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Accepted Abstracts - Submitted Abstracts - Thesis Abstracts
Jobs Adverts - Meetings Adverts - Special Announcements

From the Editor

Welcome to all the new subscribers, and thanks to everyone who contributed to this issue of the Active Galaxies Newsletter. This newsletter is intended to disseminate paper abstracts, meeting announcements, job adverts and other information which may be of interest to the active galaxies community. It is produced monthly and, whilst the deadline for contributions is the last day of the month, contributions may be submitted at any time.

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. Please note that the editor may reject submissions which do not use the template. As always, any suggestions or feedback regarding the newsletter are welcome.

Thanks for your continued subscription.

Megan Argo

Abstracts of recently accepted papers

AGN feedback in action: a new powerful wind in 1SXPS J050819.8+172149?

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Galaxy merging is widely accepted to be a key driving factor in galaxy formation and evolution, while the feedback from actively accreting nuclei is thought to regulate the black hole-bulge coevolution and the star formation process. In this context, we focused on 1SXPS J050819.8+172149, a local ($z = 0.0175$) Seyfert 1.9 galaxy ($L_{\rm bol} \sim 4 \times 10^{43}$ ergs s^{-1}). The source belongs to an infrared-luminous interacting pair of galaxies, characterized by a luminosity for the whole system (due to the combination of star formation and accretion) of $\log(L_{\rm IR}/L_{\odot}) = 11.2$. We present here the first detailed description of the $0.3 - 10$ keV spectrum of 1SXPS J050819.8+172149, monitored by *Swift* with 9 pointings performed in less than 1 month. The X-ray emission of 1SXPS J050819.8+172149 is analysed by combining all the *Swift* pointings, for a total of ~ 72 ks XRT net exposure. The averaged *Swift*-BAT spectrum from the 70-month survey is also analysed. The slope of the continuum is $\Gamma \sim 1.8$, with an intrinsic column density of $\sim 2.4 \times 10^{22}$ cm^{-2}, and a de-absorbed luminosity of $\sim 4 \times 10^{42}$ ergs s^{-1} in the $2 - 10$ keV band. Our observations provide a tentative (2.1σ) detection of a blue-shifted Fe XXVI absorption line (rest-frame $E \sim 7.8$ keV), thus suggesting the discovery for a new candidate powerful wind in 1SXPS J050819.8+172149. The physical properties of the outflow cannot be firmly assessed, due to the low statistics of the spectrum and to the observed energy of the line, too close to the higher boundary of the *Swift*-XRT bandpass. However, our analysis suggests that, if the detection is confirmed, the line could be associated with a high-velocity ($v_{\rm out} \sim 0.1c$) outflow most likely launched within $80\, r_{\rm S}$. To our knowledge this is the first detection of a previously unknown ultrafast wind with *Swift*. The high column density suggested by the observed equivalent width of the line (EW~ -230 eV, although with large uncertainties), would imply a kinetic output strong enough to be comparable to the AGN bolometric luminosity.

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A simplified view of blazars: the neutrino background

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Blazars have been suggested as possible neutrino sources long before the recent IceCube discovery of high-energy neutrinos. We re-examine this possibility within a new framework built upon the *blazar simplified view* and a self-consistent modelling of neutrino emission from individual sources. The former is a recently proposed paradigm that explains the diverse statistical properties of blazars adopting minimal assumptions on blazars' physical and geometrical properties. This view, tested through detailed Monte Carlo simulations, reproduces the main features of radio, X-ray, and γ-ray blazar surveys and also the extragalactic γ-ray background at energies > 10 GeV. Here we add a hadronic component for neutrino production and estimate the neutrino emission from BL Lacs as a class, "calibrated" by fitting the spectral energy distributions of a preselected sample of BL Lac objects and their (putative) neutrino spectra. Unlike all previous papers on this topic, the neutrino background is then derived by summing up at a given energy the fluxes of each BL Lac in the simulation, all characterised by their own redshift, synchrotron peak energy, γ-ray flux, etc. Our main result is that BL Lacs as a class can explain the neutrino background seen by IceCube above ~ 0.5 PeV while they only contribute $\sim 10\%$ at lower energies, leaving room to some other population(s)/physical mechanism. However, one cannot also exclude the possibility that individual BL Lacs still make a contribution at the $\approx 20\%$ level to the IceCube low-energy events. Our scenario makes specific predictions testable in the next few years.

