Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
No. 20 — November 1998	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

Profile variations in AGN spectra

Wolfram Kollatschny and Karsten Bischoff

Universitäts-Sternwarte Göttingen, Geismarlandstr. 11, D-37083 Götingen, Germany

We present results of optical long-term variability campaigns (10 – 20 years) of the two Seyfert galaxies NGC 7603 and Mrk 110. The variations of the continuum, of the individual broad line intensities and of their line profiles are investigated in detail and compared to line profile variations in NGC 5548 and NGC 4593. Individual emission line profiles vary differently from line to line and from outburst to outburst indicating a complex and structured broad emission line region.

To appear in: Gaskell C.M., Brandt W.N., Dietrich M., Dultzin-Hacyan D., Eracleous M. (eds.) Structure and Kinematics of Quasar Broad Line Regions, ASP Conf. Series

E-mail contact: wkollat@gwdg.de, kbischo@gwdg,de
preprint available at http://www.uni-sw.gwdg.de/~bischoff/pub/pub.html or astro-ph/9810114

Properties of new X-ray selected AGN

K. Bischoff[1], W. Pietsch[2], T. Boller[2], S. Döbereiner[2], W. Kollatschny[1], H.-U. Zimmermann[2]

[1]Universitäts-Sternwarte Göttingen, Geismarlandstr. 11, D-37083 Götingen, Germany
[2]Max–Planck–Institut für extraterrestrische Physik, Giessenbachstraße, 85740 Garching, Germany

We present the results of a program to identify so far unknown active nuclei (AGN) in galaxies. Candidate galactic nuclei have been selected for optical spectroscopy from a cross-correlation of the ROSAT all sky survey (RASS) bright source catalog with optical galaxy catalogs. A high X-ray flux has been used as pointer to galaxies with a high probability to contain active nuclei. Only galaxies have been accepted for the program for which no activity was noted in NED. For many of the galaxies no radial velocity has been reported before. The optical spectra obtained in our first two runs demonstrate that the galaxies cover a redshift range of 0.014 to 0.13 and that most of them host active nuclei. For 50% to 75% of the candidates the X-ray emission is caused by the AGN. In addition several of the remaining candidates host Seyfert 2/LINER nuclei that, however, most certainly are not the source of the X-ray emission. In this paper we present results from the second optical observing run.

To appear in: B. Aschenbach et al. (eds.) Highlights in X-ray Astronomy (Garching, June 1998)

E-mail contact: wkollat@gwdg.de, kbischo@gwdg,de
preprint available at http://www.uni-sw.gwdg.de/~bischoff/pub/pub.html or astro-ph/9810115

Warm absorbers in Narrow-Line Seyfert 1 galaxies

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

[1] Max-Planck-Institut für extraterrestrische Physik, Giessenbachstrasse, 85740 Garching, Germany
[2] Astrophys. Institut Potsdam, 14482 Potsdam, Germany

Warm absorbers are an important new tool for investigating the conditions within the central regions of active galaxies. They have been observed in ~50% of the well-studied Seyfert galaxies and have also been detected in quite a number of Narrow-line Seyfert 1 galaxies (NLSy1). Here, we present a study of the X-ray properties of several NLSy1s with focus on their warm absorbers: (a) An analysis of all *ROSAT* PSPC observations of NGC 4051 including new ones is performed, which reveals variability by a factor ~30 in count rate and much less variability in the warm absorber parameters. (b) The possibility of a *dusty* warm absorber in IRAS 13349+2438 is explored on the basis of photoionization models for dusty warm gas and explicit *ROSAT* spectral fits. (c) The X-ray spectrum of the NLSy1 1E 0117.2-2837 is analyzed. It can be successfully described by a very steep powerlaw of photon index $\Gamma_x \simeq -4$, or alternatively by a warm-absorbed flat powerlaw. UV-EUV emission lines expected to arise from the warm material are predicted. (d) The strong spectral variability of RX J0134.3-4258 (from $\Gamma_x \simeq -4.4$ in the *ROSAT* survey observation, to $\simeq -2.2$ in our subsequent pointing) is examined in terms of warm absorption.

