TALKS

Title: Plenary Talk

Presenter: Aneta Siemiginowska

Institution: Harvard-Smithsonian Center for Astrophysics

Abstract:
Active Galactic Nuclei vary on many timescales, over an entire spectral energy distribution and a wide range of amplitudes. This variability provides critical information about the processes involved in generating the AGN radiation and therefore on the nature of the AGN. I will review physical processes that can cause the observed variations.

Title: Optical Variability of AGNs

Presenter: Szymon Kozlowski

Institution: Warsaw University Observatory

Collaboration: OGLE

Abstract:
I will briefly review basic analysis methods used to describe the typical optical variability of AGNs - structure functions and the damped random walk model - their applicability, usage, biases and caveats, and limitations. I will present some of the results for the SDSS Stripe82 and OGLE AGNs.

Title: Variable and Changing Look AGN as probes of accretion physics

Presenter: Jason Dexter

Institution: MPE

Abstract:
I will review ordinary and extreme variability in the context of AGN and black hole X-ray binaries, focusing on challenges in explaining changing look AGN and future observations that could distinguish between possible physical scenarios.

Title: Reverberation Mapping of Luminous Quasars at High-z

Presenter: Paulina Lira

Institution: Universidad de Chile

Coauthors: Ismael Botti, Hagai Netzer, Shai Kaspi

Abstract:
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 several of them we are able to measure lags for the Lya and CIV lines, in this way updating the CIV radius-luminosity relation of Kaspi (2007) and providing for the first time a Lya radius-luminosity relation for low and high luminosity AGN.

Title: Long-term variability of SDSS-RM quasars

Presenter: Ian McGreer

Institution: Steward Observatory

Coauthors: Yue Shen, Niel Brandt, Pat Hall, Qian Yang, Kate Grier, Karen Kinemuchi

Collaboration: SDSS Reverberation Mapping Project

Abstract:
The SDSS Reverberation Mapping campaign has monitored a sample of 850 quasars both photometrically and spectroscopically over a span of 3 years. Including data from the CFHTLS provides a 15 year baseline for examining quasar variability over a wide range of redshift, luminosity, and time. We will present early results on the variability properties of SDSS-RM quasars, and demonstrate the success of the project in meeting its primary goal of measuring broad emission line time lags from multi-object spectroscopy.

Title: The Origin and Utility of Changing-Look Quasars

Presenter: John Ruan

Institution: University of Washington

Abstract:
Recent discoveries of changing-look quasars have revealed new properties of AGN accretion on timescales of months to years. I will discuss current evidence for these various scenarios for the origin of this phenomenon, including tidal disruption events and rapid changes in accretion rate, as well as possible links between these scenarios. I will also describe ongoing observational programs to utilize changing-look quasars to understand accretion physics and AGN feedback, with particular focus on X-ray and optical wavelengths.

Title: The Extreme AGN Zoo: a CRTS perspective

Presenter: Matthew J. Graham

Institution: California Institute of Technology

Coauthors: S. George Djorgovski, Daniel Stern, Ashish Mahabal, Andrew Drake

Abstract:
The availability of large collections of astronomical time series is now supporting systematic analyses of both the normal stochastic variability of quasars, as well as of the rare and extreme behaviors. This allows us to distinguish between a heavy-tailed distribution or different populations of behavior. In this talk I will review the different extreme categories we have so far identified in the Catalina Real-time Transient Survey: close (subparsec) supermassive black hole binaries, flaring sources suggestive of explosive stellar-related activity in the accretion disk, microlensed sources, and (dramatic) spectral variability coupled with strong, persistent changes in luminosity. I will also consider upcoming possibilities for further detection, characterization and modeling of these objects.

Title: Extremely Variable Quasars from CRTS and WISE

Presenter: Daniel Stern

Institution: JPL/Caltech

Coauthors: Matthew Graham, Nick Ross, Aaron Meisner, Hyunsung Jun, Arjun Dey

Abstract:
I will present deep dives on a few examples of highly variable quasars identified from the Catalina Real-Time Transient Survey (CRTS) and WISE/NEOWISE, complimenting more general talk(s) on variable AGN identified in these surveys presented by collaborators (e.g., Matthew Graham). In particular, I will focus on a CRTS-identified iron low-ionization broad absorption line (FeLoBAL) quasar which, over the past decade, has transformed into a more typical BAL quasar (Stern et al. 2017a, in press) and a WISE-identified quasar that has shut off in the past decade (Stern et al. 2017b, in prep.). I will focus on what we learn about the physics of these systems from the multiwavelength imaging and spectroscopy. Given the pace of discovery, additional interesting examples are expected to be discovered before the conference.

Title: Spectroscopic Followup of Changing-Look Quasar Candidates

Presenter: Chelsea MacLeod

Institution: CfA

Coauthors: Paul Green

Collaboration: TDSS

Abstract:
In the era of time domain astronomy, repeat spectroscopic observations spanning over a decade are revealing intriguing variability in Type I quasars. I present results from a spectroscopic follow-up program of changing-look quasars, which exhibit large changes in the broad components of Balmer emission lines. Such sources highlight the importance of obtaining large samples of quasars with repeat spectroscopy, one of the goals of the Time Domain Spectroscopic Survey of SDSS-IV.

