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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

Abstracts of recently accepted papers

Probing the Complex and Variable X-ray Absorption of Markarian 6 with *XMM-Newton*

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We report on an X-ray observation of the Seyfert 1.5 galaxy Mrk 6 obtained with the EPIC instruments onboard *XMM-Newon*. Archival *BeppoSAX* PDS data from 18–120 keV were also used to constrain the underlying hard power-law continuum. The results from our spectral analyses generally favor a double partial-covering model, although other spectral models such as absorption by a mixture of partially ionized and neutral gas cannot be firmly ruled out. Our best-fitting model consists of a power law with a photon index of $\Gamma = 1.81^{+0.22}_{-0.20}$ and partial covering with large column densities up to $N_{\rm H} \sim 10^{23}$ cm^{-2}. We also detect a narrow emission line consistent with Fe Kα fluorescence at $6.45^{+0.03}_{-0.04}$ keV with an equivalent width of 93^{+26}_{-20} eV. Joint analyses of *XMM-Newon*, *ASCA*, and *BeppoSAX* data further provide evidence for both spectral variability (a factor of ~ 2 change in absorbing column) and absorption-corrected flux variations (by $\sim 60\%$) during the ~ 4 year period probed by the observations.

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Major Mergers of Haloes, Growth of Massive Black Holes and Evolving Luminosity Function of Quasars

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We construct a physically motivated analytical model for the quasar luminosity function, based on the joint star formation and feeding of massive black holes suggested by the observed correlation between the black hole mass and the stellar mass of the hosting spheroids. The parallel growth of massive black holes and host galaxies is assumed to be triggered by major mergers of haloes. The halo major merger rate is computed in the frame of the extended Press-Schechter model. The evolution of black holes on cosmological timescales is achieved by the integration of the governing set of differential equations, established from a few reasonable assumptions that account for the distinct (Eddington-limited or supply-limited) accretion regimes. Finally, the typical lightcurves of the reactivated quasars are obtained under the assumption that, in such accretion episodes, the fall of matter onto the black hole is achieved in a self-regulated stationary way. The predicted quasar luminosity function is compared to the luminosity functions of the 2dF QSO sample and other, higher redshift data. We find good agreement in all cases, except for $z < 1$ where the basic assumption of our model is likely to break down.

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The Relation between Black Hole Mass, Bulge Mass, and Near-Infrared Luminosity

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We present new accurate near-infrared (NIR) spheroid (bulge) structural parameters obtained by two-dimensional image analysis for all galaxies with a direct black hole (BH) mass determination. As expected, NIR bulge luminosities $L_{\rm bul}$ and BH masses are tightly correlated, and if we consider only those galaxies with secure BH mass measurement and accurate $L_{\rm bul}$ (27 objects), the spread of $M_{\rm BH} - L_{\rm bul}$ is similar to $M_{\rm BH} - \sigma_e$, where σ_e is the effective stellar velocity dispersion. We find an intrinsic rms scatter of $\simeq 0.3$ dex in $\log M_{\rm BH}$. By combining the bulge effective radii R_e measured in our analysis with σ_e, we find a tight linear correlation ($rms \simeq 0.25$ dex) between $M_{\rm BH}$ and the virial bulge mass ($\propto R_e\sigma_e^2$), with $\langle M_{\rm BH}/M_{\rm bul}\rangle \sim 0.002$. A partial correlation analysis shows that $M_{\rm BH}$ depends on both σ_e and R_e, and that both variables are necessary to drive the correlations between $M_{\rm BH}$ and other bulge properties.

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Relativistic and slowing down: the flow in the hotspots of powerful radio galaxies and quasars

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Pairs of radio emitting jets with lengths up to several hundred kiloparsecs emanate from the central region (the 'core') of radio loud active galaxies. In the most powerful of them, these jets terminate in the 'hotspots', compact high brightness regions, where the jet flow collides with the intergalactic medium (IGM). Although it has long been established that in their inner (∼parsec) regions these jet flows are relativistic, it is still not clear if they remain so at their largest (hundreds of kiloparsec) scales. We argue that the X-ray, optical and radio data of the hotspots, despite their at-first-sight disparate properties, can be unified in a scheme involving a relativistic flow upstream of the hotspot that decelerates to the sub-relativistic speed of its inferred advance through the IGM and viewed at different angles to its direction of motion. This scheme, besides providing an account of the hotspot spectral properties with jet orientation, it also suggests that the large-scale jets remain relativistic all the way to the hotspots.

In press, ApJL, E-mail contact: markos@milkyway.gsfc.nasa.gov

Spectral Energy Distributions of Seyfert Nuclei

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We present nuclear spectral energy distributions (SEDs) in the range $0.4-16\,\mu$m for an expanded CfA sample of Seyfert galaxies. The spectral indices ($f_\nu \propto \nu^{-\alpha_{\rm IR}}$) from $1-16\,\mu$m range from $\alpha_{\rm IR} \sim 0.9$ to 3.8. The shapes of the spectra are correlated with Seyfert type in the sense that steeper nuclear SEDs (νf_ν increasing with increasing wavelength) tend to be found in Seyfert 2s and flatter SEDs ($\nu f_\nu \simeq$ constant) in Seyfert $1-1.5$s. The galaxies optically classified as Seyferts 1.8s and 1.9s display values of $\alpha_{\rm IR}$ as in type 1 objects, or values intermediate between those of Seyfert 1s and Seyfert 2s. The intermediate SEDs of many Seyfert $1.8-1.9$s may be consistent with the presence of a pure Seyfert 1 viewed through a moderate amount ($A_V < 5\,$mag) of foreground galaxy extinction. We find, however, that between 10 and 20% of galaxies with broad optical line components have steep infrared SEDs.

