Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
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Abstracts - Thesis Abstracts - Jobs - Meetings

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

The Mass of the Central Black Hole in the Seyfert Galaxy NGC 4151

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In order to improve the reverberation-mapping based estimate of the mass of the central supermassive black hole in the Seyfert 1 galaxy NGC 4151, we have reanalyzed archival ultraviolet monitoring spectra from two campaigns undertaken with the *International Ultraviolet Explorer*. We measure emission-line time delays for four lines, C IV λ1549, He II λ1640, C III] λ1909, and Mg II λ2798, from both campaigns. We combine these measurements with the dispersion of the variable part of each respective emission line to obtain the mass of the central object. Despite the problematic nature of some of the data, we are able to measure a mass of $(4.14 \pm 0.73) \times 10^7\, M_\odot$, although this, like all reverberation-based masses, is probably systematically uncertain by a factor of 3–4.

Accepted by ApJ.

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preprint available at http://xxx.lanl.gov/abs/astro-ph/0605038

A 0.8-2.4 μm spectral atlas of Active Galactic Nuclei

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*Aims:*Present a near-infrared spectral atlas of 48 active galactic nuclei (AGN), of all degrees of activity, in the wavelength interval of 0.8-2.4 μm, including the fluxes of the observed emission lines. Analyze the spectroscopic properties of the continuum and emission line spectra of the sources.

Methods: In order to exclude aperture and seeing effects we use near-infrared spectroscopy in the short cross-dispersed mode (SXD, 0.8−2.4 μm), taking simultaneously the *JHK*-bands spectra.

Results: We present the most extensive NIR spectral atlas of AGN made up to date aimed at creating a suitable database to study the continuum and line emission properties of these objects in a region full of interesting features. Overall we conclude

that the shape of the continuum of QSOs and Sy 1's are similar, being essentially flat in H and K band, in the J band, a strong variation is found. In Seyfert 2 galaxies, the continuum smoothly decreases from 1.2μm redwards in almost all sources. In J, it smoothly rises bluewards in some sources while in others a small decreased is observed. The spectra are dominated by strong emission features of H I, He I, He II, [S III] and conspicuous forbidden lines of low and high ionization species. Molecular lines of H_2 are common features to most objects. The absence of O I and Fe II lines in Sy 2 galaxies give observational support to the fact that these lines are formated in the outermost portion of the broad line region. [P II] and coronal lines are detected in all degrees of activity. The [Fe II] 12570$\AA$ /16436$\AA$ line ratio becomes as a reliable reddening indicator for Seyfert galaxies.

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E-mail contact: riffel@ufrgs.br, preprint available at http://arxiv.org/abs/astro-ph/0605463

Optical Monitoring of BL Lacertae Object OJ 287: a 40-Day Period?

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We present the results of our optical monitoring of the BL Lacertae object OJ 287 during the first half of 2005. The source did not show large-amplitude variations during this period and was in a relatively quiescent state. A possible period of 40 days was derived from its light curves in three BATC wavebands. A bluer-when-brighter chromatism was discovered, which is different from the extremely stable color during the outburst in 1994–96. The different color behaviors imply different variation mechanisms in the two states. We then re-visited the optical data on OJ 287 from the OJ-94 project and found as well a probable period of 40 days in its optical variability during the late-1994 outburst. The results suggest that two components contribute to the variability of OJ 287 during its outburst state. The first component is the normal *blazar* variation. This component has an amplitude similar to that of the quiescent state and also may share a similar periodicity. The second component can be taken as a 'low-frequency modulation' to the first component. It may be induced by the interaction of the assumed binary black holes in the center of this object. The 40-day period may be related to the helical structure of the magnetic field at the base of the jet, or to the orbital motion close to the central primary black hole.

