Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
No. 30 — September 1999	Editor: Matt Redman (mpr@ast.man.ac.uk)

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

Discovery of a giant and luminous X-ray outburst from the optically inactive galaxy pair RX J1242.6–1119

Stefanie Komossa[1], and Jochen Greiner[2]

[1] Max-Planck-Institut für extraterrestrische Physik, Giessenbachstrasse, 85748 Garching, Germany
[2] Astrophysikalisches Institut Potsdam, An der Sternwarte 16, D-14482 Potsdam, Germany

We report the discovery of large-amplitude X-ray variability from the direction of the previously unknown, optically inactive galaxy pair RX J1242.6-1119. The X-ray source shows variability by a factor > 20 between the *ROSAT* all-sky survey and a later pointed observation separated by $\sim$1.5 yr. Its spectrum is extremely soft with photon index $\Gamma_x \simeq -5$, among the steepest ever observed among galaxies. Based on the redshift derived from the optical spectra, z=0.05, the source's intrinsic luminosity is large, $L_x > 10^{43}$ erg s^{-1}. Surprisingly, the optical spectra of both galaxies are characterized by absorption lines and do not show signs of (Seyfert) activity. This makes RX J1242-11 the third candidate for giant-amplitude variability in an otherwise non-active galaxy, the first two being NGC 4552 (in the UV; Renzini et al. 1995) and NGC 5905 (in X-rays; Bade et al. 1996, Komossa & Bade 1999). Several mechanisms to explain this unexpected and peculiar behavior are investigated. The most likely one seems to be an accretion event onto an otherwise dormant supermassive black hole (SMBH), e.g., by a tidal disruption event.

A&A Letter, in press

E-mail contact: skomossa@xray.mpe.mpg.de
Preprint available at http://www.xray.mpe.mpg.de/~skomossa/ and at astro-ph/9908216

Parsec-Scale Images of Flat-Spectrum Radio Sources in Seyfert Galaxies

C.G. Mundell[1], A.S. Wilson[2]. J.S. Ulvestad[3] and A.L. Roy[4]

[1] Department of Astronomy, University of Maryland, College Park, MD, 20742, USA
[2] Department of Astronomy, University of Maryland, College Park, MD, 20742, USA; Adjunct Astronomer, Space Telescope Science Institute

[3] National Radio Astronomy Observatory, P.O. Box O, Socorro, NM, 87801, USA
[4] National Radio Astronomy Observatory, P.O. Box O, Socorro, NM, 87801, USA

We present high angular resolution (∼2 mas) radio continuum observations of five Seyfert galaxies with flat-spectrum radio nuclei, using the VLBA at 8.4 GHz. The goal of the project is to test whether these flat-spectrum cores represent thermal emission from the accretion disk, as inferred previously by Gallimore et al. for NGC 1068, or non-thermal, synchrotron self-absorbed emission, which is believed to be responsible for more powerful, flat-spectrum nuclear sources in radio galaxies and quasars. In four sources (T0109−383, NGC 2110, NGC 5252, Mrk 926), the nuclear source is detected but unresolved by the VLBA, indicating brightness temperatures in excess of 10^8 K and sizes, on average, less than 1 pc. We argue that the radio emission is non-thermal and synchrotron self-absorbed in these galaxies, but Doppler boosting by relativistic outflows is not required. Synchrotron self-absorption brightness temperatures suggest intrinsic source sizes smaller than ∼0.05−0.2pc, for these four galaxies, the smallest of which corresponds to a light-crossing time of ∼60 light days or 10^4 gravitational radii for a 10^8 $M_\odot$ black hole. In one of these galaxies (NGC 2110), there is also extended (∼0.2 pc) radio emission along the same direction as the 400-pc scale jet seen with the VLA, suggesting that the extended emission comes from the base of the jet. In another galaxy (NGC 4388), the flat-spectrum nuclear source is undetected by the VLBA. We also present MERLIN and VLA observations of this galaxy and argue that the observed, flat-spectrum, nuclear radio emission represents optically thin, free-free radiation from dense thermal gas on scales $\simeq 0.4$ to a few pc. It is notable that the two Seyfert galaxies with detected thermal nuclear radio emission (NGC 1068 and NGC 4388) both have large X-ray absorbing columns, suggesting that columns in excess of $\simeq 10^{24}$ cm^{-2} are needed for such disks to be detectable.