Title: Mrk 1018 returns to the shadows after 30 years as a Seyfert 1

Presenter: Meredith Powell

Institution: Yale

Coauthors: Bernd Husemann, Rebecca McElroy, Grant Tremblay, Tanya Urrutia, Mirko Krumpe

Collaboration: Close AGN Reference Survey

Abstract:
As part of the Close AGN Reference Survey (CARS), we have discovered that Mrk 1018 has changed optical type again after 30 years as a type 1 AGN. This is only the third 'changing look' AGN to have undergone a full cycle, and the only one that has been caught in the act of a major ongoing accretion change. I report the initial discovery from the MUSE integral field unit on the VLT, where it was found that the Type 1 spectral features had disappeared. I will present our follow-up optical photometry and spectroscopy monitoring campaigns, as well as data obtained through director's discretionary time from Chandra and HST, which strongly suggest that the dramatic change is neither caused by a TDE nor by obscuration of an intervening cloud. Excitingly, I will show that our continuing multi-wavelength monitoring of the source provides first evidence of a reignition of the nucleus.

Title: The changing-look AGN Mrk 590: radio variability, accretion flow, and gas fueling

Presenter: Jun Yi Koay

Institution: Academia Sinica Institute of Astronomy and Astrophysics

Coauthors: Marianne Vestergaard, Daniel Lawther, Hayley Bignall, Cormac Reynolds, Bradley Peterson

Abstract:
The supermassive black hole in the Seyfert galaxy Mrk 590 was accreting mass at a high rate of ~10% of the Eddington limit in the 1990s, but within a span of ~15 years has dramatically shut down. Its Hβ broad emission line has completely disappeared, and the present optical-UV continuum emission can be modeled solely by the stellar populations of the host galaxy. As one of the dozen or so known changing-look AGNs, Mrk 590 provides an excellent opportunity for studying black hole fueling and accretion physics. I present the results of our recent investigation into the origin of the parsec-scale radio emission in Mrk 590, and its flux variations relative to that observed at optical-UV and X-ray wavelengths as the AGN turned off. I will also discuss ongoing monitoring of the central continuum fluxes at radio to X-ray wavelengths, to determine if the AGN is switching to a radiatively inefficient mode of accretion, and better understand the cause of the significant changes in its accretion rate. Lastly, I will show ALMA CO line observations of Mrk 590 to examine if the AGN is running out of gas, and study its gas fueling mechanisms.

Title: The behavior of the broad Mg II emission line in changing-look quasars

Presenter: Jessie Runnoe

Institution: University of Michigan

Abstract:
Changing-look quasars are a newly recognized class of high-luminosity active galactic nucleus where we observe dramatic transitions between "quasar-like" and "galaxy-like" spectral states on timescales of a decade or less. These objects are a challenge to explain in the context of accretion physics and represent unique opportunities to study quasar unification, variability, lifetimes, and feedback. To date, a dozen changing-look quasars have been identified and the highest redshift examples highlight the striking difference between the behavior of the broad Balmer and Mg II emission lines in response to continuum changes. Under normal circumstances Mg II is known to be less responsive to continuum fluctuations, and in these extreme objects Mg II emission persists when all other signs of the central engine have disappeared. I will discuss the physical implications of this behavior in the context of extreme continuum variability, as well as present the results of new Mg II observations for several known changing-look quasars.

Title: Broad emission line variability on long timescales; Interpreting a complex BLR response

Presenter: David Homan

Institution: University of Edinburgh

Coauthors: Andy Lawrence, Chelsea MacLeod, Nicholas Ross

Abstract:
On short timescales, days to weeks, the response of the broad emission lines to changes in the ionising continuum allow us to investigate the structure of the BLR. Reverberation mapping (RM), based on the direct response of different lines to variations in the continuum, has proven particularly useful. As large survey data has become available, it is now clear that the BLR response on longer timescales, years to decades, is in fact more complex than the results of RM studies would suggest. An important example of this complex response are changing look objects, which gain or lose the broad H_beta (4861A) component of their spectrum over the course of several years. During recent years, these have been discovered to exist in greater numbers and out to higher redshifts than previously known. This presentation will expand on the study of these objects, showing that the spectral variability extends to lines that appear constant at shorter timescales. The broad MgII (2798A) line, which has shown only limited variability in some objects in RM studies, can in fact be strongly variable over the period of several years. This result is based on new observations of several extremely optically variable AGN. The correlation of MgII variability with the changing look phenomenon, as well as MgII variability in the broader AGN population will be discussed. The subject of variable broad line responsiveness will be further developed through the case study of Mrk 110. By using a high ionisation line, HeII (4686A), as a tracker of the obscured ionising continuum, it will be shown that there is a spread in the response of the broad lines, perhaps indicating a saturation-based mechanism causing these differences.

Title: Threading the microneedle

Presenter: Alastair Bruce

Institution: Institute for Astronomy, University of Edinburgh, UK

Abstract:
Over the last several years we have identified an intriguing subset of AGN which are smoothly varying by factors of 10 or more on decade-long timescales. The light curves for these events can be singly or multiply peaked. One possible explanation for this type of activity is that these are microlensing events, caused by an intervening, stellar-mass object crossing the line of sight to a background AGN. These transients appear to be in a different regime to the microlensing seen in multiply imaged quasars, as a select number are well described by comparatively simple microlensing models. With the addition of multi-epoch spectroscopy, we have also observed clear differential changes in the flux of the broad line region with respect to the continuum. If the lensing scenario is correct, these changes may be due to these different sized components being partially resolved by the lens, allowing size constraints to be made. This talk will focus on our most recent results in this area and the exciting possibilities for future.

