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Jobs Adverts - Meetings Adverts - Special Announcements

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.

As always as editor of the newsletter I am very interested to hear any suggestions or feedback regarding the newsletter. So do not hesitate in emailing me your suggestions.

Many thanks for your continued subscription.

Janine van Eymeren

Characterization of the emitting and absorbing media around the nucleus of the active galaxy UGC 11763 using XMM-Newton data

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Aims. The detailed analysis of all data taken by the *XMM-Newton* satellite of UGC 11763 to characterize the different components that are emitting and absorbing radiation in the vicinity of the active nucleus.
Methods. The continuum emission was studied through the EPIC spectra taking profit of the spectral range of these cameras. The high resolution RGS spectra were analyzed in order to characterize the absorbing features and the emission line features that arise in the spectra of this source.
Results. A power law with a photon index $\Gamma = 1.72^{+0.03}_{-0.01}$ accounts for the continuum emission of this source in the hard X-rays from 10 down to 1 keV. At lower energies, a black body model with $kT = 0.100 \pm 0.003$ keV provides a good description of the observed soft excess. The absorption signatures in the spectra of UGC 11763 are consistent with the presence of a two phase ionized material ($\log U = 1.65^{+0.07}_{-0.08}; 2.6 \pm 0.1$ and $\log N_{\rm H} = 21.2 \pm 0.2$; $21.51 \pm 0.01\,{\rm cm}^{-2}$, respectively) in the line of sight. The physical conditions found are consistent with the two phases being in pressure equilibrium. The low ionization component is more ionized than typically found for warm absorbers in other Seyfert 1 galaxies. There are also signatures of some emission lines: O VII Heα(r), O VII Heα(f), a blend of the Ne IX Heα triplet and Fe XVIII at λ 17.5 Å.

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MMTF-Hα and HST-FUV Imaging of the Filamentary Complex in Abell 1795

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We have obtained deep, high spatial resolution images of the central region of Abell 1795 at Hα and [N II] λ6583 with the Maryland Magellan Tunable Filter (MMTF), and in the far-ultraviolet (FUV) with the Advanced Camera for Surveys Solar Blind Channel on the *Hubble Space Telescope* (*HST*). The superb image quality of the MMTF data has made it possible to resolve the known SE filament into a pair of thin, intertwined filaments extending for $\sim$50 kpc, with a width $<$ 1 kpc. The presence of these thin, tangled strands is suggestive of a cooling wake where runaway cooling is taking place, perhaps aided by an enhanced magnetic field in this region. The *HST* data further resolve these strands into chains of FUV-bright stellar clusters, indicating that these filaments are indeed sites of on-going star formation, but at a rate $\sim$2 orders of magnitude smaller than the mass-deposition rates predicted from the X-ray data. The elevated [N II]/Hα ratio and large spatial variations of the FUV/Hα flux ratio across the filaments indicate that O-star photoionization is not solely responsible for the ionization. The data favor collisional heating by cosmic rays either produced in-situ by magnetohydrodynamical processes or conducted in from the surrounding intracluster medium.

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X-raying the Winds of Luminous Active Galaxies

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We briefly describe some recent observational results, mainly at X-ray wavelengths, on the winds of luminous active galactic nuclei (AGNs). These winds likely play a significant role in galaxy feedback. Topics covered include (1) Relations between X-ray and UV absorption in Broad Absorption Line (BAL) and mini-BAL quasars; (2) X-ray absorption in radio-loud BAL quasars; and (3) Evidence for relativistic iron K BALs in the X-ray spectra of a few bright quasars. We also mention some key outstanding problems and prospects for future advances; e.g., with the *International X-ray Observatory (IXO)*.

