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.
Matt Redman

Abstracts of recently accepted papers

Double-Peaked Broad Emission Lines in NGC 4450 and Other LINERs

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Spectra taken with the *Hubble Space Telescope* (*HST*) reveal that NGC 4450 emits Balmer emission lines with displaced double peaks and extremely high-velocity wings. This characteristic line profile, previously seen in a few nearby LINERs and in a small fraction of broad-line radio galaxies, can be interpreted as a kinematic signature of a relativistic accretion disk. We can reproduce the observed profile with a model for a disk with a radial range of 1000–2000 gravitational radii and inclined by 27 degrees along the line of sight. The small-aperture *HST* data also allow us to detect, for the first time, the featureless continuum at optical wavelengths in NGC 4450; the nonstellar nucleus is intrinsically very faint, with $M_B = -11.2$ mag for $D = 16.8$ Mpc.

We have examined the multiwavelength properties of NGC 4450 collectively with those of other low-luminosity active nuclei which possess double-peaked broad lines and find a number of common features. These objects are all classified spectroscopically as "type 1" LINERs or closely related objects. The nuclear luminosities are low, both in absolute terms and relative to the Eddington rates. All of them have compact radio cores, whose strength relative to the optical nuclear emission places them in the league of radio-loud active nuclei. The broad-band spectral energy distributions of these sources are most notable for their deficit of ultraviolet emission compared to those observed in luminous Seyfert 1 nuclei and quasars. The double-peaked broad-line radio galaxies Arp 102B and Pictor A have very similar attributes. We discuss how these characteristics can be understood in the context of advection-dominated accretion onto massive black holes.

To appear in *The Astrophysical Journal.*

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Evidence for a Black Hole and Accretion Disk in the LINER NGC 4203

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We present spectroscopic observations from the Hubble Space Telescope that reveal for the first time the presence of a broad pedestal of Balmer-line emission in the LINER galaxy NGC 4203. The emission-line profile is suggestive of a relativistic accretion disk, and is reminiscent of double-peaked transient Balmer emission observed in a handful of other LINERs. The very broad line emission thus constitutes clear qualitative evidence for a black hole, and spatially resolved narrow-line emission in NGC 4203 can be used to constrain its mass, with $M_{\rm BH} < 6 \times 10^6$ solar masses at 99.7% confidence. This value implies a ratio of black-hole mass to bulge mass of less than approximately 7×10^{-4} in NGC 4203, which is less by a factor of ∼3–9 than the mean ratio obtained for other galaxies. The availability of an independent constraint on central black-hole mass makes NGC 4203 an important testbed for probing the physics of weak active galactic nuclei. Assuming $M_{\rm BH}$ near the detection limit, the ratio of observed luminosity to the Eddington luminosity is approximately 10^{-4}. This value is consistent with advection-dominated accretion, and hence with scenarios in which an ion torus irradiates an outer accretion disk that produces the observed double-peaked line emission. Follow-up observations will make it possible to improve the black-hole mass estimate and study variability in the nuclear emission.

To appear in *The Astrophysical Journal (Letters).*

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preprint available at http://xxx.lanl.gov/abs/astro-ph/0004047

Discovery of Narrow X-ray Absorption Lines from NGC 3783 with the *Chandra* HETGS

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We present the first grating-resolution X-ray spectra of the Seyfert 1 galaxy NGC 3783, obtained with the High Energy Transmission Grating Spectrometer on the *Chandra* X-ray Observatory. These spectra reveal many narrow absorption lines from the H-like and He-like ions of O, Ne, Mg, Si, S and Ar, as well as Fe XVII–Fe XXI L-shell lines. We have also identified several weak emission lines, mainly from O and Ne. The absorption lines are blueshifted by a mean velocity of $\approx 440 \pm 200$ km s^{-1} and are not resolved, indicating a velocity dispersion within the absorbing gas of a few hundred km s^{-1} or less. We measure the lines' equivalent widths and compare them with the predictions of photoionization models. The best-fitting model has a microturbulence velocity of 150 km s^{-1} and a hydrogen column density of 1.3×10^{22} cm^{-2}. The measured blueshifts and inferred velocity dispersions of the X-ray absorption lines are consistent with those of the strongest UV absorption lines observed in this object. However, simple models that propose to strictly unify the X-ray and UV absorbers have difficulty explaining simultaneously the X-ray and UV absorption line strengths.