Title: AGN variability on 10^4-10^5 yr timescales - the case of IC 2497 and Hanny's Voorwerp

Presenter: Lia Sartori

Institution: ETH Zürich

Coauthors: Kevin Schawinski, Michael Koss, Ezequiel Treister, William Keel, Peter Maksym

Abstract:
The discovery of "Hanny's Voorwerp" (HV), an extended AGN-photoionised emission line region associated with the nearby galaxy IC 2497, gives us the opportunity to study AGN variability and its effect on the host galaxy on 10^4-10^5 yr timescales. The combined analysis of deep Chandra (0.5-8 keV) and new NuSTAR (3-24 keV) X-ray observations, together with WISE mid-IR photometry and optical longslit spectroscopy, suggests that IC 2497 hosts a Compton thick AGN whose luminosity dropped by more than a factor 20 within the last ~10^5 yr (change in Eddington ratio from λ_Edd ~ 0.02 to λ_Edd ~ 0.001). Due to this drop in AGN luminosity, we can now explore the host galaxy unimpeded by the presence of a strong quasar which would dominate the observations. For example, Chandra soft X-ray data suggest the presence of a bubble expanding in the hot gas around the fading AGN. We propose that this bubble might be driven by the AGN that, after dropping in luminosity, is entering a kinetic mode and provides a source for mechanical feedback on the galaxy.
Starting from the results obtained for IC 2497 and other galaxies related to extended emission line regions similar to HV, the so called Voorwerpjes, I will discuss the implications of long timescale AGN variability for the BH - host galaxy coevolution, and the analogy between AGN and X-ray binaries lifecycles.

Title: Lifetime of High Redshift Quasars

Presenter: Anna-Christina Eilers

Institution: Max Planck Institute for Astronomy (MPIA)

Coauthors: Prof. Joseph Hennawi (UCSB), Dr. Frederick Davies (MPIA, UCSB)

Abstract:
One of the major remaining goals in observational cosmology is to understand how our Universe transitioned from the "dark ages", following recombination, into the ionized universe we can observe today. For this purpose we compiled a new data set of 36 high redshift (5.8<z<6.5) quasar spectra of moderate resolution, containing several new and unpublished objects, and reduced these spectra in a coherent and homogeneous way. The analysis of this rich data set enables new insights into the early evolutionary phase of our Universe and the early stages of AGN and galaxy formation traced by the intergalactic gas.
We analyze the proximity zones of the quasars in our data set, i.e. the regions surrounding the quasars that have been ionized by their own radiation, in order to set constraints on the onset and duration of the reionization process as well as the lifetime of these quasars. We find several objects showing exceptionally small proximity zones and argue that only a very short lifetime (t_Q<10^5 years) can be causing these small zones by comparing our measurements to radiative transfer simulations. We analyze the implications of such short quasar lifetimes on their black hole accretion rates and highlight tensions with current black hole growth theories. Additionally we try to understand by theoretical modelling of quasar proximity zones how episodic quasar activity influences the size of their proximity zones.

Title: Discovery of a dying AGN in Arp 187

Presenter: Kohei Ichikawa

Institution: Columbia University/NAOJ

Coauthors: Junko Ueda, Megumi Shidatsu, Taiki Kawamuro, Kenta Matsuoka

Abstract:
We investigate optical, infrared, and radio active galactic nucleus (AGN) signs in the merger remnant Arp 187, which hosts luminous jets launched in the order of 10^5 yr ago but whose present-day AGN activity is still unknown. We find AGN signs from the optical BPT diagram and infrared [O IV] 25.89 μm line, originating from the narrow line regions of AGN. On the other hand, Spitzer/IRS show host galaxy dominated spectra, suggesting that the thermal emission from the AGN torus is considerably small or already diminished. Combining the black hole mass, the upper limit of radio luminosity of the core, and the fundamental plane of the black hole enables us to estimate X-ray luminosity, which gives <10^40 erg s^-1. Those results suggest that the AGN activity of Arp 187 has already been quenched, but the narrow line region is still alive owing to the time delay of emission from the past AGN activity.

Title: Illuminating Black Holes with Tidal Disruption Events

Presenter: James Guillochon

Institution: Harvard-Smithsonian Center for Astrophysics

Abstract:
Most supermassive black holes in the local universe lie dormant, with only one in a hundred accreting at their Eddington limits. Aside from this active minority, and the black holes in nearby galaxies that we can observe to influence the dynamics of stars and gas, most remain difficult to study. Tidal disruptions of stars by supermassive black holes give these dormant black holes a chance to be seen once every ~10,000 years, and each tidal disruption brings along with it a host of observable signatures that can be studied from gigaparsecs away, from the moment of the disruption to millennia after a disruption has occurred. In my talk I will present recent breakthroughs on the study of the tidal disruptions of stars, and describe their dynamics, observational signatures from real-time monitoring, and relics of disruption that may exist in plain sight.