MNRAS, in press

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Near-infrared polarimetric adaptive optics observations of NGC 1068: a torus created by a hydromagnetic outflow wind

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We present J′ and K′ imaging linear polarimetric adaptive optics observations of NGC 1068 using MMT-Pol on the 6.5-m MMT. These observations allow us to study the torus from a magnetohydrodynamical (MHD) framework. In a 0.5 arcsec (30 pc) aperture at K′, we find that polarisation arising from the passage of radiation from the inner edge of the torus through magnetically aligned dust grains in the clumps is the dominant polarisation mechanism, with an intrinsic polarisation of 7.0 $\pm$2.2 per cent. This result yields a torus magnetic field strength in the range of 4−82 mG through paramagnetic alignment, and 139^{+11}_{-20} mG through the Chandrasekhar-Fermi method. The measured position angle (P.A.) of polarisation at K′ is found to be similar to the P.A. of the obscuring dusty component at few parsec scales using infrared interferometric techniques. We show that the constant component of the magnetic field is responsible for the alignment of the dust grains, and aligned with the torus axis onto the plane of the sky. Adopting this magnetic field configuration and the physical conditions of the clumps in the MHD outflow wind model, we estimate a mass outflow rate $\leq$0.17 $M_\odot$ yr^{-1} at 0.4 pc from the central engine for those clumps showing near-infrared dichroism. The models used were able to create the torus in a timescale of $\geq 10^5$ yr with a rotational velocity of $\leq$1228 km s^{-1} at 0.4 pc. We conclude that the evolution, morphology and kinematics of the torus in NGC 1068 can be explained within a MHD framework.

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Multi-wavelength study of flaring activity in BL Lac object S5 0716+714 during 2015 outburst

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We present a detailed investigation of the flaring activity observed from a BL Lac object, $S50716+714$, during its brightest ever optical state in the second half of January 2015. Observed almost simultaneously in the optical, X-rays and γ-rays, a significant change in the degree of optical polarization (PD) and a swing in the position angle (PA) of polarization were recorded. A detection in the TeV (VHE) was also reported by the MAGIC consortium during this flaring episode. Two prominent sub-flares, peaking about 5-days apart, were seen in almost all the energy bands. The multi-wavelength light-curves, spectral energy distribution (SED) and polarization are modeled using the time-dependent code developed by Zhang et al. 2014. This model assumes a straight jet threaded by large scale helical magnetic fields taking into account the light travel time effects, incorporating synchrotron flux and polarization in 3D geometry. The rapid variation in PD and rotation in PA are most likely due to re-connections happening in the emission region in the jet, as suggested by the change in the ratio of toroidal to poloidal components of magnetic field during quiescent and flaring states.

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An Over-Massive Black Hole in a Typical Star-Forming Galaxy, 2 Billion Years After the Big Bang

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Supermassive black holes (SMBHs) and their host galaxies are generally thought to coevolve, so that the SMBH achieves up to about 0.2 to 0.5% of the host galaxy mass in the present day. The radiation emitted from the growing SMBH is expected to affect star formation throughout the host galaxy. The relevance of this scenario at early cosmic epochs is not yet established. We present spectroscopic observations of a galaxy at redshift $z = 3.328$, which hosts an actively accreting, extremely massive BH, in its final stages of growth. The SMBH mass is roughly one-tenth the mass of the entire host galaxy, suggesting that it has grown much more efficiently than the host, contrary to models of synchronized coevolution. The host galaxy is forming stars at an intense rate, despite the presence of a SMBH-driven gas outflow.