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preprint available at http://arXiv.org/abs/astro-ph/0004050
and also available from http://www.astro.psu.edu/users/niel/papers/papers.html

A bright X-ray transient towards NGC 5128 (Centaurus A)

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During five ROSAT HRI observations in July 1995, a bright X-ray source (designated 1RXH J132519.8-430312) was detected 2.5′ south-west of the nucleus of NGC 5128 (Centaurus A) at the outer regions of the elliptical galaxy. At that time it was the brightest point source in the ROSAT HRI field-of-view. All other ROSAT observations made before and after these observations show no trace of the source suggesting that this is a highly variable object. Chandra observations of Cen A made in September 1999 show a source at the ROSAT position which may be the quiescent counterpart of the transient. It is very probable that the transient is located in NGC 5128. Given the existence of a transient source that close to the direction of NGC 5128, all observations (at least in soft X-rays) of Cen A, with instruments of low spatial resolution, must take the presence and variability of this object into account.

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more information and a link to the preprint available at http://www.mpe.mpg.de/Cen-A/

Quasar Candidate Multicolor Selection Technique: a different approach

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We present a quasar candidate identification technique based on multicolor photometry. The traditional multi-dimensional method ($2 \times$ N dimensions, where N is the number of the color-color diagrams) is reduced to a one-dimensional technique, which consists in a standard fitting procedure, where the observed spectral energy distributions are compared to quasar simulated spectra and stellar templates. This new multicolor approach is firstly applied to simulated catalogues and its *efficiency* is examined in various redshift ranges, as a function of the filter combination and the available observing time for spectroscopy. We conclude that this method is better suited than the usual multicolor selection techniques to quasar identification, especially for high-redshift quasars. The application of the method to real quasar samples found in the literature results in an *efficiency* comparable to the one obtained from the use of color-color diagrams. The major advantage of the new method is the estimation of the *photometric* redshift of quasar candidates, enabling, in almost all cases, spectroscopy to be targeted to best suited wavelength ranges.

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preprint available at astro-ph/0001538

Relativistic beaming effects in the spectra of cores and hotspots in radio galaxies and quasars

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We present the results of multi-wavelength observations of cores and hotspots at L, C, X and U bands with the Very Large Array, of a matched sample of radio galaxies and quasars selected from the Molonglo Reference Catalogue. We use these observations to determine the spectra of cores and hotspots, and test the unified scheme for radio galaxies and quasars. Radio cores have been detected at all wavelengths in all the quasars in our sample, while only ~ 50 % of the galaxies have detected cores in at least one wavelength. The degree of core prominence in this sample is consistent with the unified scheme for radio galaxies and quasars. A comparison of the distributions of the two-point spectral index of the cores in our sample of lobe-dominated quasars (LDQs) with a matched sample of core-dominated quasars (CDQs) shows that the distributions for these two classes are significantly different, consistent with the expectations of the unified scheme. The difference in the spectral indices of the two hotspots on opposite sides are also significantly larger for quasars than radio galaxies, as expected in the unified scheme. We also investigate the relationship between the spectral index of the hotspots and the redshift or luminosity of our sample of sources.

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ROSAT PSPC detection of soft X-ray absorption in GB 1428+4217: The most distant matter yet probed with X-ray spectroscopy

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We report on a ROSAT PSPC observation of the highly-luminous $z = 4.72$ radio-loud quasar GB 1428+4217 obtained between 1998 December 11 and 17, the final days of the ROSAT satellite. The low-energy sensitivity of the PSPC detector was employed to constrain the intrinsic X-ray absorption of the currently most distant X-ray detected object. Here we present the detection of significant soft X-ray absorption towards GB 1428+4217, making the absorbing material the most distant matter yet probed with X-ray spectroscopy. X-ray variability by 25 ± 8 per cent is detected on a timescale of 6500 s in the rest frame. The X-ray variation requires an unusually high radiative efficiency η of at least 4.2, further supporting the blazar nature of the source.