Title: Systematic investigations of stellar tidal disruption flares

Presenter: Sjoert van Velzen

Institution: JHU

Coauthors: Thomas Wevers, Nicholas Stone, Peter Jonker, Brian Metzger

Abstract:
The tidal disruption of a star injects a large amount of gas close to the black hole event horizon, thus making these events very useful tools for studying the extremes of accretion physics. However, we have yet to understand how the debris of the disrupted star circularizes and forms an accretion disk. The efficiency of this circularization process is expected to depend on the mass of the black hole that disrupted the star. Hence a systematic study of tidal disruption flares as a function of black hole mass can shed light on how the circularization mechanism operates. In addition, a census of tidal disruption flares observed a few years after their maximum light can probe emission due to any "missing energy" that is predicted if circularization initially is inefficient. In this talk, I will present results from the first flux-limited sample of tidal disruption flares with consistent black hole mass estimates as well as late-time far-UV observations.

Title: Results from Long-Term Monitoring of an X-ray Bright TDE at only 90 Mpc

Presenter: W. Peter Maksym

Institution: Harvard-Smithsonian Center for Astrophysics

Abstract:
Tidal disruption events (TDEs) can probe evolution of the transition of supermassive black hole accretion from super-Eddington rates to very sub-Eddington rates in a way that is governed by the trajectory and composition of the disrupted star and its debris. Long-term monitoring of nearby TDEs can therefore provide important clues to the accretion mechanisms probed by this process. We present results from long-term monitoring of the TDE ASASSN-14li in UV and X-rays. At only 90 Mpc, ASASSN-14li is one of the closest X-ray bright TDEs in the past decades, and therefore an exceptional target for such a campaign.

Title: iPTF16fnl - a faint and fast TDE in an E+A galaxy

Presenter: Nadejda Blagorodnova

Institution: Caltech

Coauthors: Suvi Gezari, Tiara Hung, Shri Kulkarni, Brad Cenko

Collaboration: iPTF

Abstract:
Tidal disruption events power short duration accretion episodes in SMBHs. For lower mass SMBHs, the returning timescales of the bound stellar debris is expected to be faster than for larger SMBHs, leading to shorter flare timescales with high accretion rates. In my talk, I will present observations of an optical TDE candidate iPTF16fnl, discovered by the iPTF collaboration in August 2016. This event, located in an E+A galaxy, is peculiar in many ways. It is one of the closest events discovered so far, it has unusually fast timescales, but also low peak luminosity, L~1.e43 erg/s, an order of magnitude fainter than previously discovered optical TDE events. For most of the current transient surveys, such faint events would be only accessible within a limited local volume (<350 Mpc), as compared to more luminous flares.

Title: The Unusual Host Galaxies of Tidal Disruption Events

Presenter: Decker French

Institution: University of Arizona

Abstract:
Post-starburst galaxies are the sites of both a high rate of Tidal Disruption Events (TDEs) and possible AGN activity. We have recently found that the optical/UV bright TDE rate is enhanced 30-200x in post-starburst galaxies, and that at least half of these TDE hosts have LINER-like ionization sources. I will discuss these results, and their implications for whether this connection is causal or manifestations of the same phenomenon. Either circumnuclear gas fueling a LINER could increase the TDE rate, TDE debris could fuel a LINER, or the observational signatures of both the TDE and LINER could be caused by only one of these. I will describe several tests to distinguish among these possibilities, using spatially and temporally resolved spectra.

Title: Rates of Tidal Disruption Flares in Post-Starburst Galaxies

Presenter: Nicholas Stone

Institution: Columbia University

Coauthors: Brian Metzger, Sjoert van Velzen

Abstract:
Recent observations have discovered that supermassive black holes (SMBHs) in post-starburst galaxies host highly elevated rates of tidal disruption events (TDEs). SMBHs in post-starburst, or E+A, galaxies tidally disrupt stars at rates ~100 times greater than the TDE rate in normal galaxies. While it is clear that exotic dynamical processes are at play in the central regions of E+As, there is as yet no consensus on which of several possibilities enhances the TDE rate so dramatically. I will overview different dynamical hypotheses, and present tentative observational evidence that the enhanced TDE rate is due to centrally concentrated star formation, which creates an overdense cusp of stars with short two-body relaxation times. I will briefly discuss connections to SMBH mass and spin evolution.

Title: Optical variability of AGN in the Palomar Transient Factory Survey

Presenter: Neven Caplar

Institution: ETH Zurich

Coauthors: Simon J. Lilly, Benny Trakhtenbrot

Abstract:
I will show the results of the analysis of the largest fully re-calibrated single-band dataset collected with Palomar Transient Factory Survey. Focus will be on the connection between variability and the physical parameters of AGN. I will show that the amplitude of variability is mostly dependent on the luminosity of AGN, but power spectra of variability changes with black hole mass. I will also briefly explore the possible connection between variability of AGN and their co-evolution with host galaxies. At the end, I will discuss how AGN spin influences variability and the growth of black holes in Universe.

Title: Insights on the Geometry and Physical Processes at Work in AGN from Reverberation

Presenter: Chris Done

Institution: Durham University

Abstract:
The recent intensive multi-wavelength campaigns on NGC5548 and NGC4151 have got us somewhere really new in terms of data, motivating development of full physical models. I will show how such models conclusively show that the physical situation is more complicated than the standard picture where the UV/optical continuum variability is produced by simple light travel time reverberation of the observed X-ray flux. I will discuss alternative geometry and physical processes which can be at work, and stress how the requirement for large amplitude UV/optical variability biases these campaigns towards low Eddington ratio AGN.

