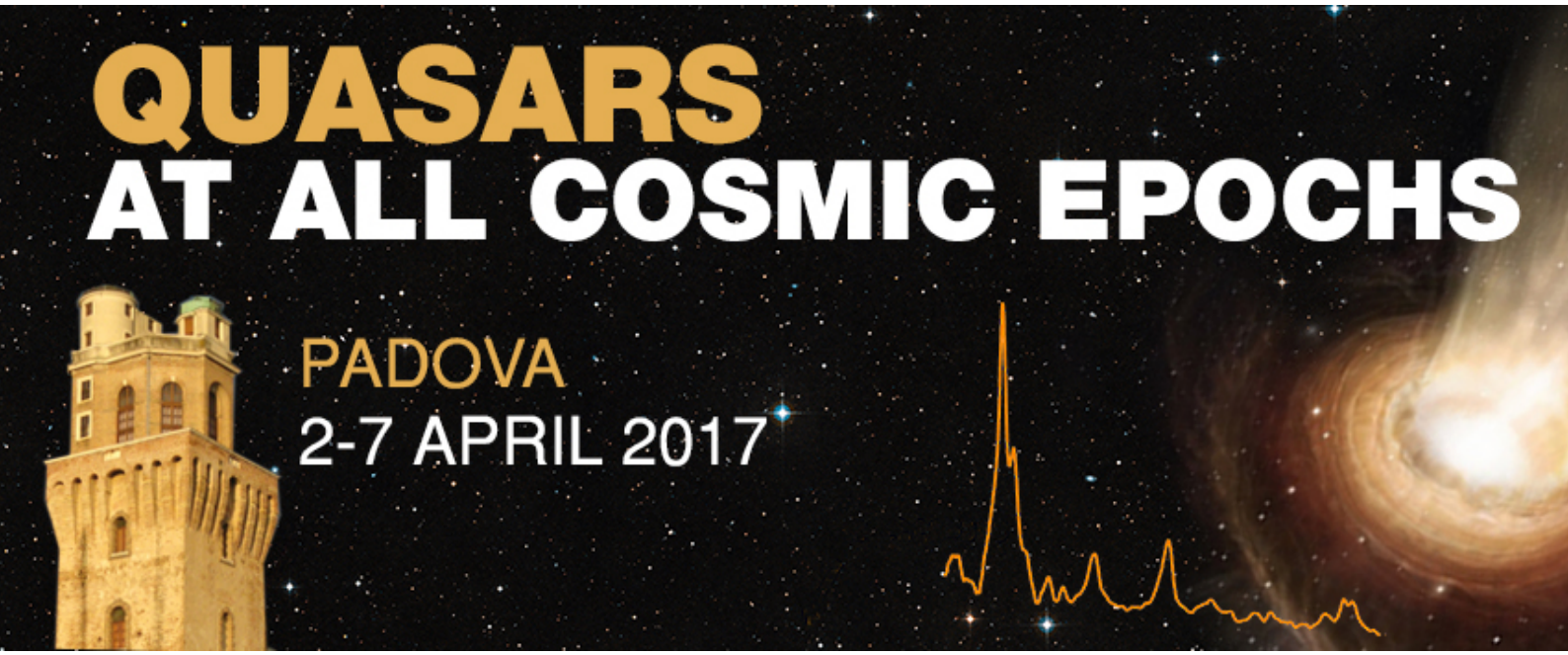

Book of Abstracts

Edited by A. del Olmo, M. D'Onofrio, D. Dultzin, P. Marziani

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Scientific Program Overview

Topic A (Day 1 and 2): Observational properties of active galactic nuclei

This session should discuss the most relevant photometric, spectroscopic, polarimetric, and variability observations over the full SED, together with their interpretation, with attention to both statistical results and case studies. Overarching issues: still enigmatic aspects of SED - such as soft X-ray excess - systematic organization and contextualization of observational properties, radio properties of radio quiet quasars. Connection between circumnuclear star formation and nuclear activity. Selection effects that still affect major surveys.

Topic B (Day 2): accretion processes on supermassive black holes

Review/contributions on accretion disk structure and wind and jet launching processes. ADAF, especially at high accretion rate and their relation to emitting regions (continuum and lines) of quasars. Overarching issue: disk (ADAF) structure and its connection to quasar continuum and line emitting regions, from a theoretical point of view. Can we really scale up the results on stellar mass black holes to AGN black hole masses?

Topic C (Day 2 and 3): connection between theory and observation

Eigenvector 1 and luminosity effects and their interpretation in terms of accretion processes, orientation, etc. Overarching questions: why quasars come in two different species in terms of radio properties, radio quiet and radio loud? What is the connection between disk structure, relativistic ejections, and emitting regions structure?

Topic D (Day 4): feedback and environment of active galaxies and quasars

The black hole host coevolution: observational evidence and interpretation. Fueling and Feedback. Role of environment over cosmic age. Overarching questions: Which are the strongest evidences and the state of the art modeling, and which are the tests and surveys, both observational and theoretical, that can lead to progress in our understanding of fueling and feedback processes on all scales?

Topic E (Day 5): quasar evolution over cosmic time and quasars as cosmological tools

The growth of quasar population at high z; role in re-ionization; the quasars in the local Universe and the ones of a distant past; the first seed quasars and their relation to galaxy formation. Overarching questions: Do we understand quasar evolution beyond selection effects? Will quasars be helpful distance indicators?

Public Lecture*

April 6, 2017, 6:45pm at the Sala Jappelli
of the Padova Astronomical Observatory
Vicolo dell' Osservatorio 5

Il fascino dei quasars, i buchi neri più massicci dell'Universo

Paolo Padovani
European Southern Observatory, Munich, Germany

Presenterò le proprietà dei quasar, partendo dalla loro scoperta più di cinquant'anni fa, e come queste siano strettamente legate alla presenza di buchi neri massicci al loro centro. Illustrerò poi il contributo di Padova allo studio dei quasar. Concluderò con una breve panoramica dell'Osservatorio Europeo Australe, l'organizzazione che gestisce telescopi all'avanguardia in tre siti diversi nel deserto di Atacama in Cile.

The beauty of quasars, the most massive black holes in the Universe

I will illustrate the properties of quasars, starting from their discovery more than fifty years ago, and how these are strongly related to the presence of supermassive black holes in the centres. I will then discuss the contribution of Padova's astronomers to quasar studies. I will then conclude with a short presentation ofthe European Southern Observatory, which manages cutting edge telescopes in three different sites in the Atacama desert in Chile.

*The lecture will be in Italian.

Contents

Abstracts: Topic A

Quasars at all wavelengths and from all angles

Apr 3
09:00
Invited

Paolo PADOVANI
ESO

Quasars are being discovered in ever-larger numbers over the whole electromagnetic spectrum. Different bands employ different methods to identify them but, most importantly, provide different windows on quasar physics. This has led to a proliferation of sub-classes, which is mesmerising. I will try to paint the quasar big picture, which comes out of these multi-wavelength surveys, with the aim of understanding the truly intrinsic and fundamental properties of quasars, and the physics behind them, by addressing also the importance of selection effects.

Gaia space mission and quasars

Apr 3
09:30
Contributed

Submitted by: Tomaz ZWITTER
University of Ljubljana, Faculty of Mathematics and Physics, Ljubljana, Slovenia

Quasars are often considered to be point-like objects. But variability in the accretion disk, and notably the dusty torus can cause photo-centre shifts at the levels detectable by the ongoing ESA mission Gaia. Similarly, unresolved optical emission at the jet base can be detected as proper motion shifts. This could be important for the reference frame determination and - together with spectrophotometric variability data for around half a million distant quasars which are being obtained by Gaia - yields new insight into their physics. Gaia had its first public data release last September and is scheduled to have the next and much more comprehensive one in April 2018. The talk will review capabilities and current results of the mission and of related ongoing ground-based spectroscopic surveys.

The deepest radio view of Quasars in the COSMOS field: a two-fold population

Apr 3
09:50
Contributed

Submitted by: Ivan DELVECCHIO
Department of Physics, University of Zagreb

I will present the main results obtained from the 3GHz VLA-COSMOS Large Project, the deepest radio survey ever conducted over the COSMOS field (2.6 deg^2). We collected nearly 10000 radio sources down to unprecedented sensitivity (2.3 μJy/beam), and identified about 3000 AGN based on multi-wavelength diagnostics. I will show how this AGN sample is an unique and ideal benchmark to track the impact of AGN feedback onto their host-galaxies over $>$ 90age of the Universe ($0 < z < 5$). The key results delivered by our study confirm that radio-loud and radio-quiet Quasars reside in different host-galaxies, as known in the local Universe. However their preferred habitat changes throughout cosmic time: intriguingly, radio-loud Quasars seem to prefer the most massive galaxies out to z$\sim$ 1, while they tend to populate less massive systems at z$\sim$ 2. We observe the opposite pattern for radio-quiet Quasars, suggesting that the onset of powerful radio-AGN activity follows an anti-hierarchical behaviour. This finding is strengthened by the different Eddington-ratio distributions inferred for these Quasar populations, with black hole (BH) accretion in radio-loud systems being predominantly mechanical and radiatively-inefficient (vice versa for radio-quiet Quasars). These results hint at a physical connection between BH accretion mode and host-galaxy type in Quasars, that our survey allows us to explore from a multifaceted perspective, paving the way towards the next-generation facilities.

Submillimetre observations of WISE-selected high-redshift, luminous AGN and their surrounding overdense environments

Apr 3
10:10
Contributed

Submitted by: Suzy JONES
Chalmers University of Technology

We present JCMT SCUBA-2 850 μm submillimetre (submm) observations of 10 mid-infrared (mid-IR) luminous active galactic nuclei (AGNs), detected by the Wide-field Infrared Survey Explorer (WISE) all-sky IR survey and 30 that have also been detected by the NVSS/FIRST radio survey. These rare sources are selected by their extremely red mid-IR spectral energy distributions (SEDs). Further investigations show that they are highly obscured, have abundant warm AGN-heated dust and are thought to be experiencing intense AGN feedback. When comparing the number of submm galaxies detected serendipitously in the surrounding 1.5 arcmin to those in blank-field submm surveys, there is a very significant overdensity, of order 3-5, but no sign of radial clustering centred at our primary objects. The WISE-selected AGN thus reside in 10-Mpc-scale overdense environments that could be forming in pre-viralized clusters of galaxies. WISE-selected AGNs appear to be the strongest signposts of high-density regions of active, luminous and dusty galaxies. SCUBA-2

850 μm observations indicate that their submm fluxes are low compared to many popular AGN SED templates, hence the WISE/radio-selected AGNs have either less cold and/or more warm dust emission than normally assumed for typical AGN. Most of the targets have total IR luminosities $\leq 10^{13}$ $L_{\odot}$, with known redshifts of 20 targets between z $\sim$0.44-4.6.

Multiple frequency databases for AGN investigation: results and perspectives

Apr 3
11:00
Contributed

Submitted by: Giovanni LA MURA
Università di Padova

The electro-magnetic radiation produced by Active Galactic Nuclei (AGN) spans more than 10 orders of magnitude in frequency, ranging from the radio domain all the way up to x-ray and high energy gamma-ray emission. AGNs are therefore characterized by a much more extended radiation spectrum than the characteristic thermal emission of other quiescent stellar systems. In spite of the striking differences between specific objects, the origin of this signal is generally attributed to a combination of emitting components, surrounding an accreting Super Massive Black Hole, according to a well established Unification Model. At present, the execution of extensive surveys of the sky, with instruments operating at various frequencies, are providing the attractive possibility to detect and to investigate the properties of AGNs on very large statistical samples. Thanks to the large spectroscopic surveys that, nowadays, allow detailed investigation of many of these sources, we have the opportunity to place new constraints on the nature and evolution of AGNs and to investigate their relations with the host systems. In this contribution we present the results obtained by carrying out a multiple frequency data survey, to investigate the range of AGN spectral energy distributions and we discuss their relations with optical spectra obtained by follow up observations. We compare our findings with the expectations based on the AGN Unification Model, and we discuss the perspectives of multiple wavelength approaches to address the physics of AGN related processes such as black hole accretion and acceleration of relativistic jets.

What we talk about when we talk about blazars?

Apr 3
11:20
Contributed

Submitted by: Luigi FOSCHINI
INAF - Osservatorio Astronomico di Brera

After the discovery of powerful relativistic jets from Narrow-Line Seyfert 1 Galaxies and the understanding of their similarity with those of blazars, a problem of terminology was born. The word blazar is today associated to BL Lac Objects and Flat-Spectrum Radio Quasars, which are somehow different from Narrow-Line Seyfert 1 Galaxies. Using the same word for all the three classes of AGN, could drive either toward some misunderstanding or to the oversight of some important characteristics. I review the main characteristics of these sources, and finally I propose a new scheme of classification.

The optical view of extragalactic gamma-ray emitters

Apr 3
11:40
Contributed

Submitted by: Simona PAIANO
INAF - Osservatorio Astronomico di Padova

The Fermi Gamma-ray Observatory has discovered thousands sources emitting from 100 MeV to 100 GeV. The majority of the extragalactic ones belong to the class of blazars characterized by a quasi-featureless optical spectrum (BL Lac Objects), which makes the determination of their redshift very difficult. About one third of the detected Fermi sources are still not identified with optical objects, either because of the lack of counterparts in the error box or of multiple associations at other wavelengths. Although most of these sources are expected to be blazars, a new class of AGNs might be discovered. Blazars are not only unique machines to test extreme physics, but can also be exploited as light-houses to probe the distant Universe. Their emitted very high energy photons are known to interact with the low-energy photon backgrounds, the Extragalactic Background Light (EBL), and decay into e-/e+ pairs. Therefore observations of the blazar GeV-TeV spectra, with Cherenkov telescopes or Fermi satellite, are used to probe the the properties of EBL. To investigate the nature of these sources, we are carrying out an extensive campaign at the Gran Telescopio Canarias to secure high S/N optical spectra. These observations allow us to confirm the blazar classification of the targets, to identify new blazars, and to find new redshift and/or to set stringent limits on it. These results are of importance for the emission models of the sources, for the characterization of the EBL and to shed light on their cosmic evolution and abundance in the far Universe.

Complete Infrared View of the 70 Month Swift/BAT AGN Catalog

Apr 3
12:00
Contributed

Submitted by: Kohei ICHIKAWA
NAOJ/Columbia University

We systematically investigate the near- to far-infrared (FIR) photometric properties of a nearly complete sample of local AGN detected in the Swift/BAT all-sky ultra-hard (14-195 keV) X-ray survey. Out of 606 non-blazar AGN in the BAT 70 month catalog at high galactic latitudes of —b— $>$ 10 degree, we obtain IR photometric data of 604 objects by cross-matching the AGN positions with catalogs from the WISE, AKARI, IRAS, and Herschel infrared satellites. We find a good correlation between the ultra-hard X-ray and mid-IR luminosities over five orders of magnitude ($41 < \mathrm{Lx} < 46$). Informed by previous measurements of the intrinsic spectral energy distribution of AGN, we find FIR pure-AGN candidates whose FIR emission is thought to be AGN-dominated with low star-formation activities. We also show that the completeness of the WISE color-color cut in selecting Swift/BAT AGN increases strongly with 14-195 keV luminosity.

Pair-matching of radio-loud and radio-quiet AGNs

Apr 3
12:20
Contributed

Submitted by: Dorota KOZIEŁ-WIERZBOWSKA
Jagiellonian University

Active galactic nuclei (AGNs) are known to cover an extremely broad range of radio luminosities and the spread of their radio-loudness is very large at any value of the Eddington ratio. This implies very diverse jet production efficiencies which can result from the spread of the black hole spins and magnetic fluxes. Magnetic fluxes can be developed stochastically in the innermost zones of accretion discs, or can be advected to the central regions prior to the AGN phase. In the latter case one might expect systematic differences between the properties of galaxies hosting radio-loud (RL) and radio-quiet (RQ) AGNs. In the former case the differences should be negligible for objects having the same Eddington ratio. To study the problem we decided to conduct a comparison study of host galaxy properties of RL and RQ AGNs. In this study we selected type II AGNs from SDSS spectroscopic catalogues. These AGNs were divided into RL and RQ based on the Best & Heckman (2012) catalogue. To compare RL and RQ galaxies that have the same AGN parameters we used pair-matching technique, and matched galaxies in black hole mass, Eddington ratio and redshift. We compared several properties of the host galaxies in these two groups of objects like galaxy mass, colour, concentration index, star-formation rate, line widths, morphological type and interaction signatures. We found that in the studied group RL AGNs are preferentially hosted by elliptical galaxies while RQ ones are hosted by galaxies of earlier type. We also found that the fraction of interacting galaxies is the same in both groups of AGNs. These results suggest that the magnetic flux in RL AGNs is advected to the nucleus prior to the AGN phase.

Feeding of Supermassive Black Holes – from the accretion disk to hundred parsec scales

Apr 3
14:30
Invited

Thaisa STORCHI-BERGMANN
Instituto de Fisica, Universidade Federal do Rio Grande do Sul

I will present and discuss observational signatures of the feeding processes of Supermassive Black Holes in two spatial scales: (1) unresolved scales of the accretion disk ($\sim$ 1000 gravitational radii); (2) resolved gas kinematics of the inner few hundred parsecs of nearby Active Galactic Nuclei (AGN) hosts. In (1) I will show that broad ($\sim$ 10,000 km/s), double-peaked emission lines clearly observed in a few nearby LINERs and radio-galaxies, originating in the outer parts ($\sim$ 1000 gravitational radii) of the accretion disks, seem to be present in the Broad Line Region profiles of most type 1 AGN, being responsible for the strongest variation of the profiles. In (2), I will present new observations of resolved molecular and ionised gas kinematics of the inner few hundred parsecs of nearby AGN hosts showing: rotation in the galaxy plane combined with inflows associated with nuclear spirals, nuclear bars and capture of a dwarf companions.

Highly accreting quasars at high redshift

Apr 3
15:00
Contributed

Submitted by: Mary Loli MARTÍNEZ-ALDAMA
Instituto de Astrofísica de Andalucía

We present the first results of a spectroscopic analysis for a sample of type I highly accreting quasars ($L/L_{Edd} \sim 1$) at redshift z$\sim$ 2 - 3. The quasars were observed with the OSIRIS spectrograph on the GTC 10.4 m telescope located at the Observatorio del Roque de los Muchachos in La Palma. The highly accreting quasars were identified using the 4D Eigenvector 1 formalism, which is able to recognize type I quasars over a broad range of redshift and luminosity. The kinematical and physical properties of the broad line region have been derived by fitting the profiles of strong UV emission lines such as CIV1549, SiII 1808, AIII 1860, SiIII] 1892 and CIII] 1909. This kind of analysis enables to gain insights about the physical conditions, metallicity and dynamics of the broad line emitting region. We are able to estimate black hole masses and Eddington ratios avoiding the use of scaling laws. The majority of the sources show high Eddington ratios high that are related with the productions of outflows . The importance of highly accreting quasars goes beyond a detailed understanding of their physics: their extreme Eddington ratio makes them candidates standard candles for cosmological studies.

Long-term monitoring of the broad-line region in a selected sample of AGN

Apr 3
15:20
Contributed

Submitted by: Dragana ILIC
Faculty of Mathematics University of Belgrade

Co-authors: Dragana Ilic, Alla I. Shapovalova, Luka C. Popovic, Alexander N. Burenkov, Vahram Chavushyan, Andjelka Kovacevic, Wolfram Kollatschny, Nemanja Rakic, Giovanni La Mura, Piero Rafanelli We discuss here the results of the long-term optical monitoring campaign of active galactic nuclei (AGN) performed with telescopes of SAO (Russia), INAOE and OAN-SPM (Mexico), and Calar Alto (Spain). We have monitored for more than a decade different types of broad line AGN, from a NLSy1, double-peaked, radio loud and radio quiet AGN, to a supermassive binary black hole candidate. We study properties of the broad line region (BLR) from the analysis of the line profiles, that are strongly variable in both flux and shape. Some interesting results are found, e.g. a significant intrinsic Baldwin effect is present in all objects, or that the photoionization by the central continuum source may not be the only heating mechanisms of the BLR, etc. We show that during decade(s) of monitored period, the structure (size and geometry) of the BLR may change. Therefore, we point out the importance of the spectroscopic monitoring campaigns in the investigation of the BLR properties, since these are later used in other research, as e.g. mass estimates of the supermassive black holes in AGN.

