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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.

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

Abstracts of recently accepted papers

Resolving the nucleus of Centaurus A at mid-IR wavelengths

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Abstract: We have observed Centaurus A with the MID-infrared Interferometric instrument (MIDI) at the Very Large Telescope Interferometer (VLTI) at resolutions of 7 – 15 mas (at 12.5 μm) and filled gaps in the (u, v) coverage in comparison to earlier measurements. We are now able to describe the nuclear emission in terms of geometric components and derive their parameters by fitting models to the interferometric data. With simple geometrical models, the best fit is achieved for an elongated disk with flat intensity profile with diameter (76 ± 9)mas $\times$ (35 ± 2)mas $((1.41 \pm 0.17)$pc $\times$ (0.65 ± 0.03)pc) whose major axis is oriented at a position angle (PA) of $(10.1 \pm 2.2)^\circ$ east of north. A point source contributes (47 ± 11) % of the nuclear emission at 12.5 μm. There is also evidence that neither such a uniform nor a Gaussian disk are good fits to the data. This indicates that we are resolving more complicated small-scale structure in AGNs with MIDI, as has been seen in Seyfert galaxies previously observed with MIDI. The PA and inferred inclination $i = 62.6^{+2.1}_{-2.6}$ $^\circ$ of the dust emission are compared with observations of gas and dust at larger scales.

Published in the Publications of the Astronomical Society of Australia's special issue on Centaurus A

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preprint available at http://arxiv.org/abs/1008.0858

Short-term VHE variability in blazars: PKS 2155-304

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CONTEXT: The γ-ray blazar PKS 2155-304 has attracted considerable attention because of its extreme TeV variability characteristics during an exceptional flaring period in 2006. Among the observed key findings are (i) a minimum variability timescale as short as ~ 200 sec and (ii) highly variable TeV emission, which in the frequency interval [10^{-4} Hz, 10^{-2} Hz] can be described by a log-normal distribution and suggests an underlying multiplicative (and not additive) process. AIMS: Simultaneously accounting for these findings appears difficult within conventional approaches. Following earlier suggestions for the TeV blazar Mkn 501, we explore a possible scenario where PKS 2155-304 is supposed to harbor a supermassive binary black hole system and where the observed TeV variability is dominated by emission from the less massive black hole. METHODS: We analyze the constraints on the very high energy (VHE) source imposed by the observed variability characteristics and the integrated VHE luminosity output, and discuss its implications for a binary black hole system. RESULTS: We show that for a secondary mass of $m_{\rm BH} \sim 10^7 M_\odot$, fluctuations in the disk accretion rate that feed the jet could account for the observed red-noise type variability process down to frequencies of $\sim 10^{-2}$ Hz. Jet curvature induced by orbital motion, on the other hand, could further relax constraints on the intrinsic jet speeds. CONCLUSIONS: Because a binary system can lead to different (yet not independent) periodicities in different energy bands, a longterm (quasi-) periodicity analysis could offer important insights into the real nature of the central engine of PKS 2155-304.

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preprint available at http://arxiv.org/abs/1007.4879

Extended X-ray Emission in the HI Cavity of NGC 4151: Galaxy-scale AGN Feedback?

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We present the *Chandra* discovery of soft diffuse X-ray emission in NGC 4151 ($L_{0.5-2keV} \sim 10^{39}$ erg s^{-1}), extending $\sim$2 kpc from the active nucleus and filling in the cavity of the HI material. The best fit to the X-ray spectrum requires either a $kT \sim 0.25$ keV thermal plasma or a photoionized component. In the thermal scenario, hot gas heated by the nuclear outflow would be confined by the thermal pressure of the HI gas and the dynamic pressure of inflowing neutral material in the galactic disk. In the case of photoionization, the nucleus must have experienced an Eddington limit outburst. For both scenarios, the AGN-host interaction in NGC 4151 must have occured relatively recently (some 10^4 yr ago). This very short timescale to the last episode of high activity phase may imply such outbursts occupy $\geq$1% of AGN lifetime.