Accepted by The Astrophysical Journal

E-mail contact: cgm@astro.umd.edu; preprint available - astro-ph/9908255

A Comprehensive Spectral and Variability Study of Narrow-Line Seyfert 1 Galaxies Observed by ASCA: I. Observations and Time Series Analysis

Karen M. Leighly

Columbia Astrophysics Laboratory, Columbia University, 550 West 120th Street, New York, NY 10027

I present a comprehensive and uniform analysis of 25 *ASCA* observations from 23 Narrow-line Seyfert 1 galaxies. The time series analysis is presented in this paper, Part 1, and the spectral analysis and correlations are presented in the companion paper, Part 2.

Time series analysis shows that the excess variance from the NLS1 light curves is inversely correlated with their X-ray luminosity. However, with a logarithmic slope of ~ -0.3, the dependence of the excess variance on luminosity is flat compared with broad-line objects and the expected value of -1 from simple models. At a particular X-ray luminosity, the excess variance is typically an order of magnitude larger for NLS1s than for Seyfert 1 with broad optical lines. There is, however, a large scatter and a few objects show an even larger excess variance. The excess variance can be interpreted as a time scale if the shape of the variability power spectrum, the length of the observation and the window function are the same for all observations, and the properties of the sample objects are shown to be roughly consistent with this requirement. In particular, no strong evidence for changes during an observation in the shape or normalization of the power spectrum was found once the systematic errors due to the $1/f$ nature of the power spectrum was accounted for properly. Some of the more variable light curves are shown to be inconsistent with a linear, Gaussian process, implying that the process is nongaussian. It is possible that the process is nonlinear, but while the distinction between these possibilities is very important for differentiating between models, such a distinction cannot be made using these data. The enhanced excess variance exhibited by NLS1s can be interpreted as evidence that they are scaled-down versions of broad-line objects, having black hole masses roughly an order of magnitude smaller and requiring an accretion rate an order of magnitude higher. Alternatively, NLS1s may exhibit an inherently different type of variability, characterized by high amplitude flares, in which case a smaller black hole mass would not be required.

ApJS in press, December 1999

E-mail contact: leighly@astro.columbia.edu,
preprint available at http://www.astro.columbia.edu/ leighly/research.html

A Comprehensive Spectral and Variability Study of Narrow-Line Seyfert 1 Galaxies Observed by ASCA: II. Spectral Analysis and Correlations

Karen M. Leighly

Columbia Astrophysics Laboratory, Columbia University, 550 West 120th Street, New York, NY 10027

I present a comprehensive and uniform analysis of 25 *ASCA* observations from 23 Narrow-line Seyfert 1 galaxies. The spectral analysis and correlations are presented in this paper, Part 2; the reduction and time series analysis is presented in the companion paper, Part 1.

A maximum likelihood analysis confirms that the hard X-ray photon index is significantly steeper at >90% confidence in this sample of NLS1s compared with a random sample of Seyfert galaxies with broad optical lines. Soft excess emission was detected in 17 of the 19 objects which had no significant absorption, a result that demonstrates that soft excesses appear considerably more frequently in NLS1s than in Seyfert 1 galaxies with broad optical lines. The strength of the soft excess, parameterized using a flux ratio obtained from the black body plus power law model, has a wide range of values in these objects (a factor of 50). The photon index was found to be correlated with the Hβ FWHM, despite the small range of the latter parameter; however, neither parameter is correlated with the strength of the soft excess or *ROSAT* slope. Therefore, assuming that an excess of soft photons results in the steep photon index and narrow Hβ FWHM, that excess may lie primarily in the unobservable EUV. The strength of the soft excess is correlated with the variability parameters, so that objects with strong soft excesses show higher amplitude variability; this potentially important result is not easily explained. While a range of two orders of magnitude in luminosity is represented, the temperature of the soft excess is approximately consistent throughout the sample, in contrast with expectations of simple accretion disk models. The presence of ionized absorption was sought using a two-edge model. It was found that this component appears to be typically less common in NLS1s and some evidence was found that the typical ionization state is lower compared with broad-line Seyfert galaxies. This fact, plus evidence for a correlation between the presence of the warm absorber and significant optical polarization, may imply that the inner warm absorber is missing or is too highly ionized to be detected, and only the outer, dusty, less ionized warm absorber is present in many cases. The iron line equivalent width appears to be similar among narrow and broad-line Seyfert galaxies. This could mean that reprocessing occurs with similar geometry in both classes of objects; however, the detection of ionized iron lines in a few objects, implying possibly altered fluorescence yields, and poor statistics, makes this conclusion tentative. Constraints on physical processes and models based on extreme values of orientation and accretion rate for NLS1s are examined in light of the observational results.