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The messy environment of Mrk 6

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In recent years it has become clear that understanding the absorption present in AGN is essential given its bearing on unification models. We present the most recent *XMM-Newton* observation of Mrk 6, with the goal of understanding the nature and origin of the complex absorption intrinsic to this source. X-ray spectral fitting shows that a simple warm absorption model provides an equally good statistical representation of the CCD data as a partial covering model. Furthermore, once the RGS data are included in the spectral fitting, the simple warm absorber model provides a very good fit to the data, without increasing the complexity of the model, in contrast with the partial covering model which requires the addition of either a low metalicity (<0.03 solar) thermal plasma or low temperature blackbody emission in order to provide a similar quality fit. The warm absorber is also a considerably more natural way to explain the variability observed in the X-ray absorbing column density between the previous *XMM-Newton* observation and this one, requiring only a second, higher column density, higher ionisation, absorber to be present during the previous *XMM-Newton* observation. In comparison, the partial covering models which requires moving, clumpy, material relatively close to the source that result in two distinct lines of sight, with separate absorbing columns that each vary considerably without any associated change in their covering fractions, in order to explain the observed variability. We associate the warm absorber either with an accretion disk wind with densities of $\sim 10^9$ cm^{-3}, or with an ionised 'skin' or atmosphere of the molecular torus with densities of $\sim 10^{3\rightarrow 5}$ cm^{-3}.

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Multiwavelength Observations of the Extreme X-Ray Selected BL Lac Object PG 1553+11 (1ES 1553+113)

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PG 1553+11 was the target of a coordinated three week multiwavelength campaign during 2003 April and May. A significant X-ray flare was observed during the second half of this campaign. Although no optical flare was recorded during the X-ray campaign, optical observations obtained immediately prior to the campaign displayed a higher flux than that recorded during the campaign. An optical flare was observed a few days after the end of the X-ray campaign and may be related to the X-ray flare. Radio observations were made at three frequencies, with no significant changes in flux detected near the times of the optical and X-ray flares. The spectral energy distributions and flux ratios in different wavebands observed for this object are compared to other X-ray selected blazars to demonstrate how PG 1553+11 is an extreme member of this group.

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New Chandra observations of the jet in 3C273.
I. Softer X-ray than radio spectra and the X-ray emission mechanism

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The jet in 3C273 is a high-power quasar jet with radio, optical and X-ray emission whose size and brightness allow a detailed study of the emission processes acting in it. We present deep Chandra observations of this jet and analyse the spectral properties of the jet emission from radio through X-rays. We find that the X-ray spectra are significantly softer than the radio spectra in all regions of the bright part of the jet except for the first bright "knot A", ruling out a model in which the X-ray emission from the entire jet arises from beamed inverse-Compton scattering of cosmic microwave background photons in a single-zone jet flow. Within two-zone jet models, we find that a synchrotron origin for the jet's X-rays requires fewer additional assumptions than an inverse-Compton model, especially if velocity shear leads to efficient particle acceleration in jet flows.

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X-ray Nature of the LINER nuclear sources

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We report the results from an homogeneous analysis of the X-ray (*Chandra* ACIS) data available for a sample of 51 LINER galaxies selected from the catalogue by Carrillo et al. (1999) and representative of the population of bright LINER sources.

The nuclear X-ray morphology has been classified attending to their nuclear compactness in the hard band (4.5–8.0 keV) into 2 categories: Active Galactic Nuclei (AGN) candidates (with a clearly identified unresolved nuclear source) and Starburst (SB) candidates (without a clear nuclear source). 60% of the total sample are classified as AGNs, with a median luminosity of $L_X(2-10 \text{ keV}) = 2.5 \times 10^{40}$ erg s^{-1}, which is an order of magnitude higher than that for SB-like nuclei. The spectral fitting allows to conclude that most of the objects need a non-negligible power-law contribution. When no spectral fitting can be performed (data with low signal-to-noise ratio), the Color-Color diagrams allow us to roughly estimate physical parameters such as column density, temperature of the thermal model or spectral index for a power-law and therefore to better constrain the origin of the X-ray emission. All together the X-ray morphology, the spectra and the Color-Color diagrams allow us to conclude that a high percentage of LINER galaxies, at least $\approx 60\%$, could host AGN nuclei, although contributions from High Mass X-ray Binaries or Ultra-luminous X-ray sources cannot be ruled out for some galaxies.