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preprint available at http://arxiv.org/abs/1007.4472

Variability of the 3C 390.3 nucleus in 2000–2007 and a new estimate of the central black hole mass

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We present further results of optical observations of the 3C 390.3 nucleus undertaken at the Crimean Astrophysical Observatory since 1992. From the new data obtained in 2000–2007, we find differences in the responses of the Balmer emission lines to the optical continuum variations. Moreover, these responses (i.e., the relationship between line and continuum fluxes) show long-term changes that can be presumably attributed to the evolution of the relationship between the fluxes of the optical and driving continua. We suspect that some small discrepancy between our spectral and photometric measurements of 3C 390.3 can be attributed to the long-term variability of the [O III] $\lambda\,5007$ Å forbidden line. The cross-correlation analysis of the light curves let us to improve the values of the time delays between continuum and emission-line variations: $\tau_{cent} = 94 \pm 6$ and 174 ± 16 days for the Hβ and Hα lines, respectively. The black hole mass, derived from the Hβ line was found to be $2.0 \times 10^9\ M_\odot$. This result suggests even larger black hole mass to the 3C 390.3 nucleus and, therefore, lower accretion rate under a given luminosity than was previously thought and thus provides more evidence for anticorrelation between broad line widths and Eddington luminosity ratios $L_{\rm bol}/L_{\rm Edd}$ in AGNs.

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On the Origin of the Extended Hα Filaments in Cooling Flow Clusters

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We present a high spatial resolution Hα survey of 23 cooling flow clusters using the Maryland Magellan Tunable Filter (MMTF), covering 1–2 orders of magnitude in cooling rate, dM/dt, temperature and entropy. We find 8/23 (35%) of our clusters have complex, filamentary morphologies at Hα, while an additional 7/23 (30%) have marginally extended or nuclear Hα emission, in general agreement with previous studies of line emission in cooling flow cluster BCGs. A weak correlation between the integrated near-UV luminosity and the Hα luminosity is also found for our complete sample, with a large amount of scatter about the expected relation for photoionization by young stars. We detect Hα emission out to the X-ray cooling radius, but no further, in several clusters and find a strong correlation between the Hα luminosity contained in filaments and the X-ray cooling flow rate of the cluster, suggesting that the warm ionized gas is linked to the cooling flow. Furthermore, we detect a strong enhancement in the cooling properties of the ICM coincident with the Hα emission, compared to the surrounding ICM at the same radius. While the filaments in a few clusters may be entrained by buoyant radio bubbles, in general, the radially-infalling cooling flow model provides a better explanation for the observed trends. The correlation of the Hα and X-ray properties suggests that conduction may be important in keeping the filaments ionized. The thinness of the filaments suggests that magnetic fields are an important part of channeling the gas and shielding it from the surrounding hot ICM.

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Broad Balmer-line Absorption in SDSS J172341.10+555340.5

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I present the discovery of Balmer-line absorption from Hα to H9 in iron low-ionizaton broad absorption line (FeLoBAL) quasar, SDSS J172341.10+555340.5 by near-infrared spectroscopy with the Cooled Infrared Spectrograph and Camera for OHS (CISCO) attached to the Subaru telescope. The redshift of the Balmer-line absorption troughs is 2.0530 ± 0.0003, and it is blueshifted by 5370 km s^{-1} from the Balmer emission lines. It is more than 4000 km s^{-1} blueshifted from the previously known UV absorption lines. I detect relatively strong ($\mathrm{EW_{rest}} = 20$ Å) [O III] emission lines which are similar to those found in other broad absorption line quasars with Balmer-line absorption. I derived a column density of neutral hydrogen of 5.2×10^{17} cm^{-2} by using the curve of growth and taking account of Lyα trapping. I searched for UV absorption lines which have the same redshift with Balmer-line absorption. I found Al III and Fe III absorption lines at z=2.053 which correspond to previously unidentified absorption lines, and the presence of other blended troughs that were difficult to identify.

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preprint available at http://arxiv.org/abs/1003.4622

The nature of nuclear H_α emission in LINERs

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We present the study of HST Hα imaging of 32 LINERs we have made to get insight into the nature of the ionized gas in the nuclear region. The main conclusion from this analysis is that for the large majority of LINERs (84%) an unresolved nuclear source has been identified as well as extended emission with equivalent sizes ranging from few tens till about hundredths of parsecs. Their morphologies appear not to be homogeneous being basically grouped into three classes: nuclear outflow candidates (42%), core-halo morphologies (25%) and nuclear spiral disks (14%). Clumpy structures reminiscent of young stellar clusters are not a common property on LINERs. The remaining 5 galaxies are too dusty to allow a clear view of the ionized gas distribution.