Title: A theoretical study of the geometry of accretion flow in AGN

Presenter: Bifang LIU

Institution: National Astronomical Observatories, Chinese Academy of Sciences

Abstract:
The X-ray emission from AGN is believed to originate in a hot corona lying above a thin accretion disk. The inner accretion disk produces copious optical-UV emission, which is Compton up-scattered into X-rays by the hot corona. The rapid variability of the 2–10 keV X-ray emission seen from many AGN, X-ray spectral timing studies such as reverberation analyses of AGN spectra, the emissivity profile of the broad iron line, point to a very compact corona locating within 10 gravitational radii of the black hole. Variability analyses of lensed quasars also indicate small hard X-ray emission regions. We present a disk corona model, where the corona and the disk are well coupled with mass and energy exchange. We show that the corona is radiatively compact while the accretion flow is extended, the compactness of direct emission from the corona changes with Eddington ratio, leading to a change in the emissivity profile of reflected emission. The correlation between the hard X-ray photon index and the reflection scaling factor is also well interpreted by the model.

Title: Wavelength-Dependent Variability of Active Galactic Nuclei in the UV and Optical from GALEX and Pan-STARRS1

Presenter: Tiara Hung

Institution: University of Maryland

Coauthors: S. Gezari, D.O. Jones, R. Chornock

Abstract:
Several mechanisms (e.g. X-ray reprocessing, accretion rate variations in the disk, localized temperature fluctuations) operating on different timescales have been proposed to be responsible for the UV and optical variability seen in AGNs. In order to investigate the origin of UV/optical variability, we test the wavelength-dependent variability of a sample of 23 spectroscopically confirmed AGNs using the standard thin disk model with variable accretion rate. Our sample, selected by cross-matching the GALEX Time Domain Survey and the Pan-STARRS1 Medium Deep Survey, has a broader wavelength coverage than any previous study. On the timescale of a year, we find good agreement between the data and the thin disk model, which fits the data better than a simple power-law. We derived a median characteristic disk temperature of 1.2$\times$10^5 K and a median power law index of -2.1 from fitting, both of which are consistent with the expectation of a classical accretion disk.

Title: X-ray timing constraints on AGN winds

Presenter: T.J.Turner

Institution: UMBC

Coauthors: L. Miller, J.N.Reeves, V. Braito

Abstract:
Joint consideration of X-ray timing data in conjunction with time resolved spectroscopy allows us to detect and interpret lags within the X-ray band and thus tackle several key questions in AGN research, including the origin of the time lags between different X-ray bands and the distance, global covering, physical state, velocity and mass of the X-ray reprocessing gas.

Title: Investigating the Dramatic X-ray Variability of a Low-Redshift NLS1 with XMM-Newton and NuSTAR

Presenter: Sara Frederick

Institution: University of Maryland College Park

Coauthors: Erin Kara, Christopher Reynolds

Abstract:
The most variable AGN offer powerful illustrations of interesting accretion-related phenomena. They often exhibit dramatic variability in the X-ray band on a range of timescales down to a few minutes. In addition to stochastic variability, a fraction of these are observed to change flux "state", the origin of which remains poorly understood within the unified AGN scheme. We present the exemplifying case study of 1H1934-063A (z = 0.0102), a narrow-line Seyfert 1 (NLS1) that is among the most variable AGN observed with XMM (Ponti 2012). Similar to other highly variable Seyfert 1s, this AGN is X-ray bright and displays strong reflection features. We present spectral and temporal analyses of a concurrent XMM-Newton and NuSTAR observation (120 ks), during which we explore a steep 33% plummet and subsequent full recovery of flux. We compare detailed time-resolved spectral fitting with reverberation mapping in order to constrain source geometry, dynamics, and emission/absorption processes dictating the nature of the variability. Combined spectral and timing results point to a dramatic change in the continuum on timescales as short as a few ks. We find agreement with a change in the X-ray source height, and rule out purely Compton-thin absorption. We also announce the discovery of a high-frequency Fe-K time lag between the X-ray continuum emission and its reflection off the inner accretion flow.

Title: Unveiling the physics of AGN through X-ray variability

Presenter: Lorena Hernandez-Garcia

Institution: Istituto di Astrofisica e Planetologia Spaziali (IAPS-INAF)

Coauthors: Josefa Masegosa, Isabel Marquez, Omaira Gonzalez-Martin, Francesca Panessa, Matteo Guainazzi

Abstract:
Variability is a general property characterizing active galactic nuclei (AGN); however, it is not well established whether the changes occur in the same way in different families of AGN. Our aim is to disentangle the structure of low ionization nuclear emission line regions (LINERs) compared to Seyferts by the study of their spectral properties and X-ray variations. The main purpose of this work is to study the X-ray variability pattern(s) in AGN selected at optical wavelengths in a large sample, including low ionization nuclear emission line regions (LINERs) and type 1.8, 1.9, and 2 Seyferts, using the public archives in Chandra and/or XMM-Newton. Spectra of the same source gathered at different epochs were simultaneously fitted to study long term variations; the variability patterns were studied allowing different parameters to vary during the spectral fit. Whenever possible, short term variations from the analysis of the light curves and long term UV flux variability were studied.
Variations at X-rays in timescales of months/years are very common in all AGN families but short term variations are only found in type 1.8 and 1.9 Seyferts. The main driver of the long term X-ray variations seems to be related to changes in the nuclear power. Other variability patterns cannot be discarded in a few cases. I will discuss the geometry and physics of AGN through the X-ray variability analysis.

