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Accepted Abstracts - Submitted Abstracts - Thesis Abstracts
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.

Rob Beswick

Abstracts of recently accepted papers

Optical Variability of the Radio Source J1128+5925

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Very recently, J 1128+5925 was found to show strong intraday variability at radio wavelengths and may be a new source with annual modulation of the timescale of its radio variability. Therefore, its radio variability can be best explained via interstellar scintillation. Here we present the properties of its optical variability for the first time after a monitoring program in 2007 May. Our observations indicate that in this period J 1128+5925 only showed trivial optical variability on internight timescale, and did not show any clear intranight variability. This behavior is quite different from its strong radio intraday variability. Either this object was in a quiescent state in optical in this period, or it is intrinsically not so active in optical as it is in radio regimes.

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preprint available at http://arxiv.org/abs/0710.1472

New results on particle acceleration in the Centaurus A jet and counterjet from a deep *Chandra* observation

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We present new deep *Chandra* observations of the Centaurus A jet, with a combined on-source exposure time of 719 ks. These data allow detailed X-ray spectral measurements to be made along the jet out to its disappearance at 4.5 kpc from the nucleus. We distinguish several regimes of high-energy particle acceleration: while the inner part of the jet is dominated by knots and has properties consistent with local particle acceleration at shocks, the particle acceleration in the outer 3.4 kpc of the jet is likely to be dominated by an unknown distributed acceleration mechanism. In addition to several compact counterjet features we detect probable extended emission from a counterjet out to 2.0 kpc from the nucleus, and argue that this implies that the diffuse acceleration process operates in the counterjet as well. A preliminary search for X-ray variability finds no jet knots with dramatic flux density variations, unlike the situation seen in M87.

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preprint available at http://hercules.herts.ac.uk/∼mjh/cena-jet.pdf

Active Galactic Nuclei in Void Regions

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We present a comprehensive study of accretion activity in the most underdense environments in the universe, the voids, based on the SDSS DR2 data. Based on investigations of multiple void regions, we show that Active Galactic Nuclei (AGN) are definitely common in voids, but that their occurrence rate and properties differ from those in walls. AGN are more common in voids than in walls, but only among moderately luminous and massive galaxies ($M_r < -20$, log $M_*/M_{sun} < 10.5$), and this enhancement is more pronounced for the relatively weak accreting systems (i.e., $L_{[\mathrm{OIII}]} < 10^{39}$ erg s^{-1}). Void AGN hosted by moderately massive and luminous galaxies are accreting at equal or lower rates than their wall counterparts, show lower levels of obscuration than in walls, and similarly aged stellar populations. The very few void AGN in massive bright hosts accrete more strongly, are more obscured, and are associated with younger stellar emission than wall AGN. These trends suggest that the accretion strength is connected to the availability of fuel supply, and that accretion and star-formation co-evolve and rely on the same source of fuel. Nearest neighbor statistics indicate that the weak accretion activity (LINER-like) usually detected in massive systems is not influenced by the local environment. However, H IIs, Seyferts, and Transition objects are preferentially found among more grouped small scale structures, indicating that their activity is influenced by the rate at which galaxies interact with each other. These trends support a potential H II→Seyfert/Transition Object→LINER evolutionary sequence that we show is apparent in many properties of actively line-emitting galaxies, in both voids and walls. The subtle differences between void and wall AGN might be explained by a longer, less disturbed duty cycle of these systems in voids.

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preprint available at http://arxiv.org/abs/0710.1631

Measuring the accretion rate and kinetic luminosity functions of supermassive black holes

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We derive accretion rate functions (ARFs) and kinetic luminosity functions (KLF) for jet-launching supermassive black holes. The accretion rate as well as the kinetic power of an active galaxy is estimated from the radio emission of the jet. For compact low-power jets, we use the core radio emission while the jet power of high-power radio-loud quasars is estimated using the extended low-frequency emission to avoid beaming effects. We find that at low luminosities the ARF derived from the radio emission is in agreement with the measured bolometric luminosity function (BLF) of AGN, i.e., all low-luminosity AGN launch strong jets. We present a simple model, inspired by the analogy between X-ray binaries and AGN, that can reproduce both the measured ARF of jet-emitting sources as well as the BLF. The model suggests that the break in power law slope of the BLF is

due to the inefficient accretion of strongly sub-Eddington sources. As our accretion measure is based on the jet power it also allows us to calculate the KLF and therefore the total kinetic power injected by jets into the ambient medium. We compare this with the kinetic power output from SNRs and XRBs, and determine its cosmological evolution.