A size-luminosity relation has been found between the equivalent radius of the Hα emission and the (2-10 keV) X-ray luminosities. Both ionised gas morphologies and the size-luminosity relation are indistinguishable from those of low luminosity Seyferts, suggesting the same origin for the NLR of LINERs and Seyferts. Also a relation between soft X-rays and ionized gas has been suggested for the first time in LINERs. From multiwavelength data, only 4 out of the 32 LINERs have no evidences on an AGN nature of their nuclear sources from multiwavelength data, but extremely obscured AGNs cannot be discarded out given the Compton thick signatures of their X-ray emission. For the confirmed AGN LINERs, their Hα imaging favour core-halo and outflow morphologies (65% of the cases). Finally, their calculated Eddington ratios show that our LINER sources radiate at sub-Eddington regime, with core-halo systems having on average larger Eddington ratios than outflows.

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A new extensive catalog of optically variable AGN in the GOODS Fields and a new statistical approach to variability selection

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Variability is a property shared by practically all AGN. This makes variability selection a possible technique for identifying AGN. Given that variability selection makes no prior assumption about spectral properties, it is a powerful technique for detecting both low-luminosity AGN in which the host galaxy emission is dominating and AGN with unusual spectral properties. In this paper, we will discuss and test different statistical methods for the detection of variability in sparsely sampled data that allow full control over the false positive rates. We will apply these methods to the GOODS North and South fields and present a catalog of variable sources in the z band in both GOODS fields. Out of 11931 objects checked, we find 155 variable sources at a significance level of 99.9%, corresponding to about 1.3% of all objects. After rejection of stars and supernovae, 139 variability selected AGN remain. Their magnitudes reach down as faint as 25.5 mag in z. Spectroscopic redshifts are available for 22 of the variability selected AGN, ranging from 0.046 to 3.7. The absolute magnitudes in the rest-frame z-band range from $\sim$ -18 to -24, reaching substantially fainter than the typical luminosities probed by traditional X-ray and spectroscopic AGN selection in these fields. Therefore, this is a powerful technique for future exploration of the evolution of the faint end of the AGN luminosity function up to high redshifts.

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preprint available at http://arxiv.org/abs/1008.3384

Jobs

High Energy Group

The High Energy group of Universidad Nacional Autónoma de México (UNAM) invites researchers to submit applications for postdoctoral fellowships in astrophysics, to begin as early as October 2010. The appointment is for one year with a possible extension for a second year. Fellows will work in with the high energy (HE) group of the Institute of Astronomy in Mexico City. Fellows are expected to carry out multi-frequency studies, mainly optical and gamma ray, of Blazars and GRBs using the facilities of the National Astronomical Observatory and Gamma Ray Observatories such as Fermi, Swift, Integral, Milagro and HAWC. The selected Postdoc will work with staff, faculty and students of the HE team at the host institution and the HAWC collaboration doing theoretical research as well as data analysis.

The main selection criteria will be outstanding research accomplishments and promise of future achievement. Fellows will have access to all of the resources and facilities of the National Astronomical Observatory. In particular, the Institute operates the San Pedro Martir Observatory near Ensenada, which includes a 2.1-meter, a 1.5-meter and an 84-cm telescope, equipped with modern instrumentation for optical and near- and mid-infrared imaging and spectroscopy. The institute collaborates in the development of the gamma ray observatory HAWC, an array of 300 water Cerenkov detectors at Volcn Sierra Negra in Puebla, Mexico, designed to observe gamma rays of energies from 100GeV to 100TeV. The fellowship provides support for observing, traveling and publishing. These facilities will be accessible for the entire duration of the fellowship.

Applicants should have a PhD in Astronomy or in Astronomical Instrumentation. Applicants should be less than 35 years old, and have earned their PhD degree at most 5 years earlier to the application. Knowledge of the English and/or Spanish language is required. Salary is compatible with international standards. Applicants should send curriculum vitae, bibliography, and research plan, and arrange for three letters of recommendation to be sent to Magda Gonzalez (magda@astro.unam.mx) at the Institute of Astronomy. For additional information also contact Magda Gonzalez.

Additional Information

LETTERS OF REFERENCE. Please make sure official hard copies (signed) of the letters of reference are submitted to Instituto de Astronomía UNAM, Apartado Postal 70-264, Cd. Universitaria, CP 04510 Mexico DF, Mexico. E-mails are ok temporarily, but the final documentation must include signed versions. ALL should be sent to Dr. Magda Gonzalez.

STIPENDS. The fellowship is tax-free. The fellowship stipend is 24,000 pesos/month if appointed in Mexico City (the current exchange rate is approximately 13pesos/US Dollar. The fellowship also includes the cost of air travel (to Mexico City) for the appointee. Visa entry rights are not covered, however.

SELECTION. The fellowships are funded by a Conacyt project not by the Instituto de Astronomía directly. Applications are received and reviewed until position is filled.

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