Title: Radio Observations of TDEs: Status and Prospects

Presenter: Kate D. Alexander

Institution: Harvard University

Coauthors: Edo Berger, Ashley Zauderer, Richard Saxton, Stefanie Komossa, James Guillochon

Abstract:
Tidal disruption events (TDEs) in which a star is torn apart by a supermassive black hole (SMBH) offer a unique opportunity to study the physics underlying the formation and growth of relativistic jets and outflows and to discover lower mass SMBHs than with existing techniques (~10^4 - 10^7 solar masses). Radio observations of TDEs allow us to precisely localize the emission (confirming its nuclear origin), to determine the properties of outflowing material (energy, size, expansion velocity), and to trace the ambient density profile around previously-dormant SMBHs on otherwise unresolvable scales of ~0.1 - 10 pc. I will present our high-cadence broadband radio studies of TDEs, which have revealed that some TDEs produce powerful relativistic jets, while others produce only lower-energy non-relativistic outflows. I will also comment on the prospects for studying TDEs and other extreme transient phenomena in AGN with upcoming radio facilities and surveys. With the advent of sensitive facilities like the Karl G. Jansky Very Large Array and planning well underway for vastly more powerful wide-field interferometers like the Square Kilometer Array, the study of radio astrophysical transients is poised for dramatic growth and current in-depth investigations will be invaluable for designing and interpreting the results from future surveys.

Title: PS16dtm: A Tidal Disruption Event in a Narrow-Line Seyfert 1 Galaxy

Presenter: Peter Blanchard

Institution: Harvard University

Coauthors: Matt Nicholl, Edo Berger, James Guillochon, Raffaela Margutti, Ryan Chornock

Abstract:
The latest generation of untargeted time-domain surveys have discovered new rare types of transients such as superluminous supernovae and tidal disruption events. Recent discoveries have also included luminous transients coincident with the nuclei of their host galaxies, making classification into established categories difficult, especially when the galaxy also has an active galactic nucleus. In this talk I will present results on PS16dtm, a recently discovered luminous transient coincident with the nucleus of a narrow-line Seyfert 1 galaxy. While initially classified as a Type IIn SLSNe, our extensive multi-wavelength follow-up campaign suggests that PS16dtm can best be explained as a tidal disruption event. PS16dtm highlights the importance of obtaining multi-wavelength observations for understanding the origin of rare nuclear transients as SLSNe, TDEs, or AGN variability.

Title: Mid-Infrared Light Curves of Tidal Disruption Event Candidates

Presenter: Lin Yan

Institution: California Institute of Technology

Coauthors: Tinggui Wang (University of Science and Technology of China), Ning Jiang (USTC, China), Roc Cutri (IPAC, Caltech)

Abstract:
We carry out a systematic search for mid-IR Tidal Disruption Events (TDE) candidates using time series photometries from WISE and NEOWISE data spanning more than 6 years. We present the results from this search, a total of 20 quiescent galaxies at $z < 0.1$ with strong mid-IR light curves with time scales of several 100 days. This is the first and largest sample of mid-IR LCs whose properties suggesting them being strong TDE candidates. We discuss the implications of this work.

Title: Probing the high-z TDE population with WFIRST and JWST

Presenter: Armin Rest

Institution: STScI

Coauthors: Dan Scolnic

Abstract:
WFIRST is the first wide-field and deep survey in the optical and infrared from space. One of the WFIRST core surveys is a SN Ia survey, which will regularly image an area on the order of 40 square degrees with the purpose of discovering thousands of supernovae and measuring high-cadence light curves of them. The search will also be very fruitful in the search for other transients, like tidal disruption events, at previously not accessible redshifts. These searches will enable new science investigations of the nature, origin, and environment of these objects. From simulations, we will show estimates of the TDE redshift range that will be probed by the WFIRST SN Ia survey, possible discovery rates with dependencies on different characteristics of the nature of TDEs, and how they can be spectroscopically followed up by JWST.

Title: Insights into the Supermassive Black-Hole Accretion Process from X-ray and Optical Time-Domain Surveys

Presenter: Ohad Shemmer

Institution: University of North Texas

Abstract:
AGN variability, on timescales of minutes to years, provides a powerful probe of the sub-pc region surrounding supermassive black holes (SMBHs). In the first part of my talk I will review recent efforts to use X-ray variability for estimating SMBH masses and for tracing the SMBH accretion history across cosmic time. I will discuss the prospects as well as the challenges and limitations of this approach. In the second part, I will describe what the future holds for investigations of SMBH accretion physics in the LSST era, when millions of AGN will be monitored frequently in multiple bands across wide ranges of redshift and luminosity.

Title: AGN hypervariables in the LSST era

Presenter: Andy Lawrence

Institution: University of Edinburgh

Coauthors: Alastair Bruce, David Homan, Nic Ross, Chelsea MacLeod, Bob Mann

Collaboration: LSST:UK consortium

Abstract:
Although rare cases of extreme AGN variability have been known for many years, we have moved into an era of discovery because of massive surveys and robotic facilities - in particular SDSS, PanSTARRS, PTF, and CRTS. With LSST, we will move beyond the novelty stage and perform systematic experiments. I will look at the prospects for LSST, the infrastructure we need to filter the firehose, how to achieve the follow up we need, and how to learn enough over the next few years to use LSST effectively.