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Optical Spectroscopy of Active Galactic Nuclei in SA57

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Context: The cosmological evolution of X-ray-selected and optically selected Active Galactic Nuclei (AGNs) show different behaviours interpreted in terms of two different populations. The difference is evident mainly for low luminosity AGNs (LLAGNs), many of which are lost by optical photometric surveys.
Aims: We are conducting a spectroscopical study of a composite sample of AGN candidates selected in SA57 following different searching techniques, to identify low luminosity AGNs and break down the sample into different classes of objects.
Methods: AGN candidates were obtained through optical variability and/or X-ray emission. Of special interest are the extended variable objects, which are expected to be galaxies hosting LLAGNs.
Results: Among the 26 classified objects a fair number (9) show typical AGN spectra. 10 objects show Narrow Emission Line Galaxy spectra, and in most of them (8/10) optical variability suggests the presence of LLAGNs.

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HST/WFPC2 imaging of the circumnuclear structure of LLAGNs. I Data and nuclear morphology

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In several studies of Low Luminosity Active Galactic Nuclei (LLAGNs), we have characterized the properties of the stellar populations in LINERs and LINER/HII Transition Objects (TOs). We have found a numerous class of galactic nuclei which stand out because of their conspicuous 0.1–1 Gyr populations. These nuclei were called "Young-TOs" since they all have TO-like emission line ratios. To advance our knowledge of the nature of the central source in LLAGNs and its relation with stellar clusters, we are carrying out several imaging projects with the Hubble Space Telescope (HST) at near-UV, optical and near-IR wavelengths. In this paper, we present the first results obtained with observations of the central regions of 57 LLAGNs imaged with the WFPC2 through any of the V (F555W, F547M, F614W) and I (F791W, F814W) filters that are available in the HST archive. The sample contains 34% of the LINERs and 36% of the TOs in the Palomar sample. The mean spatial resolution of these images is 10 pc. With these data we have built an atlas that includes structural maps for all the galaxies, useful to identify compact nuclear sources and, additionally, to characterize the circumnuclear environment of LLAGNs, determining the frequency of dust and its morphology. The main results obtained are: 1) We have not found any correlation between the presence of nuclear compact sources and emission-line type. Thus, nucleated LINERs are as frequent as nucleated TOs. 2) The nuclei of "Young-TOs" are brighter than the nuclei of "Old-TOs" and LINERs. These results confirm our previous results that Young-TOs are separated from other LLAGNs classes in terms of their central stellar population properties and brightness. 3) Circumnuclear dust is detected in 88% of the LLAGNs, being almost ubiquitous in TOs. 4) The dust morphology is complex and varied, from nuclear spiral lanes to chaotic filaments and nuclear disk-like structures. Chaotic filaments are as frequent as dust spirals; but nuclear disks are mainly seen in LINERs. These results suggest an evolutionary sequence of the dust in LLAGNs, LINERs being the more evolved systems and Young-TOs the youngest.

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preprint available at http://www.iaa.es/∼rosa/research/LLAGNs2007/LLAGNs-HSTIma1.html

The Mid-Infrared Emission of Seyfert Galaxies: A New Analysis of ISOCAM Data

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We present mid–infrared data of a sample of 57 AGNs obtained with the instrument ISOCAM on board the satellite ISO. The images were obtained through the LW2 (6.75 μm) and LW7 (9.62 μm) filters. This is a new analysis of Clavel et al. (2000) galaxy sample, which is divided into 26 type 1 ($\leq$ 1.5) and 28 type 2 ($>$ 1.5) Seyfert galaxies, plus three QSOs. The spatial resolution of the images allow us to separate the nuclear and the extended contributions to the total emission after decomposing the brightness profiles into different morphological components. The most common components are a central point source (identified as the active nucleus) and an exponential disk. In some cases a bulge, a bar or a ring are needed. The relative contribution of the nucleus to the total emission appears larger in Seyfert 1 than in Seyfert 2. This result confirms that both types of Seyfert galaxies are different in the mid-infrared wavelength range and supports the existence of an structure which produces anisotropic emission in this wavelength range. We have also explored correlations between the mid-infrared and the radio and X–ray wavelength ranges. The well established radio/infrared correlation is mantained in our sample for the global emission of the galaxies. If only the nuclear infrared emission is considered then a non–linear correlation is apparent in the luminosity–luminosity scatter diagram. The ratio between the intrinsic hard X–ray and the nuclear mid-infrared emission presents large scatter and slightly larger values for type 2 Seyfert galaxies. These results seem to be consistent with the presence of a clumpy dusty torus surrounding the active nucleus.

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NGC 3147: a "true" Seyfert 2 without the broad-line region

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We report on simultaneous optical and X-ray observations of the Seyfert galaxy, NGC 3147. The XMM-*Newton* spectrum shows that the source is unabsorbed in the X-rays ($N_H < 5 \times 10^{20}$ cm^{-2}). On the other hand, no broad lines are present in the optical spectrum. The origin of this optical/X-rays misclassification (with respect to the Unification Model) cannot be attributed to variability, since the observations in the two bands are simultaneous. Moreover, a Compton-thick nature of the object can be rejected on the basis of the low equivalent width of the iron Kα line ($\simeq$ 130 eV) and the large ratio between the 2-10 keV and the [OIII] fluxes. It seems therefore inescapable to conclude that NGC 3147 intrinsically lacks the Broad Line Region (BLR), making it the first "true" Seyfert 2.