Variability of the AGN Broad Line Region in the context of Eigenvector 1

Apr 3
15:40
Contributed

Submitted by: Natasa BON

Astronomical Observatory, Belgrade, Serbia

Many active galactic nuclei (AGN) show strong variability. Since the line flux, shape and ratio are changing in different states of activity, using EV1 characterization we try to analyze their variability. Especially, with very long term monitoring campaigns data, we try to analyze the variability patterns and possible periodicity of Type 1 AGN using EV1 diagrams in different variability states. Using such approach, and characteristic variability patterns we discuss the variability of each type, and identify special sub samples of "changing look" AGN. We discuss possible physical mechanisms for the variability.

Reverberation Mapping of High$-z$, High-luminosity Quasars

Apr 3
16:00
Contributed

Submitted by: Paulina LIRA

Universidad de Chile

Reverberation Mapping (RM) provides the only tool to determine Black Holes (BH) masses directly, but so far this method has been applied only to small and intermediate luminosity systems (L $< 10^{46}$ ergs/s). We are extending these studies by two orders of magnitude, probing the BH-mass of luminous AGN at redshift 2-3, obtaining the measurement of the largest BHs and extending our knowledge of the physics of AGN and their hosts into the most crucial epoch in galaxy evolution. Since 2005 we have been monitoring very luminous Quasars using broad-band imaging with the SMARTS telescopes and in 2007 we started the RM campaign of our most variable targets obtaining spectroscopic follow-up with the du Pont telescope. Here we will present results for 17 quasars with good quality R-band and emission line light curves. For 7 of them we are able to measure lags for the Lyα and CIV lines, in this way updating the CIV radius-luminosity relation of Kaspi (2009) and providing for the first time a Lyα radius-luminosity relation for low and high luminosity AGN.

Results From Reverberation Mapping of High Luminosity Quasars

Apr 3
16:50
Contributed

Submitted by: Shai KASPI
Tel-Aviv University

Over the past three decades reverberation mapping (RM) was applied to about 100 AGNs. Their broad line region (BLR) sizes were measured and yielded a mass measurement of the black holes in their center. However, very few attempts were carried out toward high-luminosity quasars, at luminosities higher than 10^{46} erg/s in the optical. Most of these attempts failed since RM of such quasars is difficult due to a number of reasons, mostly due to the long time needed to monitor these objects. During the past two decades we carried out RM campaign on six high-luminosity quasars. This contribution will present the results of that RM campaign in which we measured the BLR size of three of the objects. We will present the BLR size, mass, and luminosity relations over eight orders of magnitude in luminosity, pushing the luminosity limit to its highest point so far.

Reverberation Mapping of AGN Accretion Disks

Apr 3
17:10
Contributed

Submitted by: Michael FAUSNAUGH
The Ohio State University

I will discuss new reverberation mapping results that allow us to investigate the temperature structure of AGN accretion disks. By measuring time delays between inter-band continuum light curves, we can determine the size of the disk as a function of wavelength. We have detected accretion disk reverberations in three Seyfert 1 galaxies so far – I will present these data, as well as our recent measurements of their black hole masses using broad emission-line lags. The mass measurements allow us to compare the continuum lags to predictions from standard thin disk theory, and our results indicate that the accretion disks are physically larger than the simplest expectations.

The first spectroscopic dust reverberation program on AGN

Apr 3
17:30
Contributed

Submitted by: Hermine LANDT
Durham University, UK

The most promising technique to constrain the location and geometry of the dusty torus is reverberation, i.e. measuring the time with which the dust responds to changes in the ionising flux. We have recently started the first spectroscopic monitoring campaign of the dusty torus in the near-IR. Near-IR spectroscopy, unlike photometry, can explore several signatures of the hottest dust simultaneously, e.g. its spectral energy distribution, the lag times at different wavelengths and the variability of the coronal lines and Paschen broad emission lines, which, in their combination, are expected to reveal important physics of the torus. Here I will present preliminary results from our on-going monitoring campaigns using cross-dispersed near-IR spectroscopy obtained with SpeX on IRTF 3 m and GNIRS on Gemini North 8 m of three well-known AGN, namely, NGC 5548, Mrk 876 and Mrk 110.

Velocity-Delay Maps of the Broad Line Region in NGC 5548

Apr 3
17:50
Contributed

Submitted by: Keith HORNE
SUPA St Andrews

The 2014 STORM campaign used HST, Swift, and ground-based telescopes to monitor over 6 months the Seyfert galaxy NGC 5548. The observed spectral variations encode light travel time delays that resolve micro-arcsecond structure of the accretion flow. I will outline echo mapping methods, briefly discuss anomalous behaviour observed during the campaign, and present velocity-delay maps of the broad UV and optical emission lines, exhibiting evidence for an inclined Keplerian flow extending from 2 to 20 light days.

C IV Broad Absorption Line Variability in QSO Spectra

Apr 3
18:10
Contributed

Demetra DE CICCO
University of Napoli "Federico II"

We present the results of our study of C IV broad absorption line (BAL) variability in the spectra of more than 1500 QSOs from several SDSS I-III surveys up to BOSS. Absorption lines in QSO spectra are due to outflowing winds which originate from the accretion disk, at a distance of about 0.01-0.1 pc from the central super-massive black hole (SMBH). Winds trigger the accretion mechanism onto the SMBH removing angular momentum from the disk and, since they evacuate gas from the host galaxy, they are believed to play a fundamental role in galaxy evolution. Absorption lines can be classified on the basis of their width and of the observed transitions, and their equivalent width can change on timescales from months to years, due to variations in the covering factor and/or in the ionization level. We analyzed the

largest sample ever used for such kind of studies. We find that the fraction of disappearing BALs is 1.5 times larger than the one found in previous works. Strong evidence is found for a coordinated variability in spectra with multiple BAL troughs which may be interpreted in terms of disk-wind rotation, and/or variations in the physical status of the shielding gas. We also find that, in spectra with multiple BAL troughs, the disappearing ones are generally those with the highest central velocity.

Periodic variability patterns in AGN

Apr 3
18:30
Contributed

Submitted by: Edi BON
Astronomical Observatory in Belgrade

We select the sample of periodic AGN from the literature with broad emission line spectra obtained at multiple epochs. We analyze broad emission line profiles and their light curves and discuss possible mechanisms that could produce periodic variability, including their implications. We find that possible periodicity of light curves are consistent with an orbital motion. Focusing on high mass ratio systems, we combine results of disk models fitted to broad emission line profiles and periodicity obtained from light curves. Assuming that the secondary object perturbs the disk (as a source of variability in light curves), we obtain the dynamical properties of these systems.

The AGN nature of LINER nuclear sources

Apr 4
08:45
Invited

Isabel MARQUEZ
Instituto de Astrofísica de Andalucía

LINERs (Low Ionization Emission Line Regions) are specially interesting objects since not only they represent the most numerous local AGN population, but they could be the link between normal and active galaxies as suggested by their low X-ray luminosities. The origin of LINER nuclei being still controversial, our work have contributed to confirm that a large number of nuclear LINERs are AGN powered. Long term spectral X-ray variability is very common, with variations mostly related to hard energies (2-10 keV), these variations being mainly due to changes in the absorber and/or intrinsic variations of the source. MIR imaging also indicates that LINERs follow the extent of Asmus' relation of AGN towards lower luminosities, and MIR spectroscopy shows that the average spectrum of AGN-dominated LINERs with X-ray luminosities LX(2-10 keV) $> 10^{41}$ erg/s is similar to the average mid-IR spectrum of AGN-dominated Seyfert 2s; for fainter LINERS, their spectral shape suggests that the dusty-torus may disappear. The extended Halpha emission of LINERs at the HST resolution indicates that they follow remarkably well the Narrow Line Region morphology and the luminosity-size relation obtained for Seyfert and QSOs; HST Halpha morphology indicates the presence of outflows, which could contribute to the line broadening, with the resulting consequences on the percentage

of LINERs where the BLR is detected. This issue is revisited with a high spectral resolution set of optical data for nearby type-1 LINERs. Systematic studies on the role of star formation in LINERs are scarce. Our contribution deals with the study of a sample of the most luminous, highest star formation rate LINERs in the local Universe (at $z = 0.04 - 0.11$), together with its comparison with both lower-redshift LINERs and luminous LINERs previously detected at $z \sim 0.3$ by Tommasin et al. (2012). Most of our sources have $L_{AGN} \sim L_{SF}$, suggesting co-evolution of black hole and stellar mass. The position of local LINERs on the main-sequence of SF galaxies is generally related to their AGN luminosity.

Looking for the dusty torus in quasars

Apr 4
09:15
Contributed

Submitted by: Mariela MARTÍNEZ PAREDES
Instituto de Radioastronomía y Astrofísica de la UNAM

I present the results from study the nuclear near- and mid-IR emission in quasars. We built a sample of 20 nearby quasars ($z < 0.1$) and obtained high angular resolution data with the 10.4 m Gran Telescopio CANARIAS. We used these IR data to constrain the clumpy dusty torus models, which describe the torus as a clumpy distribution of clouds through six free parameters (the angular width of torus, radial extension Y , number of clouds along the equatorial ray N0, radial density distribution q, optical depth V and viewing angle i). A statistical analysis on the geometrical parameters derived, reveals that the properties of the dusty torus are intrinsically different from those of Seyfert 1 nuclei. Nevertheless, in QSOs the combination of the width of torus, number of clouds and inclination results in escape probabilities (Pesc < 5 per cent) and covering factors (f2 < 0.6) consistent with the optical classification of QSOs as type 1 AGN. Additionally, Higher luminosity QSOs have the lowest covering factor f2. We conclude that the lower number of clouds, steeper radial distribution and less optically thick clouds in QSOs can be interpreted as dusty structures that have been partly evaporated and piled up by the higher intensity radiation held in QSOs, as proposed by a receding torus scenario.

The spectrum of hot dust in luminous quasars

Apr 4
09:35
Contributed

Submitted by: Antonio HERNAN-CABALLERO
Universidad Complutense de Madrid

I will present the analysis of a sample of 85 luminous (L 3μm $> 10^{45.5}$ erg/s) quasars with rest-frame $\sim$ 2-11 μm NIR spectroscopy from AKARI and Spitzer/IRS. Their high luminosity and careful subtraction of the disk component allow for a direct determination of the NIR spectrum of the dusty torus clean from contamination by the host galaxy and accretion disk emissions. We find that the entire UV-to-MIR SED of individual quasars can be accurately reproduced with a semi-empirical disk+dust model that uses a single template for the accretion disk and two blackbody components (hot and warm) for the dust. The observed diversity in individual SEDs

is reproduced with varying levels of extinction affecting the disk component and differences in the relative luminosities of the disk and dust components. Quasars with higher dust-to-disk luminosity ratio show slightly redder infrared continua and less prominent silicate emission. However, no luminosity dependence is found in the shape of the average infrared quasar spectrum. I will present a new quasar template [0.1-10 μm] as well as separate templates for the disk and dust components. These templates are the first to provide a detailed view of the infrared emission on both sides of the 4 μm bump.

The mean star-formation rates of unobscured QSOs: searching for evidence of suppressed or enhanced star formation

Apr 4
09:55
Contributed

Submitted by: Flora STANLEY
Chalmers University, Onsala Space Observatory

In this talk I will present our recent findings on the mean star formation rates (SFRs) of $\sim$ 3000 optically selected QSOs of the SDSS survey covering the redshift range of z =0.2-2.5. Our QSO sample was selected to have H-ATLAS coverage, and is also covered by the WISE all-sky survey, used to construct composite SEDs in bins of redshift and AGN luminosity. From the composite SEDs we are able to calculate the mean SFRs for each bin after removing the emission due to the AGN, using our SED decomposition method. The mean SFRs show a weak positive trend with increasing AGN luminosity. I will demonstrate how the observed trend can be attributed to an increase of BH masses, and how our sample is consistent to the main sequence of star-forming galaxies.

Accretion and ejection in AGN: the X-ray and radio perspective

Apr 4
10:15
Contributed

Submitted by: Francesca PANESSA
IAPS-INAF

The accretion-ejection mechanism acting in QSO is one of the main astrophysical open issue. The X-ray emission, associated with the accretion flow, is strongly coupled with the radio emission, associated with a jet. Strong correlations between the radio and the X-ray luminosities are found both in radio-loud and in radio-quiet AGN, despite the fact that in RQ AGN jets are often absent or very weak. For two well defined and complete samples of low and high luminosity AGN, we have investigated the origin of the radio emission, its connection with the X-ray emission and the accretion rates. Moreover, we have examined the incidence of large scale radio structures, such as those observed in Giant Radio Galaxies, among powerful hard X-ray AGN. Our latest results will be discussed within the current accretion-ejection physical scenarios.

Quasar Physics from Spectral Energy Distributions

Apr 4
11:05
Invited

Gordon RICHARDS
Drexel University

I will present some broad perspectives on the relationship between quasar physics and their spectral energy distributions (SED) from the X-ray to radio. In particular I will discuss how the SED changes as a function of radio loudness, broad absorption line properties, and even emission line properties. I will also consider whether changes in the SED as a function of black hole mass and Eddington ratio provide evidence for significant deviations from a standard Shakura & Sunyaev accretion disk model. Lastly, I will explore whether taking into account all of these correlations leads to robust corrections for orientation and dust extinction that then enables the use of optical/UV properties of quasars for cosmology.

What we can (still) learn from the non-linear X-ray to UV relation in AGN

Apr 4
11:35
Contributed

Submitted by: Elisabetta LUSSO
Durham University

I will present the latest results on our analysis of the non-linear X-ray to UV relation in quasars. I will show that this correlation is not only very tight, but can be potentially even tighter by including a further dependence on the emission line full-width half maximum. We interpreted this new relation through a very simple, ad-hoc model of accretion disc corona, where a geometrically thin, optically thick accretion disc is coupled with a magnetized uniform corona. Our results imply that the $L_X - L_{opt}$ relation is the manifestation of an ubiquitous physical mechanism, whose details are still unknown, that regulates the energy transfer from the accretion disc to the X-ray emitting corona in quasars.

Dust in the wind – a new paradigm for the dust emission in AGN

Apr 4
11:55
Contributed

Submitted by: Sebastian HOENIG
University of Southampton

The classical dusty torus has long been held responsible for angle-dependent obscuration and as the origin of the infrared (IR) emission from AGN. Current models to interpret the IR emission are based on this torus paradigm. Using infrared interferometry, it was recently discovered that the bulk of the mid-IR emission is not originating from a compact torus, but from an extended source in the outflow region of the AGN, ranging from sub-parsec scales to 100s pc. A new paradigm is emerging where two components a geometrically thin dusty disk and an extended dusty wind are responsible for the observed IR emission, obscuration, and potentially feedback reactions. In this talk, I will review the current state of knowledge from resolved

infrared observations of AGN. New radiative transfer models are presented that are able to simultaneously reproduce the observed SEDs and geometric distribution of the light. I will discuss implication in terms of wind models, possible driving mechanisms, and our new efforts in radiative hydrodynamic simulations of the dusty environment around AGN.

Quasars shine longer than 25 Myr - A Statistical lifetime constraint from the HeII Transverse Proximity Effect

Apr 4
12:15
Contributed

Submitted by: Tobias SCHMIDT
Max Planck Institute for Astronomy

The reionization of helium at $z \sim 3$ is the final phase transition of the intergalactic medium and supposed to be driven purely by quasars. The HeII transverse proximity effect – enhanced HeII transmission in a background sightline caused by the ionizing radiation of a foreground quasar – therefore offers a unique opportunity to probe the morphology of HeII reionization and to investigate the emission properties of quasars, e.g. ionizing emissivity, lifetime and beaming geometry. We use the most-recent HST/COS far-UV dataset of 22 HeII Lyα absorption spectra and conduct our own dedicated optical spectroscopic survey to find foreground quasars around these HeII sightlines. Based on a set of 66 foreground quasars, we perform the first statistical analysis of the HeII transverse proximity effect. Despite a large object-to-object variance, our stacking analysis reveals an excess in the average HeII transmission near the foreground quasars at 3sigma significance. This statistical evidence for the transverse proximity effect is corroborated by a clear dependence of the signal strength on the inferred HeII ionization rate at the background sightline. Our detection places, based on the transverse light crossing time, a geometrical limit on the quasar lifetime of $t_Q > 25$ Myr. This evidence for sustained activity of luminous quasars is relevant for the morphology of HI and HeII reionization and helps to constrain AGN triggering mechanisms, accretion physics and models of black hole mass assembly. We show how future modeling of the transverse proximity effect can additionally constrain quasar emission geometries and e.g. clarify if the large observed object-to-object variance can be explained by current models of quasar obscuration. Based on: http://arxiv.org/abs/1701.08769

BLR winds in hyper-luminous quasars

Apr 4
12:35
Contributed

Submitted by: Giustina VIETRI
INAF-OAR

The WISE/SDSS-selected hyper-luminous quasar (WISSH) survey is an extensive multi-band observing program to investigate the role of nuclear activity in SMBH-galaxy self-regulated growth via extended outflows. We found that WISSH AGN are typically powered by highly accreting (0.3 - 3 L_{Edd}), ten billion solar masses SMBHs, demonstrating that WISSH provides a simple and valuable tool to complete the census of the extreme SMBH population in the universe. We found that the 70% of quasars lacks [OIII] emission but shows strong winds traced by 3,000-8,000 km/s blueshifts of the high-ionization (CIV) with respect to low-ionization (Hβ) broad emission lines, revealing strong radiatively driven winds that dominate the BLR kinematics. The possible origins of this intriguing dichotomy which involves fundamental parameters such as bolometric luminosity, SMBH mass, Eddington ratio and shape of the UV-X-ray spectrum will be discussed.

Topic B

The AGN as a Protostar

Apr 4
14:30
Invited

Moshe ELITZUR
University of Kentucky & UC Berkeley

The variety of observations of Active Galactic Nuclei (AGN) show that the nuclear activity is powered by a central massive black hole that drives radio emitting jets and ionizes surrounding line-emitting clouds. This central engine is surrounded by an obscuring torus, comprised of optically thick dusty clouds in a rotating configuration. There is no accepted scenario yet for the dynamics behind this complex environment. In this talk I will suggest that we may get our clues from star formation,the other known case of accretion to a point mass, and present observational evidence in support of this suggestion.

The self-consistent dynamical model of the Broad Line Region

Apr 4
15:00
Contributed

Submitted by: Bozena CZERNY
Center for Theoretical Physics

In 2011 we proposed an idea that the BLR forms as a failed wind driven by the dust (FRADO - Failed Radiatively Accelerated Dusty Outflow). We now developed a detailed description of the dynamics of the clouds. Clouds rise due to the radiation pressure from the disk, acting on the cloud dust content, they become irradiated by the non-local radiation from the innermost part of the accretion disks, the dust then evaporated, the radiation pressure drops and the clouds fall back as a dustless clouds. The location of the inner radius of the BLR is thus given by the condition then the effective temperature drops below the dust sublimation temperature. Also the forces acting on dust are given by the global parameters: black hole mass, accretion rate and a black hole spin. We give simple expressions for the ratio of the vertical to Keplerian velocity component in this model, we calculate the full dynamics numerically, and wepredict the shape of the emission lines at the basis of the proposed dynamics.

Planting seeds for gravitational wave generators around active galactic nuclei: Analog of planetary systems around massive black holes.

Apr 4
15:20
Contributed

Submitted by: Douglas LIN
University of California, Santa Cruz, USA

Advanced LIGO event GW150914 has been attributed to the coalescence of two black holes with masses more than double that of most known stellar black holes. Formation of such stellar black holes directly through supernova explosions requires massive, metal-deficient progenitors. This requirement and their nearly equal masses may not be compatible with its occurrence in the local Universe. I consider an alternative possibility which may lead to the robust production of binary black holes with masses up to a hundred solar masses in the proximity of active galactic nuclei (AGNs). I will describe some relevant mechanisms which are analogous to the astrophysics of planet formation. I will discuss the implications of this scenario in the context of structure and evolution of AGN disks including the cause of their super solar metallicity, duty cycle of their active phase, and the rapid growth of their central massive black holes.

Inflow and Outflow in the Broad Line Region

Apr 4
15:40
Contributed

Submitted by: Anna PANCOAST
Harvard-Smithsonian Center for Astrophysics

While the broad line region is too small to be spatially resolved for broad emission lines in the optical and UV, we can still probe its structure by using light echoes through the technique of reverberation mapping. A new generation of high-quality reverberation mapping datasets has motivated a direct modeling approach in which the geometry and dynamics of the broad line region can be constrained. I will discuss what we have learned so far from applying a simply parameterized, phenomenological model for the broad line region to high-quality reverberation mapping data for over a dozen AGN. Our results suggest that inflow is prevalent in the H-beta broad line region, although at least one object shows a strong preference for outflow.