POSTERS

Title: Characterization of AGN variability in the optical and near infrared regimes

Presenter: Paula Sanchez, presented by Paulina Lira

Institution: Universidad de Chile

Coauthors: Paulina Lira, Regis Cartier

Abstract:
Variability is arguably the defining feature of Active Galactic Nuclei (AGN), and is observed in every waveband, so variability studies are fundamental to understanding the extreme physical conditions of accretion disks near supermassive black holes. Several efforts have analyzed variability in the optical. However, to relate the variability and physical properties of AGN, we need well sampled light curves, which are still rare. At the same time very little is known about variability in the near infrared (NIR). At low redshift this waveband gives us information about the dust surrounding the accretion disk; at high redshift it tells us about the accretion disk itself. In this contribution we will present the current status of our QUEST-La Silla AGN variability survey. We have used the QUEST camera on the ESO-Schmidt telescope to obtain well sampled optical light curves of AGN in well-studied extragalactic fields that already have multiwavelength observations. The survey uses a broadband filter, the Q-band, similar to the union of the g and the r filters. We will present our results on variability-based AGN selection and AGN variability characterization in the optical regime. We will also present our statistical study of the NIR variability of AGN in the COSMOS field, using UltraVISTA data. This dataset give us a huge sample of light curves, allowing us to construct a global description of the nature of AGNs for different ranges of redshift, and for different levels of obscuration. By combining both surveys we expect to have a better understanding of the differences between the various classes of AGN.

Title: Extensive Coverage of Radio AGN Variability with CHILES

Presenter: Charee Peters

Institution: University of Wisconsin - Madison

Coauthors: Evangelia Tremou, Laura Chomiuk, Eric Wilcots

Collaboration: CHILES

Abstract:
Although many of the most energetic phenomena in the universe display changes in their brightness over time, the study of these variable and transient events in the radio sky is a relatively new field with many questions waiting to be answered. Previous studies of radio AGN variability have suffered from small number statistics and have focused on longer (month to year) variability or only the brightest of sources. The new deep-field survey, COSMOS HI Large Extragalactic Survey (CHILES) being conducted at the Karl G. Jansky Very Large Array (VLA) will observe 431 sources at a single time, the vast majority of which are expected to be AGN. CHILES will be collected over a total of 334 epochs of 3-hour integrations spanning over at least four years, with each epoch being able to be broken up into timescales as short as 10 seconds. CHILES will serve as a unique data set from which we can begin to statistically understand the radio transient and variable universe. Although the survey is ongoing, we are measuring the light curves of active galactic nuclei (AGN) over week- and month-long timescales to fill an important gap in our knowledge of low-luminosity radio AGN variability, and are beginning to answer: what is the full range of AGN variability on timescales from ten seconds to ten years?

Title: Identification of Active Galactic Nuclei through optical variability selection in GOODS South field

Presenter: Ektoras Pouliasis

Institution: National Observatory of Athens, Greece

Coauthors: A. Bonanos, I. Georgantopoulos

Abstract:
This work is part of the validation of the "Hubble Catalogue of Variables" (HCV), a new project of the European Space Agency that has been launched at the National Observatory of Athens and aims to identify variable sources (extended and point-like) in the Hubble Source Catalogue (Whitmore et al. 2016) through different variability indices. We aim to identify variable sources and especially Active Galactic Nuclei (AGN) through optical variability selection in the GOODS South deep field. In particular, we used Hubble Space Telescope (HST) z-band images taken over 5 epochs, separated by ~45 days and performed aperture photometry using SExtractor to derive the lightcurves of the sources. Two statistical methods (rms deviation & interquartile range) were employed for variability search, resulting in a final sample of 175 AGN candidates, having removed the artifacts by visual inspection and known stars and supernovae. We used the Chandra X-ray published catalogs to find the X-ray counterparts and validate the AGN activity.

Title: Dust formation in NGC 4151

Presenter: Johannes Esser

Institution: MPIA

Coauthors: Jörg-Uwe Pott (MPIA Heidelberg), Hans-Walter Rix (MPIA)

Abstract:
The relation between the UV luminosity of Active Galactic Nuclei (AGN) and the radius of the dust torus is proposed to be a powerful cosmological standard candle. Due to the very high brightness of AGN they can be used to higher redshift compared to supernova. However we need to better understand how the dust behaves in the AGN environment. For example how is the dust formed and destroyed leading to changes of the radius of the dust torus. Recently the picture of the dust torus changed from being symmetrical and with a sharp inner edge to a clumpy torus composed of individual dusty gas clouds and a radially extended inner edge. We have found evidence for NGC 4151 which connects a decreasing radius of the dust torus and the variability of the shape of its broad emission lines. In addition to that we can show that the luminosity of the accretion disc is most likely not low enough to enable dust formation above the accretion disc at the minimum radius of the dust torus during our observations. Therefore the dust has to be formed within the accretion disc and is afterwards pushed above the accretion disc by radiation pressure. The shape variation of the broad emission line suggests this event is not occurring throughout the accretion disc but only in a limited part of the accretion disc. This supports an extended inner edge of the dust torus and additionally indicates a common origin of the broad line clouds and the dust torus.