6 pages, to appear in the proceedings of *High Energy Processes in Accreting Black Holes* (Sweden, June 29 -July 4, 1998), J. Poutanen & R. Svensson (eds)

E-mail contact: skomossa@xray.mpe.mpg.de; preprint available as astro-ph/9810105

The *ROSAT* view of NGC 1365 and the luminous highly variable off-nuclear X-ray source NGC 1365–X1

Stefanie Komossa[1] **and Hartmut Schulz**[2]

[1] Max-Planck-Institut für extraterrestrische Physik, Giessenbachstrasse, 85740 Garching, Germany
[2] Astronomisches Institut der Ruhr-Universität, 44780 Bochum, Germany

We present an X-ray spectral and spatial analysis of the composite starburst/Seyfert galaxy NGC 1365. Excellent fits of the *ROSAT* PSPC spectrum are obtained by combining a soft thermal component with a hard powerlaw. The hard component may be either seen directly or can be explained by scattering of the AGN powerlaw at circumnuclear warm high-column-density gas. A compilation of the multi-wavelength properties of NGC 1365 and comparison with hard X-ray selected AGNs shows that the hard component of NGC 1365 is too faint compared to its broad Balmer line components challenging simple unified models. According to analytical estimates, supernova driven outflow can fully account for the X-ray luminosity in the Raymond-Smith component if the observed IR emission is mainly provided by the central starburst. We do not find obvious optical counterparts for three faint PSPC sources south of the nucleus. In particular, there is no coincidence with the two supernovae reported in NGC 1365.

With the *ROSAT* HRI data, we have precisely located the extraordinary southwest X-ray source NGC 1365–X1 which falls on one of the subordinate spiral arms. The source is found to be highly variable (a factor $\gtrsim 10$) on the timescale of months. Intrinsic to NGC 1365, its huge luminosity makes it exceptional among stellar X-ray sources. At present, the most likely interpretation seems to be an ultra-powerful X-ray binary.

to appear in A&A 339, 345, 1998 (November II issue)

E-mail contact: skomossa@xray.mpe.mpg.de; preprint available as astro-ph/9810174

Markarian 6 nucleus since 1992

S. G. Sergeev[1,2], **V. I. Pronik**[1,2], **E. A. Sergeeva**[1,2] **and Yu. F. Malkov**[1]

[1] Crimean Astrophysical Observatory, P/O Nauchny, 334413 Crimea, Ukraine
[2] Isaac Newton Institute of Chile, Crimean Branch

We present results of an optical spectral monitoring campaign of the Seyfert galaxy Markarian 6 for a period of nearly six years between 1992 January and 1997 November carried out with a CCD spectrograph at the 2.6-m Shajn Telescope of the Crimean Astrophysical Observatory. Our data set consists of 104 H_β region spectra and 56 H_α region spectra. Light curves for H_α and H_β emission lines, and the continuum at two bands near these lines are given. The continuum variations are generally smooth and very well pronounced. The H_β emission line is found to respond to continuum variations with a time lag of 18 ± 2

days. The H_α line has a similar lag. The continuum variations at $\lambda 5170$ Å and $\lambda 7030$ Å are tightly correlated pointing no evidence for changes in the non-stellar continuum color in optics. A lag of about 5 days between these two continuum bands is suspected. The blue wing lags behind the red wing ruling out a radial outflow in BLR, and, in particular, the biconical outflow as responsible for the bumps in the broad line profiles. We find that some changes in the profile shapes of Balmer emission lines in Mrk 6 are related to neither the matter redistribution nor the reverberation effects, but probably driven by the changes in the anisotropy of the ionizing radiation. The H_β emission-line profile at $V_r = \pm 3000\,km\,s^{-1}$ and optical continuum show a well correlated variability (with a lag), while the correlation for the profile segment at $V_r = +1300\,km\,s^{-1}$ is a strikingly poor pointing to the presence of two components in the broad line profiles. One of the components has a double-peaked structure and associated with the well known blue bump observed in the Balmer profiles in Markarian 6.