ApJS in press, December 1999

E-mail contact: leighly@astro.columbia.edu,
preprint available at http://www.astro.columbia.edu/ leighly/research.html

Starbursts in active galaxy nuclei: observational constraints from IR stellar absorption lines

E.Oliva[1], L.Origlia[2], R.Maiolino[1], and A.Moorwood[3]

[1] Osservatorio Astrofisico di Arcetri, Large E. fermi 5, I-50125 Firenze, Italy
[2] Osservatorio Astronomico di Bologna, Via Ranzani 1, I-40127 Bologna, Italy
[3] European Southern Observatory, Karl Schwarzschild Str. 2, D-85478 Garching, Germany

High quality infrared spectra of active galaxies including the stellar absorption features of Si at 1.59 μm, CO(6,3) at 1.62 μm, and CO(2,0) at 2.29 μm are used to measure the stellar mass to light ratio at 1.65 μm ($M/L_{\rm H}$) and investigate the occurrence of circum–nuclear starbursts. We find that old and powerful starbursts are relatively common in obscured AGNs (5 objects out of 13) while absent in genuine Seyfert 1's (0 objects out of 8).

The data are also used to derive the non–stellar continuum which is very red and compatible with emission from warm ($\simeq$1000 K) dust even in bare Sy1's, thus indicating that the near IR nuclear continuum is reprocessed radiation. Hot dust ($\simeq$800 K) emission is also detected in a few bscured AGNs, including the Seyfert 2 prototype NGC1068. The observed non–stellar flux is too high to be accounted for by scattered light and therefore indicates that the material obscuring the AGN must have a quite small ($\lesssim$1 pc) projected size.

Accepted by A&A

E-mail contact: oliva@arcetri.astro.it, preprint available at http://www.arcetri.astro.it/ oliva

Unveiling the Active Nucleus of Centaurus A

Alessandro Marconi[1], Ethan J. Schreier[2], Anton Koekemoer[2], Alessandro Capetti[3], David Axon[4], Duccio Macchetto[2,6] and Nicola Caon[5]

[1] Osservatorio Astrofisico di Arcetri, Largo E. Fermi 5, I-50125 Firenze, ITALY
[2] Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, USA
[3] Osservatorio Astronomico di Torino, Strada Osservatorio 20, I-10025 Pino Torinese, ITALY
[4] Department of Physical Sciences, University of Hertfordshire, College Lane, Hatfield, Herts AL10 9AB, UK

[5] Instituto de Astrofisica de Canarias, c/ via Lactea s/n, E-38200 La Laguna, Tenerife, SPAIN
[6] Affiliated to ESA scientific division

We report new HST *WFPC2* and *NICMOS* observations of the center of the nearest radio galaxy Centaurus A (NGC 5128) and discuss their implications for our understanding of the active nucleus and jet. We detect the active nucleus in the near–IR (K and H) and, for the first time, in the optical (I and V), deriving the spectral energy distribution of the nucleus from the radio to X-rays. The optical and part of the near-IR emission can be explained by the extrapolation of the X-ray power law reddened by $A_V \sim 14$, a value consistent with other independent estimates.

The 20pc-scale nuclear disk discovered by Schreier et al. (1998) is detected in the [FeII]$\lambda 1.64\mu$m line and presents a morphology similar to that observed in Paα with a [FeII]/Paα ratio typical of low ionization Seyfert galaxies and LINERs. NICMOS 3 Paα observations in a 50"×50" circumnuclear region suggest enhanced star formation ($\sim 0.3 M_\odot$ yr^{-1}) at the edges of the putative bar seen with ISO, perhaps due to shocks driven into the gas.

The light profile, reconstructed from V, H and K observations, shows that Centaurus A has a core profile with a resolved break at ∼4" and suggests a black–hole mass of $\sim 10^9 M_\odot$. A linear blue structure aligned with the radio/X–ray jet may indicate a channel of relatively low reddening in which dust has been swept away by the jet.