Jet physics of accreting super-massive black holes in the Fermi era

Apr 4
16:00
Contributed

Submitted by: Filippo D'AMMANDO
DIFA University of Bologna / INAF-IRA

The Fermi Gamma-ray Space Telescope with its main instrument on-board, the Large Area Telescope, opened a new era in the study of high-energy emission from Active Galactic Nuclei. When combined with contemporaneous ground- and space-based observations, Fermi-LAT achieves its full capability to characterize the jet structure and the emission mechanisms at work in radio-loud AGN with different black hole mass and accretion rate, from flat spectrum radio quasars to narrow-line Seyfert 1 galaxies. Moreover, the detection of blazars at redshift beyond 3 allows us to constrain the growth and evolution of heavy black holes over cosmic time. In this talk I will discuss the broad-band properties of gamma-ray emitting AGN, highlighting major findings and open questions regarding the jet physics, cosmological evolution, and accretion processes of super-massive black holes in the Fermi era.

The physical parameters of jets - the non-uniform transversal model.

Apr 4
16:20
Contributed

Submitted by: Elena NOKHRINA
Moscow Institute of Physics and Technology

The physical parameters of relativistic jets from active galactic nuclei can be estimated using the core-shift effect and the brightness temperature of the radiating core. The standart model of the radiating region is a uniform jet domain, with magnetic field and particles number density obeying the Blandford-Konigl model. We use the non-uniform transversal jet model obtained earlier in semi-analytical and numerical simulations in order to estimate the jet physical parameters usings the observations. In particular, we show that the magnitude of a magnetic field, obtained in the frame of the non-uniform jet model, is two orders higher than the one obtained in the uniform model.

Two mass independent Eddington ratio distribution functions regulate black hole growth of blue and red galaxies in the local Universe

Apr 4
17:10
Contributed

Submitted by: Anna WEIGEL
ETH Zurich

Using a phenomenological model I will show that black hole growth in the local Universe can be described by two separate, mass independent Eddington ratio distribution functions (ERDFs). I assume that black holes can be classified into two independent groups: those with radiatively efficient accretion, primarily hosted by optically blue galaxies, and those with radiatively inefficient accretion, which are mainly found in red galaxies. Using observed galaxy stellar mass functions as input, I constrain the ERDF by forward modelling and comparing to observed AGN luminosity functions. I use the observed hard X-ray and 1.4 GHz radio luminosity functions to constrain the ERDF for radiatively efficient and inefficient AGN, respectively. I show that these AGN luminosity functions are consistent with mass independent, broken power law shaped ERDFs. This result implies a mass independent AGN fraction and that AGN hosts are randomly drawn from the galaxy population. Galaxy colour seems to be a direct indicator of the ERDF. However, I argue that the ERDF is most likely not shaped by large, galaxy-scale effects, but by how efficiently material can be transported from the inner few parsecs to the accretion disc. The results are incompatible with the simplest form of mass quenching which requires AGN activity to increases as a function of stellar mass. Furthermore, if reaching a certain Eddington ratio is a sufficient condition for maintenance mode, it can occur in all red galaxies, not just the most massive ones.

High accretion rate AGN: Can theory, observations and simulations agree on the basic physics driving thin and slim accretion discs?

Apr 4
17:30
Contributed

Submitted by: Nuria CASTELLO-MOR
Tel Aviv University

A central missing piece of information for understanding AGN physics is the correct interpretation of the observed spectral energy distribution (SED), in particular the differentiation between geometrically thin and slim accretion discs (ADs) representing low and high accretion rate onto the central BH. Unfortunately, theoretical calculations of the disc SED do not agree with the most recent simulations and the reason for the discrepancy is not really understood. I will present new panchromatic observations of thin and slim disc candidates which demonstrate that our understanding of fast accreting systems is very limited. In particular, none of the theoretical and numerical calculations, available so far, come close to a real description of the observed SED of fast accreting systems. I will also show how additional physical processes, or a very special geometry, must be at work in order to explain the reduced UV radiation in fast accreting systems, reconciling theory, simulations

and observations. Finally, I will show that probing the extreme-UV and IR bands with high-resolution observations of fast accreting systems is the most promising way to advance our understanding of the basic accretion processes in high-accretion rate AGN.

A model for periodic balzars

Apr 4
17:50
Contributed

Submitted by: Emanuele SOBACCHI
Ben Gurion University

We describe a scenario to explain blazar periodicities with timescales of $\sim$ few years. The scenario is based on a binary super-massive black hole (SMBH) system in which one of the two SMBH carries a jet. We discuss the various mechanisms that can cause the jet to precess and produce corkscrew patterns through space with a scale of $\sim$ few pc. It turns out that the dominant mechanism responsible for the precession is simply the imprint of the jet-carrying SMBH orbital speed on the jet. Gravitational deflection and Lense-Thirring precession (due to the gravitational field of the other SMBH) are second order effects. We complement the scenario with a kinematical jet model which is inspired to the spine-sheath structure observed in M87. One of the main advantages of such a structure is that it allows the peak of the synchrotron emission to scale with frequency according to $\nu F \propto \nu^{\xi}$ as the viewing angle is changed, where ξ is not necessarily 3 or 4 as in the case of jets with uniform velocity, but can be $\xi \sim 1$. Finally, we apply the model to the source PG1553+113, which has been recently claimed to show a $T_{\rm obs} = (2.18 \pm 0.08)$yr periodicity. We are able to reproduce the optical and gamma-ray light curves and multiple synchrotron spectra simultaneously. We also give estimates of the source mass and size.

Making Low-mass Supermassive Blackhole Spin

Apr 4
18:10
Contributed

Submitted by: Jing WANG
National Astronomical Observatories, Chinese Academy of Sciences

The origin of spin of low-mass supermassive black holes (SMBHs) is still a puzzle at present. We report here a study on the host galaxies of a sample of radio-selected nearby (z $<$ 0.05) Seyfert 2 galaxies with a BH mass of $10^{6-7} M_{\odot}$. By modeling the SDSS r-band images of these galaxies through a two-dimensional bulge+disk decomposition, we identify a new dependence of SMBH radio power on host bulge surface brightness profiles, in which more powerful radio emission comes from an SMBH associated with a more disk-like bulge. This result means low-mass and high-mass SMBHs are spun up by two entirely different modes that correspond to two different evolutionary paths. A low-mass SMBH is spun up by a gas accretion with significant disk-like rotational dynamics of the host galaxy in the secular evolution, while a high-mass one by a BHBH merger in the merger evolution.

Topic C

Inferring physical properties of z$\sim$ 6 quasars from mm and X-ray observations

Apr 4
18:30
Contributed

Submitted by: Simona GALLERANI
Scuola Normale Superiore

High$-z$ quasars represent ideal laboratories for studying the properties of their host galaxies and the coeval formation with the SMBHs they contain. I present millimeter and X-ray observations of one of the most distant quasar known, namely SDSSJ1148 a z =6.4. Firstly, I discuss the detection of broad wings in the [CII] emission line observed with the Plateau de Bure Interferometer. The extent of the wings and the size of the [CII] emitting region are indicative of a powerful and massive QSO-driven outflow. I compare these data with the results of cosmological SPH simulations, and I discuss how quasar feedback affect the properties of z$\sim$ 6 quasar host galaxies. Moreover, I present the serendipitous detection of the CO(1716) line toward the same source. I explain how these observations, once combined with radiative calculations of X-ray dominated and photo-dissociation regions, allow us to derive the molecular cloud and radiation field properties in the nuclear region of J1148. I also compare these results with new ALMA observations of highly excited CO lines (J $>$ 14) in other two $z > 6$ quasars. Finally, I show the recent detection of X-ray emission in J1148 obtained with Chandra. I discuss the possibility of using X-ray observations to provide measurements of the molecular hydrogen mass that are independent from millimeter observations of CO emission lines.

An X-ray/SDSS sample: multiphase outflow incidence, Dependence on AGN luminosity, and PLASMA properties

Apr 4
18:50
Contributed

Submitted by: Michele PERNA
Osservatorio Astrofisico di Arcetri

The connection between the growth of super-massive black holes and the evolution of their host galaxies is nowadays well established, through the underlying mechanisms explaining their mutual relation are still debated. Multi-phase fast, massive outflows have been postulated to play a crucial role in this process. I'll present the spectroscopic analysis results we obtained studying a sample of $\sim$ 600 X-ray/SDSS AGNs at $z < 0.8$. We combined ionized emission line and neutral absorption feature information to derive kinematic and physical properties of both warm and cold gas

components of the ISM. We derived the incidence of ionized and atomic outflows, covering a wide range of AGN bolometric luminosity (from 10^{42} to 10^{46} erg/s) and related the presence of ionized outflows with different AGN power tracers, such as black hole mass, [O III] and X-ray luminosity. We also studied in detail various diagnostic diagrams to infer information about flowing gas ionization mechanisms. Finally, the analysis of stacked spectra and sub-samples of sources with high S/N temperature- and density-sensitive emission lines permitted to constrain, for the first time, the plasma properties of the outflowing ionized gas component. I will discuss about the possible implications of these results in the context of the effects of outflows on the host galaxies.

A main sequence for quasars

Apr 5
8:45
Invited

Paola MARZIANI
INAF - Osservatorio Astronomico di Padova

The last 25 years have seen a major step forward in the analysis of optical and UV spectroscopic data of large quasar samples. Multivariate statistical approaches have led to the definition of systematic trends (first and second eigenvector derived from Principal Component Analysis) in observed properties that are the basis of physical and dynamical modeling of quasar structure. In this talk I will discuss the empirical correlates of the so-called quasar "main sequence associated with the quasar eigenvector 1, its governing physical parameters, as well as luminosity effects associated with the second eigenvector. I will also briefly discuss quasars in a segment of the main sequence that includes the strongest FeII emitters. These sources show a small dispersion around a well-defined Eddington ratio value, a property which makes them potential Eddington standard candles.

The virial factor and biases in Single Epoc Black Hole Mass determination

Apr 5
09:15
Contributed

Submitted by: Julian MEJIA-RESTREPO *Speaker: Paulina LIRA*
Universidad de Chile

In this talk we compare two alternative approaches that we have followed to estimate the black hole mass (Mbh) in our sample that consist of 39 unobscured AGN at $z \sim$1.55 observed by VLT/X-shooter. The first approach consists of the broadly used Single Epoch virial method (Mse) that stands on the relation between the AGN luminosity and the size of the Broad line region (BLR) obtained from reverberation campaigns. The second approach (Mad) is obtained from Bayesian SED fitting of the Accretion disk. Our results suggest that the virial factor f is strongly anti-correlated with the observed FWHM of the Balmer-line-width. We tested different alternatives to explain the origin of this behavior, including line of sight (LOS) BLR inclination, turbulent components, and non-virial motion of the BLR. We do not find, however, conclusive evidences favoring any of these scenarios. Hence, we propose that the observed anticorrelation between f and the FWHM is inherent to the physics of the BLR

The Optical Fundamental Plane of black hole activity

Apr 5
09:35
Contributed

Submitted by: Payaswini SAIKIA
Dept of Astrophysics, IMAPP, Radboud University, Nijmegen

Black hole accretion disc and its associated jets form a coupled system, which is thought to scale globally across the entire black hole mass range - from the stellar mass X-ray Binaries to the supermassive Active Galactic Nuclei. Using a sample of 39 low-luminosity AGN selected from the Palomar Spectroscopic Survey and a sample of the best-studied stellar mass X-ray binaries in the low/hard state, we report the discovery of a fundamental plane of black hole activity in the optical band, with the nuclear [OIII] emission line luminosity as a tracer of accretion rate. This plane is obtained with the supermassive black hole sample alone, and for the first time, we show that the stellar mass black holes statistically agree with the found relation. We also study a large sample of 10149 AGN on the optical fundamental plane, obtained by cross-correlating the AGN samples in SDSS survey and 1.4 GHz VLA FIRST catalogue. We show that 1.4 GHz FIRST fluxes do not trace pure AGN nuclear activities, and is rather heavily contaminated by environmental and other non-nuclear factors. We conclude that 1.4 GHz VLA FIRST fluxes do not trace the instantaneous nuclear radio emission and should not be used on the fundamental plane and in other studies of AGN nuclear activity.

Black Hole mass scaling relations: the case of local AGN2

Apr 5
09:55
Contributed

Submitted by: Eleonora SANI
ESO - Chile

Nowadays there is growing observational evidence that type 1 and type 2 AGN are actually characterised by intrinsically different physical properties. Thanks to our new virial relation based on unbiased physical quantities, i.e. hard Xray luminosity and Paβ emission line FWHM, we have been able to measure for the first time in a virial way also the supermassive black hole mass of AGN2, whose values have been up today estimated using scaling relations. With direct virial masses for AGN2, we discuss, for the first time, if the relation between the BH mass and the bulge luminosity hold also for our AGN2, thus putting a missing piece to the AGN/galaxy coevolution puzzle.

New constraints on the black hole spin in radio-loud quasars

Apr 5
10:15
Contributed

Submitted by: Andreas SCHULZE
NAOJ

One of the major unsolved questions on the understanding of the AGN population is the origin of the dichotomy between radio-quiet and radio-loud quasars. The most promising explanation is provided by the spin paradigm, which suggests radio-loud quasars to exhibit higher black hole spin. However, the measurement of black hole spin remains extremely challenging. We here present results comparing the mean radiative efficiencies of carefully matched samples of radio-loud and radio-quiet SDSS quasars at 0.3 <z< 0.8. We find evidence for systematically larger radiative efficiencies by a factor 1.5 in the radio-loud sample, suggesting that the radio-loud quasar population has on average higher black hole spin than the radio-quiet population. This provides strong observational support for the black hole spin paradigm.

Ultraviolet/optical emission of the ionised gas in AGN: diagnostics of the ionizing source and gas properties

Apr 5
11:05
Contributed

Submitted by: Anna FELTRE
CRAL - Centre de Recherche Atrophysique de Lyon

The emission from the ionised gas in quasars and active galactic nuclei (AGN) contains valuable clues about the nature of the radiation source and the physical conditions of the emitting regions surrounding the central black holes. In particular, high-quality spectroscopy from forthcoming facilities, such as JWST and extremely large ground based telescopes (E-ELT, TMT), will allow detailed statistical studies of the ultraviolet rest-frame spectral features of the very distant AGN with unprecedented accuracy. In this context, it is fundamental to develop the dedicated models required for the interpretation of these revolutionary datasets in terms of the physical properties of the ionizing sources. In this talk I will first briefly describe the new photoionization models of the narrow-line emitting regions (NLR) of AGN that we have recently computed. I will present new ultraviolet and standard optical spectral diagnostics to distinguish between nuclear activity and star formation. I will then explain how predictions of AGN nebular emission can be best used to understand the physical properties of the ionised gas in the NLR of AGN, thought the exploitation of new sophisticated SED fitting techniques. To conclude, I will present recent results from a study on one of the most comprehensive set of optical spectra (from VIMOS/VLT) sampling the rest-frame ultraviolet range of $\sim$ 90 type 2 AGN ($1.5 < z < 3$), drawn from the z-COSMOS deep survey.

The relationship between Mg II broad emission and quasar inclination angle

Apr 5
11:25
Contributed

Submitted by: Conor WILDY

Center for Theoretical Physics, Warsaw

We analyse the effect of quasar inclination angle on the line profile of broad Mg II 2798, using a sample of giant radio quasars taken from Kuzmicz and Jamrozy (2012). We improve on the subtraction of background emission in the spectral region of Mg II by additionally including the starlight contribution, which is especially important in high inclination objects. Early investigations confirm the similarity in profile shape (including width) of the lowest and highest inclination objects. Such a result could be explained by the presence of an ionizing continuum produced in the jet, generating a broad line region extended beyond the inner parsec, as reported in Leon-Tavares et al. 2013. This follows from the extended emission reducing the effect of obscuration on the observed line. For the quasar of highest inclination angle, we find that the background emission is due almost entirely to starlight and Fe II emission, while the lowest inclination quasar background is dominated by the power-law continuum. Unlike the case for the Mg II line, this suggests obscuration of the disk is important here. This is consistent with the presence of an extended BLR, while the disc remains compact. Further work will determine the dependence of Mg II strength/profile and background emission on inclination across the entire sample, in an attempt to test this hypothesis.

New constraints on quasar broad absorption and emission line regions from microlensing

Apr 5
11:45
Contributed

Submitted by: Damien HUTSEMEKERS

University of Liege, Belgium

Co-authors D. Hutsemekers, L. Braibant, D. Sluse, T. Anguita, R. Goosmann Gravitational microlensing is a powerful tool allowing one to unveil the structure of quasars on sub-parsec scale, and in particular of the broad emission line region. This is possible owing to the analysis of the microlensing-induced broad line deformation (core/wings or red/blue) observed in some gravitationally lensed quasars. After a description of examples of strong profile deformations, different in low- and high-ionization lines, we present newly developed simulations of line profile changes for various models of the emission line region in presence of microlensing. We explain how these simulations, confronted to observations of microlensed quasars, strongly favors the keplerian disk model for the low-ionization emission line region. We also discuss how microlensing helps to probe the structure of other unresolved components, such as the broad absorption line and the continuum scattering regions.

Polarization of broad lines in AGNs and black hole mass estimation.

Apr 5
12:05
Contributed

Submitted by: Djordje SAVIC

Astronomical Observatory of Belgrade, L'Observatoire astronomique de Strasbourg

Co-authors: R. Goosmann, F. Marin, V. Afanasiev, and L. Popovič The last few years have seen rapid advancement in our understanding of the role supermassive black holes (SMBHs) play in the evolution of galaxies. Part of this progress come from increased con dence in the techniques for measuring SMBH masses, both directly indirectly, and part has arisen from the discovery of new correlations between SMBH masses the properties of the host galaxies.
Here we present our investigations of the possibilities and limits of the method for measuring SMBH masses from the shape of the polarization angle (PA) across the broad line profiles in AGNs, as presented by Afanasiev & Popovič (2015). We use 3D Monte Carlo radiative transfer code STOKES to model polarized broad line emission with the central engine consisting of a point-like isotropic continuum source surrounded by the BLR and the scattering region.

The nature of Intermediate Line Region (ILR) in AGN

Apr 5
12:25
Contributed

Submitted by: Tek Prasad ADHIKARI

Nicolaus Copernicus Astronomical Center, Polish Academy of Sciences, Warsaw, Poland

In the recent years, the emission lines with velocity FWHM $\sim$ 700 - 1200 km s^{-1} originated from a region between BLR and NLR have been observed for some AGN. This is different from the usual observational picture of line emission in most AGN where a significant suppression due to dust grains occurs in the intermediate line region (ILR) between BLR and NLR. In this work, we model an Intermediate line region (ILR) using a photoionisation code CLOUDY and show that the effect of dust is insignificant above certain threshold gas denisty of the emitting cloud, independent of the shape of ionising radiation from a central AGN. Increasing the gas density to $\sim 10^{11.5}$ cm^{-3} at the dust sublimation radius provides the continuous line emission versus radial distance and fully explains the observed ILR in some AGN. We investigate how the line emission vs radial distance behaves with the different gas density profiles used in our model. We discuss ILR as a possible indicator of the gas dynamics in the emission region.

Topic D

Low redshift QSO environments

Apr 6
08:35
Contributed

Submitted by: Daniela BETTONI
INAF - Osservatorio Astronomico di Padova

Coauthors: D. Bettoni, R. Falomo, J. Kotilainen and K. Karhunen QSO phenomenon assumes that the nuclear activity occurs due to the major merger of two gas-rich galaxies that feed the central engine and enable the growth of a spheroidal stellar component. However, important details on what triggers the gas fueling and how nuclear activity affects the subsequent evolution of the host galaxies remain poorly understood. The study of correlations between black hole masses, properties of the host galaxies and their environments could provide relevant clues to investigate the fundamental issues on quasar activity and its role on the evolution of galaxies. To pursue this goal it is crucial to analyze an adequate large sample of active QSOs and a suitable comparison sample of inactive galaxies. We investigate a sample of $\sim$ 400 low z (< 0.5) quasars that were imaged in the SDSS Stripe82. These images are $\sim$ 2 mag deeper than standard Sloan images. For these quasars we undertake a study of the host galaxies and of their environments in u,g,r,i and z bands. For a subsample of low z sources the imaging study is complemented by spectroscopy of QSO hosts and close companion galaxies. This study suggests that the fueling and triggering of the nuclear activity is only weakly dependent on the local environment of quasars. Contrary to past suggestions, for low z QSO there is a very modest connection between recent star formation and the nuclear activity.

