I 1.59μm $\times$ Mg I 1.58μm, equally for both kinds of activity. Part of the $W_{\rm Na\,I\,2.21\mu m}$ and $W_{\rm CO\,2.3\mu m}$ strengths may be related to galaxy inclination. Our synthesis shows significant differences between Sy 1 and Sy 2 galaxies: the hot dust component is required to fit the K-band spectra of $\sim$90% of the Sy 1 galaxies, and only of $\sim$25% of the Sy 2; about 50% of the Sy 2 galaxies require a FC component contribution $\geq$20%, while this fraction increases to about 60% in the Sy 1; also, in about 50% of the Sy2, the combined FC and young components contribute with more than 20%, while this occurs in 90% of the Sy1, suggesting recent star formation in the central region. The central few hundred parsecs of our galaxy sample contain a substantial fraction of intermediate-age SPs with a mean metallicity near solar. Our SP synthesis confirms that the 1.1μm CN band can be used as a tracer of intermediate-age SPs. The simultaneous fitting of SP, FC and hot dust components increased in $\sim$ 150% the number of AGNs with hot dust detected and the mass estimated. The NIR emerges as an excellent window to study the stellar population of Sy 1 galaxies, as opposed to the usually heavily attenuated optical range. Our approach opens a new way to investigate and quantify the individual contribution of the three most important NIR continuum components observed in AGNs.

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preprint available at http://arxiv.org/abs/0907.4144

An accretion disc origin for the 'X-ray broad line region' in 1H0707-495

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We use a 380 ks XMM-Newton high-resolution RGS spectrum to look for narrow spectral features from the nuclear environment of 1H0707-495. We do not find any evidence of a line-of-sight ionized wind (warm absorber). We do, however, detect broad emission lines, of width $\sim$5000 km s^{-1}, consistent with O VIII Lyα, N VII Lyα, C VI Lyα and a Fe XIX/Fe XX/Ne IX Heα blend. Intriguingly, these lines have both blueshifted and redshifted components, whose velocity shifts are consistent with an origin in an accretion disc at $\sim$1600 R$_g$ from the black hole. The features can be interpreted as the narrow line cores of the disc reflection spectrum, thus providing independent support for the discline interpretation of the X-ray spectrum of 1H0707-495. We discuss the relevance of our findings for the 'X-ray broad line region' in other Seyferts, and for the origins of the optical broad line region itself.

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On the nature of the near-UV extended light in Seyfert galaxies

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We study the nature of the extended near-UV emission in the inner kiloparsec of a sample of 15 Seyfert galaxies which have both near-UV (F330W) and narrow band [OIII] high resolution Hubble images. For the majority of the objects we find a very similar morphology in both bands. From the [OIII] images we construct synthetic images of the nebular continuum plus the emission line contribution expected through the F330W filter, which can be subtracted from the F330W images. We find that the emission of the ionised gas dominates the near-UV extended emission in half of the objects. A further broad band photometric study, in the bands F330W (U), F547M (V) and F160W (H), shows that the remaining emission is dominated by the underlying galactic bulge contribution. We also find a blue component whose nature is not clear in 4 out of 15 objects. This component may be attributed to scattered light from the AGN, to a young stellar population in unresolved star clusters, or to early-disrupted clusters. Star forming regions and/or bright off-nuclear star clusters are observed in 4/15 galaxies of the sample.

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Magellan Spectroscopy of Low-Redshift Active Galactic Nuclei

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We present an atlas of moderate-resolution ($R \approx 1200 - 1600$) optical spectra of 94 low-redshift ($z \lesssim 0.5$) active galactic nuclei taken with the Magellan 6.5 m Clay Telescope. The spectra mostly cover the rest-frame region $\sim 3600 - 6000$ Å. All the objects have preexisting *Hubble Space Telescope* imaging, and they were chosen as part of an ongoing program to investigate the relationship between black hole mass and their host galaxy properties. A significant fraction of the sample has no previous quantitative spectroscopic measurements in the literature. We perform spectral decomposition of the spectra and present detailed fits and basic measurements of several commonly used broad and narrow emission lines, including [O II] λ3727, He II λ4686, Hβ, and [O III] $\lambda\lambda$4959, 5007. Eight of the objects are narrow-line sources that were previously misclassified as broad-line (type 1) Seyfert galaxies; of these, five appear not to be accretion-powered.

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preprint available at http://users.ociw.edu/lho/preprints.html

Very Light Magnetized Jets on Large Scales - I. Evolution and Magnetic Fields

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Magnetic fields, which are undoubtedly present in extragalactic jets and responsible for the observed synchrotron radiation, can affect the morphology and dynamics of the jets and their interaction with the ambient cluster medium. We examine the jet propagation, morphology and magnetic field structure for a wide range of density contrasts, using a globally consistent setup for both the jet interaction and the magnetic field. The MHD code NIRVANA is used to evolve the simulation, using the constrained-transport method. The density contrasts are varied between $\eta = 10^{-1}$ and 10^{-4} with constant sonic Mach number 6. The jets are supermagnetosonic and simulated bipolarly due to the low jet densities and their strong backflows. The helical magnetic field is largely confined to the jet, leaving the ambient medium nonmagnetic. We find magnetic fields with plasma $\beta \sim 10$ already stabilize and widen the jet head. Furthermore they are efficiently amplified by a shearing mechanism in the jet head and are strong enough to damp Kelvin–Helmholtz instabilities of the contact discontinuity. The cocoon magnetic fields are found to be stronger than expected from simple flux conservation and capable to produce smoother lobes, as found observationally. The bow shocks and jet lengths evolve self-similarly. The radio cocoon aspect ratios are generally higher for heavier jets and grow only slowly (roughly self-similar) while overpressured, but much faster when they approach pressure balance with the ambient medium. In this regime, self-similar models can no longer be applied. Bow shocks are found to be of low excentricity for very light jets and have low Mach numbers. Cocoon turbulence and a dissolving bow shock create and excite waves and ripples in the ambient gas. Thermalization is found to be very efficient for low jet densities.