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Differences in the dense gas between type 1 and type 2 Seyferts

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We have used observations of the CO $J = 1 \to 0$ transition in a sample of 20 Seyfert galaxies in order to test the result of Heckman et al. (1989), who find that type 2 Seyferts have a higher molecular gas content than type 1 Seyferts. From our the observational results alone, we possibly find that $L_{\rm CO}/L_{\rm FIR}$ $(Sy2) \approx L_{\rm CO}/L_{\rm FIR}$ $(Sy1)$ for $L_{\rm FIR} \sim 10^{11}{\rm L}_{\odot}$ Seyferts, but $L_{\rm CO}/L_{\rm FIR}$ $(Sy2) \approx 3L_{\rm CO}/L_{\rm FIR}$ $(Sy1)$, when we use all of our sample ($L_{\rm FIR} \sim 10^{10} - 10^{11}{\rm L}_{\odot}$). The results suggest that star-burst activity is most dominant in the ($L_{\rm FIR} \sim 10^{10}{\rm L}_{\odot}$) type 2 Seyferts, and the relative contribution of this activity to the FIR flux (compared to the AGN) may decrease with increasing $L_{\rm FIR}$.

Also, in order to test whether the Seyfert classes differ in their molecular gas distributions, we have used a simple model to estimate the inclination of the sub-kpc scale molecular ring, and, upon comparison with the observed spectra, conclude that the ring is generally aligned with the galactic disc, with the largest deviations from this being exhibited by the type 1 Seyferts. With regard to the nucleus, for most of the sample, the pc-scale obscuring torus appears to be approximately (within $\approx 30°$) aligned with the molecular ring for both Seyfert classes.

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X–ray Emission of Mkn 421: New Clues From Its Spectral Evolution. I. Temporal Analysis

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Mkn 421 was repeatedly observed with *Beppo*SAX in 1997–1998. This is the first of two papers where we present the results of a thorough temporal and spectral analysis of all the data available to us, focusing in particular on the flare of April 1998, which was simultaneously observed also at TeV energies. Here we focus on the time analysis, while the spectral analysis and physical interpretation are presented in the companion paper.

The detailed study of the flare in different energy bands reveals very important new results: i) hard photons lag the soft ones by 2–3 ks – a behavior opposite to what is normally found in high energy peak BL Lacs X–ray spectra; ii) the flare light curve is symmetric in the softest X–ray band, while it becomes increasingly asymmetric at higher energies, with the decay being progressively slower than the rise; iii) the flux decay of the flare can be intrinsically achromatic if a stationary underlying emission component is present.

The temporal and spectral information obtained challenge the simplest models currently adopted for the (synchrotron) emission and most importantly provide clues on the particle acceleration process.

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X–ray Emission of Mkn 421: New Clues From Its Spectral Evolution. II. Spectral Analysis and Physical Constraints

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Mkn 421 was repeatedly observed with *Beppo*SAX in 1997–1998. The source showed a very rich phenomenology, with remarkable spectral variability. This is the second of two papers presenting the results of a thorough temporal and spectral analysis of all the data available to us, focusing in particular on the flare of April 1998, which was simultaneously observed also at TeV energies. The spectral analysis and correlations are presented in this paper, while the data reduction and timing analysis are the content of the companion paper. followed over few ks intervals, allowing us to detect for the first time the peak of the synchrotron component shifting to higher energies during the rising phase, and then receding. This spectral analysis nicely confirms the delay of the flare at the higher energies, which in Paper I we quantified as a hard lag of a few ks. Furthermore, at the highest energies, evidence is found of variations of the inverse Compton component. challenge the simplest models currently adopted for the (synchrotron) emission and most importantly provide clues on the particle acceleration process. A scenario accounting for all the observational constraints is discussed, where electrons are injected at progressively higher energies during the development of the flare, and the achromatic decay is ascribed to the source light crossing time exceeding the particle cooling timescales.