The host galaxies of AGN with powerful relativistic jets

Apr 6
08:55
Contributed

Submitted by: Jari KOTILAINEN
University of Turku

We have studied the nearinfrared morphology of a large sample of intermediate-redshift (0.3 <z< 1.0) radio-loud AGN with powerful relativistic jets (BL Lac objects and Flat Spectrum Radio Quasars [FSRQ]). While the host galaxy luminosity of BL Lacs is independent (or weakly anti-correlated) of the AGN luminosity, for FSRQs we found the host and AGN luminosities to be positively correlated. This is in agreement with semi-analytical models, where the correlation is interpreted as induced by a common supply of gas for the AGN and for galactic star formation, with major mergers triggering the cold gas flows. This correlation indicates that

the powerful relativistic jets clearly affect the evolution of their host galaxies. First follow-up results from imaging campaigns of FSRQs at lower and higher redshift will also be presented, with the aim of assessing the role of the jets in the assembly of their host galaxies, and the cosmic evolution of the correlation.

Resolving the stars, dust and molecular gas on 100 pc-scales in quasar host galaxies with gravitational lensing

Apr 6
09:15
Contributed

Submitted by: John MCKEAN
ASTRON / Kapteyn Astronomical Institute

Understanding the interplay between the quasar and its host galaxy is crucial for investigating the co-evolution of star-formation and AGN activity. At cosmologically interesting epochs where such activity peaks, current studies are limited by the resolution of the observations, which makes separating and interpreting the different emission mechanisms challenging. However, the development of sophisticated gravitational lensing techniques in combination with high resolution imaging now allows the structure of such sources to be mapped in detail. In this talk, I will give a brief critical assessment of the current state-of-the-art in gravitational lensing source reconstruction methods. I will then present a detailed study of the radio-quiet gravitationally lensed quasar RXJ1131-1231 at optical (HST), radio (VLA) and mm (ALMA) wavelengths that is used to map the stellar, non-thermal synchrotron (star-formation) and molecular gas (CO) on 100 parsec-scales. These data show that the spiral quasar host galaxy has a plentiful supply of molecular gas to feed both star-formation and AGN activity, but also, thanks to the excellent angular resolution, we find evidence for feedback from the AGN that directly disturbs the molecular gas distribution. If time permits, I will also present an initial study of the dust and molecular gas within the radio-loud gravitationally lensed quasars B1938+666 and MG J0414+0534, which show evidence for an extended starburst and molecular gas distribution on kpc-scales.

A Relation between Star-Formation and Accretion Luminosities of Infrared-Luminous Galaxies in the COSMOS Field

Apr 6
09:35
Contributed

Submitted by: Kenta MATSUOKA
University of Florence

The connection between star formation (SF) and active galactic nucleus (AGN) is a key phenomenon to understand the coevolution of galaxies and supermassive black holes (SMBHs). Many studies have tried to understand the SF-AGN connection, e.g., by focusing on a relation between SF and AGN luminosities. However, these studies were mainly based on moderately matured AGNs (e.g., quasars) in the unobscured epoch (i.e., a late stage in the major merger evolutionary scenario). In

order to understand the SF-AGN link correctly, it is crucial to focus on heavily-obscured AGNs which would show violent star formation with buried BH growth. Thus, we focus on infrared-luminous galaxies, e.g., ulitraluminous infrared galaxies (ULIRGs) in the COSMOS field, and investigate the relation between SF and AGN luminosities by using high-energy (i.e., 3-24 keV) X-ray data obtained by the Nuclear Spectroscopic Telescope Array (NuSTAR). In this meeting, we will discuss the SF-AGN connection based on our resent results about the relation between SF and AGN luminosities.

Tracing the external origin of the AGN gas fuelling reservoir

Apr 6
09:55
Contributed

Submitted by: Sandra RAIMUNDO
Dark Cosmology Centre, University of Copenhagen

Molecular gas is thought to be the main supply for AGN and quasar fuelling; however, the physical mechanisms that drive the gas supply to the central black hole are still not clear. In this contribution I will present the recent discovery of a counter-rotating molecular gas disc in the centre of the Seyfert galaxy MCG–6-30-15. Using high spatial resolution integral field spectroscopy data we determined that the AGN fuelling reservoir at the scales of r $<$ 50 - 100 pc has been replenished by a recent external accretion event. MCG–6-30-15 provides one of the few examples in which the origin of the molecular gas reservoir for AGN fuelling can be identified. I will discuss the stellar and gas properties in the vicinity of the black hole in MCG–6-30-15 and the implications of external gas accretion to AGN fuelling.

The two missing parameters in AGN Unification

Apr 6
10:15
Contributed

Submitted by: Beatriz VILLARROEL
Uppsala University/ETH Zurich

The last years, numerous works have shown the necessity of including effects beyond torus obscuration to explain the dichotomy between Type-1 AGN and Type-2 AGN. Using supernovae from the intermediate Palomar Transient Factory, and galaxies from SDSS, WISE and Galaxy Zoo, we take an empirical look at the connection between the AGN host galaxy properties and the central engines of AGN. We find remarkable differences in detection rates of supernovae in Type-1 and Type-2 AGN hosts. We also find that Type-1 and Type-2 AGN matched in the host galaxy dust emission differ by more than a factor of 10 in L[OIII]5007, a difference too large to be explained by any [OIII]5007 anisotropy. This suggests that the average AGN luminosity and stellar ages in the hosts must differ considerably between the Type-1 and Type-2 AGN populations.

The most powerful AGNs reside in the most strongly star-forming galaxies.

Apr 6
11:05
Contributed

Submitted by: Emmanuel BERNHARD
University of Sheffield

Although computer simulations suggest that AGNs quench SFRs via feedback, there is little evidence of a strong anti-correlation between AGN luminosity and SFR. Previous studies have, however, focussed on absolute AGN luminosity, whereas power per unit host-mass (i.e., specific AGN luminosity) may be more relevant. To investigate this, we consider the star-forming properties of 1620 X-ray selected AGN host galaxies as a function of their specific AGN luminosity. Contrary to finding evidence of "negative feedback", we find that the SFRs of high specific luminosity AGNs are slightly enhanced compared to their lower specific AGN luminosity counterparts. This result is reinforced by our finding of a significantly higher fraction of starbursting hosts among high specific luminosity AGNs compared to that of the general star-forming galaxy population. To investigate this further, we have developed a simple analytical model that uses the X-ray luminosity functions and the mass functions to infer the specific AGN luminosity distribution at various redshifts, split in terms of star-forming and quiescent galaxies. We found that the knee of the specific AGN luminosity distribution evolves strongly with redshift. Our model also predicts that quiescent galaxies dominate the knee of the specific AGN luminosity distribution, whereas star-forming galaxies dominate at high specific AGN luminosities.

Gravitational lensing reveals extreme star formation in quasar host galaxies

Apr 6
11:25
Contributed

Submitted by: Hannah STACEY
Kapteyn Institute / ASTRON

The physical connection between star formation and AGN growth is a fundamental aspect in the study of galaxy formation and evolution. However, investigating these processes in the high redshift Universe is challenging due to limitations in sensitivity and resolution of observational data. While there are previous studies revealing high levels of star formation in quasar host galaxies, these studies have inevitably focused on a few bright sources. By targeting sources that are gravitationally-lensed, intrinsic flux densities below the confusion limit of field sources can be observed, thus probing lower luminosity sources and allowing us to construct a more complete sample of the quasar population. We have derived dust temperatures, dust masses, SFRs and FIR luminosities for the 104 gravitationally-lensed quasars observed with Herschel/SPIRE, the largest such sample ever studied. Evidence is found for extreme star formation in 83% of the sample, similar to dusty star-forming galaxies at high redshifts. This result is in line with current models of quasar evolution, but suggests that most quasars exist in a transitional phase between a dusty star-forming galaxy and an AGN dominated system, indicating that positive AGN and stellar feedback plays a significant role in the evolutionary process. In addition to the Herschel study,

we present the initial results of our high-resolution studies of the FIR emission as traced by ALMA, which resolve the dust emission and star forming regions on scales of 10-200 parsecs in combination with sophisticated gravitational lens modelling techniques.

On the frequency of star-forming galaxies in the vicinity of powerful AGNs

Apr 6
11:45
Contributed

Judit FOGASY

Chalmers University of Technology, Department of Earth and Space Sciences

In the last decade several massive molecular gas reservoirs were found < 100 kpc distance from active galactic nuclei (AGNs), residing in gas-rich companion galaxies. The study of AGN-gas-rich companion systems opens the opportunity to determine whether the stellar mass of massive local galaxies was formed in their host after a merger event or outside of their host galaxy in a close starbursting companion and later incorporated via mergers. However, the discovery of close quasarstar-forming galaxy systems is challenging, since it requires high-resolution observations in the far-infrared and mm range. In this talk I focus on two high$-z$ AGNs: the submm-discovered quasar SMM J04135+10277 ($z = 2.84$), which has a gas-rich companion galaxy $\sim$42 kpc away from the quasar and the radio galaxy TXS 0828+193 (z =2.57), which has a potential gas-rich companion. I present new observational data obtained with ALMA with the aim of investigating the properties of their host galaxy and companions.

Large-scale environments of narrow-line Seyfert 1 galaxies

Apr 6
12:05
Contributed

Submitted by: Emilia JÄRVELÄ

Aalto University Metsähovi Radio Observatory

Narrow-line Seyfert 1 galaxies (NLS1) have proven to be a peculiar class of active galactic nuclei (AGN). Gamma-ray detections of multiple NLS1s by Fermi confirmed that they are able to produce fully developed relativistic jets. This discovery challenges our current understanding of AGN since the differences between NLS1s and other gamma-ray emitting AGN are pronounced; NLS1s have lower mass black holes, higher accretion rates, preferably compact radio morphology, they reside mostly in spiral galaxies, and were thought to be radio-quiet. NLS1s offer a unique opportunity to study the jet phenomena with a different set of initial properties, but they also complicate the general AGN scenario. It is necessary to revise the AGN unification schemes to fit in NLS1s, question our knowledge about the mechanisms triggering and maintaining the AGN activity, and rethink the evolutionary lines of the different AGN populations. NLS1s are an essential piece in the AGN puzzle but so far our knowledge of them is very limited. NLS1 studies are further complicated by the seemingly heterogeneous nature of the NLS1 population; some of them seem to be totally radio-silent, but a considerable fraction are radio-loud and

thus probably host jets. What triggers the radio loudness remains unclear, but, for example, the host galaxy properties and the large-scale environment might play a role. Environment studies of NLS1s might offer insight into, for example, how their surroundings affect their intrinsic properties, and where should they be placed in the big picture of AGN. We studied the large-scale environments of NLS1s using diverse and large, statistically significant, samples. We compare them with the large-scale environments of other types of AGN, as well as study the differences in the environments within the NLS1 population. We will present the results of this study and discuss its implications for interpreting the nature of the NLS1 population, and the evolution and unification scenarios of AGN.

Fast-growing SMBHs in Fast-growing Galaxies, at $z \sim$5: the Role of Major Mergers as Revealed by ALMA

Apr 6
12:25
Contributed

Submitted by: Benny TRAKHTENBROT
ETH Zurich

I will present a long-term, multi-wavelength project to understand the epoch of fastest growth of the most massive black holes, at $z \sim 4.8$. These luminous quasars have rather uniform properties, with typical accretion rates and black hole masses are L/L_{Edd} ∼0.7 and $M_{BH} \sim 10^9 M_\odot$. The sample consists of "FIR-bright" sources which were individually detected in previous Herschel/SPIRE observations, with star formation rates of SFR > 1000 $M_\odot$/yr, and "FIR-faint" sources for which Herschel stacking analysis implies a typical SFR of ∼400 $M_\odot$/yr. Six of the quasars are studied in a new ALMA project, which provides clear detections of the dusty ISM in all six hosts, in both continuum ($\lambda_{rest} \sim 150\mu$m) and [CII]157.74$\mu$m line emission. We detect companion, spectroscopically confirmed sub-mm galaxies (SMGs) for three sources – one FIR-bright and two FIR-faint, separated by ∼ 14 - 45 kpc from the quasar hosts, which we interpret as major galaxy mergers. Our ALMA data therefore clearly support the idea that major mergers may be important drivers for rapid, early SMBH growth. However, the fact that not all high-SFR quasar hosts are accompanied by interacting SMGs, and the gas kinematics as observed by ALMA, suggest that other processes may fueling these systems. Our analysis thus demonstrates the diversity of host galaxy properties and gas accretion mechanisms associated with early and rapid SMBH growth.

X-ray AGN in the XXL survey galaxy clusters

Apr 6
12:45
Contributed

Submitted by: Elias KOULOURIDIS
Service d'Astrophysique, CEA Saclay, France

The effect of the group and cluster environment on the activity of the central super-massive black hole (SMBH) of galaxies is still fairly undetermined, but nevertheless crucial. Galaxy clusters represent one end of the density spectrum in our universe, and as such they are an ideal place to investigate the effect of the dense environment in the triggering of AGN, especially since an excessive number of X-ray point-like sources are undoubtedly found there. Recent studies reported a significant lack of AGN in rich galaxy clusters by comparing X-ray to optical data, but no evidence of AGN suppression was found in poor and moderate clusters. I will present the results of the analysis of nearly 200 X-ray clusters found by the XXL survey. The survey's 50 sq. deg. together with extensive spectroscopic follow-up and deep photometry of the optical counterparts provides reliable and robust results.

The many routes to AGN feedback

Apr 6
14:30
Invited

Raffaella MORGANTI
ASTRON

The energy released by Active Galactic Nuclei (AGN) is known to interacts with and impacts on the surrounding interstellar medium. This energy, released as radiation, winds or jets, can remove, or at least redistribute, the gas by driving massive and fast outflows, and can prevent the gas, in and around the galaxy, from cooling. The result of these processes, also known as AGN (negative) feedback, has been suggested to regulate the accretion onto the super-massive black hole as well as quenching the star formation in the host galaxy, hence playing a key role in galaxy evolution. I will review some of the recent results obtained from observations of different types of AGN and on different scales, illustrating these processes and their impact. I will dedicate part of the talk to the results from the study of AGN-driven outflows, now traced in all phases of the gas, from hot ionised to cold molecular. The possible mechanisms driving such outflows will be discussed. Finally, I will comment on the impact of the observed processes including the possibility to observe positive feedback, where these mechanisms (and in particular massive outflows) can actually also boost star formation in galaxies.

The Origin of the Black Hole Mass Scaling Relations

Apr 6
15:00
Contributed

Submitted by: Vardha N. BENNERT
California Polytechnic State University San Luis Obispo

The discovery of close correlations between supermassive BHs and their host-galaxy properties has sparked a flood of observational studies pertaining both to the local Universe and cosmic history over the last decade. Nevertheless, a clear understanding of their origin still eludes us. Uncertainty remains as to the fundamental driver of these relations, whether purely local and baryonic or global and dark matter dominated. While studying the evolution of these relations with cosmic time provides valuable clues, a definitive resolution of this conundrum relies on understanding slope and scatter of local relations for AGNs. We discuss results from a unique three-fold approach. (i) From a sample of $\sim$ 100 AGNs in the local Universe, we build a robust baseline of the BH mass scaling relations (MBH-sigma, MBH-L, MBH-M), combining spatially-resolved Keck spectroscopy with SDSS imaging. (ii) We study the evolution of the MBH-sigma and MBH-L relations out to a look-back time of 4-6 Gyrs using Keck spectra and HST images. (iii) We extend this study out to the pivotal cosmic time between the peak of AGN activity and the establishment of the present-day Hubble sequence, a look-back time of 8-10 Gyrs. We measure spheroid stellar masses using deep multi-color HST images from GOODS and determine the MBH-M relation. The results (i) indicate that AGNs follow the same scaling relations as inactive galaxies. From (ii-iii) we conclude that BH growth precedes bulge assembly. Combining results from (i-iii) allows us to test the hypothesis that evolution is driven by disks being transformed into bulges.

Delayed or no feedback? connection between AGN outflows and star formation

Apr 6
15:20
Contributed

Submitted by: Jong-Hak WOO
Seoul National University

We investigate the observational signature of AGN feedback, 1) by comparing outflow kinematics and star formation using a large sample of $\sim$ 110,000 AGNs and star forming (SF) galaxies at $z < 0.3$, and 2) by studying spatially resolved kinematics of outflows and star formation based on optical IFU data of a sample of $\sim$ 40 AGNs selected from our statistical sample based on their strong outflow features. First, we find a dramatic difference in outflow kinematics between AGNs and SF galaxies: while the [OIII] kinematics of SF galaxies are entirely accounted by the gravitational potential of host galaxies, the majority of luminous AGNs clearly shows non-gravitational kinematics, i.e., outflows. Second, the [OIII] velocity and velocity dispersion increase with AGN luminosity, implying that the outflows are AGN-driven. These results indicate that AGN-driven outflows are prevalent in AGNs. Nevertheless, we find no direct evidence of SF quenching in AGNs with strong outflows since the SSFR of these AGNs is comparable to that of SF galaxies. In contrast, the SSFR of non-outflow AGNs is much lower than that of SF galaxies.

We interpret this trend as a delayed AGN feedback as it takes dynamical time for the outflows to suppress star formation over galactic scales. Alternatively, it is also possible that the connection between outflows and SF is simply due to the gas content and depletion, instead of AGN feedback. Our IFU analysis shows that AGN and SF are typically observed together for given galaxies, while we detect a ring like structure of SF region in many AGNs. These results suggest that negative and positive feedback may occur together and the overall impact of AGN feedback may not be prominent among luminous AGNs with strong outflows.

AGN feedback and its quenching efficiency

Apr 6
15:40
Contributed

Françoise COMBES
Observatoire de Paris

Observations are now accumulating on gas outflows, and in particular massive molecular ones. The mass outflow rate is estimated between 1-5 times the star formation rate. When driven by AGN, these outflows are therefore a clear way to moderate or suppress star formation. However, AGN feedback can be also positive in many occasions, and the net effect is difficult to evaluate. I will discuss the quenching efficiency in view of recent observations.

Negative and positive outflow-feedback in nearby (U)LIRGs

Apr 6
16:00
Contributed

Submitted by: Sara CAZZOLI
INSTITUTO DE ASTROFISICA DE ANDALUCIA

The starburst-AGN coexistence in local (U)LIRGs makes these galaxies excellent laboratories for the study of stellar and AGN outflows and feedback. Outflows regulate star formation and AGN activity, redistributing gas, dust and metals over large scales in the interstellar and intergalactic media (negative feedback) being also considered to be able to undergo vigorous star formation (positive feedback). In this contribution, I will summarize the results from a search for outflows in a sample of 38 local (U)LIRG systems observed with VIMOS/VLT integral field unit (Cazzoli et al. 2014, 2016). For two galaxies of the sample I will detail the outflow properties and discuss the observational evidence for negative and positive outflow-feedback.

An infrared view of AGN feedback in a type-2 quasar: ionized, coronal and molecular phase

Apr 6
16:20
Contributed

Submitted by: Cristina RAMOS ALMEIDA
IAC

Now that ionized outflows have been identified as a common process in type-2 quasars, the next goal is to investigate their impact on other gaseous phases.The near-infrared range allows to trace the outflow signatures in the molecular, ionized and coronal phases simultaneously. Our new VLT/SINFONI observations of a type-2 quasar at z =0.1 confirm the presence of the nuclear ionized outflow previously reported for this galaxy using optical spectra and reveal, for the first time in this type of AGN, its coronal counterpart. The distribution of molecular gas is completely different from the ionized and coronal one. It corresponds to a rotating disk, perpendicular to the radio jet and similar to those observed in nearby Seyfert galaxies. This type-2 quasar is one of the few showing unambiguous evidence for AGN feedback working accross tens of kpc, constituting an excellent testbed for simulations.