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Confirming a population of hot-dust dominated, star-forming, ultraluminous galaxies at high redshift

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We identify eight z ¿ 1 radio sources undetected at 850 μm but robustly detected at 70 μm confirming that they represent ultraluminous infrared galaxies (ULIRGs) with hotter dust temperatures (<T_d >= 53 ± 10K) than submillimetre galaxies (SMGs)at similar luminosities and redshifts. These galaxies share many properties with SMGs: ultraviolet spectra consistent with starbursts, high stellar masses and radio luminosities. We can attribute their radio emission to star formation since high-resolution Multi-Element Radio Linked Interferometer Network (MERLIN) radio maps show extended emission regions (with characteristic radii of 2-3 kpc), which are unlikely to be generated by active galactic nucleus (AGN) activity. These observations provide the first direct confirmation of hot, dusty ULIRGs which are missed by current submillimetre surveys. They have significant implications for future observations from the Herschel Space Observatory and Submillimetre Common-User Bolometer Array 2 (SCUBA2), which will select high-redshift luminous galaxies with less selection biases.

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A Search for Neutral Carbon towards two z=4.05 Submillimetre Galaxies, GN20 and GN20.2

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Using the IRAM Plateau-de-Bure Interferometer (PdBI) we have searched for the upper fine structure line of neutral carbon (C I($^3P_2 \rightarrow {}^3P_1$), $\nu_{\rm rest}$ = 809 GHz) and ^{12}CO(J=7→6) ($\nu_{\rm rest}$=806 GHz) towards the submillimetre galaxies (SMGs) GN20 (SMM J123711.9+622212, z = 4.055) and GN20.2 (SMM J123708.8+622202, z = 4.051). The far-infrared (FIR) continuum is detected at 8σ significance in GN20, with a flux density of $S_{1.8\,\rm mm} = 1.9\pm0.2$ mJy, while no continuum is detected in GN20.2. Both sources are statistically undetected in both C I($^3P_2 \rightarrow {}^3P_1$) and ^{12}CO($J$=7→6) lines; we derive line luminosity limits for both C I and CO of $L' \lesssim 2\times10^{10}\,\rm K\,km\,s^{-1}\,pc^2$. Assuming carbon excitation temperatures of $T_{\rm ex} = 30$ K (the galaxies' measured dust temperatures), we infer C I mass limits of $M_{\rm CI} < 5.4\times10^6\,\rm M_\odot$(GN20) and $M_{\rm CI} < 6.8\times10^6\,\rm M_\odot$(GN20.2). The derived C I abundance limits are $< 1.8\times10^{-5}$ for GN20 and $< 3.8\times10^{-5}$ for GN20.2 implying that the systems have Milky Way level neutral carbon enrichment (X[C I]/X[H_2]) or lower, similar to high-redshift carbon-detected systems (at 5×10^{-5}) but about 50 times less than the neutral carbon enrichment of local starburst galaxies. Observations of GN20 and GN20.2 in high-resolution MERLIN+VLA radio maps of GOODS-N are used to further constrain the sizes and locations of active regions. We conclude that the physical gas properties of young rapidly evolving systems like GN20 and GN20.2 are likely significantly different than amplified examples can be found, observations of galaxies like GN20 will require the order of magnitude increase in sensitivity of the Atacama Large Millimetre Array (ALMA) to constrain their C I and high-J CO content, despite the fact that they are the brightest systems at $z \sim$4.

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Thesis Abstracts

Modeling the Infrared Emission from Cygnus A

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The Spitzer Space Telescope provides a unique view of the Universe at infrared wavelengths. Improved sensitivity and angular resolution over previous missions enable detailed studies of astrophysical objects, both in imaging and spectroscopic modes. Spitzer observations of active galactic nuclei can help shed light on the physical conditions of the central regions of these active glalaxies.

The nearby radio galaxy Cygnus A is one of the most luminous radio sources in the local Universe. In addition to the high radio power, it is also very luminous in the infrared. New Spitzer spectroscopy and photometry of Cygnus A is combined with data from the literature at radio and sub-mm wavelengths. The resulting complication is modeled with a combination of: a synchrotron emitting jet, a burst of star formation, and emission from an AGN torus.

The infrared emission in Cyngus A shows contributions from all three processes and the models are able to reproduce the observed emission over almost 5 dex in frequency. The bolometric AGN luminosity is found to be $\sim 10^{45}$ erg s^{-1}, with a clumpy torus size of ~ 7 pc. Evidence is seen for a break in the synchrotron spectrum in the mid-infrared. The relevant component of the infrared emission suggests Cygnus A has a star formation rate of ~ 20 M$_\odot$ yr^{-1}. Even in the absence of the AGN, it would still be a luminous infrared source.

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