Torus models usually adopt high equatorial opacities to reproduce the infrared properties of Seyfert 1s and 2s, resulting in a dichotomy of infrared SEDs (flat for type 1s, and steep for type 2s). Such a dichotomy, however, is not observed in our sample. The wide range of spectral indices observed in the type 2 objects, the lack of extremely steep SEDs, and the large numbers of objects with intermediate spectral indices cannot be reconciled with predictions from existing optically thick torus models. We discuss possible modifications to improve torus models, including low optical depth tori, clumpy dusty tori, and high-optical-depth tori with an extended optically thin component.

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preprint available at astro-/ph0303617

Comptonization in Super–Eddington Accretion Flow and Growth Timescale of Supermassive Blackholes

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Super-Eddington accretion onto black-holes (BHs) may occur at Ultra-Luminous compact X-ray sources in nearby galaxies, Galactic microquasars and Narrow-Line Seyfert 1 galaxies (NLS1s). Effects of electron scattering (opacity and Comptonization) and the relativistic correction (gravitational redshift and transverse Doppler effect) on the emergent spectra from super-Eddington accretion flows onto non-rotating BHs are examined for $10^{1.5}$ and $10^{6.5}\,M_\odot$ BH masses ($M_{\rm BH}$). With $\dot{m}\,[\equiv \dot{M}/(L_{\rm Edd}/c^2)$, where $\dot{M}$ is the accretion rate$] \geq 100$, the spectral hardening factor via electron scattering is $\lesssim 2.3-6.5$. Due to the $\dot{m}$-sensitive hardening factor, the color temperature of the innermost radiation is not proportional to $L^{0.25}$, differing from the simplest standard accretion disk. The model is applied to optical–soft X-ray emission from NLS1s. We pick up one NLS1, namely PG 1448+273 with an inferred $M_{\rm BH}$ of $10^{6.4}\,M_\odot$, among the highest $\dot{m}$ candidates. The broadband spectral distribution is successfully reproduced by the model high $\dot{m}$ (=1000) and the viscosity parameter α of 0.01. This implies that this object, as well as some other highest $\dot{m}$ systems, is really young: the inferred age, $M_{\rm BH}/\dot{M}$, is about 10^6 years. We also briefly discuss the distribution of $\dot{m}$ for transient and highly variable NLS1s, finding that those are located at $3 \lesssim \dot{m} \lesssim 300$. Such a moderately high accretion rate is indicative of thermal instability. Furthermore, $\dot{m}$ for a possible type-2 counterpart of NLS1s, NGC 1068, is found to be similar to $\dot{m}$ for NLS1s.

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The optical emission from gamma-ray quasars.

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We present photometric observations of six radio-loud quasars that were detected by the COMPTEL gamma-ray telescope. The data encompasses seven wavebands in the optical and near-infrared. After correction for Galactic extinction, we find a wide range in optical slopes. Two sources are as blue as optically-selected quasars, and are likely to be dominated by the accretion disc emission, while three others show colours consistent with a red synchrotron component. We discuss the properties of the COMPTEL sample of quasars, as well as the implications our observations have for multi-wavelength modelling of gamma-ray quasars.

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Anaylsis of the broad emission line profiles in the active galactic nucleus 3C 390.3

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We present a study of UV and optical spectra of the active galaxy 3C390.3 taken as part of the International AGN Watch during the period January 1995 – January 1996. We have measured the C IV/Lyα and Lyα/Hβ ratios at the different velocities in the line profiles. We find that the Lyα/Hβ varies across the line profiles. The ratio is high in the low-velocity center of the lines at all times, but decreases in the high-velocity wings. The ratio of the line intensities of C IV/Lyα however is low at the line center but becomes higher in the wings. The Lyα/Hβ ratio for the variable part of the lines when the lags in Hβ $\approx$ are 20 and 80 days is different.

The line ratios have been modeled using the photoionization code CLOUDY for plane parallel slab of gas with solar abundances. The emission in the lines can be reproduced approximately by using two components:

a) a high-density component ($n_e = 10^{12-13}\mathrm{cm}^{-3}$) contributing $\approx 60-40\%$ to the emission in low-ionization Hβ line, and
b) a low-density component (n_e=$10^{8-10}\mathrm{cm}^{-3}$) contributing mainly to the high ionization line emission.

These regions are approximately at 20 and 80 light days from the centre of the nucleus respectively. We discuss the possible geometry of the BLR in 3C390.3.

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preprint available at http://www.lsn.kzn.ru; or http://physics.unl.edu/directory/gaskell/preprints/preprints.html

Extended gas in Seyfert 2 Galaxies: Implications for the nuclear source.