Fast outflows and star formation quenching in quasar host galaxies

Apr 6
17:10
Contributed

Submitted by: Stefano CARNIANI
University of Cambridge

Negative feedback from active AGN is considered a key mechanism in shaping galaxy evolution. Fast, extended outflows are frequently detected in the AGN host galaxies at all redshifts and luminosities, both in ionised and molecular gas. However, these outflows are only potentially able to quench star formation and we are still missing a decisive evidence of negative feedback in action. Here we present SINFONI H- and K-band integral-field spectroscopic observations of six quasars at $z \sim 2.4$ characterised by fast, extended outflows detected through the [OIII]5007 line. The high signal-to-noise ratio of our observations allows us to identify faint narrow (FWHM $<$ 500 km/s), and spatially extended Halpha emission associated with star formation in the host galaxy. Such star-formation powered emission is spatially anti-correlated with the fast outflows. The ionised outflows therefore appear to be able to suppress star formation in the region where the outflow is expanding. However the detection of narrow, spatially-extended Halpha emission indicates star formation rates of at least 50 – 100 $M_{\odot}$/yr , suggesting either that AGN feedback does not affect the whole galaxy or that many feedback episodes are required before star formation is completely quenched. On the other hand, the narrow Halpha emission extending along the edges of the outflow cone may lead also to a positive feedback interpretation. Our results highlight the possible twofold role of galaxy-wide outflows in host galaxy evolution. In addition to SIFONI observations, I will present the new CO(3-2) ALMA images of three out of six QSOs. The main goal of our observations is to compare the spatial distribution of the molecular gas with that of the fast-outflowing ionised gas detected in the blueshifted [OIII] emission. The flux maps of

CO(3-2) transition suggest that fast winds sweep away molecular gas from the host galaxy. In all sources the inferred molecular gas mass is significantly below what observed in inactive main-sequence galaxies at high$-z$, hence supporting a quasar negative-feedback scenario

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How quasar feedback may shape the co-evolutionary paths

Apr 6
17:30
Contributed

Submitted by: Wako ISHIBASHI
University of Zurich

Observations point towards some form of "co-evolutionary sequence", from dust-enshrouded starbursts to luminous unobscured quasars. Active galactic nucleus (AGN) feedback is generally invoked to expel the obscuring dusty gas in a blow-out event, eventually revealing the hidden central quasar. However, the physical mechanism driving AGN feedback, either due to winds or radiation, remains uncertain and is still a source of much debate. We consider quasar feedback, based on radiation pressure on dust, which directly acts on the obscuring dusty gas. We show that radiative feedback is capable of efficiently removing the obscuring cocoon, and driving powerful outflows on galactic scales, consistent with recent observations (Ishibashi and Fabian 2016). I will discuss how such quasar feedback may provide a natural physical interpretation of the observed evolutionary path, and the physical implications in the broader context of black hole-host galaxy co-evolution.

Supermassive black holes at the end of the cosmic dark ages: Insights from a sample of 15 quasars at $z > 6.5$

Apr 6
17:50
Contributed

Submitted by: Chiara MAZZUCCHELLI
Max Planck Institute for Astronomy

Quasars are the most luminous, non-transient sources in the sky, and hence they can be observed at extremely large cosmological distances. Up to date, only a handful of quasars (10) have been discovered at$z$ >6.5: these sources, hosting supermassive black holes (SMBHs; $M > 10^8\ M_\odot$) at only $\sim$ 800 Myr after the Big Bang, represent a crucial challenge to modern theories of SMBHs formation. Additionally, they can be used as key probes of the state of the intergalactic medium (IGM) well into the epoch of reionization. In this talk, I will present 6 new quasars at z $\sim$6.5 discovered in the Pan-STARRS1 Survey. I will then report a comprehensive study of 15 quasars known to date at z <6.5, supported by new NIR/optical spectroscopic observations, as well as new mm data collected with NOEMA. I will derive several quasar properties, e.g. virial black hole masses, magnesium-to-iron line flux ratios, near zones sizes, and, by placing them in the context of lower redshift measurements, I will discuss some constraints derived on current models of black holes formation and IGM reionization.

Exploring the consequences of selection effects in black hole-galaxy evolution studies

Apr 6
18:10
Contributed

Submitted by: Mackenzie JONES

Dartmouth College

In probing the connection between active galactic nuclei (AGN) and their host galaxies, an understanding of the full underlying AGN population is presently limited by complex observational biases that can be challenging to model theoretically. Determining the intrinsic Eddington ratio distribution in the optical, in particular, can be strongly influenced by selection effects and dilution from the host galaxy star formation. Using spectroscopic galaxies from SDSS, we show that an optically selected AGN population is consistent with being drawn from a universal AGN Eddington ratio distribution in the form of the broad Schechter function that is observed in the X-ray surveys. To more completely explore selection effects in the context of galaxy formation, we use a semi-numerical galaxy evolution simulation along with this universal Eddington ratio distribution to model the AGN population. We explicitly model selection effects to produce the observed AGN population for comparison with both theoretical and observational X-ray data. We investigate the impact on the observed population of selecting AGN in the X-rays based on a thresholds in luminosity (as they are selected in most surveys) as well as Eddington ratio. We find that we can broadly reproduce the host galaxies and halos of the X-ray AGN population, and that selecting AGN using these luminosity or Eddington ratio limits yield samples with very different host galaxy properties.

TBD

Apr 6
18:30
Contributed

Poster prize winners

Topic E

A New Cosmological Distance Measure Using AGN X-Ray Variability

Apr 7
08:45
Invited

Fabio LA FRANCA
Università Roma Tre - Dip. di Matematica e Fisica

We report the discovery of a luminosity distance estimator using Active Galactic Nuclei (AGN). We combine the correlation between the X-ray variability amplitude and the Black Hole (BH) mass with the single epoch spectra BH mass estimates which depend on the AGN luminosity and the line width emitted by the broad line region. We demonstrate that significant correlations do exist which allows one to predict the AGN (optical or X-ray) luminosity as a function of the AGN X-ray variability and either the HBeta or the PaBeta line widths. In the best case, when the PaBeta is used, the relationship has an intrinsic dispersion of ~ 0.6 dex. Although intrinsically more disperse than Supernovae Ia, this relation constitutes an alternative distance indicator potentially able to probe, in an independent way, the expansion history of the Universe. We also discuss how using new generation X-ray telescopes, our estimator has the prospect to become a cosmological probe even more sensitive than current Supernovae Ia samples.

Quasars as cosmological standard candles

Apr 7
09:15
Contributed

Submitted by: Alenka NEGRETE
Instituto de Astronomia - UNAM, Mexico

We propose the use of quasars with accretion rate near to Eddington ratio (extreme quasars) to use them as standard candles. The selection criteria is based on the Eigenvector 1 (E1) formalism. Our first sample is a selection of 334 optical quasar spectra from the SDSS DR7 database with a S/N larger than 20. Using the E1, we define primary and secondary selection criteria in the optical spectral range. We present the catalog and the spectra analysis. We show that it is possible to derive a redshift- independent estimate of luminosity for extreme Eddington ratio sources. Our results are consistent with concordance cosmology but we need to work with other spectral ranges to take into account the cuasar orientation, among other constrains. indexauthorsNEGRETE!Alenka

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A Hubble Diagram for Quasars

Apr 7
09:35
Contributed

Submitted by: Guido RISALITI *Speaker: Susanna BISOGNI*
Università di Firenze

The cosmological model is at present not tested between the redshift of the farthest observed supernovae (z$\sim$ 1.4) and that of the Comsic Microwave Background (z$\sim$ 1,100). Here we introduce a new method to measure the cosmological parameters: we show that quasars can be used as "standard candles" by employing the non-linear relation between their intrinsic UV and X-ray emission as an absolute distance indicator. We built a sample of $\sim$ 2,000 quasars with available UV and X-ray observations, and produced a Hubble Diagram up to z$\sim$ 6.3. When used in combination with supernovae, our data provide Ω_M=0.25 $\pm$ 0.05 and Ω_Λ = 0.67 $\pm$ 0.08. The application of this method to forthcoming, larger quasar samples, will provide tight constraints on the dark energy equation of state.

Big and young SMBHs in the early Universe

Apr 7
09:55
Contributed

Submitted by: Tullia SBARRATO
Università degli Studi di Milano - Bicocca

The existence of extremely massive black holes at very high redshift is a true challenge to the commonly accepted black hole formation and evolution models. The quasars found at $z > 4$ host extremely massive black holes, up to the case of a quasar found at $z > 6$ with 11 billion solar masses. These objects are particularly problematic: there is not enough time to accrete such large masses in a standard scenario, and their disc emission seems consistent with sub-critical accretion. The presence of a jet could speed up the accretion process enough to build up $10^9 M_\odot$ black holes before z$\sim$ 6 from a reasonable black hole seed. Studying the population of jetted quasars is hence necessary. The peculiar orientation of blazars (that have jets directed along our line of sight) makes them the most effective tracers of the whole population of jetted quasars. Do relativistic jets really have a role in the early formation of extremely massive black holes? Does the high$-z$ quasar population have a different fraction of jetted sources? It seems so, and this can help us drawing strong conclusions about the most urgent question: how could the first, most massive black holes form so fast in the early Universe?

The first black holes: constraints from deep fields and quasar surveys

Apr 7
10:15
Contributed

Submitted by: Kevin SCHAWINSKI
ETH Zurich

When, where and how the original seeds of black holes formed and grew is one of the major outstanding questions in astrophysics. The observational constraints for seed formation and growth consist of very massive quasars at z$\sim$ 6 with very low space densities on the one hand, and a lack of $z > 6$ AGN in the deepest Chandra observations on the other hand. The lack of AGN at z $>$ 6 in the 4 Msec deep field in particular is puzzling as the same volume contains on the order of $\sim$ 1e3 dropout galaxies detected by Hubble; Chandra detects neither individual AGN in these galaxies, nor an integrated signal of black hole growth from stacking. I will present a simple phenomenological model with meets both the observational constraints from the Chandra deep fields, and the quasar surveys. The only configuration which works is that black hole seed formation at $z > 6$ is highly inefficient and suppressed in most galaxies. I discuss these results and their implications for future surveys and missions.

From the first stars to the first quasars

Apr 7
11:05
Contributed

Submitted by: Rosa VALIANTE
INAF-Osservatorio Astronomico di Roma

The growth of the first supermassive black holes (SMBHs) at $z >$6 is still a major challenge for theoretical models. If it starts from black hole (BH) remnants of Population III stars (light seeds with mass $\sim$ 100 $M_\odot$), it requires super-Eddington accretion. An alternative route is to start from heavy seeds formed by the direct collapse of gas on to a $\sim 10^5 M_\odot$ BH. I will present the results we investigate the relative role of light and heavy seeds as BH progenitors of the first SMBHs. We use the cosmological, data constrained semi-analytic model GAMETE/QSODUST to simulate several independent merger histories of $z >$6 quasars. In addition, I will investigate the detectability of the two different progenitors (light and heavy seeds) by self-consistently modelling the spectral energy distribution of the accreting BHs and their host galaxy, in a cosmological context.

Probing the early Universe with sub-millimeter observations of extremely luminous QSOs

Apr 7
11:25
Contributed

Submitted by: Amy KIMBALL
National Radio Astronomy Observatory

I will present ALMA observations of some of the most luminous quasi-stellar objects (QSOs) known, investigating their far-infrared emission and discussing an extremely broad and luminous double-peaked [CII] line in a QSO at redshift z =4.6. The parent sample was compiled from multi-wavelength sky survey data, with which we were able to identify the most luminous (unobscured) QSOs in the Universe. Of over 100,000 broad-line quasars identified in the SDSS, just 90 have bolometric luminosities greater than 10^{14} solar luminosities (as or more luminous than the most luminous obscured quasars currently known). We are for the first time determining the far-infrared properties of these most extremely luminous QSOs, and can estimate their contribution to the global star formation rate. Furthermore, the unusual [CII] emission line indicates a massive rotating disk around an extremely massive black hole that was already established at high redshift.

The first detection of cosmic reionization from QSO spectra

Apr 7
11:45
Contributed

Submitted by: Andrei MESINGER
Scuola Normale Superiore, Pisa

Quasars have provided invaluable insight into the properties of the high-redshift intergalactic medium (IGM), in which most of the matter of our Universe resides. Recent surveys have pushed this observational frontier beyond $z > 6$, perhaps before the completion of the Epoch of Reionization (EoR). An unambiguous detection of the EoR is complicated by the fact that the Lyman alpha forest saturates at these redshifts, as well as the inability to distinguish EoR spectral imprints from the uncertainties in the intrinsic QSO emission. I will present a recently-developed analysis which combines an MCMC reconstruction of the intrinsic Lyman alpha emission line together with state-of-the-art simulations of the EoR. When applied to the z =7.1 quasar ULAS J1120+0641, this analysis results in the first detection of an ongoing EoR (> 2sigma).

Conference summary

Apr 7
12:15
Invited

Hagai NETZER
Tel Aviv University

TBD

General discussion

Apr 7
12:35

*Chaired by:*Hagai NETZER
Tel Aviv University

Abstracts of Posters

Topic A

SDSS QSO samples completeness check

Poster A1

Submitted by: Sergei KOTOV

Special Astrophysical Observatory, Russian Academy of Sciences

A completeness check of the SDSS QSO selection process was made by direct comparison of broad band and medium band QSO samples. We have compared samples, received with broadband SDSS photometry (Richards 2002, Richards et al. 2015, Di Pompeo et al. 2015) and medium band photometry (Dodonov 2012), in the field 9 40 +50. We have estimated that SDSS QSO samples are complete up to 80% for $z < 2.2$, and for z <2.2 comleteness of SDSS QSO samples is near 30%.

Obscured quasars at high redshift in the UKIDSS Ultra Deep Survey

Poster A2

Submitted by: Ismael BOTTI

University of Nottingham

In the search of highly obscured AGN, we have used the depth and excellent multiwavelength coverage of the UKIDSS Ultra Deep Survey, along with a custom bayesian SED-fitting analysis tool, to obtain a reliable sample of obscured quasars at z$\sim$ 2. Here, I will present the results of the statistical study of this population, including its demographic evolution and clustering. In addition, given their high obscuration, I will show some host galaxy properties to characterize this population in the context of galaxy evolution.

Catalog of 3<z<5.5 quasar candidates selected among XMM-Newton sources and its spectroscopic verification.

Poster A3

Submitted by: Georgii KHORUNZHEV

IKI

We have compiled a catalog of 903 quasar candidates (including known quasars) at 3< z <5.5 selected among X-ray sources from the XMM-Newton serendipitous survey (3XMM-DR4 catalog). We used photometric SDSS, 2MASS and WISE data to select the objects. The surface number density of objects in our sample exceeds that in the SDSS spectroscopic quasar sample at the same redshifts by a factor of 1.5. We have performed quasi-random spectroscopic observations of our quasar candidates using a new low- and medium-resolution spectrograph at the 1.6-m AZT-33IK telescope (Mondy, Russia) and demonstrated that the purity of our quasar catalog is about 70%We have discovered one of the most distant (z =5.08) X-ray selected quasars.

Observational studies of NLS1 galaxies

Poster A4

Submitted by: Dawei XU

National Astronomical Observatories, Chinese Academy of ScienceNational Astronomical Observatories, Chinese Academy of Science

Narrow-line Seyfert 1 (NLS1) galaxies, as active galactic nuclei with relatively low-mass black holes and high accretion rates, are important targets when addressing questions related to black hole growth and accretion physics. We have performed observational studies of NLS1 galaxies. We present a summary of our previous results, and new results, in particular, of NLS1 galaxies with high-velocity outflows.

A catalogue of active galactic nuclei from the first 1.5 Gyr of the Universe

Poster A5

Submitted by: Krisztina PERGER

Eöltvös Loránd University

Active galactic nuclei (AGN) are prominent astrophysical objects that can be observed throughout the whole Universe. To understand the underlying physical processes and the different appearance of AGN types, extensive samples are needed. Nowadays, various AGN catalogues are available at different wavebands. However, at the highest redshifts data are still relatively sparse. These data are required for examining AGN properties in the early Universe. This way we can compare the earliest AGN with those seen at lower redshifts, and can study their cosmological evolution. Additionally, because of their high luminosity, AGN may also be used as probes to test cosmological models. With the aim of constructing a complete sample of all known AGN at z > =4, we are currently compiling a catalogue from literature

sources. We cross-match catalogues particularly at optical and radio wavebands, to build up a sample for detailed high-resolution radio interferometric studies. The continously updated list now contains nearly 2500 objects with known spectroscopic redshifts, optical magnitudes, and auxiliary information about observations at other wavebands. About 150 of them are known radio sources for which we collect existing radio interferometric data from the literature. We intend to make the z > =4 AGN catalogue publicly available in the near future.

The radio-selected quasar luminosity function at $1 < z < 5$

Poster A6

Submitted by: Edwin RETANA-MONTENEGRO
Leiden Observatory

To understand the evolutionary link between the growth of galaxies and the black holes (BH) they host, it is crucial to study the properties of BH across cosmic time. This correlation can be tested by quasars, which are excellent tracers of the large-scale structure and black hole growth to up z$\sim$ 7. Particularly, radio-loud quasars are thought to be powered by the most massive BHs. Deep low-frequency radio observations carried out with powerful new facilities like LOFAR, allow to extend the search for distant quasars to a relatively unexplored parameter-space. In this talk, we present the analysis of two radio quasar samples selected using LOFAR observations from the Bootes field and the LOFAR Two-metre Sky Survey (LoTSS), which reach a flux density limit at 150MHz of 50μJy and 500μJy, respectively. The resulting samples consist of quasars with reliable photo$-z$'s in the Bootes region over 9 square degrees, while the spectroscopy for the LoTSS is drawn from the overlapping with the BOSS and SDSS surveys over more than 500 square degrees. We derive luminosity functions (LFs) with these samples at $1 < z < 5$. Finally, we discuss the results of our analysis and compare our LFs with previous works from the literature.

Relativistic jets from low mass black holes in AGN

Poster A7

Submitted by: Marco BERTON
Università di Padova

In recent years, the old paradigm according to which only high-mass black holes can launch powerful relativistic jets in active galactic nuclei (AGN) proved to be uncorrect. The discovery of γ-rays coming from narrow-line Seyfert 1 galaxies (NLS1s), usually considered young and growing AGN harboring a black hole mass typically lower than 10^8 $M_\odot$, indicated that also these low-mass AGN (LMAGN) can produce powerful relativistic jets. The search for parent population of γ-ray emitting NLS1s revealed their connection with compact steep-spectrum sources (CSS). This population includes a number of LMAGN which are not classified as NLS1s. To find out whether such non-NLS1 LMAGN exist among γ-ray emitters, I carried out a research in the 3rd Fermi-LAT catalog. I will present the results of this study,

which was aimed to provide new, accurate black hole mass estimates, and revealed the presence of a consistent fraction of LMAGN. I will compare their properties to those of NLS1s, and show how they might represent, along with CSS, the population of young AGN.

Determination of the coronal properties of luminous quasars at cosmological redshifts

Poster A8

Submitted by: Elias KAMMOUN
SISSA

Several precise measurements of high-energy cutoffs in the X-ray spectra of bright local AGN have been reported recently. These measurements can be also done for luminous quasars at cosmological redshifts. The shift of the high-energy cutoff to lower energies, in the observer frame, compensates for the relative faintness of the source, allowing an estimate of the coronal temperature analogous to the ones done for local, low luminosity but very bright AGN. I present the analysis of the joint XMM-Newton and NuSTAR observations of the luminous radio-quiet quasar QSO B2202-209 (z = 0.53; L(2-10 keV) = $1.93{\cdot}10^{45}$ erg/s) and the radio-loud quasar 4C+25.05 (z =2.36; L(2-10 keV) = $3.77{\cdot}10^{46}$ erg/s). Assuming a Comptonization model, we estimated a coronal temperature of kTe = 42 $\pm$ 3 keV and kTe = 56 $\pm$ 3 keV for a spherical and a slab geometry, respectively, for B2202-209. The unusual X-ray loudness of this quasar (αOX = 1.00 $\pm$0.02) and the exceptionally strong optical [O III] line, that we found, can be explained by a nearly edge-on disc, leading to a reduction in the observed ultraviolet continuum light. Moreover, the X-ray spectrum of 4C+25.05 reveals the presence of a neutral reflection from distant material, with a low reflection fraction R=0.4 $\pm$ 0.2 and a 3-sigma lower limit on the high-energy cutoff, Ecut $>$ 241 keV.

What makes red quasars red?