Accepted by the Astrophysical Journal

E-mail contact: marconi@arcetri.astro.it,
preprint available at http://www.arcetri.astro.it/∼marconi/pubs.html

Spectroscopic Study of High Redshift Quasars

M. Dietrich[1], I. Appenzeller[2] S.J. Wagner [1] W. Gässler[3] R. Häfner[3] H.-J. Hess[3] W. Hummel[3] B. Muschielok[3] H. Nicklas[2] G. Rupprecht[5] W. Seifert[1] O. Stahl[1] T. Szeifert[5,1] & K. Tarantik[3]

[1] Landessternwarte Heidelberg, Königstuhl, D-69117 Heidelberg, Germany
[2] Universitätssternwarte Göttingen, Geismarlandstr. 11, D-37083 Göttingen, Germany
[3] Universitätssternwarte München, Scheinerstr. 1, D-81679 München, Germany
[4] Max-Planck-Institut für Astronomie, Königstuhl, D-69117 Heidelberg, Germany
[5] European Southern Observatory, Casilla 19001, Santiago 19, Chile

We obtained optical spectra of four quasars with $3<z<4$ and SDSSp J033829.31+002156.3 with $z=5.0$ with FORS 1 at the VLT UT1 Antu. To estimate the relative abundances of the line emitting gas we used the line ratios NV1240/CIV1549, NV1240/HeII1640, and OVI1034/HeII1640 as suggested by Hamann & Ferland (1992, 1999). Based on chemical evolutionary models we estimate a metallicity of $Z \simeq 7\,Z_\odot$ for the quasars with $z \simeq 3$ within the framework of the rapid star formation scenario. Even Q0338+0021 indicates a comparable high relative abundance. Qur results provide support for supersolar metallicities at very high redshifts of $z \simeq 5$.

Accepted by A & A Letters

E-mail contact: mdietric@lsw.uni-heidelberg.de,
preprint available at ftp.lsw.uni-heidelberg.de incoming/mdietric/VFI01mdietric.ps

Thesis Abstract

The Study of Intraday Variability of Extragalactic Compact Radio Sources

Lucyna Kedziora-Chudczer

Thesis work conducted at: Special Research Centre for Theoretical Astrophysics, University of Sydney, Australia

Current address: Anglo-Australian Observatory 1999, PO Box 296, Epping NSW 1710 Australia

Electronic mail: lkedzior@aaoepp.aao.gov.au

Ph.D dissertation directed by: Prof. Don Melrose & Dr David Jauncey

Ph.D degree awarded: December 1998

This thesis describes the Australia Telescope Compact Array (ATCA) Survey of extragalactic radio sources in search for the intraday variability (IDV). The work reported here was carried out in two institutions jointly: the Special Research Centre for Theoretical Astrophysics at the University of Sydney, and in laboratories of the Australia Telescope National Facility, CSIRO, over the period 1993-1998.

The main part of this project consisted of the IDV Survey observations of the sample of 118 compact, flat-spectrum radio sources, by use of the ATCA in 1993-1994. The observations and the sample selection is described in Chapter 2. The results and analysis of the Survey are the subject of the following two chapters. In Chapter 3 the IDV of the total flux density is discussed and the statistics of IDV phenomenon, such as a dependence of the variability strength on spectral characteristics and the position of the sources in respect to the Galactic plane are presented. In Chapter 4 the search for the intraday variability in polarized flux density is described.

The total of 22 IDV sources were discovered in the ATCA IDV Survey and the properties of these sources are presented in the remaining part of the thesis. The four strongest intraday variable sources are described in Chapter 5 (PKS 1034-293, PKS 1144-379 and PKS 1519-273) and in Chapter 6 (PKS 0405-385). The follow-up ATCA observations of these strong IDV sources, which took part in June 1996 are presented and discussed. Among the mechanisms which could cause such rapid and strong variability, the interstellar scintillation (ISS) is suggested as a most likely cause of IDV observed in these sources.

In Chapter 7 the common properties of the IDV sources are discussed in search of the characteristic features of a 'model' IDV source. The question of the possible mechanisms of IDV is addressed, and a summary of the intended future projects is presented.

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/