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Constraining FeLoBAL outflows from absorption line variability

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FeLoBALs are a rare class of quasar outflows with low-ionization broad absorption lines (BALs), large column densities, and potentially large kinetic energies that might be important for 'feedback' to galaxy evolution. In order to probe the physical properties of these outflows, we conducted a multiple-epoch, absorption line variability study of 12 FeLoBAL quasars spanning a redshift range of $0.7 \leq z \leq 1.9$ over rest frame time-scales of $\sim$10 d to 7.6 yr. We detect absorption line variability with $\geq 8\sigma$ confidence in 3 out of the 12 sources in our sample over time-scales of $\sim$0.6 to 7.6 yr. Variable wavelength intervals are associated with ground and excited state Fe II multiplets, the Mg II $\lambda\lambda$2796, 2803 doublet, Mg I λ2852, and excited state Ni II multiplets. The observed variability along with evidence of saturation in the absorption lines favors transverse motions of gas across the line of sight (LOS) as the preferred scenario, and allows us to constrain the outflow distance from the supermassive black hole (SMBH) to be less than 69, 7, and 60 pc for our three variable sources. In combination with other studies, these results suggest that the outflowing gas in FeLoBAL quasars resides on a range of scales and includes matter within tens of parsecs of the central source.

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A new search for variability-selected active galaxies within the VST SUDARE-VOICE survey: the Chandra Deep Field South and the SERVS-SWIRE area

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This work makes use of the VST observations to select variable sources. We use also the IR photometry, SED fitting and X-ray information where available to confirm the nature of the AGN candidates. The IR data, available over the full survey area, allow to confirm the consistency of the variability selection with the IR color selection method, while the detection of variability may prove useful to detect the presence of an AGN in IR selected starburst galaxies.

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A remarkably flat relationship between the average star formation rate and AGN luminosity for distant X-ray AGN

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In this study we investigate the relationship between the star formation rate (SFR) and AGN luminosity (L_{AGN}) for ∼2000 X-ray detected AGN. The AGN span over three orders of magnitude in X-ray luminosity (10^{42} <L_{2-8keV}< $10^{45.5}$ erg s^{-1}) and are in the redshift range $z = 0.2 - 2.5$. Using infrared (IR) photometry ($8 - 500\,\mu$m), including deblended *Spitzer* and *Herschel* images and taking into account photometric upper limits, we decompose the IR spectral energy distributions into AGN and star formation components. Using the IR luminosities due to star formation, we investigate the average SFRs as a function of redshift and AGN luminosity. In agreement with previous studies, we find a strong evolution of the average SFR with redshift, tracking the observed evolution of the overall star forming galaxy population. However, we find that the relationship between the average SFR and AGN luminosity is broadly flat at all redshifts and across all the AGN luminosities investigated; in comparison to previous studies, we find less scatter amongst the average SFRs across the wide range of AGN luminosities investigated. By comparing to empirical models, we argue that the observed flat relationship is due to short timescale variations in AGN luminosity, driven by changes in the mass accretion rate, which wash out any underlying correlations between SFR and L_{AGN}. Furthermore, we show that the exact form of the predicted relationship between SFR and AGN luminosity (and its normalisation) is highly sensitive to the assumed intrinsic Eddington ratio distribution.

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Herschel-ATLAS:the connection between star formation and AGN activity in radio-loud and radio-quiet active galaxies

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We examine the relationship between star formation and AGN activity by constructing matched samples of local ($0 < z < 0.6$) radio-loud and radio-quiet AGN in the *Herschel*-ATLAS fields. Radio-loud AGN are classified as high-excitation and low-excitation radio galaxies (HERGs, LERGs) using their emission lines and *WISE* 22-μm luminosity. AGN accretion and jet powers in these active galaxies are traced by [OIII] emission-line and radio luminosity, respectively. Star formation rates (SFRs) and specific star formation rates (SSFRs) were derived using *Herschel* 250-μm luminosity and stellar mass measurements from the SDSS−MPA-JHU catalogue. In the past, star formation studies of AGN have mostly focused on high-redshift sources to observe the thermal dust emission that peaks in the far-infrared, which limited the samples to powerful objects. However, with *Herschel* we can expand this to low redshifts. Our stacking analyses show that SFRs and SSFRs of both radio-loud and radio-quiet AGN increase with increasing AGN power but that radio-loud AGN tend to have lower SFR. Additionally, radio-quiet AGN are found to have approximately an order of magnitude higher SSFRs than radio-loud AGN for a given level of AGN power. The difference between the star formation properties of radio-loud and -quiet AGN is also seen in samples matched in stellar mass.