Poster A9

*Submitted by:*Dohyeong KIM
Seoul National University

Red quasars have red colors in optical through NIR (e.g., r'-K >5mag in Urrutia et al. 2009), and the red colors are possibly due to the dust extinction in their host galaxies as an intermediate population between merger-driven star-forming galaxies and unobscured type 1 quasars. However, the red colors can be explained by alternative mechanisms of (i) an intrinsically red continuum, (ii) an unusual high covering factor of the hot dust component (CF_{HD}), and (iii) a moderate viewing angle, somewhere between type 1 and type 2 quasars. In order to study why red quasars are red, we use optical to NIR spectra of 20 red quasars at z$\sim$0.3 and 0.7. The L(Pβ)/L(Hβ) ratios of red quasars are found to be $\sim$10 times higher than unobscured type 1 quasars, and the L(Pβ)/LHβ ratios of $\sim$55% red quasars cannot be explained by any physical conditions without adopting the concept of

the dust extinction. The CF_{HD} of red quasars are similar to that of unobscured type 1 quasars. Furthermore, we find that the Eddington ratios of red quasars are significantly higher than those of unobscured type 1 quasars. Consequently, these results strongly suggest the dust extinction in the host galaxy as the origin of the red colors of red quasars, as suggested in the merger-driven galaxy evolution scenario.

Understanding optical variability of quasars

Poster A10

Submitted by: Szymon KOZLOWSKI
Warsaw University Observatory

I will review common methods of quantifying quasar variability, in particular their biases and problems that impact the measured variability parameters. I will provide predictions on quasar science from the forthcoming surveys such as Gaia and LSST, but also concentrate on the results form the already existing OGLE and SDSS data.

AGN detection efficiency through optical variability: results from the COSMOS and CDFS VST surveys

Poster A11

Maurizio PAOLILLO
Università di Napoli Federico II

We exploited 3 years of VST monitoring observations of the COSMOS and CDFS regions, to assemble samples of AGN candidates based on variability. Variability selection does not make strong a-priori assumptions about the properties of the sources and can thus integrate and complete samples selected by other techniques. We investigate the efficiency and reliability of this selection method at fainter magnitude than probed in previous studies, by comparing it with spectroscopic, X-ray and IR selected samples, showing that variability-selection can yield extremely pure samples, with completeness >50% with respect of X-ray and IR selections. We explore the dependence of variability from obscuration, mass and accretion rate, and predict the performance that can be expected by future monitoring surveys such as LSST.

Discovery of new radio transients the key to solving the puzzle of radio-loudness?

Poster A12

Submitted by: Aleksandra WOŁOWSKA

Torun Centre for Astronomy/Nicolaus Copernicus University

Despite the intensive studies of the evolution of radio-loud AGNs we still don't know many details of this process. We already know that not all radio-loud AGNs follow the same evolutionary path. There are more of them and not all tracks finally lead to the development of large-scale radio structure. Possibly part of the young and small radio objects will never be able to grow up and become a large-scale radio sources. Thus we predict that they will appear as transients, the short-lived objects. The Caltech- NRAO Stripe 82 Survey (CNSS), a multi-epoch radio transient survey carried out recently with the Jansky VLA, has facilitated an unbiased study of such objects for the first time. The total number of 12 new radio transients have been discovered and they are the subject of our presentation. These objects did not occur previously in any catalog of radio sources until a sudden outburst of their AGN activity recorded by CNSS monitoring. This discovery gives us not only a possibility of investigation of the population of short-lived objects but also an unique opportunity to study fast-evolving young jets. Moreover, according to the preliminary calculations, the new sources have been radio-quiet so far. Thus, the recorded radio transient phenomenon is not only the moment of the birth of the radio source, but also the moment of transition from radio-quiet to the radio-loud state. The discussion of the preliminary results of radio, optical and X-ray observations of the discovered objects will be presented.

Rapid Cv BAL variability: Re-Emerging Absorption

Poster A13

Submitted by: Damla ERAKUMAN

Erciyes University, Turkey

Broad absorption lines (BAL) in quasar spectra have observed as an indicator of quasar winds. In this study, we analyze SDSS J141955.28+522741.4, using 32 epochs of BOSS spectroscopic observations. We found three individual absorption features of CIV transitions: Trough A lies between -7828.22 and - 2088.52 km/s, Trough B lies between -10283.64 and -8408.82 km/s, Trough C lies between -15742.17 and -11302.38 km/s. We also found and absorption feature lies between and of SiIV transition that its velocity range corresponds to that of CIV trough A. We discovered rapidly variating Civ BAL troughs. Also, we have observed coordinated variations among Civ and between Civ and Siiv BAL troughs. The conclusions were discussed which mechanism can cause rapidly and coordinated variability on BAL structures.

The accuracy of quasars core shift measurements

Poster A14

Submitted by: Ilya PASHCHENKO
Lebedev Physical Institute

Inhomogeneous model of quasar jet predicts frequency-dependent shift of the observed VLBI core. Measurement of this effect provides information about physics and geometry of the outflow. We estimate the value of the effect measurement uncertainty paying special attention to systematic error of approximating the observed brightness distribution with simple models. Methods allowing to reduce the total error are presented.

Core shift variability in AGN jets

Poster A15

Submitted by: Alexander PLAVIN
Astro Space Center of Lebedev Physics Institute

The observed position of the core in radio jets of active galactic nuclei changes with the observing frequency because of synchrotron self-absorption and external absorption. Measuring this shift allows to reconstruct geometry of the jet base, probe physical conditions close to the core and determine the core position itself more accurately. We performed successful measurements for more than 20 quasars observed with VLBI at two frequencies (2 and 8 GHz) at 20 to 50 observing epochs per source covering the time interval from 1994 to 2012. The core shift was measured by aligning the corresponding images using 2D cross-correlation with automatically determined mask and finding the core component position by model-fitting the core region of calibrated visibility data. The method employed is almost automatic, which delivers robust and unbiased results. Prominent core shift variability is found for the first time in several targets including J0136+4751, J1642+6856. We present these results, discuss relation between core shift changes and observed flares, and estimate upper bounds on variability for all sources. Interpretation and implications for astrometry and astrophysics will be considered.

Taking the pulse of extreme blazar AO 0235+164 with VLBI and single-dish radio observations.

Poster A16

Submitted by: Alexander KUTKIN
Lebedev Physical Institute

We present a detailed study of ultra-compact blazar AO 0235+164 based on measurements of apparent core size and variability time lags. We use two multi-frequency VLBA observations sets, $>$ 30 VLBA monitoring snapshots at 43 GHz and more than 30 years of single-dish flux density measurements at five radio bands 5-37 GHz. Radioastron space VLBI data is included to study brightness temperature distribution. We estimate jet flow velocity at the core region and characteristic parameter k, which reflects the opacity-driven core shift effect.

The relativistic jet of the gamma-ray emitting narrow-line Seyfert 1 galaxy 1H 0323+342

Poster A17

Submitted by: Daniel KYNOCH
Durham University, UK

Narrow-line Seyfert 1 (NLS1) galaxies have been identified by the Fermi Gamma-Ray Space Telescope as a rare class of gamma-ray emitting active galactic nuclei. All of these sources are radio-loud and their gamma-ray emission is thought to be produced via the external Compton mechanism whereby the relativistic jet electrons upscatter a photon field external to the jet, e.g. from the accretion disc, broad line region or dusty torus, to higher energies. We will present our analysis of the superb multi-wavelength data set we have assembled for the lowest-redshift gamma-ray emitting NLS1, 1H 0323+342. Our new approach has been to first constrain the external photon field using recent quasi-simultaneous near-IR, optical and X-ray spectroscopy. We then use a single-zone leptonic jet model to simulate the range of jet parameters for which this photon field, when Compton scattered to higher energies, can explain the observed Fermi gamma-ray emission.

Hunting 'peculiar' gamma-ray AGNs

Poster A18

Submitted by: Nenghui LIAO
Purple Mountain Observatory, Chinese Academy of Science

Strong gamma-ray emissions are usually detected from blazars. In this talk, I would like to report our analyses on Fermi-LAT data which lead detections of gamma-ray emission on new subtype AGNs. Firstly, we discover significant gamma-ray emission from a radio-intermediate quasar III Zw 2. Further study of its multiwavelength variability properties suggests it likely harbors a recurrent activity jet, which makes it a valuable target for investigation of the fueling and triggering of the activity in radio-loud AGNs. Secondly, we present the first case that gamma-ray emission is detected from a strongly lobe-dominated quasar 3C 275.1 (jet viewing angle $\sim$ 20 degree from radio morphology), which provides a picture that strong gamma-ray emission (almost 1e46 erg/s) can be generated without significant Doppler boosting effect at a relatively high redshift and hence the contribution of mis-aligned sources for the extragalactic gamma-ray background may be underestimated. Lastly, corresponding to the flat spectrum radio-loud narrow-line Seyfert I (RLNLS1) that is the new subclass of the gamma-ray AGN in the Fermi era, we manage to detect gamma-ray emission from its large jet viewing angle counterpart, filling a blank in the orientation-based AGN unified model.

Direct Hubble Space Telescope dust lane detection in powerful narrow-line radio galaxies

Poster A19

Submitted by: Edgar A. RAMIREZ

National Institute of Astrophysics, Optic and Electronics (INAOE)

We present the analysis of near-infrared Hubble Space Telescope imaging of 10 Fanaroff-Riley II powerful radio galaxies at low redshift ($0.03 < z < 0.11$) optically classified as narrow-line radio galaxies (NLRG). In the context of the unified schemes for active galactic nuclei (AGN), our direct view of the AGN in NLRG is impeded by a parsec-scale dusty torus structure when this is viewed edge-on. Our high resolution near-infrared HST observations provide new information on the central kpc-scale dust lanes in powerful NLRG that could potentially be connected to the pc-scale structure. We detect kpc-scale dust lanes in 6 AGN of our sample, 3 of which are perpendicular to the inner kpc radio jet axis. Assuming that the torus is perpendicular to the radio jet, this suggests a continuity from the parsec-scale tori to the kpc-scale dust lanes. The misalignment of the rest can be explained as a warping disks. Comparing the sources that show no traces of a near-infrared large scale dust lane and without silicate absorption line in their IRS/Spitzer spectrum, with independent measurements of the optical extinction, we came with the suggestion that the dusty torus structure is composed of big grains that extinguish the quasar optical light but do not produce enough extinction to the silicate line.

Optical and infrared observations of the double-peaked galaxy Mrk622

Poster A20

Submitted by: Alenka NEGRETE

Instituto de Astronomia - UNAM, Mexico

Mrk622 is known to be double-peaked narrow emission line galaxy, and proposed as a dual AGN candidate. In order to verify the origin of the double-peaked emission lines, new optical long-slit spectroscopic observations were obtained. Our new data clearly show the existence of the three spatially separated narrow components in the [OIII]4959,5007, emission lines, two of them are blue-shifted and red-shifted with respect to the third one that is found to be the systemic component. The velocity difference between the blue and the red components is $\sim$ 500 km/s, and are responsible of the double-peak emission lines. The analysis of new high resolution mid infrared images reveal the presence of a single source in the nuclear region, therefore Mrk622 is not dual AGN candidate. If it is a single source, the velocity difference observed in the optical components could be due to a ionised outflow produced by the AGN. Also, the analysis of mid-infrared data along with previously obtained X-ray data shows that the object has a column density $N_H \sim$ (1-2)10^{24} cm^{-2}, putting it at the Compton-thick limit. The higher obscuration found could be the result of more dust produced as a consequence of a previous major merger. This is in agreement with recent results that show that there is a larger fraction of mergers in Compton-thick AGN.

Time-Evolving SED of MKN421: a multi-band view and polarimetric signatures

Poster A21

Submitted by: Bernardo FRAGA
Centro Brasileiro de Pesquisas Físicas

The most detailed temporal studies of the emission from blazars are usually done by trying to obtain a dense, simultaneous coverage of the source over a large multi-wavelenght observational campaign. Although it is well know that correlations between multi-band emission present sizeable temporal lags in their correlated variability, such properties are usually neglected in the majority of observational studies, which model the evolution of source parameters over time by either building time-averaged SEDs (when data is scarce) or considering strictly simultaneous snapshots of the source along the spectrum. By making use of the resources and large database made available through the ASI Science Data Center (ASDC), we present a novel approach to the modelling of blazar emission whereby the multi-epoch SEDs for Mkn 421 are modelled considering the temporal lags between bands (both in short and long-timescales), as obtained by a detailed cross-correlation analysis, spanning data from radio to VHE gamma-rays from 2008 to 2014. In addition to that, long-term optical polarisation data is used to aid and complement our physical interpretation of the state and evolution of the source.

HE0359-3959: an extremely radiating quasar

Poster A22

Submitted by: Mary Loli MARTÍNEZ-ALDAMA
Instituto de Astrofísica de Andalucía

Co-authors: Negrete C. A.; Del Olmo A.; Marziani, P.; Dultzin, D.; Sulentic, J. W; Stirpe, M. G. We present a multiwavelength analysis of the quasar HE0359-3959. Along the 4DE1 sequence this source is classified as highly accreting, of spectral type A3. Its CIV1549 profile shows a high amplitude blueshift (slightly less than 6000 km/s) and the optical and UV spectra show prominent FeII emission. In the NIR region, the CaII is detected in emission with narrow symmetric profile that allow us to isolate the individual components of the triplet. The one peculiarity of this object is the observation of a prominent blueshifted excess on the side of the 1900 blend, resembling the blueshifted emission observed in CIV. We interpret this source as an extreme among extreme Pop. A sources, with a very-low ionization emitting region coexsiting with a prominent high-ionization outflow.

Diffuse emission from the inner galaxy

Poster A23

Amid NAYERHODA

We will present preliminary analysis of HAWC diffuse emission data from the inner Galaxy. The HAWC measurements will be used to constrain particle transport properties close to the Galaxy center.

Multiwavelength Variability Study in 3C 279 and the Location of its Gamma-Ray Emission Zone

Poster A 24

Submitted by: Víctor Manuel PATIÑO ÁLVAREZ

Max Planck Institute for Radioastronomy

We present light curves for 3C 279 over a time period of six years; the longest time period used for a multiwavelength analysis since the Fermi/LAT was launched. Our multiwavelength data comprises radio to gamma-rays, with additional optical polarimetry. We find that synchrotron emission is dominant in the regime from ultraviolet to Near Infrared during the entire time-frame. Cross-Correlation analysis of the gamma-ray light curves with different bands on different time periods, suggests a change over time in the dominant gamma-ray emission mechanism (Synchrotron Self-Compton or External Inverse Compton). We also find an anomalous activity period with multiple flares in all bands, but with no counterpart in gamma-rays, we argue that this might be due to gamma-ray opacity caused by an increment in the Lorentz factor of the emission region; and we show theoretical calculations for the cross-sections of both Inverse Compton Scattering and Electron-Positron Pair Production. Preliminary results on the analysis made to VLBA images from MOJAVE, show that the dominant source of radio continuum in this source is static over time, and since the cross-correlation results show a change in delay between the gamma-rays light curve and the synchrotron light curves (UV through radio), this strongly suggests that the location of the gamma-ray emission region in 3C 279 changes over time.

Multi-frequency, photometric and spectroscopic variability study of Narrow Line Seyfert 1: 1H 0323+342

Poster A25

Submitted by: Harold PEÑA
INAOE, UniTO

It is presented a spectroscopic and photometric variability study of the gamma-ray detected Narrow Line Seyfert 1 (NLS1), 1H0323+342. The bands used are the flux of the Hβ λ 4861 emission line, the flux of the optical continuum at λ5100Å, the flux of the Fe II emission lines at λ4750Å, the γ-rays band, the X-rays band, the V band, the J, H and K bands at near infrared and the 15 GHz band. To conduct the study, were used spectra taken at Guillermo Haro Astrophysics Observatory and San Pedro Martir observatory 2.1 m telescopes during a time period from 2012 to 2015. These spectra were reduced using the standard procedure: cosmetic reduction, wavelength calibration and flux calibration. Later, continuum emission and Fe II emission were subtracted and the flux was re-calibrated, relative to the flux of the emission line [OIII]λ5007. Finally, Hβ flux and continuous light curves were built. In addition, a multi-frequency flux variations analysis was made using available observational data from: Owens Valley Radio Observatory 40 m radio-telescope, at 15 GHz; Steward Observatory Support of the Fermi Mission, at V filter; Swift X-Ray Telescope, from 0,3 to 10 KeV and the Large Aperture Telescope (LAT) onboard of FERMI mission, from 0,1 to 300 GeV. The construction of the light curves was done using the software HEASoft from the High Energy Astrophysics Science Archive Research Center (HEASARC). Finally, cross-correlation analysis were conducted between bands and Fractional rms Variability Amplitude in order to find and detect delays and variability. As, variability was found in the flux of the emission line Hβ λ4861A, in the continuum measured at λ5100Å, in Fe II λ4750Åflow and the H, J and K infrared bands. The spectral variation H line (Fmax / Fmin) is 1.7, while the continuous λ5100 Å is 2.6.

The MEXSAS2 sample and the ensemble X-ray variability of quasars

Poster A26

Submitted by: Roberto SERAFINELLI
University of Rome "Tor Vergata"

We present the second Multi-Epoch X-ray Serendipitous AGN Sample (MEXSAS2), extracted from the most recent XMM Serendipitous Source Catalogue release (XMMSSC-DR6), cross-matched with Sloan Digital Sky Survey quasar catalogues DR7Q and DR12Q. Our sample also includes measurements for masses, bolometric luminosities, and Eddington ratios extracted from Shen et al. (2011) and Kozlowski (2016). Analyses of the ensemble structure function and spectral variability are presented, together with their dependences on such parameters. We also present the analysis of the spectral variability as a function of the time lag. We discuss the role of the measurement errors in the analysed correlations.

Probing the diffuse optical-IR background with TeV blazars

Poster A27

Submitted by: Elisa PRANDINI

Padova University

Blazars are radio loud quasars whose jet is almost aligned to the line of sight. The emission is non-thermal, dominated by the jet emission, and in some cases extends up to the very high energies (VHE; E > 100 GeV). To date, more than 50 blazars have been detected at VHE mainly with ground-based imaging atmospheric Cherenkov telescopes (IACTs) like MAGIC, H.E.S.S. or VERITAS. Energetic photons from a blazar may interact with the diffuse optical and IR background (the extragalactic background light, EBL) leaving an imprint on the blazar energy spectrum. This effect can be used to constrain the EBL, with basic assumptions on the intrinsic energy spectrum. Current generation of IACTs is providing valuable measurements of the EBL density and energy spectrum from optical to infrared frequencies. In this contribution, I will present the latest results obtained with the MAGIC telescopes and outline the future perspectives.

Topic B

Extragalactic VHE neutrino background from the accretion disks around active galaxies

Poster B1

Submitted by: Wlodek BEDNAREK

University of Lodz

We propose that extra-galactic neutrino background can be produced by neutrons interacting with the matter of the accretion disks around black holes in active galaxies. Neutrons are extracted from nuclei which are disintegrated in jets of active galaxies. We propose that neutrinos produced from the whole population of the active galaxies can explain the extra-galactic neutrino background recently measured by the IceCube neutrino detector, provided that 5% fraction of galaxies is AGN and a few percent of neutrons reach the accretion disk.

Resolving the spatially unresolved AGN in data-driven dissection

Poster B2

Submitted by: Beatriz VILLARROEL

Uppsala University/ETH Zurich

It is a non-trivial task to infer from spatially unresolved spectra of AGN the region of origin of an observed spectral line. To constrain the structure of line-emitting gas, one may utilize either photoionisation theory or expensive reverberation mapping. We introduce a statistical method under development, Co-locative correlation analysis (CoCoA), for identifying the origin of an emission line by calculating the correlation-of-correlations, called rho', between line fluxes in observed low-resolution spectra of AGN. We show results from testing the code on tens of single-epoch SDSS spectra to figure out the characteristic NLR lines. We find no difference between the characteristic lines of the NLR in Seyfert-1 and Seyfert-2 AGN, in accordance with the AGN Unification theory. Finally, we show an apparent linear relation between rho' of Balmer lines in Seyfert-1s and time lags obtained from reverberation mapping for Zw 229-015, suggesting that the code could predict the structure of gas regions in AGN.