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Evidence of a double–double morphology in B 0818+214

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The so-called double-double structure in radio sources is the most conspicuous signature of their restarted activity. Observations indicate that in the majority of double-double radio sources (DDRS), the span of the radio lobes is larger than 0.7 Mpc. This lower limit is also suggested by theory. However, it seemed likely that the apparent core of B0818+214, a radio galaxy with an overall linear size of its radio structure below that limit, could harbour a compact double well aligned with the outer lobes so that the whole object would fulfil the criteria of a DDRS. Here, we present evidence that the central component of B0818+214, when magnified through the EVN+MERLIN 18-cm observations shows two FR II-like lobes. As the separation of the inner lobes is not greater than 5.7 kpc, they are immersed in the ISM of the host galaxy. This circumstance is the likely reason why the inner double has become visible, despite the predictions of the theory according to which B0818+214 as a whole is too small for a new double to develop inside the cocoon inflated during the previous active phase. Moreover, we speculate that its host galaxy is not active at the moment and so the inner double may be in the coasting phase often observed in other medium-sized symmetric objects with intermittent activity. It could be, therefore, that two different mechanisms of accretion disk instabilities, ionisation and radiation-pressure driven, may be independently responsible for triggering active phases, manifesting as the outer and the inner doubles, respectively.

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Radio Emission from Young Supernovae and Supernova Remnants in Arp 299

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We have made sensitive milliarcsecond-resolution radio images of the nearby merger galaxy Arp 299 at four epochs spread over 18 months between 2003 and 2005. The combined data revealed a total of 30 point sources in the two primary merger nuclei. Twenty-five of these are found in the northeastern nucleus (component "A"=IC 694) over a region $\sim$ 100 pc in diameter, while 5 are in the southwestern nucleus (component "B1"=NGC 3690) within a region $\sim$ 30 pc in size. These objects are interpreted as young supernovae and supernova remnants; the ratio of the source counts in nuclei A and B1 is approximately equal to the ratio of their predicted supernova rates. An approximate luminosity function has been derived for nucleus A, and indicates that it might contain as many as 500–1000 compact radio sources more powerful than Cas A; the integrated flux density of these sources would be about 20% of the total flux density seen at lower resolution. A new supernova occurred in nucleus B1 in the first half of 2005, having a peak radio power at least 2,000 times the present power of Cassiopeia A. This supernova is located within 0.4 pc (projected distance) of an apparently older supernova remnant, making it very likely that this indicates the presence of a massive super star cluster within nucleus B1. Comparison of the typical radio flux densities of our compact radio sources to the observed X-ray luminosities of nuclei A and B1 indicates that it is possible that one radio source in each nucleus actually could be associated with an active galactic nucleus rather than being a supernova remnant.

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Diverse Kinematic Signatures From Reverberation Mapping of the Broad-Line Region in Active Galactic Nuclei

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A detailed analysis of the data from a high sampling rate, multi-month reverberation mapping campaign, undertaken primarily at MDM Observatory with supporting observations from telescopes around the world, reveals that the Hβ emission region within the broad line regions (BLRs) of several nearby AGNs exhibit a variety of kinematic behaviors. While the primary goal of this campaign was to obtain either new or improved Hβ reverberation lag measurements for several relatively low luminosity AGNs (presented in a separate work), we were also able to unambiguously reconstruct velocity-resolved reverberation signals from a subset of our targets. Through high cadence spectroscopic monitoring of the optical continuum and broad Hβ emission line variations observed in the nuclear regions of NGC 3227, NGC 3516, and NGC 5548, we clearly see evidence for outflowing, infalling, and virialized BLR gas motions, respectively.

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Long term variability of the Broad Emission Line profiles in AGN

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Results of a long-term monitoring ($\gtrsim$ 10 years) of the broad line and continuum fluxes of three Active Galactic Nuclei (AGN), 3C 390.3, NGC 4151, and NGC 5548, are presented. We analyze the Hα and Hβ profile variations during the monitoring period and study different details (as bumps, absorption bands) which can indicate structural changes in the Broad Line Region (BLR). The BLR dimensions are estimated using the time lags between the continuum and the broad lines flux variations. We find that in the case of 3C 390.3 and NGC 5548 a disk geometry can explain both the broad line profiles and their flux variations, while the BLR of NGC 4151 seems more complex and is probably composed of two or three kinematically different regions.