to appear in the Astrophys. J. Suppl. Ser., vol.121

E-mail contact: sergeev@crao.crimea.ua

HST Observations of the Host Galaxies of BL Lacertae Objects

C. Megan Urry[1], Renato Falomo[2], Riccardo Scarpa[1], Joseph E. Pesce[3], Aldo Treves[4] and Mauro Giavalisco[5]

[1] Space Telescope Science Institute, 3700 San Martin Dr., Baltimore, MD 21218, USA
[2] Osservatorio Astronomico di Padova, Vicolo dell'Osservatorio 5, 35122 Padova, Italy
[3] Department of Astronomy, Pennsylvania State University, 525 Davey Lab, University Park, PA 16802
[4] University of Milan at Como, Via Lucini 3, Como Italy
[5] Carnegie Observatories, 813 Santa Barbara St., Pasadena CA 91101-1292

Six BL Lac objects from the complete 1 Jy radio-selected sample of 34 objects were observed in Cycle 5 with the *HST* WFPC2 camera to an equivalent limiting flux of $\mu_I \sim 26$ mag arcsec^{-2}. Here we report results for the second half of this sample, as well as new results for the first three objects, discussed previously by Falomo et al. (1997). In addition, we have analyzed in the same way *HST* images of three X-ray-selected BL Lacs observed by Jannuzi et al. (1997). The ensemble of 9 BL Lac objects spans the redshift range from $z = 0.19$ to ~ 1. Host galaxies are clearly detected in seven cases, while the other two, at $z \sim 0.258$ (redshift highly uncertain) and $z = 0.997$, are not resolved. The *HST* images constitute a homogeneous data set with unprecedented morphological information between a few tenths of an arcsecond and several arcseconds from the nucleus, allowing us in 6 of the 7 detected host galaxies to rule out definitively a pure disk light profile. The host galaxies are luminous ellipticals with an average absolute magnitude of $M_I \sim -24.6$ mag (with dispersion 0.7 mag), more than a magnitude brighter than L^* and comparable to brightest cluster galaxies. The morphologies are generally smooth and have small ellipticities ($\epsilon \lesssim 0.2$). Given such roundness, there is no obvious alignment with the more linear radio structures. In the six cases for which we have *HST* WFPC2 images in two filters, the derived color profiles show no strong spatial gradients and are as expected for K-corrected passively evolving elliptical galaxies. The host galaxies of the radio-selected and X-ray-selected BL Lacs for this very limited sample are comparable in both morphology and luminosity.

Accepted by Astrophysical Journal

E-mail contact:cmu@stsci.edu,
preprint available at astro-ph/9809060

Spectral Synthesis of the Nuclear Region of Seyfert 2 and Radio Galaxies

Henrique R. Schmitt[1,2], Thaisa Storchi Bergmann[2,4] and Roberto Cid Fernandes Jr.[3]

[1] Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD21218, USA
[2] Instituto de Física - UFRGS, Caixa Postal: 15051. CEP: 91501-970 Porto Alegre, RS, Brazil.
[3] Departamento de Física, CFM - UFSC, Campus Universitário - Trindade, Caixa Postal: 476. CEP: 88040-900 Florianópolis, SC, Brazil.
[4] Visiting Astronomer at the Cerro Tololo Interamerican Observatory, operated by the Association of Universities for Research in Astronomy, Inc. under contract with the National Science Foundation.

We present the results of an optical spectral synthesis analysis for the nuclei of 20 Seyfert 2 and four Radio Galaxies, using a base of stellar population templates of different ages and metallicities and a power-law continuum. Compared with the stellar population of elliptical galaxies, we find that Seyfert 2s usually have a smaller contribution from old metal rich stars (10 Gyr, $Z \geq Z_\odot$), and a larger contribution from stars with 100 Myr. We also find that the contributions from stars with age ≤ 10 Myr and from a power law continuum are small, rarely exceeding 5 per cent. These results show that the general assumption of elliptical galaxies as stellar population templates for these objects is incorrect, also implying that the excess blue continuum frequently found in their nuclear spectra is probably due to this template mismatch. We find a considerable contribution from

100 Myr stars (≈ 5 per cent), which can be interpreted from the point of view of models where the fueling of the AGN is done by interactions/mergers.