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Variable iron-line emission near the black hole of Markarian 766

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We investigate the link between ionised Fe X-ray line emission and continuum emission in the bright nearby AGN, Mrk 766. A new long (433 ks) XMM-Newton observation is analysed, together with archival data from 2000 and 2001. The contribution from ionised line emission is measured and its time variations on short (5-20 ks) timescales are correlated with the continuum emission. The ionised line flux is found to be highly variable and to be strongly correlated with the continuum flux, demonstrating an origin for the ionised line emission that is co-located with the continuum emission. Most likely the emission is ionised reflection from the accretion disc within a few A.U. of the central black hole, and its detection marks the first time that such an origin has been identified other than by fitting to spectral line profiles. Future observations may be able to measure a time lag and hence achieve reverberation mapping of AGN at X-ray energies.

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Swift Observations of the highly X-ray variable Narrow Line Seyfert 1 galaxy RX J0148.3-2758

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We report on *Swift* observations of the Narrow-Line Seyfert 1 galaxy (NLS1) RX J0148.3–2758. It was observed for 41.6 ks in 2005 May and for 15.8 ks in 2005 December. On short as well as on long timescales RX J0148.3–2758 is a highly variable source. It doubles its X-ray flux within 18-25 ks. The observation of 2005 December 09, which had a flux 4 times lower than during the 2005 May observations, shows a significant hardening of the X-ray hardness ratio compared with the 2005-May and 2005-December 20/21 observations. A detailed analysis of the X-ray spectra shows that we actually observe two spectral changes in RX J0148.3-2758: first, a decrease of the soft X-ray component between 2005 May and December 09, which is most likely due to an increase of the intrinsic absorber column, and second, a decrease of the hard X-ray flux in the December 20/21 observations. The soft X-ray spectral slope $\alpha_{\rm X,soft}$=$2.58^{+0.15}_{-0.12}$ during the high state in 2005 May agrees well with that measured by *ROSAT* ($\alpha_{\rm X,soft}$=2.54±0.82). This soft X-ray spectrum is superimposed on a hard X-ray component with $\alpha_{\rm X,hard}$=$0.96^{+0.15}_{-0.12}$ which in consistent with the hard X-ray spectral slope $\alpha_{\rm X,hard}$=$1.11^{+0.16}_{-0.19}$ found by *ASCA*. The soft X-ray slope $\alpha_{\rm X,soft}$=$1.93^{+0.58}_{-0.42}$ measured during the December 09 observation, agrees well with $\alpha_{\rm X,soft}$=$2.03^{+0.23}_{-0.20}$ measured from the *ASCA* observation when RX J0148.3-2758 was also in a low state. In contrast to the strong X-ray variability, the analysis of the *Swift* UVOT photometry from December 2005 of RX J0148.3–2758 shows no significant variability in any of the 6 UVOT filters. ¿From the simultaneous

X-ray and UV observations in 2005 December we measured the X-ray loudness $\alpha_{\rm ox}$ and found it to vary between $\alpha_{\rm ox}$=1.5 and 1.8. Our *Swift* observations of RX J0148.3-2758 demonstrate the great potential that the multi-wavelength observatory *Swift* has for AGN science.

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An Atlas of STIS-HST Spectra of Seyfert Galaxies

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We present a compilation of spectra of 101 Seyfert galaxies obtained with the Space Telescope Imaging Spectrograph (HST-STIS), covering the UV and/or optical spectral range. Information on all the available spectra have been collected in a *Mastertable*, which is a very useful tool for anyone interested in a quick glance at the existent STIS spectra for Seyfert galaxies in the HST archive, and it can be recovered electronically at the URL address **www.if.ufrgs.br/˜pat/atlas.htm**. Nuclear spectra of the galaxies have been extracted in windows of 0.″2 for an optimized sampling (as this is the slit width in most cases), and combined in order to improve the signal-to-noise ratio and provide the widest possible wavelength coverage. These combined spectra are also available electronically.