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The Lick AGN Monitoring Project: Broad-Line Region Radii and Black Hole Masses from Reverberation Mapping of Hβ

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We have recently completed a 64-night spectroscopic monitoring campaign at the Lick Observatory 3-m Shane telescope with the aim of measuring the masses of the black holes in 12 nearby ($z < 0.05$) Seyfert 1 galaxies with expected masses in the range $\sim 10^6$–10^7 $M_\odot$ and also the well-studied nearby active galactic nucleus (AGN) NGC 5548. Nine of the objects in the sample (including NGC 5548) showed optical variability of sufficient strength during the monitoring campaign to allow for a time lag to be measured between the continuum fluctuations and the response to these fluctuations in the broad Hβ emission. We present here the light curves for all the objects in this sample and the subsequent Hβ time lags for the nine objects where these measurements were possible. The Hβ lag time is directly related to the size of the broad-line region in AGNs, and by combining the Hβ lag time with the measured width of the Hβ emission line in the variable part of the spectrum, we determine the virial mass of the central supermassive black hole in these nine AGNs. The absolute calibration of the black hole masses is based on the normalization derived by Onken et al., which brings the masses determined by reverberation mapping into agreement with the local $M_{\rm BH} - \sigma_\star$ relationship for quiescent galaxies. We also examine the time lag response as a function of velocity across the Hβ line profile for six of the AGNs. The analysis of four leads to rather ambiguous results with relatively flat time lags as a function of velocity. However, SBS 1116+583A exhibits a symmetric time lag response around the line center reminiscent of simple models for circularly orbiting broad-line region (BLR) clouds, and Arp 151 shows an asymmetric profile that is most easily explained by a simple gravitational infall model. Further investigation will be necessary to fully understand the constraints placed on physical models of the BLR by the velocity-resolved response in these objects.

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An Improved Black Hole Mass–Bulge Luminosity Relationship for AGNs

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Two effects have substantially increased the scatter in the AGN black hole mass–host galaxy bulge luminosity relationship derived from SDSS spectra. The first is that at a fixed black hole mass, $M_\bullet$, the SDSS spectrum depends strongly on redshift because an SDSS fiber sees a larger fraction of the total light of more distant galaxies. The second is that at a given redshift, the fraction of host-galaxy light in the fiber increases with decreasing galaxy luminosity. We illustrate the latter effect using the Kormendy et al. (2009) light profiles of Virgo ellipticals. With allowance for the two effects, we obtain a black hole mass—bulge luminosity ($M_\bullet$ – L_{host}) relationship for AGNs which has a scatter of only ± 0.23 dex in mass. This is less than the scatter found for inactive galaxies, and is consistent with the measuring errors. We show that there is a corresponding tight linear relationship between the fraction of host galaxy light in AGN spectra, L_{host}/L_{AGN}, and the Eddington ratio, L/L_{Edd}. This linearity implies that at a given $M_\bullet$, host luminosities of high-accretion-rate AGNs (NLS1s) and low-accretion-rate AGNs are similar. The L_{host}/L_{AGN} – L/L_{Edd} relationship provides a simple means of estimating the fraction of host galaxy light in AGN spectra. This means that the real amplitude of variability of low-accretion-rate AGNs is increased relative to NLS1s.

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MOJAVE: Monitoring of Jets in Active Galactic Nuclei with VLBA Experiments. VI. Kinematics Analysis of a Complete Sample of Blazar Jets

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We discuss the jet kinematics of a complete flux-density-limited sample of 135 radio-loud active galactic nuclei (AGN) resulting from a 13 year program to investigate the structure and evolution of parsec-scale jet phenomena. Our analysis is based on new 2 cm Very Long Baseline Array (VLBA) images obtained between 2002 and 2007, but includes our previously published observations made at the same wavelength, and is supplemented by VLBA archive data. In all, we have used 2424 images spanning the years 1994–2007 to study and determine the motions of 526 separate jet features in 127 jets. The data quality and temporal coverage (a median of 15 epochs per source) of this complete AGN jet sample represents a significant advance over previous kinematics surveys. In all but five AGNs, the jets appear one-sided, most likely the result of differential Doppler boosting. In general the observed motions are directed along the jet ridge line, outward from the optically thick core feature. We directly observe changes in speed and/or direction in one third of the well-sampled jet components in our survey. While there is some spread in the apparent speeds of separate features within an individual jet, the dispersion is about three times smaller than the overall dispersion of speeds among all jets. This supports the idea that there is a characteristic flow that describes each jet, which we have characterized by the fastest observed component speed. The observed maximum speed distribution is peaked at $\sim 10c$, with a tail that extends out to $\sim 50c$. This requires a distribution of intrinsic Lorentz factors in the parent population that range up to ~ 50. We also note the presence of some rare low-pattern speeds or even stationary features in otherwise rapidly flowing jets, that may be the result of standing re-collimation shocks, and/or a complex geometry and highly favorable Doppler factor.