Using an artificial neural network to obtain the redshift probability distribution for quasars

Poster B3

Submitted by: Carolina QUEIROZ DE ABREU SILVA
University of Sao Paulo (USP)

Quasars are valuable sources for several cosmological applications. In particular, they can be used to trace some of the heaviest halos and their high intrinsic luminosities allow them to be detected at high redshifts. This implies that quasars (or active galactic nuclei, in a more general sense) have a huge potential to map the large-scale structure. The upcoming narrow-band optical survey J-PAS is now a concrete possibility of mapping a massive number of quasars, over a large area of the sky. At the same time, artificial neural network techniques are becoming increasingly popular due to their ability to recognize patterns or trends and acquire knowledge through an adaptive learning process. In this work, we show how to derive a redshift probability distribution for quasars using the publicly available code ANNz. We also combine three different techniques (template fitting, neural network and Bayesian inference) to help break the degeneracies that arise between quasars and stars, which can degrade the quality of the quasar catalog through both misidentification and catastrophic redshift errors.

Phylogenetic Analyses of Quasars and Galaxies

Poster B4

Submitted by: Didier FRAIX-BURNET
CNRS / IPAG

We have performed a cladistic analysis on two samples of 215 and 85 low$-z$ quasars ($z < 0.7$) which were studied in several previous works and which offer a satisfactory coverage of the Eigenvector 1-derived main sequence. The data encompass accurate measurements of observational parameters which represent key aspects associated with the structural diversity of quasars. Cladistics is able to group sources radiating at higher Eddington ratios, as well as to separate radio-quiet (RQ) and radio-loud (RL) quasars. The analysis suggests a black hole mass threshold for powerful radio emission and also properly distinguishes core-dominated and lobe-dominated quasars, in accordance with the basic tenet of RL unification schemes. Considering that black hole mass provides a sort of "arrow of time" of nuclear activity, our result suggests that the ontogeny of black holes is represented by their monotonic increase in mass. More massive radio-quiet Population B sources at low-z become a more evolved counterpart of Population A i.e., wind dominated sources to which the "local" Narrow-Line Seyfert 1s belong. In addition to the analysis of luminous type 1 AGN and low$-z$ quasars, we have applied cladistic techniques to a sample of viz. 4000 galaxies of the WINGS survey which are mostly quiescent or host modest star formation activity and low-luminosity AGNs. Preliminary results is given in this poster.

On the efficiency of jet production in FR II radio galaxies and quasars

Poster B5

Submitted by: Katarzyna RUSINEK

Nicolaus Copernicus Astronomical Center, Polish Academy of Sciences

The main aim of our work was to check whether powers of jets in FR II radio galaxies and quasars can be reproduced by the MAD (Magnetically Arrested Disk) scenario. Assuming that established in the recent numerical simulations of the MAD scenario the $(H/R)^2$ dependence of the jet production efficiency is correct, we demonstrate that in order to reproduce the observed jet powers in FR II sources: (i) accretion disks must be geometrically much thicker than the standard ones; (ii) and/or that the jet production is strongly modulated.

Modeling the reverberation of optical polarization inside AGN

Poster B6

Submitted by: Patricia Andrea ROJAS LOBOS

Observatoire astronomique de Strasbourg

The central region of AGN cannot be resolved by direct optical observations because of its small angular size. It is proposed to exploit time-dependent polarization as a useful tool to indirectly resolve the unresolvable. Using polarimetric observations we can elucidate indirectly the inner region of AGN by conducting polarization reverberation mapping. In this talk, I am going to present the results of radiative transfer calculations with STOKES, in its time-lag version, for a few AGN models involving different morphologies, different dust prescriptions and several half-opening angles of the circumnuclear region. The models were also tested with and without polar outflows. This is a first step towards confronting consistent models to the observational data obtained from polarization reverberation mapping.

Dynamics and formation of obscuring tori in AGNs

Poster B7

Submitted by: BANNIKOVA, Elena

Institute of Radio Astronomy, Ukranian Academy of Science

In the framework of the unified scheme, the observed diversity of active galactic nuclei (AGNs) can be explained by the orientation of the dusty torus relative to an observer. Direct observations of tori in the nearest Seyfert galaxies confirm the suggestion of a thick geometrical structure. Investigations of the mega-maser radiation show non-Keplerian rotation curves which can be related to the influence of the torus self-gravity. Indeed, the torus mass in NGC 1068 from ALMA observations is approximately 10^5 solar masses. We explored the gravitational properties of the torus in the framework of N-body simulations. One main result is that a thick torus with the mass of a few percent of the central mass is stable due to moving clouds in inclined and elongated orbits. The shape of the torus cross-section is oval with

a Gaussian distribution of the density matching the observed AGN spectra; the rotation curves differ from Keplerian due to the torus self-gravity. We investigated the influence of different initial conditions on an equilibrium shape of the torus cross-section. The thickest toroidal structure forms from the initial spherically-symmetric distribution of the clouds with anisotropy along two polar cones. This may imply that the formation of torus is related to the appearance of outflows and to the beginning of the active stage in the galaxy nuclei.

Topic C

Blazar meets Seyfert, or the interesting gamma-loud NLSy1 galaxies and their modeling

Poster C1

Submitted by: Maialen ARRIETA-LOBO
Observatoire de Paris

Prior to the Fermi-LAT era, only two classes of AGN were thought to harbor relativistic jets that radiate up to gamma-ray energies: blazars and radio galaxies. The detection of variable gamma-ray emission from radio-loud narrow-line Seyfert 1 (RL-NLSy1) galaxies has put them on the spotlight as a new class of gamma-loud AGN. The interpretation of the high-energy emission of RL-NLSy1s requires taking into account Inverse Compton emission of particles in the relativistic jet that interact with external photons fields, such as infrared emission from a dusty torus, optical emission from an accretion disk, and the photons from the broad line region. In this respect, RL-NLSy1s seem to be situated between blazars, which are dominated by the non-thermal jet emission, and accretion-disk dominated Seyferts. In this work, we try to bridge the physical properties of the central engines of gamma-loud NLSy1s and the origin of the observed multi-wavelength radiation by modeling the SED of particularly interesting gamma-ray emitting RL-NLSy1s via a multi-component radiative model.

An orientation indicator for quasars

Poster C2

Submitted by: Susanna BISOGNI
Università di Firenze - INAF OAA

We present an analysis of of the average spectral properties of ∼12,000 SDSS quasars as a function of accretion disk inclination, as measured from the equivalent width of the [O III] 5007 line. The employment of this indicator on a large sample of quasars of the SDSS DR7 has proven the presence of orientation effects on the features of UV/optical spectra, confirming the presence of outflows in the NLR gas and that the geometry of the BLR is disk-like. Relying on the goodness of this indicator, we are now using it to investigate other bands/components of AGN. Specifically, the study of the UV/optical/IR SED of the same sample provides information on the obscuring "torus". The SED shows a increase of the IR fraction moving from face-on to to edge-on positions, in agreement with models where the torus is coaxial with the accretion disk, and characterized by a clumpy structure.

Challenges in reconciling observations and theory of the brightest high-energy flare ever of 3C 279

Poster C3

Submitted by: Eugenio BOTTACINI

University of Padova

Recent high-energy missions have allowed keeping watch over quasars in flaring states, which provide deep insights into the engine powered by supermassive black holes. However, having a quasar caught in a very bright flaring state is not easy requiring long surveys. Therefore, the observation of such flaring events represents a goldmine for theoretical studies. Such a flaring event was captured by the INTEGRAL mission in June 2015 while performing its today's deepest extragalactic survey when it caught the prominent quasar 3C 279 in its brightest flare ever recorded at gamma-ray energies. The flare was simultaneously recorded by the Fermi-LAT mission, by the Swift mission, and by observations ranging from UV, through optical to the near-IR bands. The derived snapshot of this broad spectral energy distribution of the flare has been modeled in the context of a one-zone radiation transfer leptonic and lepto-hadronic models constraining the single emission components. I will discuss results and challenges faced by trying to reconcile these observations and theory. Also implications for the detection of VHE gamma rays by Atmospheric Cherenkov Telescopes for such a flare will be discussed.

On the Rotation of the Super-Massive Black Hole in Mrk 876

Poster C4

Submitted by: Elena ORLANDO

Stanford University

Most galaxies undergo one or more eras of Active Galactic Nucleus (AGN) activity throughout their existence. During this era their environment around the central super-massive black hole emits from X-ray to soft gamma-ray energies. Therefore these spectra and their features carry the information of the extreme gravitational conditions. However these spectral features can be transient and shifted to unexpected energies making their detection difficult. We present our recent results of a case study on the AGN Mrk 876. The detection of a transient and extreme gravitationally redshifted Fe-line allows us to find its emission mechanism, thereby constraining the rotation of the super-massive black hole in the center of Mrk 876. These findings tie in Mrk 876's morphology with observed evolutionary properties of AGN in the nearby Universe.

On the nature of radio-quiet weak emission line quasars.

Poster C5

Submitted by: Parveen KUMAR

Aryabhatta Research Institute of Observational Sciences (ARIES), Nainital, India

Optically selected radio-quiet QSOs with weak or no emission lines, could belong to the hitherto unrecognised population of radio-quiet BL-Lac objects or radio-quiet QSOs with a depleted broad line region (BLR). One strategy to pursue such a search is to characterize the optical polarisation, spectroscopic and intra-night optical variability (INOV) of radio-quiet WLQs (RQWLQs). In the context of INOV properties of RQWLQs our group has recently exploited a sample of 60 light curves of 33 RQWLQs, and reported that two of the RQWLQs in two sessions exhibit very strong INOV amplitude $\psi > 10\%$ like that of BL Lac, though the average duty cycle is found about $\sim 5\%$ like normal radio-quiet QSOs. High percentage polarisation, $> 3 - 4\%$, being one of the defining criteria of classical BL Lac, can be used to test whether the optically selected radio-quiet weak emission line QSOs (RQWLQs) show high enough percentage polarisation for them to be radio-quite analogue of BL Lac objects. For this we carried out spectral and polarisation measurements of a sample of 19 such RQWLQs. We also report a statistical comparative study of the spectral slope, long time temporal variation of the continuum flux at different time scales using a sample of 45 RQWLQs with 900 redshift-luminosity matched control sample of QSOs and 120 blazars collected from the literature. The structure function analysis shows that the mechanism triggering the optical variability in RQWLQs is similar to that in QSOs than that of blazars. Similarly, the spectral slope distribution of RQWLQs differ at high significance from that of blazars, suggesting that the mechanism of RQWLQs central engine might be resembling more with that of normal QSOs, perhaps with less developed BLR as a cause of their weak emission lines. Unlike BL Lacs the role of jet emission may not be prominent in RQWLQs.

The physical driver of Eigenvector 1 in Quasar Main Sequence

Poster C6

Submitted by: SWAYAMTRUPTA PANDA

Nicolaus Copernicus Astronomical Center, PAS, Warsaw

Eigenvector 1 (EV1), is a singular dominant trend controlling the AGN spectra wherein many properties (Eddington ratio, black hole mass, accretion rate and others) are found to be correlated. Analogous to the problem of identification of the entities that govern the stellar main sequence on the HR diagram, EV1, is defined to be the horizontal trend with the FeII strength (RFeII = EWFeII / EWHβ). We propose that the physical driver of EV1 is the maximum of the accretion disk temperature, reflected in the shape of the SED. It depends BOTH on the Eddington ratio AND the black hole mass. We will show the results of tests of sensitivity of Hβ and optical FeII emissions upon SED by testing the dependence on the position of the peak of SED using CLOUDY photoionisation code. We use a single density cloud as a first approximation.

Using the SCUBA-2 Cosmology Legacy Survey to investigate the relationship between black hole growth and star formation

Poster C7

Submitted by: Joanna RAMASAWMY

University of Hertfordshire

We investigate the relationship between black hole accretion and star formation in galaxies hosting active galactic nuclei at redshifts $1 < z < 3$. By combining ultradeep 850- μm data from the SCUBA-2 Cosmology Legacy Survey with XMM-Newton and Chandra X-ray observations, we study the average sub-millimetre properties of galaxies hosting active galactic nuclei across a number of survey fields, probing a wide range of X-ray luminosities. We will present the results of a stacking analysis to explore relationships between accretion luminosity, obscuration and star formation rate, and discuss the implications of these results on different models of AGN fuelling and feedback mechanisms.

Probing Accretion Black Holes Using Reverberation Mapping

Poster C8

Submitted by: David STARKEY

University of Saint Andrews

The extreme distances and small sizes of AGN render their interiors unresolvable. Despite this resolution barrier, it is widely accepted that the centres of AGN host supermassive black holes surrounded by luminous accretion disks. These disks exhibit correlated variability in UV through optical light curves with a time lag that increases with wavelength. Reverberation mapping is a technique that exploits these time lags to gather information on the size and geometry of the disk. I present a series of lightcurve observations of a nearby AGN (NGC 5548) and describe how statistical methods can be used to infer (interesting) accretion disk parameters. For NGC 5548, I find lags that are $\sim$ 3x larger than expected for a standard-steady-state accretion disk with the mass and accretion rate found for this object from previous studies. I suggest a theoretically-predicted mechanism that naturally inflates the time lags by splitting the accretion disk into two misaligned structures. Self-heating between these twin disks increases the temperature profile and can go some way to reconciling the observed and predicted lags. Work is ongoing to improve the tilted disk model to incorporate relativistic effects and more realistic accretion disk physics.

Upper limits on the masses of supermassive black holes from HST gas dynamics

Poster C9

Submitted by: Ilaria PAGOTTO

Università di Padova

Key information about the co-evolution between the central supermassive black holes and their host galaxies is derived by the analysis of correlations between the black hole mass and properties of the host galaxy. We obtained tight upper limits on the black hole mass of a sample of eight galaxies from gas dynamical modeling of the emission-line width measured on sub-arcsec apertures with HST. The sample comprises seven spiral galaxies which to date are less extensively studied with respect to early-type galaxies.

Black hole mass estimation in AGN type 1: optical vs. UV spectral parameters

Poster C10

Submitted by: Luka POPOVIC

Astronomical Observatory Belgrade

Here we present the investigation of the black hole mass estimation using optical and UV spectral parameters, measured from a large sample of AGN type 1 spectra selected from the Sloan Digital Sky Survey (SDSS) database. We have applied the model of multi-Gaussian spectral decomposition and calculated UV and optical Fe II templates in order to obtain the pure profiles of the Hβ (in optical) and Mg II (in UV) lines. We have analyzed and compared the virilization of the Hβ and Mg II lines, and their possible usage for black hole mass estimation. We have applied the Balmer continuum model, calculated as a sum of the high order Balmer lines, in order to estimate the pure power-law UV continuum luminosity, for black hole mass calculation. Finally, we have compared the black hole mass estimations derived from UV and optical spectral parameters, calculated with different methods: using virial theorem and gravitational redshift.

The Super Eddington accretion flow in a Type-1 narrow line QSO

Poster C11

Submitted by: Martin WARD

Durham University

We present a detailed multi-wavelength study of an unobscured, highly super-Eddington Type-1 QSO RXJ0439.6-5311. Our recent XMM-Newton observation, combined with all archival data from the infrared to hard X-rays, provides a better understanding of extremely super-Eddington accretion flows. We estimate its black hole mass to be in the range 5-10 million solar masses. For this mass range the optical/UV continuum implies a standard thin disc structure down to 190-380 R(grav), within which the disc may become geometrically thick and so trigger a disc wind. This puffed-up inner disc is probably associated with the observed soft X-ray component. The broadband SED tightly constrains the bolometric luminosity and mass accretion rate through the outer disc. For its mass range, we estimate L(bol)/L(Edd) of 2.7 - 6.5.The difference we find between this Eddington ratio and the accretion rate through the outer disc, suggests a significant energy loss in the inner disc region due to a disc wind and/or advection. No short-term optical/UV variability was detected, but correlated optical/UV/X-ray variability is clearly detected on a timescale of years, which is probably due to long-term changes in the mass accretion rate through the outer disc. Significant outflows are also inferred from both the NLR and BLR emission lines, confirming an extremely powerful radiation field. We construct a global picture for the structure of the super-Eddington accretion flow in this object. We note that it has a very similar optical/UV spectrum to the NLS1 1H0707-495, which in contrast exhibits a complex X-ray spectrum. However, it also has similar X-ray properties and broadband SED to the NLS1 PG1244+026, which has a simple X-ray spectrum. Therefore, RXJ0439.6-5311 provides strong evidence that the 'simple' and 'complex' super-Eddington NLS1s could be unified within the same accretion flow scenario, but with different inclination angles. We propose that these extreme NLS1s are the low-redshift analogs of weak emission-line quasars.

Covering factors of the dusty obscurers in radio-loud and radio-quiet quasars

Poster C12

Submitted by: Maitrayee GUPTA

Nicolaus Copernicus Astronomical Centre

We compare covering factors of circumnuclear dusty obscurers in radio-loud and radio-quiet quasars. The radio-loud quasars are represented by a sample of FR II quasars obtained by cross-matching a catalogue of the FR II radio sources selected by van Velzen et al. with the SDSS DR7 catalogue of quasars. Covering factors of FR II quasars are compared with covering factors of the radio-quiet quasars matched with them in redshift, black hole mass, and Eddington-ratio. We found that covering factors, proxied by the infrared-to-bolometric luminosity ratio, are on average slightly smaller in FR II quasars than in radio-quiet quasars. For both samples, no

statistically significant dependence of a median covering factor on Eddington ratio, black hole mass, nor redshift can be claimed.

Topic D

High resolution spectroscopy of the extended narrow-line region of IC 5063 and NGC 7212

Poster D1

Submitted by: Enrico CONGIU
Dipartimento di Fisica e Astronomia

Some active galactic nuclei (AGN) are characterized by conical or bi-conical structures of highly ionized gas called extended narrow-line region (ENLR) or ionization cones. They are observed only in a small number of objects (~ 50) and their properties are far to be understood. I will present a detailed study of the properties of the gas of the ENLR of two Seyfert 2 galaxies, IC 5063 and NGC 7212, by mean of high resolution spectroscopy. We investigated how the main physical properties of the ionization cones depend on the gas velocity. Then we reproduced the observed spectra with photo-ionization and shock models to deeply investigate physical properties that are difficult to estimate from the observations.

Decoupled kinematics of neutral and ionized gas outflows in low$-z$ galaxies

Poster D2

Submitted by: Hyun-Jin BAE
Yonsei/SNU

We investigate the kinematics of the neutral gas of the interstellar medium (ISM) using the Na I$\lambda\lambda$5890,5896 (Na D) absorption lines by exploiting a large sample of $\sim$113,000 galaxies selected from the SDSS at $z < 0.3$. After removal of Na D contributed from the stellar atmosphere, we isolate the amount of Na D excess, which stems from neutral gas absorption in the ISM. We find that the kinematics of Na D from the stellar atmosphere are consistent with the stellar kinematics, while the Na D-excess kinematics show strong signs of outflows. The Na D-excess kinematics of both optical AGNs and star-forming galaxies are similar to one another, suggesting that AGN activity has no or little contribution to the neutral gas. By comparing the Na D-excess kinematics with the [O III]λ5007 kinematics, which is governed by AGN outflows, we confirm that the Na D-excess and [O III] are kinematically decoupled. In addition, we find that the Na D-excess kinematics strongly depend on the host galaxy's inclination, supporting that the outflows driven by star formation are a main driver for the observed neutral gas kinematics in the ISM. Since AGN does not seem to play a significant role for the neutral gas outflows, AGN activity may

not provide a rapid quenching on the star formation at least for the host galaxies at low redshift.

The primordial environment of supermassive black holes (II): deep Y and J band images around the z$\sim$ 6.3 quasar SDSS 1030+0524

Poster D3

Submitted by: Barbara BALMAVERDE

Scuola Normale Superiore di Pisa

Many cosmological studies predict that early supermassive black holes (SMBHs) can only form in the most massive dark matter halos embedded within large scale structures marked by galaxy over densities that may extend up to $\sim$ 10 physical Mpc. This scenario, however, has not been confirmed observationally. The field around the z =6.28 quasar SDSSJ1030+0524 (J1030) is unique for multi-band coverage and represents an excellent data legacy for studying the environment around a primordial SMBH. Here we present wide-area ($\sim$ 25′×25'), Y- and J-band imaging of the J1030 field obtained with the near infrared camera WIRCam at the Canada-France-Hawaii Telescope (CFHT). We used these new infrared data to refine our selection of Lyman Break Galaxies (LBGs) presented in Morselli et al. 2014 (M14). We found a significant asymmetry in the distribution of the high-z galaxies in J1030, supporting the existence of a coherent large-scale structure around the quasar. We estimated an over-density of $z \sim 6$ galaxies in the field of $\delta = 2.4$, which is significant at >4 σ. The over-density value and its significance are higher than those found in M14, and we interpret this as evidence of an improved LBG selection.