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We use long-slit spectroscopic optical data to derive the properties of the extended emitting gas and the nuclear luminosity of a sample of 18 Seyfert 2 galaxies. From the emission-line luminosities and ratios we derive the density, reddening and mass of the ionized gas as a function of distance up to 2–4 kpc from the nucleus. Taking into account the geometric dilution of the nuclear radiation, we derive the radial distribution of covering factors as well as the minimum rate of ionizing photons emitted by the nuclear source. This number is an order of magnitude larger than that obtained from the rate of ionizing photons 'intercepted' by the gas and measured from the Hα luminosity. A calibration is proposed to recover this number from the observed luminosity. The He IIλ4686/Hβ line ratio was used to calculate the slope of the ionizing SED, which in combination with the number of ionizing photons allows the calculation of the hard X-ray luminosities. These luminosities are consistent with those derived from X-ray spectra in the 8 cases for which such data are available and recover the intrinsic X-ray emission in Compton thick cases. Our method can thus provide reliable estimates of the X-ray fluxes in Seyfert 2 galaxies for the cases it is not readily available. We also use the ionizing SED and luminosity to predict the IR luminosity under the assumption that it is dominated by reprocessed radiation from a dusty torus, and find a good agreement with the observed *IRAS* luminosities.

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E-mail contact: ico@if.ufrgs.br, preprint available at http://www.if.ufrgs.br/∼ico/mnr6397_449-463.pdf

The presence and distribution of HI absorbing gas in sub-galactic sized radio sources

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We consider the incidence of HI absorption in intrinsically small sub-galactic sized extragalactic sources selected from sources classified as Gigahertz Peaked Spectrum (GPS) and Compact Steep Spectrum (CSS) sources. We find that the smaller sources (< 0.5 kpc) have larger HI column densities than the larger sources (> 0.5 kpc). Both a spherical and an axi-symmetric gas distribution, with a radial power law density profile, can be used to explain this anti-correlation between projected linear size and HI column density. Since most detections occur in objects classified as galaxies, we argue that if the unified schemes apply to GPS/CSSs a disk distribution for the HI is more likely. The most favoured explanation for the compact sizes of the GPS/CSSs is that they are young sources evolving in a power law density medium. For the GPSs with measured expansion velocities, our derived densities are within an order of magnitude of those estimated from ram-pressure confinement of the lobes assuming equipartition. Our results therefore support the youth model.

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astroph/0304305

Jobs

Three Postdoctoral Vacancies [1,2,3]

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[2] Osservatorio Astronomico di Torino, Via Osservatorio, Torino, Italy
[3] Osservatorio Astronomico di Brera, 20121 Milano and 23807 Merate, Italy
Available between June 2003 and September 2003

ENIGMA Network
Structure and Radiation Processes of AGN through multi-frequency analysis

Within the newly established European Research Training Network ENIGMA on "Structure and Radiation Processes of AGN through multi-frequency analysis" we seek to fill three postdoctoral positions. They will be hosted by three of the eight European research institutions working within this project.

The network has been established to carry out research in the following areas:

- Numerical simulations and analytical modeling of Blazar jets to study:
  - particle acceleration and radiation mechanisms,
  - magnetohydrodynamic flows,
  - jet physics in Blazars.
- Multi-frequency observations of radio-loud AGN to study:
  - radio/optical Intra-Day variability,
  - relationships between structural and flux density variability,
  - relations in different high-energy bands (X-ray, γ-rays, and VHE radiation with Cerenkov telescopes).
- Advanced statistical methods for time-series and applications to astrophysical models.
- Developing high-precision photometric routines in different waveband regimes.
- Developing reliable robotic systems for automated ground-based monitoring of AGN.

The postdocs will work in their host team and within this active and interacting network of empirical and theoretical research. They are encouraged to spend part of their time at other institutes during their appointment. They will have access to unique observational facilities and will profit from a strong training program involving hardware-related aspects, observational strategies in all waveband regimes, and theoretical research.

Questions regarding the research program can be directed to the network coordinator, S. Wagner.

The three positions will become available between June 2003 and September 2003. The positions are available for up to three years. Competitive salaries will be paid, differing according to local regulations. Additional support will be available for extended visits to other partner institutions within the network, network meetings and conferences.

According to the rules of the EC, the positions are open to young researchers, holding a passport of a member or associate state of the European Union. Further details are given by the regulations of the EC programme
(http://www.cordis.lu/improving/networks/faq.htm# q5).

Applications should include a curriculum vitae, a publication list, a summary of current research interests as well as a list of topics of interest or institutes which they would prefer to join. Two letters of reference should also be arranged for. The review of applications will start in the end of May 2003, and will continue until all positions are filled. Material should be sent to Landessternwarte Heidelberg, S. Wagner, Königstuhl 12, 69117 Heidelberg, Germany, swagner@lsw.uni-heidelberg.de.

Further positions will become available during the next months.

E-mail contact: swagner@lsw.uni-heidelberg.de,
further information is available at http://www.lsw.uni-heidelberg.de/enigma.html

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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.