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Spitzer IRS spectra of a large sample of Seyfert galaxies: a variety of infrared SEDs in the local AGN population

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We are conducting a large observing program with the Spitzer Space Telescope to determine the mid-to-far infrared spectral energy distributions of a well-defined sample of 87 nearby, 12 μm-selected Seyfert galaxies. In this paper we present the results of IRS low-resolution spectroscopy of a statistically representative subsample of 51 of the galaxies (59%), with an analysis of the continuum shapes and a comparison of the Seyfert types. We find that the spectra clearly divide into groups based on their continuum shapes and spectral features. The largest group (47% of the sample of 51) shows very red continuum suggestive of cool dust and strong emission features attributed to PAHs. Sixteen objects (31%) have a power-law continuum with spectral indices $\alpha_{5-20\,\mu{\rm m}}$ =-2.3 – -0.9 that flatten to $\alpha_{20-35\,\mu{\rm m}}$ =-1.1 – 0.0 at $\sim$20 μm. Clear silicate emission features at 10 and 18 μm are found in two of these objects (Mrk 6 and Mrk 335). A further 16% of the sample show power-law continua with unchanging slopes of $\alpha_{5-35\,\mu{\rm m}}$ =-1.7 – -1.1. Two objects are dominated by a broad silicate absorption feature. One object in the sample shows an unusual spectrum dominated by emission features, that is unlike any of the other spectra. Some spectral features are clearly related to a starburst contribution to the IR spectrum, while the mechanisms producing observed power-law continuum shapes, attributed to an AGN component, may be dust or non-thermal emission. The infrared spectral types appear to be related to the Seyfert types. Principal component analysis results suggest that the relative contribution of starburst emission may be the dominant cause of variance in the observed spectra. The derived starburst component of each spectrum, however, contributes <40% of the total flux density. We compare the IR emission with the optically thin radio emission associated with the AGN and find that Sy 1's have higher ratios of IR/radio emission than Sy 2's, as predicted by the unified model if the torus is optically thick in the mid-IR. However, smooth-density torus models predict a much larger difference between type 1's and 2's than the factor of 2 difference observed in our sample; the observed factor of $\sim$2 difference between the type 1's and 2's in their IR/radio ratios above 15 μm requires the standard smooth-density torus models to be optically thin at these wavelengths. However, the resulting low torus opacity requires that the high observed columns detected in X-ray absorption be produced in gas with very low dust to gas ratio (perhaps within the dust sublimation region). On the other hand, our observations may be consistent with clumpy torus models containing a steep radial distribution of optically thick dense clumps. The selection of our sample at 12 μm, where the torus may be optically thick, implies that there may be orientation-dependent biases in the sample, however we do not find that the sample is biased towards Sy 2's with more luminous central engines as would be expected. We find that the Sy 2's typically show stronger starburst contributions than the Sy 1's in the sample, contrary to what is expected based on the unified scheme for AGN. This may be due to the selection effect that only those Seyfert 2's with strong starburst contributions had high enough integrated 12 μm flux densities to fall above the flux limit of the sample.