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Low-Ionization Emission Regions in Quasars: Gas Properties Probed with Broad O I and Ca II Lines

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We have compiled the emission-line fluxes of O I λ8446, O I λ11287, and the near-infrared IR Ca II triplet (λ8579) observed in 11 quasars. These lines are considered to emerge from the same gas as do the Fe II lines in the low-ionized portion of the

broad emission line region (BELR). The compiled quasars are distributed over wide ranges of redshift ($0.06 \leq z \leq 1.08$) and of luminosity ($-29.8 \leq M_B \leq -22.1$), thus providing a useful sample to investigate the line-emitting gas properties in various quasar environments. The measured line strengths and velocities, as functions of the quasar properties, are analyzed using photoionization model calculations. We found that the flux ratio between the Ca II triplet and O I λ8446 is hardly dependent on the redshift or luminosity, indicating similar gas densities in the emission region from quasar to quasar. On the other hand, a scatter of the O I $\lambda11287/\lambda8446$ ratios appears to imply the diversity of the ionization parameter. These facts invoke the picture of the line-emitting gases in quasars that have similar densities and are located at regions exposed to various ionizing radiation fluxes. The observed O I line widths are found to be remarkably similar over more than 3 orders of magnitude in luminosity, which indicates a kinematically-determined location of the emission region and is in clear contrast to the well-studied case of Hβ. We also argue about the dust presence in the emission region since the region is suggested to be located near the dust sublimation point at the outer edge of the BELR.

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Evidence for a Type 1/Type 2 dichotomy in the correlation between quasar optical polarization and host galaxy/extended emission position angles

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For Seyfert galaxies, the AGN unification model provides a simple and well established explanation of the Type 1/Type 2 dichotomy through orientation based effects. The generalization of this unification model to the higher luminosity AGNs that are the quasars remains a key question. The recent detection of Type 2 Radio-Quiet quasars seems to support such an extension. We propose to further test this scenario.

On the basis of a compilation of quasar host galaxy position angles consisting of previously published data and of new measurements performed using HST Archive images, we investigate the possible existence of a correlation between the linear polarization position angle and the host galaxy/extended emission position angle of quasars.

We find that the orientation of the rest-frame UV/blue extended emission is correlated to the direction of the quasar polarization. For Type 1 quasars, the polarization is aligned with the extended UV/blue emission while these two quantities are perpendicular in Type 2 objects. This result is independent of the quasar radio-loudness. We interpret this (anti-)alignment effect in terms of scattering in a two-component polar+equatorial model which applies to both Type 1 and Type 2 objects. Moreover the orientation of the polarization –and then of the UV/blue scattered light– does not appear correlated to the major axis of the stellar component of the host galaxy measured from near-IR images.

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Superluminal non-ballistic jet swing in the quasar NRAO 150 revealed by mm-VLBI

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NRAO 150 -a compact and bright radio to mm source showing core/jet structure- has been recently identified as a quasar at redshift z=1.52 through a near-IR spectral observation. To study the jet kinematics on the smallest accessible scales and to compute the first estimates of its basic physical properties, we have analysed the ultra-high-resolution images from a new monitoring program at 86 GHz and 43 GHz with the GMVA and the VLBA, respectively. An additional archival and calibration VLBA data set, covering from 1997 to 2007, has been used. Our data shows an extreme projected counter-clock-wise jet position angle swing at an angular rate of up to 11 deg./yr within the inner 31 pc of the jet, which is associated with a non-ballistic

superluminal motion of the jet within this region. The results suggest that the magnetic field could play an important role in the dynamics of the jet in NRAO 150, which is supported by the large values of the magnetic field strength obtained from our first estimates. The extreme characteristics of the jet swing make NRAO 150 a prime source to study the jet wobbling phenomenon.

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WFPC2 LRF Imaging of Emission Line Nebulae in 3CR Radio Galaxies

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We present HST/WFPC2 Linear Ramp Filter images of high surface brightness emission lines (either [OII], [OIII], or Hα+[NII]) in 80 3CR radio sources. We overlay the emission line images on high resolution VLA radio images (eight of which are new reductions of archival data) in order to examine the spatial relationship between the optical and radio emission. We confirm that the radio and optical emission line structures are consistent with weak alignment at low redshift ($z < 0.6$) except in the Compact Steep Spectrum (CSS) radio galaxies where both the radio source and the emission line nebulae are on galactic scales and strong alignment is seen at all redshifts. There are weak trends for the aligned emission line nebulae to be more luminous, and for the emission line nebula size to increase with redshift and/or radio power. The combination of these results suggests that there is a limited but real capacity for the radio source to influence the properties of the emission line nebulae at these low redshifts ($z < 0.6$). Our results are consistent with previous suggestions that both mechanical and radiant energy are responsible for generating alignment between the radio source and emission line gas.

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