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Ionised outflows in $z \sim 2.4$ quasar host galaxies

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Outflows driven by active galactic nuclei (AGN) are invoked by galaxy evolutionary models to quench star formation and to explain the origin of the relations observed locally between super-massive black holes and their host galaxies. We here aim to detect extended ionised outflows in luminous quasars, where we expect the highest activity both in star formation and in black-hole accretion. Currently, there are only a few studies based on spatially resolved observations of outflows at high redshift, $z > 2$.

We analysed a sample of six luminous ($L > 10^{47}$ erg/s) quasars at $z \sim 2.4$, observed in H band using the near-IR integral field spectrometer SINFONI at the VLT. We performed a kinematic analysis of the [OIII] emission line at $\lambda = 5007\AA$.

We detect fast, spatially extended outflows in five out of six targets. [OIII] has a complex gas kinematic, with blue-shifted velocities of a few hundreds of km/s and line widths up to 1500 km/s. Using the spectroastrometric method, we infer a size of the ionised outflows of up to ∼2 kpc. The properties of the ionised outflows, mass outflow rate, momentum rate, and kinetic power, are correlated with the AGN luminosity. The increase in outflow rate with increasing AGN luminosity is consistent with the idea that a luminous AGN pushes away the surrounding gas through fast outflows that are driven by radiation pressure, which depends on the emitted luminosity.

We derive mass outflow rates of about 6-700 $M_\odot$/yr for our sample, which are lower than those observed in molecular outflows. The physical properties of ionised outflows show dependences on AGN luminosity that are similar to those of molecular outflows, but indicate that the mass of ionised gas is lower than that of molecular outflows. Alternatively, this discrepancy between ionised and molecular outflows could be explained with different acceleration mechanisms.

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Bayesian High-Redshift Quasar Classification from Optical and Mid-IR Photometry

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We identify 885,503 type 1 quasar candidates to $i \lesssim 22$ using the combination of optical and mid-IR photometry. Optical photometry is taken from the Sloan Digital Sky Survey-III: Baryon Oscillation Spectroscopic Survey (SDSS-III/BOSS), while mid-IR photometry comes from a combination of data from the Wide-Field Infrared Survey Explorer (*WISE*) "ALLWISE" data release and several large-area *Spitzer Space Telescope* fields. Selection is based on a Bayesian kernel density algorithm with a training sample of 157,701 spectroscopically-confirmed type-1 quasars with both optical and mid-IR data. Of the quasar candidates, 733,713 lack spectroscopic confirmation (and 305,623 are objects that we have not previously classified as photometric quasar candidates). These candidates include 7874 objects targeted as high probability potential quasars with $3.5 < z < 5$ (of which 6779 are new photometric candidates). Our algorithm is more complete to $z > 3.5$ than the traditional mid-IR selection "wedges" and to $2.2 < z < 3.5$ quasars than the SDSS-III/BOSS project. Number counts and luminosity function analysis suggests that the resulting catalog is relatively complete to known quasars and is identifying new high-z quasars at $z > 3$. This catalog paves the way for luminosity-dependent clustering investigations of large numbers of faint, high-redshift quasars and for further machine learning quasar selection using *Spitzer* and *WISE* data combined with other large-area optical imaging surveys.

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http://www.physics.drexel.edu/~gtr/outgoing/optirqsos/data/master_quasar_catalogs.011414.fits.bz2 and
http://www.physics.drexel.edu/~gtr/outgoing/optirqsos/data/optical_ir_quasar_candidates.052015.fits.bz2

A new period of activity in the core of NGC 660

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The core of the nearby galaxy NGC 660 has recently undergone a spectacular radio outburst; using a combination of archival radio and Chandra X-ray data, together with new observations, the nature of this event is investigated. Radio observations made using e-MERLIN in mid-2013 show a new compact and extremely bright continuum source at the centre of the galaxy. High angular resolution observations carried out with the European VLBI Network show an obvious jet-like feature to the north-east and evidence of a weak extension to the west, possibly a counter-jet. We also examine high angular resolution H i spectra of these new sources, and the radio spectral energy distribution using the new wide-band capabilities of e-MERLIN. We compare the properties of the new object with possible explanations, concluding that we are seeing a period of new active galactic nuclei (AGN) activity in the core of this polar ring galaxy.

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