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Meetings

Galaxy Mergers: - *From the Local Universe to the Red Sequence*

2006 Fall Space Telescope Science Institute Mini-Workshop
Baltimore, MD 21218 USA
October 4-6, 2006

Conference Rationale:
The link between star-formation and galaxy evolution is of considerable interest in the context of results from recently completed deep imaging and spectroscopic surveys. A recent flurry of papers in the last two years have presented results which indicate that enough so-called "red and dead" early-type galaxies exist to form the Red Sequence as far back as z$\sim$1. These studies suggest that non-dissipative (or "dry") merging is the key to forming massive early-type galaxies. It is further postulated that gas-rich (or "wet") mergers are unable to account for the most massive "red and dead" galaxies. Some evidence to support this can be found in numerical simulations of mergers. Yet, other lines of evidence support the importance of gas-rich merging: massive disk galaxies with large reservoirs of gas at z > 1 with colors that place them on the Red Sequence, nearby giant ellipticals which show the presence of both intermediate-age stellar populations and intermediate-age globular clusters and merger simulations which indicate that gaseous disks are needed in the central regions of mergers in order for these objects to have the same dynamical properties as elliptical galaxies. Taken together, these results seem to point towards a serious dichotomy in our view of mergers and galaxy evolution. How do these competing merger pictures fit into our overall understanding of galaxy evolution, and can the observed Color-Magnitude Diagram be reconciled with predictions made by Λ-CDM cosmology and hierarchical assembly? Answering these questions and addressing the dichotomy in the merger picture is critical to a more comprehensive understanding of galaxy formation and evolution.

We will hold a 2.5 day workshop to address these important issues, both in an observational and theoretical context. In addition to the invited review talks, the conference will include room for posters and $\sim$ 20 contributed talks. Each contributed talk will be 20 minutes in length, with an additional 10 minutes set aside for discussion and questions.

Invited Speakers:
- Josh Barnes - *Numerical Simulations of Mergers*
- Eric Bell - *The Red Sequence/Blue Cloud from z $\sim$ 1*
- Avishai Dekel - *Feedback Processes*
- Barry Rothberg - *Dynamical Properties of Mergers*
- Francois Schweizer - *Mergers in the Local Universe*
- Rachel Somerville - *Hierarchical Assembly & Building the Red Sequence/Blue Cloud*
- Scott Trager- *Stellar Populations in Elliptical Galaxies*
- Pieter van Dokkum - *Distant Red Mergers*

Schedule:
DAY 1:
- Setting the Stage: *Mergers & the Red Sequence/Blue Cloud*
- Stellar Evolution: *Models & Observations, Can you get from the Blue Cloud to the Red Sequence?*
- Galaxy Assembly: *Making Predictions & Testing (or Breaking) the Models*

DAY 2:
- Low-z Mergers & End Products: *Merger Dynamics & Evolution, Assembly Histories, E+A Galaxies*
- High-z Progenitors: *early mergers (same, similar, or different?) emergence of the Hubble Sequence*

DAY 3:
- Feedback, Quenching, & Truncated Star-formation: *AGNs and other mechanisms for stopping star-formation*
- Final Session: *Interactive Workshop Forum*

Contact Information:
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The 5th Stromlo Symposium
Disks Winds and Jets: From Planets to Quasars
Dec 3-8 2006
Research School of Astronomy & Astrophysics
Australian National University
Mt Stromlo Observatory

Webpage: `http://www.mso.anu.edu.au/5SS`

The Texas Symposium on Relativistic Astrophysics will be held in Melbourne from Dec 10-15. Part of the motivation for a satellite meeting on Jets, Disks and Winds was to take advantage of the fact that a number of international visitors with interests in these topics will be in Australia for Texas in Melbourne. At the same time we thought that such a symposium should not only consider relativistic aspects but also aspects related to protostars, planets and starburst galaxies - these being major research thrusts within the Australian astronomical community.

The rationale for the meeting is to explore the common physics underlying accretion, energy generation and outflow in different systems such as black holes with masses ranging from a few to several billion solar masses, young stellar objects, starburst galaxies and the early phases of protoplanetary disks. Sessions will cover new theoretical ideas and results and new observational data from space- and ground-based observatories, including Chandra, HST, Gemini, HESS, Keck, Spitzer, Swift, VLT and XMM.

Please visit the symposium web page at `http://www.mso.anu.edu.au/5SS`

Geoff Bicknell & Rita Sambruna Co-chairs Scientific Organising Committee

The Active Galaxies Newsletter is available on the World Wide Web. You can access it via the University of Manchester home page :- http://www.ast.man.ac.uk/~rb/agn/
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