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Thesis abstract

Molecular Gas in Seyfert Galaxies

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Ph.D degree awarded: March 2000

In this report we present the results of a single dish study of the molecular gas properties in Seyfert galaxies. From the observations of the closest lying example, the Circinus galaxy, we find that about half of the molecular gas is distributed in a circumnuclear ring orbiting the central super-massive black hole, believed to be powering this type 2 Seyfert. The 100 pc-scale ring orbits with non-Keplerian rotation at a maximum velocity of ≈ 180 km s^{-1}. From this we deduce that the $N_{\rm H_2}/I_{\rm CO}$ Galactic conversion ratio causes us to overestimate the gas mass fraction by a factor of ≈ 5. From further studies, the remainder of the gas appears to be in a 90° wide outflow which extends to ±500 pc along the rotation axis of the ring. The maximum outflow velocity of $\approx \pm190$ km s^{-1} gives a mechanical luminosity of $\gtrsim 10^7 \mathrm{L}_\odot$ and the orientation of the outflow axis suggests that the molecular ring is very nearly coplanar with the central body obscuring the active galactic nucleus.

By observing a sample of 20 Seyfert galaxies, we find that the HCN to CO luminosity ratio, $\frac{L_{\rm HCN}}{L_{\rm CO}} \approx 1/6$, is considerably higher than for normal spiral galaxies and comparable to the ratios found in ultra-luminous infra-red galaxies (ULIRGs). Our observations suggest that there may be differences in the molecular gas distributions between low ($L_{\rm FIR} \sim 10^{10}$ L$_\odot$) and high ($L_{\rm FIR} \sim 10^{11}$ L$_\odot$) far infra-red luminous (FIR) Seyferts. By combining our results with the FIR luminosities, we find that $\frac{L_{\rm FIR}}{L_{\rm CO}}$ ($L_{\rm FIR} \sim 10^{11}$ L$_\odot$ Seyferts) $\approx 10\frac{L_{\rm FIR}}{L_{\rm CO}}$ (normal spirals) and $\frac{L_{\rm FIR}}{L_{\rm HCN}}$ (Seyferts) $\approx \frac{L_{\rm FIR}}{L_{\rm HCN}}$ (ULIRGs) $\approx \frac{L_{\rm FIR}}{L_{\rm HCN}}$ (normal spirals). From this we cannot ascertain the relative radiation contribution of the star-burst and the active nucleus, although between NGC 4945 and Circinus, in which we have performed multi-transitional observations, these seem to differ. This may have the effect of lowering current estimates of the star formation rates in Seyfert galaxies, although both galaxies do appear to have relatively high populations (c.f. the Galaxy) of massive ($\gtrsim 10\mathrm{M}_\odot$) stars. Finally, estimates of the gas inclinations in these 20 Seyferts appear to suggest that the various gas disk structures on all scales are usually aligned in each galaxy, supporting the notion that the obscuration may be but a dense component of the large-scale gas structure.

Meetings

QSO hosts and their environments

Granada, Spain
10-12 January 2001

This 3 days workshop will be devoted to the revision of the *state of the art* on QSO hosts and their environments, the multi-wavelength properties of these objects till look back times, and their implications in galaxy formation and evolution. The main topics to be summarized will be the following:

- Hosts of radio-loud and radio-quiet QSOs and their redshift evolution. Black hole formation, growth, relation to host galaxy, and fuelling.

- BL-Lacs and radio galaxies as related phenomena in unification framework.

- QSO luminosity, the effect of beaming and dust. Evolution of AGN luminosity function and energy balance in the Universe.

High redshift QSOs as tracers of structures and galaxy formation.

- Effects of tidal interacions/mergers.

- Cluster environment and its redshift evolution.