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MOJAVE: Monitoring of Jets in AGN with VLBA Experiments. VII. Blazar Jet Acceleration

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We discuss acceleration measurements for a large sample of extragalactic radio jets from the MOJAVE program which studies the parsec-scale jet structure and kinematics of a complete, flux-density-limited sample of Active Galactic Nuclei (AGN). Accelerations are measured from the apparent motion of individual jet features or "components" which may represent patterns in the jet flow. We find that significant accelerations are common both parallel and perpendicular to the observed component velocities. Parallel accelerations, representing changes in apparent speed, are generally larger than perpendicular acceleration that represent changes in apparent direction. The trend for larger parallel accelerations indicates that a significant fraction of

these changes in apparent speed are due to changes in intrinsic speed of the component rather than changes in direction to the line of sight. We find an overall tendency for components with increasing apparent speed to be closer to the base of their jets than components with decreasing apparent speed. This suggests a link between the observed pattern motions and the underlying flow which, in some cases, may increase in speed close to the base and decrease in speed further out; however, common hydrodynamical processes for propagating shocks may also play a role. About half of the components show "non-radial" motion, or a misalignment between the component's structural position angle and its velocity direction, and these misalignments generally better align the component motion with the downstream emission. Perpendicular accelerations are closely linked with non-radial motion. When observed together, perpendicular accelerations are usually in the correct direction to have caused the observed misalignment.

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What broad emission lines tell us about how active galactic nuclei work

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I review progress made in understanding the nature of the broad-line region (BLR) of active galactic nuclei (AGNs) and the role BLRs play in the AGN phenomenon. The high equivalent widths of the lines imply a high BLR covering factor, and the absence of clear evidence for absorption by the BLR means that the BLR has a flattened distribution and that we always view it near pole-on. The BLR gas is strongly self-shielding near the equatorial plane. Velocity-resolved reverberation mapping has long strongly excluded significant outflow of the BLR and shows instead that the predominant motions are Keplerian with large turbulence and a significant net inflow. The rotation and turbulence are consistent with the inferred geometry. The blueshifting of high-ionization lines is a consequence of scattering off inflowing material rather than the result of an outflowing wind. The rate of inflow of the BLR is sufficient to provide the accretion rate needed to power the AGN. Because the motions of the BLR are gravitationally dominated, and the BLR structure is very similar in most AGNs, consistent black hole masses can be determined. The good correlation between these estimates and masses predicted from the bulge luminosities of host galaxies provides strong support for the similarity of AGN continuum shapes and the correctness of the BLR picture presented. It is concluded that although many mysteries remain about the details of how AGNs work, a general overall picture of the torus and BLR is becoming clear.

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Jobs

Postdoctoral Research Position, University of Kentucky

Prof. Moshe Elitzur
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Lexington, KY 40506-0055, USA

Applications are invited for a postdoctoral research position in theoretical astrophysics to work with Prof. Moshe Elitzur at the University of Kentucky, Lexington, KY, USA. The start date is around September 2010, although an earlier start is possible. Interest in radiative processes, AGN and starburt galaxies is advantageous. The successful applicant will be able to join the science team of CanariCam, the mid-IR imager on the 10.4m GTC telescope. Applicants should send curriculum vita, bibliography and a statement of research interests by e-mail to moshe@pa.uky.edu and arrange for three letters of recommendation to be sent the same way. The initial appointment is for one year, with an expected extension for another year. The review of applications will start at the end of December, and will continue until the position is filled

E-mail contact: moshe@pa.uky.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.manchester.ac.uk/jodrellbank/∼agnews
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