Accepted by MNRAS

E-mail contact: schmitt@stsci.edu,
preprint available at astro-ph/9810265

The core structure of AGN: perils of adaptive optics artifacts

Scott C. Chapman[1], Gordon A. H. Walker[1] and Simon L. Morris[2]

[1] University of British Columbia, Vancouver, B.C. V6T 1Z4, Canada
[2] Dominion Astrophysics Observatory, Victoria, B.C., Canada

As part of a project to map nearby Seyfert galaxies in the near-IR with adaptive optics, we present high spatial resolution, near-IR images in J,H, and K of the nuclei of NGC 3227 and NGC 2992, obtained with the Adaptive Optics Bonnette (AOB) on CFHT. The ∼ 0.15" resolution allows us to probe structures in the core region at unprecedented scales. With NGC 3227, we are able to identify an inwards spiraling starburst in all three near-IR bands. NGC 2992 shows evidence for emission along a radio loop. Compared with HST optical images, dust obscuration becomes significantly less pr onounced at longer wavelengths, revealing the true geometry of the core regions. The observed structures may help to elucidate fueling mechanisms for the central engine, as well as providing insight into the unification paradigms. The results are tempered with the discovery of AOB-related artifacts in the central arcsec of observed AGN galaxies which take on the appearance of spiral/disk structures.

Proceedings of "Topical Meeting on Astronomy with Adaptive Optics", held in Garching, Germany, Sept 1998.

E-mail contact: schapman@astro.ubc.ca,
preprint available at astro-ph/9810250

A barred spiral at the centre of the giant elliptical radio galaxy Centaurus A

I.F. Mirabel[1,2], O. Laurent[1], D.B. Sanders[3], M. Sauvage[1], M. Tagger[1], V. Charmandaris[4], L. Vigroux[1], P. Gallais[1], C. Cesarsky[1] and D.L. Block[5]

[1] CEA/DSM/DAPNIA Service d'Astrophysique F-91191 Gif-sur-Yvette, France
[2] IAFE. cc 67, suc 28. 1428 Buenos Aires. Argentina
[3] Institute for Astronomy, University of Hawaii, 2680 Woodlawn Drive, Honolulu, HI 96822
[4] Observatoire de Paris, DEMIRM, 61 Av. de l'Observatoire, F-75014 Paris, France
[5] Department of Computational and Applied Mathematics, Univ. of the Witwatersrand, Private Bag 3, WITS 2050, South Africa

We report observations at mid-infrared and sub-millimeter wavelengths of Centaurus A (CenA, NGC 5128), the giant elliptical galaxy that harbors the closest radio loud Active Galactic Nucleus (AGN) to Earth. The dust emission from the deep interior of CenA reveals a bisymmetric structure with a diameter of 5' (5 kpc), centred at the AGN. This structure is remarkably similar to that of a barred spiral galaxy, with the bar lying in a plane that is tilted ∼ 18° from the line of sight. The true nature of the distribution of dust in the inner regions of CenA is noticeably displaced from the more chaotic and widespread optical obscuration. The barred spiral is a quasi-stable structure formed at the center of the giant elliptical from the tidal debris of a gas-rich object(s) accreted in the past 10^9 years. The total size and mass of interstellar gas in the barred spiral at the center of CenA is comparable to the small Local Group spiral galaxy Messier 33. The observation of this remarkable structure opens the more general question on whether the dusty hosts of giant radio galaxies like CenA, are "symbiotic" galaxies composed of a barred spiral inside an elliptical, where the bar serves to funnel gas toward the AGN.