Scientific Organising Comitee:

John N. Bahcall, Institute for Advanced Study, Princeton (USA)

Malcolm Bremer Bristol University (United Kingdom)

Deborah Dultzin-Hacyan, Instituto de Astronomía, UNAM (Mexique)

James Dunlop, John Moore University, Liverpool (United Kingdom)

Jochen Heidt, Landessternwarte, Heidelberg (Germany)

John Hutchings, Dominion Astroph. Observatory, Victoria (Canada)

Isabel Márquez, IAA (CSIC), Granada (Spain)

Patrick Petitjean, IAP, Paris (France)

The first announcement of this workshop will be available in May 2000.

We are limited to a maximum of 60 people.

FOR FURTHER INFORMATION PLEASE CONTACT THE CONFERENCE ORGANISER: Isabel Marquez, E-mail: isabel@iaa.es, FAX: +34 958 81 45 30

Meeting home page: http://www.iaa.csic.es/∼qsoenv/

Announcements

The Tartarus Database of ASCA Observations of AGN: Version 2 - May 5 2000

T.J.Turner[1,2] **& K.Nandra**[2,3]

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We are happy to announce the release of version 2 of the Tartarus database. This version of the database contains 529 reduced sequences, and includes everything in the public archives up to May 3 2000. The main improvement over version 1 is a refinement of the source detection routine so that, even when the target AGN is very faint, it will be extracted correctly, even in the presence of a bright serendipitous source.

For more details, please visit:

`http://tartarus.gsfc.nasa.gov/`

ACCESS VIA W3BROWSE:

Tartarus pages and products will shortly (within a few weeks) be available via the W3BROWSE interface.

NOTE:

Some sequences have failed the automatic processing, and some suffer contamination of source or background regions by a serendipitous source. Those sequences will be fixed as time allows, and we will give highest priority to fix sequences that have been requested. Please send requests/comments to our helpdesk at:

`tartarus@olegacy.gsfc.nasa.gov`

If you have received this message erroneously or do not wish to receive further updates, please reply to this e-mail and we will remove your name from our list.

Best Regards,

The Tartarus Team `http://tartarus.gsfc.nasa.gov/doc/team.html`

E-mail contact: tartarus@olegacy.gsfc.nasa.gov

Release of the INES Archive

The International Ultraviolet Explorer (IUE) Archives have been delivered to the world scientific community on 21st March. ESA, in collaboration with the Spanish Laboratory of Space Astrophysics and Theoretical Physics (LAEFF) belonging to INTA (National Institute of Air and Space Technology), has developed and set up the INES system to access IUE Data.

INES (IUE Newly Extracted Spectra) is a complete astronomical archive and data-distribution system. Its release to the community represents the final activity by ESA in the context of the IUE project. From now LAEFF, on behalf of the international astronomical community, will be responsible of maintaining INES, making it available and providing world-wide support to scientists using IUE data.

The IUE Archive contains more than 110,000 spectra of more that 11,000 astronomical objects. All data are fully reduced and calibrated. The INES archive consists of:

- an access catalog containing the parameters required to query the archive and evaluate the observations,

- a publications catalog which links each spectrum to the publications in which it has been used via the ADS,

- and the data themselves (low dispersion spectra, high dispersion spectra rebinned to the low resolution wavelength step, full high dispersion concatenated spectra, and bi-dimensional low dispersion images).

The INES Archive can be accessed at http://ines.vilspa.esa.es. Users can consult the catalogue, preview the spectra and download the data with a standard browser from the Principal Centre at LAEFF, its Mirror Centre located at the Canadian

Astronomical Data Centre or any of the National Centres spread in all continents. This distributed system guarantees the availability and efficient access to the data.

Questions about the INES archive can be directed to the INES Help Desk at

ineshelp@iuearc.vilspa.esa.es

or at

http://iuearc.vilspa.esa.es/ines_jb/HelpDesk/

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/~mpr/agn/

If you move or your e-mail address changes, please send the editor your new address. If the Newsletter repeatedly bounces back from an address then that address is deleted from the mailing list.