The most powerful [OIII] outflows in SDSS/WISE hyperluminous quasars (WISSH)

Poster D4

Submitted by: Manuela BISCHETTI

INAF OAR

The WISSH quasars project is designed to accurately constrain both AGN and host galaxy ISM properties in a large sample of $\sim$ 90 broad-line quasars at the brightest end of the AGN luminosity function (L_{bol} < 1e47 erg/s) and at the peak of the AGN number density ($z \sim 2-4$). I will present the discovery in 30 % of the sample of [OIII] emission lines with broad, skewed profiles of exceptional luminosities ($\sim$ 1e45 erg/s), revealing among the most powerful (up to $\sim$8000 M_{odot}/yr and $\sim$ 4% of L_{bol}) ionized outflows. I will discuss the physical properties of these extreme outflows, the relation between large-scale ionized winds and AGN properties, and the likely possibility that at the highest luminosities the ionized outflows may trace a larger fraction of the total outflowing gas.

AGN feedback drives ULIRGs into post-starburst E+A galaxies

Poster D5

Submitted by: Dalya BARON

Tel Aviv University

Radiation and winds from active galactic nuclei (AGN) can result in negative feedback that affects the growth of the stellar population in the host galaxy and quenches its star formation (SF). In particular, theory and simulations suggest that the ULIRG phase of a large merger can end its evolution as a result of such feedback, leaving behind a post-starburst system with little gas and dust but with an active AGN in its center. This, somewhat speculative scenario, has never been put to a real observational test. Here we present the first direct evidence for an AGN-driven feedback in a quiescent, post starburst E+A galaxy. Our Keck/ESI spectroscopy shows the clear signature of a nuclear wind, driven by an active black hole, with a large enough mass outflow rate to quench the former SF phase. We detect two sets of nuclear emission lines, LINER-like and Seyfert-like, that enable us to measure the AGN luminosity and the mass outflow rate. We also derive the time required to complete the process of transforming a powerful ULIRG into a red and dead early type galaxy.

Proximity effect as a probe to study quasar nearby environment.

Poster D6

Submitted by: Priyanka JALAN

Aryabhatta Research Institute of observational sciencES (ARIES) , India

The analysis of the absorption systems seen in the spectra of QSOs is found to be one of the most sensitive and powerful tools to determine the physical conditions of quasar environment. Using one of the traditional and powerful methods to study the quasar effect on the nearby environment is using proximity effect. It is sort of easy to study line of sight proximity effect as all it need is a spectra of quasars. While transverse proximity effect needs a close pair of quasars. With close pairs of quasars at different redshifts, a background quasar sight-line can be used to study a foreground quasar's environment in absorption. SDSS DR12 gives 270 quasars pair with separation less than 1 arc-min. Using all these pairs we tried to analyse the longitudinal and transverse proximity effect comparing with a control sample of IGM matching in redshift and SNR. In this way the redshift evolution is taken care of, which if was done by scaling would introduce artefacts. We used pixel optical depth statistics in our analysis. Comparing the affected region with IGM by cumulative probability distribution function gives an indication, that the overdensity at radius less than 2 Mpc overshadows proximity while as we go further away from the quasar the proximity or the ionisation seems to dominate. Using the UV background radiation as a function of redshift, we took care of the ionisation part and we see an exponentially decreasing excess overdensity with radius. This excess overdensity is evident till 5Mpc.

Massive ionized outflows in quasars.

Poster D7

Submitted by: Paola MARZIANI
INAF - Osservatorio Astronomico di Padova

The most luminous quasars in the Hamburg-ESO survey show, at a high prevalence, CIVλ1549 and [OIII]$\lambda\lambda$4959,5007 emission line profiles with high-amplitude blueshifts that provide evidence of outflows occurring over a wide range of spatial scales. The derived ionized gas mass, kinetic power, and radiation thrust are extremely high, and support the occurrence of widespread feedback effects of nuclear origin on the host galaxies of luminous quasars, at cosmic epochs between 2 and 6 Gyr since the Big Bang.

The properties of circumgalactic gas and environment of quasars.

Poster D8

Submitted by: Riccardo OTTOLINA
Università degli Studi dell'Insubria

The properties of circumgalactic gas in the halo of quasar (QSO) host galaxies are investigated analyzing MgII 2800 and C IV 1550 absorption-line systems. We use the optical spectroscopy of closely aligned pairs of quasars (projected distance $\leq$ 200 kpc) obtained at the VLT and Gran Telescopio Canarias to investigate the distribution of the absorbing gas for a sample of quasars at $z \sim 2$. Absorption systems of EW ≥ 0.3Å associated with the foreground QSOs are revealed up to 200 kpc from the centre of the host galaxy, showing that the structure of the absorbing gas is patchy with a covering fraction quickly decreasing beyond 100 kpc. We also study the relations between the properties of the circumgalactic medium and those of the host galaxies and of the large scale galaxy environments of the foreground quasars. We used deep optical and near-IR images obtained at VLT.

Ionized gas outflows in active galactic nuclei: a detailed study of their physical properties from the MAGNUM survey

Poster D9

Submitted by: Giacomo VENTURI
UniFi / INAF-OA Arcetri

AGN are believed to have a strong feedback on their host galaxies, accelerating fast outflows powerful enough to completely quench star formation. Quasars, as high luminosity AGN, are among the best candidates to observe intense feedback in action. However, it is not possible to study quasar outflows on scales smaller than 100 pc, as spatial information is limited by their large distances. This is however feasible in nearby active galaxies, which are ideal laboratories to explore outflow properties, their formation and acceleration mechanisms, as well as the effects of AGN on their host galaxies. The results from studies of local galaxies

can then be extended to outflow observations in distant quasars. In this talk I will present results from the MAGNUM survey, which aims at investigating in details the properties of outflows in nearby AGN, both in ionized gas with VLT/MUSE and in molecular gas with ALMA. Thanks to its unique combination of large field of view and spectral coverage, MUSE allows us to map AGN-driven outflows in several emission lines revealing a clear kinematical and spatial structure related to the ionisation cone, whose correlation with the molecular features from ALMA is also examined. The intrinsic outflow 3D shape and physical properties can then been inferred with kinematical modelling. Finally, tentative evidence of star formation induced by AGN outflows ("positive feedback") is found.

STELLAR POPULATION AND GAS KINEMATICS OF POST-STARBURST QUASARS

Poster
D10

Submitted by: David SANMARTIM
Gemini Observatory South

Post-Starburst Quasars (PSQs) are an intriguing set of galaxies that simultaneously host active galactic nuclei (AGNs) and post-starburst stellar populations. Considering that PSQs show both the signatures of a post-starburst stellar population – which indicates the cessation of star formation – and nuclear activity, they are the most suitable objects to investigate the nature of the connection between these two components. The simultaneous presence of a post-starburst stellar population and nuclear activity may be explained by two possible scenarios. In the secular evolutionary one, flow of gas towards the nucleus triggers star formation in the central region, and then an episode of nuclear activity is triggered after few 100 Myrs. In the meantime, star formation may cease due to exhaustion of the gas. In the quenching scenario, flow of gas towards the nucleus triggers star formation in the nuclear region, and the nuclear activity, when triggered, quenches star formation. In order to test these scenarios we have mapped the central kiloparsecs of the star formation history, manifestations of nuclear activity and excitation mechanism for two nearby PSQs by using the Gemini GMOS-IFU. In these two first exploratory studies, we have found that the young and intermediate age populations are located in a ring at $\approx$ 300-500 kpc and we also found some contribution of the intermediate age component located in the central region. In both of them, the gas outflow – from which the AGN feedback power can be calculated – does not coincide with the young stellar population ring. It suggests that the ring is not being affected by the AGN feedback, but only the innermost regions. As a general behavior, the velocities of the outflows are on the order of $\sim$ 600-800 km/s and the mass outflow rates of $\approx$ 0.0-0.03 $M_\odot$ /yr, one order of magnitude greater than the AGN accretion rate, which suggests a scenario where the AGN-driven wind has entrained material from the circumnuclear region. The individual study of the PSQ 0330-0532 for instance, has supported the evolutionary scenario, since the post-starburst population is not located close enough to the nucleus, where the outflow is observed. Instead, it is located in a ring at $\approx$500 pc from the nucleus, which is out of the reach of the AGN feedback. In the most central region, internal to the ring, where we observed the

outflow, stellar population is predominantly old with some contribution from young stars and it does not show any signature of star formation quenching. On the other hand, for the PSQ 0210-0903, both scenarios seem to be playing: the quenching due to the AGN feedback close to the nucleus, which is co-spatial with the nuclear outflow, and the evolutionary scenario due to the ring at $\approx$ 800 pc from the nucleus. In order to increase the statistical significance of our previous results and to distinguish between the proposed scenarios, we are conducting the same analysis to a wider sample of PSQs selected from the SDSS DR12, which we hope can point out more conclusively regarding the scenario that could be favored: the evolutionary scenario or the quenching one. During the meeting we will detail the results of our two first exploratory studies and for other 3 compelling cases, which are being analyzed currently and being compared to a control sample.

Theoretical Re-evaluations of Scaling Relations between SMBHs and Their Host Galaxies 1. Effect of Seed BH Mass

Poster D11

Submitted by: Hikari SHIRAKATA
Hokkaido University, JAPAN

We explore the effect of varying the mass of a seed black hole on the resulting black hole mass bulge mass relation at $z \sim 0$, using a semi - analytic model of galaxy formation combined with large cosmological N-body simulations. When the mass of the seed is set at 10^5 $M_\odot$, we find that the model results become inconsistent with recent observational results of the black hole mass – bulge mass relation for dwarf galaxies. On the other hand, when we employ seed black holes of $10^3 M_\odot$ or select their mass randomly within a 10^3 – 10^5 $M_\odot$ range, the resulting relation is consistent with observational results including the dispersion. We also find that black hole mass - bulge mass relations for less massive bulges at $z \sim 0$ put stronger constraints on the seed BH mass than the relations at higher redshifts.

Theoretical Re-evaluations of Scaling Relations between SMBHs and Their Host Galaxies –2. Importance of AGN feedback suggested by stellar age velocity dispersion relation

Poster D12

Submitted by: Hikari SHIRAKATA
Hokkaido University, JAPAN

Abstract2: We present the galactic stellar age – velocity dispersion relation obtained from a semi-analytic model of galaxy formation. We divide galaxies into two populations: galaxies which have an over-massive/under-massive BH against the best-fitting BH mass – velocity dispersion relation. We find that galaxies with an over-massive BH have older stellar age. This result is consistent with observational results obtained from Martin-Navarro et al. (2016) and Merrifield et al. (2000).

We also find that to obtain this result, AGN feedback is one of the key processes; without the AGN feedback, galaxies with larger velocity dispersion have younger stellar age. In this poster, we also present some statistical properties of galaxies and AGNs obtained from the semi-analytic model to confirm that the model results are consistent with recent observational results.

Luminous and obscured quasars and their host galaxies

Poster D13

*Submitted by:*Agnese DEL MORO

Max-Planck Institute for Extraterrestrial Physics (MPE)

The most heavily-obscured, luminous quasars might represent a specific phase of the evolution of the actively accreting super massive black holes and their host galaxies, possibly related to mergers. We investigated a sample of the most luminous quasars at $z \sim 2$ in the GOODS fields, detected in the mid-infrared band through detailed SED decomposition. The vast majority of these quasars ($\sim$80%) are obscured, and $\sim$30% of them to such an extent that they are undetected in some of the deepest X-ray data. Although no clear relation is found between the star-formation rate of the host galaxies and the X-ray obscuration, we find a higher incidence of heavily-obscured quasars in disturbed/merging galaxies compared to the unobscured ones, thus possibly representing an earlier stage of evolution, after which the system is relaxing and becoming unobscured.

Probing the gas fuelling and outflows in nearby AGN with ALMA

Poster D14

Submitted by: Anelise AUDIBERT

Observatoire de Paris

Feeding and feedback in AGN play a very important role to gain a proper understanding of galaxy formation and evolution. The interaction between activity mechanisms in the nucleus and its influence in the host galaxy are related to the physical processes involved in feedback and the gas fuelling of the black hole. The discovery of many massive molecular outflows in the last few years have been promoting the idea that winds may be major actors in sweeping the gas out of galaxies. Also, the widely observed winds from the central regions of AGN are promising candidates to explain the link of scaling relations (e.g. the black hole-bulge mass relation, BH accretion rate tracking the star formation history) under the AGN feedback scenario. Out goal is to probe these phenomena through the kinematic and morphology of the gas inside the central kpc in nearby AGN. This has recently been possible due to the unprecedented ALMA spatial resolution and sensitivity. We are going to present the results for NGC7213 and NGC1808, the latter is part of a new ALMA follow-up of the NUGA project, a previous high-resolution (0.5-1) CO survey of low luminosity AGN performed with the IRAM PdBI.

Topic E

Quasar Outflows at $z \geq 6$ in Cosmological Hydrodynamical Simulations

Poster E1

Submitted by: Paramita BARAI

IAG-USP: Instituto de Astronomia, Geofisica e Ciencias Atmosfericas - Universidade de So Paulo

I will present results from cosmological hydrodynamical simulations to probe $z \geq 6$ quasar outflows in the early universe. Accretion of gas onto central supermassive black holes of quasars and resulting energy feedback from the AGN generates powerful outflows, as has started to being observed at high redshifts. We perform zoom-in cosmological hydrodynamical simulations of high$-z$ massive galaxies, which are typical host galaxies of quasars. Our simulations employ the 3D TreePM SPH code GADGET-3, and include metal cooling, star formation, chemical enrichment, supernova feedback, AGN accretion and feedback. We analyze the simulation output in post-processing to study the growth of the first SMBHs and their co-evolution with galaxies. We quantify the impact of quasar outflows on their host galaxies; especially the effects on star formation in terms of negative or positive feedback.

Obscured Quasars in the Cosmic Web: Dark Matter Halos and Unification Models

Poster E2

Submitted by: Michael DIPOMPEO

Dartmouth College

With WISE all-sky mid-IR data we can now assemble large obscured quasar samples, allowing us to place them in the context of the growth of cosmic structure and galaxy evolution. Using two independent methods, we find that obscured quasars reside in halos with larger masses than their unobscured counterparts, with implications for evolutionary quasar models. Under the assumption that a subset of the obscured population is indeed obscured by a torus, and otherwise intrinsically identical to the unobscured population, our measurement places a lower limit on the halo masses of obscured quasars that represent a particular evolutionary phase. Using analytical methods and cosmological simulations, we predict the halo masses of this distinct population. Finally, using a simple halo growth model and empirical relationships between halo, stellar, and black hole masses, we show that an evolutionary sequence from obscured to unobscured quasar phases in conjunction with a flux or luminosity

limit can not only naturally reproduce our halo mass measurements, but explain some discrepant results in the literature.

Dusty rulers and candles behind VEILS – a push for AGN as cosmological probes

Poster E3

Submitted by: Sebastian HOENIG
University of Southampton

(1) On dusty rulers and sooting candles behind VEILS – a push for establishing AGN as cosmological probes AGN have long been sought as cosmological probes since they are ubiquitous, luminous, and can be readily pointed. Well-established lag-luminosity relationships of the broad-line region (BLR) and the hot dust emission offer the foundation for their use as standardisable candles. More recently, we demonstrated a method to measure geometric distances to AGN, thereby establishing the hot dust emission as a standard ruler. We are now pushing for combining both methods to provide new independent constraints for cosmological parameters based on AGN. The talk will focus on the state of the direct distance measurements to determine the Hubble constant as well as the new ESO public survey VEILS from which we will create an AGN Hubble diagram out to redshift 1.2. I will also discuss the next phase in these efforts in the framework of the upcoming 4MOST TiDES spectroscopic survey.

New insights into the formation of the first black holes

Poster E4

Submitted by: Fabio PACUCCI
Yale University - Department of Physics

The first black hole seeds likely formed when the Universe was younger than 500 Myr . They play an important role in the growth of early (z =7) super-massive black holes. While much progress ha s been made in understanding their formation and growth, their observational signatures remain largely unexplored. As a result, we are yet to detect these sources. We developed a theoretical/computational framework to study the growth properties and the spectrum emitted by the first black holes. We then present a novel photometric method to identify black hole seed candidates in deep multi-wavelength surveys. The method relies on infrared and X-ray observations and selects the only two objects with a robust X-ray detection found in the CANDELS/GOODS-S survey with a photometric redshift $z > 6$. To date, the se selected objects represent the most promising black hole seed candidates, possibly formed via the direct collapse black hole scenario. While this result is based on the best photometric observations of high$-z$ sources available to date, additional gains are expected from deeper spectroscopic and X-ray data. For this reason, we explore the role that JWST will play in the detect ion of the first black holes in the Universe. The case of CR7, a high$-z$ Lyα emitter suspected to host a direct collapse black hole, is also presented.

Quasars as a tracer of large-scale structures in the distant universe

Poster E5

Submitted by: Hyunmi SONG
Korea Institute for Advanced Study

We study the dependence of the number density and properties of quasars on the background galaxy density using the currently largest spectroscopic data sets of quasars and galaxies. We construct a galaxy number density field smoothed over the variable smoothing scale of between approximately 10 and $20h^{-1}$ Mpc over the redshift range $0.46 < z < 0.59$ using the Sloan Digital Sky Survey (SDSS) Data Release 12 (DR12) Constant MASS galaxies. The quasar sample is prepared from the SDSS-I/II DR7. We examine the correlation of incidence of quasars with the large-scale background density and the dependence of quasar properties such as bolometric luminosity, black hole mass, and Eddington ratio on the large-scale density. We find a monotonic correlation between the quasar number density and large-scale galaxy number density, which is fitted well with a power-law relation, $n_Q \propto \rho_G^{0.618}$. We detect weak dependences of quasar properties on the large-scale density such as a positive correlation between black hole mass and density, and a negative correlation between luminosity and density. We discuss the possibility of using quasars as a tracer of large-scale structures at high redshifts, which may be useful for studies of the growth of structures in the high-redshift universe.

Variability of MgII line in Quasars as one step to understand dark energy properties.

Poster E6

Submitted by: ŚREDZIŃSKA, Justyna
Nicolaus Copernicus Astronomical Center, PAS

The Universe day after day give us more discoveries and even more surprises. Current astronomical observations indicate that the Universe consists in only 5% of the well-known matter, but in 95% of invisible and not understood substances: dark matter and dark energy. This last component is most difficult to understand. Dark energy acts in the opposite way to gravitational attraction: it causes the acceleration of the universal expansion. This conclusion is extremely peculiar and is one of the most interesting problem to solve in modern relativistic astrophysics. Precise and independent measurement methods of this effect are necessary to understand the nature of dark energy. Quasars are very luminous centres of active galaxies, which are observed from very large distances (wide range of redshift) and It turned out they are ideal candidates for this purpose (Watson et al. 2011, Czerny et al. 2013, Marziani & Sulentic 2013, 2014; Wang et al. 2013; Hoenig 2014; Yoshii et al. 2014). They are not standard candles, but their use is based on the determination of the absolute luminosity for each of them. This can be achieved by measuring the time delay between the variable nuclear continuum and the emission lines, as confirmed by the delay measurement of the Hβ line done for nearby AGNs. The time delays in quasars are of the order of a few years, so the project requires sparse monitoring

over an extended period of time. We monitor intermediate redshift quasars (at redshift around 1), which requires using the MgII line (this strong line moves to optical band), and not to many groups work on such research. The observations performed so far with SALT showed that we achieve the requested accuracy (below 2 per cent) of the MgII measurement to determine its variability, and the simulations indicate that the program can provide accuracy of 0.06-0.32 mag in the distance modulus for each single quasar. High-quality spectra from SALT allow for a very detailed modeling of the line shape and remove potential sources of the systematic errors. I will describe new encouraging results from the dedicated spectroscopic monitoring being currently performed by our team using Mg II line.

Quasars as Standard Candles

Poster
E7

Submitted by: Damien COFFEY

Max Planck Institute for Extraterrestrial Physics

Quasars are well known to exhibit a non-linear relationship between the UV emission from their accretion disks and the X-ray emission from the surrounding corona. This relationship has recently been used to include quasars as standard candles in a Hubble diagram in order to test the ΛCDM cosmological model and to constrain the cosmological parameters Ω(m) and Ω(Λ) (Risaliti and Lusso 2015). In this work, we investigate the relationship between X-ray and UV emission in quasars using two large multi-wavelength quasar samples detected by ROSAT and XMM-Newton. Using the combined sample of over 4000 quasars, we improve the cosmological constraints available from the quasar Hubble diagram.

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