Accepted by Astronomy and Astrophysics, 1998

E-mail contact: mirabel@discovery.saclay.cea.fr,
preprint available at astro-ph/9810419

Integral field spectroscopy of the Seyfert–2 galaxy Mkn 917

S. Ciroi[1], P. Rafanelli[1,2], M. Radovich[2], G. Richter[1], J. Vennik[3]

[1] Astrophysikalisches Institut Potsdam, Potsdam, Germany
[2] Dipartimento di Astronomia, Universita' di Padova, Padova, Italy
[3] Tartu Astrophysical Observatory, Tartumaa, Estonia

We present bidimensional spectroscopy of the circumnuclear and extranuclear regions of the nearby Seyfert–2 galaxy MKN 917. Our data have been obtained with MPFS, the *Multi Pupil Field Spectrograph*, developed at the Special Astrophysical Observatory (Russia) for the 6 m telescope. 128 spectra in two wavelength ranges centered at [OIII]λ5007 and Hα respectively, have been extracted and calibrated using routines developed by ourselves in IRAF environment. We show here the maps of the continuum and line emission at different wavelengths, e.g. [OIII]λ5007 and Hα, as well as the velocity field of the gas.

Accepted by Mem. S.A.It., Proceedings of the 3rd National Meeting on AGN

E-mail contact: sciroi@aip.de

The Seyfert–2 galaxy Tol1238-364 and its companion ESO381-G009: long-slit spectroscopy and IRAS data analysis

S. Temporin[1], **P. Rafanelli**[2,3], **G. Richter**[3], **J. Vennik**[4], **S. Ciroi**[3], **K. Birkle**[5]

[1] Institut für Astronomie, Universität Innsbruck, Innsbruck, Austria
[2] Department of Astronomy, University of Padova, Padova, Italy
[3] Astrophysikalisches Institut Potsdam, Potsdam, Germany
[4] Tartu Astrophysical Observatory, Tartumaa, Estonia
[5] Max Planck Institut für Astronomie, Heidelberg, Germany

The results of a spectroscopic study of the pair of galaxies Tol1238-364 and ESO381-G009 are presented. Long-slit spectroscopy at different slit position angles combined with Laplace filtering of $H\alpha$ images of the two galaxies allowed us to isolate several circumnuclear and extranuclear regions. Their physical properties have been derived by means of a grid of photoionization models computed with the code CLOUDY 90. Star formation rates in both galaxies have been calculated and compared with their infrared emission, obtained from IRAS data after application of the Maximum Entropy method.

Accepted by Mem. S.A.It., Proceedings of the 3rd National Meeting on AGN

E-mail contact: giovanna.temporin@uibk.ac.at

The Seyfert–2 galaxy Tol1238-364 and its companion ESO381-G009: long-slit spectroscopy and IRAS data analysis

S. Temporin[1], **P. Rafanelli**[2,3], **G. Richter**[3], **J. Vennik**[4], **S. Ciroi**[3], **K. Birkle**[5]

[1] Institut für Astronomie, Universität Innsbruck, Innsbruck, Austria
[2] Department of Astronomy, University of Padova, Padova, Italy
[3] Astrophysikalisches Institut Potsdam, Potsdam, Germany
[4] Tartu Astrophysical Observatory, Tartumaa, Estonia
[5] Max Planck Institut für Astronomie, Heidelberg, Germany

The results of a spectroscopic study of the pair of galaxies Tol1238-364 and ESO381-G009 are presented. Long-slit spectroscopy at different slit position angles combined with Laplace filtering of $H\alpha$ images of the two galaxies allowed us to isolate several circumnuclear and extranuclear regions. Their physical properties have been derived by means of a grid of photoionization models computed with the code CLOUDY 90. Star formation rates in both galaxies have been calculated and compared with their infrared emission, obtained from IRAS data after application of the Maximum Entropy method.

Accepted by Mem. S.A.It., Proceedings of the 3rd National Meeting on AGN

E-mail contact: giovanna.temporin@uibk.ac.at

The Warm Absorber constrained by the coronal lines in Seyfert 1 galaxies

D. Porquet[1], **A.-M. Dumont**[1], **S. Collin**[1], **and M. Mouchet**[1,2]

[1] DAEC, Observatoire de Paris, Section Meudon, F-92195 Meudon Cedex, France
[2] Université Denis Diderot, F-75251 Paris Cedex 05, France

We present results of the photoionization code IRIS, which calculates the spectrum emitted by the Warm Absorber (WA) in Seyfert 1 galaxies for a large grid of parameters (density, column density, ionization parameter...). We show that in Seyfert 1s, coronal lines ([Fe X], [Fe XI], [Fe XIV]...), whose emission region shares common characteristics with the WA, could be formed in

the WA. Unlike the absorption edges, such as those of O VII and O VIII observed in soft X-rays which are produced by the WA, these lines strongly constrain the physical parameters of the WA, especially the hydrogen density. Indeed, in order to avoid producing coronal line equivalent widths larger than observed, a high density ($n_H \geq 10^{10}$ cm^{-3}) is required for the WA in most cases. This result is obtained for the mean observed Seyfert 1 features, as well as for the case study of MCG-6-30-15. It implies that the distance of the WA from the incident radiation source is of the order of that of the Broad Line Region (BLR).

Accepted by A&A

E-mail contact: delphine.porquet@obspm.fr,
preprint available: astro-ph/9810333 (version 2)

Cm-Wavelength Total Flux and Linear Polarization Properties of Radio-Loud BL Lacertae Objects

Margo F. Aller[1], Hugh D. Aller[1], Philip A. Hughes [1], and George E. Latimer[1]

[1] Department of Astronomy, University of Michigan, Ann Arbor, MI, USA

We present results from a long-term program to quantify the range of behavior of the cm-wavelength total flux and linear polarization variability properties of a sample of 41 radio-loud BL Lac objects using weekly to tri-monthly observations with the University of Michigan 26-meter telescope operating at 14.5, 8.0, and 4.8 GHz; these observations are used to identify class-dependent differences between these BL Lacs and QSOs in the Pearson-Readhead sample. As a group, the BL Lacs are found to be more highly variable in total flux density than the QSOs. These changes are often nearly-simultaneous and of comparable amplitude at 14.5 and 4.8 GHz, which contrasts with the behavior in the QSOs and supports the existence of class-dependent differences in opacity within the parsec-scale jet flows. Structure function analyses of the flux observations quantify that a characteristic timescale is identifiable in only 1/3 of the BL Lacs and that in the majority of the program sources the activity is uncorrelated within the timescales probed. The time-averaged fractional linear polarizations are only on the order of a few percent and are consistent with the presence of tangled magnetic fields within the emitting regions. In many sources a preferred long-term orientation of the electric vector position angle is present. When compared with the VLBI structural axis, no preferred position angle difference is identified; the derived distribution resembles that known for core components from VLBP measurements. The polarized flux typically exhibits variability with timescales of months to a few years and exhibits the signature of a propagating shock during several resolved outbursts. The flux and polarization variability indicate that the source emission is predominately due to evolving source components and supports the occurrence of more frequent shock formation in BL Lac parsec-scale flows than in QSO jets where the magnetic field topology even during outbursts is similar to that of the underlying quiescent flow. The differences in variability behavior and polarization between BL Lacs and QSOs which we find can be explained by differences in stability between the jet flows found by recent studies of relativistic hydrodynamic flows.

Accepted by the Astrophysical Journal.

E-mail contact: margo@astro.lsa.umich.edu

Radioband Variability Properties of BL Lac Objects

M. F. Aller

Dept. of Astronomy, University of Michigan, Ann Arbor, MI, USA

Centimeter-wavelength total flux density and linear polarization observations have quantified the high levels of activity in BL Lac objects and identified variability timescales ranging from < 1 day to several years. Nearly two decades of single-antenna (UMRAO) observations of a flux-limited sample show that the radioband spectra of the total flux are characteristically flat even during this activity: they rarely show the effects of self-absorption typically found for QSO events. The polarized flux is also highly variable, and few objects exhibit long-term preferred position angle orientations. The data suggest that the integrated emission from BL Lacs is predominately due to contributions from evolving VLB-scale components, while in the case of QSOs it is predominantly from the underlying quiescent jet. Class-dependent differences in variability properties and in magnetic field morphology support the more frequent occurrence of weak internal shocks in BL Lac jet flows than in the QSOs; this may plausibly be explained by speed-dependent differences in jet stability found by recent theoretical studies of relativistic hydrodynamic flows.

To appear in the Proceedings of the conference BL LAC PHENOMENON, Turku, Finland, June 22-26, 1998 (invited paper).

E-mail contact: margo@astro.lsa.umich.edu

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/