Title: The combined roles of gas kinematics and electron scattering in shaping the optical line profiles of TDEs

Presenter: Nathan Roth

Institution: University of Maryland

Abstract:
The origin of the optical and UV emission from tidal disruption events (TDEs) remains poorly understood. Discriminating between the various theoretical models for this emission requires careful analysis of the spectra from these events, which display a large amount of diversity. Due to the high gas densities in the line emitting regions of TDEs, photoionization calculations along the lines used to analyze the broad line region of AGN may break down. I will present results from radiative transfer calculations designed to model the spectral features from this high-density gas, showing how the combined effects of electron scattering and gas kinematics can shape the line profiles. In particular, I will demonstrate how the line profiles from several TDE spectra can be interpreted as evidence for massive outflows, as predicted by some models of the optical emission.

Title: Powerful AGN driving massive outflows in two low-redshift Lyman-α blobs

Presenter: Mischa Schirmer

Institution: Gemini Observatory

Abstract:
Lyman-α blobs (LABs) are powerful emission-line nebulae commonly found at redshifts $z \geq 2$. Their ionization sources have remained mysterious. Recently, we have shown that a few LABs may still exist at $z = 0.3$. Our *NuSTAR* + *Chandra* X-ray data reveal powerful AGN, and we derive their luminosities ($L_X \sim 10^{44}$), obscurations ($\log N_H$=22.8-23.8), and structural parameters. The AGN drive [OIII]-luminous outflows over 20-30 kpc, some of the most massive outflows known to date in type-2 AGN. One of the systems, J0113-0106, features a recurrent bipolar outflow accelerating over radii of at least 10 kpc. Common to both systems are very low velocity dispersions of just ~150 km s^{-1}. We explain them with previous outflow events having removed most of the mechanical resistance along the outflow paths.

Title: An upgraded inhomogeneous disk model with tight inter-band correlations and lags

Presenter: Zhen-Yi CAI

Institution: USTC (CHINA)

Coauthors: Jun-Xian WANG (USTC), Fei-Fan ZHU (USTC)

Abstract:
The UV-optical variability of active galactic nuclei and quasars is useful for understanding the physics of the accretion disk and is gradually being attributed to stochastic fluctuations over the accretion disk. As suggested by the hard X-ray reprocessing scenario, these fluctuations may be induced by the driving stochastic hard X-ray emissions, and the tight inter-band correlations as well as the short time lags among the UV-optical wavelengths could be explained though under some assumptions. Even so, the reprocessing scenario is gradually challenged by new evidences, such as the simulated UV-optical lightcurves possessing too much high frequency power (Gardner \& Done 2016) as well as the failure in reproducing the observed timescale-dependent color variations among $Swift$ lightcurves of NGC 5548 (Zhu et al. 2017, in prep.). In a different manner, we have shown that a revised inhomogeneous disk model, where the characteristic timescales of temperature fluctuations in the disk are radius-dependent (i.e., $\tau \sim r$; based on that originally proposed by Dexter \& Agol), can reproduce well a timescale-dependent color variation pattern (Cai et al. 2016), while it implies poor inter-band correlations and zero lags among the UV-optical wavelengths, attributed to the strong assumption that temperature fluctuations are completely independent. Further considering a speculated common fluctuations over the whole disk, tight inter-band correlations and lags comparable to those of NGC 5548 are encouragingly found (Cai et al. 2017, in prep.). Since this speculated common fluctuations may be a realization of the X-ray reprocessing, a hybrid model combining independent temperature fluctuations and reprocessing processes is worthy of assessing their relative contributions, explaining all available observations simultaneously and consistently, and then helping comprehend the variabilities across X-ray to UV-optical (Cai et al. 2017, in prep.).

Title: Accretion--Jet coupling following the stellar tidal disruption flare ASASSN-14li

Presenter: Dheeraj R. Pasham, presented by S. van Velzen

Institution: MIT

Coauthors: Sjoert van Velzen

Abstract:
ASASSN-14li has been dubbed the Rosetta stone for thermal tidal disruption flares. One of the remarkable aspects about this source is the detection of a radio flare coincident with its X-ray flare. While the X-rays likely originate from an inner accretion flow, the origin of the radio emission is still actively debated. Previously studies have ascribed the radio emission to synchrotron radiation from the interaction of the freely expanding ejecta with the ambient medium. However, we find that (1) the 16 GHz radio brightness fluctuations are correlated with the X-ray flux changes, and (2) these radio fluctuations lag the X-ray changes by about 13 days. This accretion--jet coupling is inconsistent with all previous models that involve freely expanding shocks. In this talk, I will discuss the implications of this coupling for the origin of the radio emission.

Title: Multifrequency Blazar Microvariability as a tool to Investigate Relativistic Jet Flow

Presenter: James R. Webb

Institution: Florida International University

Abstract:
For the past 10 years we have been studying microvariability in a sample of Blazars. The intermittency, the stochastic nature, and the similar profile shapes seen in microvariations at different times and in different objects have led us to a possible model to explain the observed microvariations. The model is based on a strong shock propagating down a relativistic jet and encountering turbulence which causes density or magnetic field enhancements. We use the theory of Kirk, Reiger, and Mastichiadis (1998) to describe the pulse of synchrotron emission emanating from individual turbulent cells energized by the shock. By fitting these "pulses" to microvariability observations, we obtain excellent fits to actual microvariations. The model predicts that the spectral index changes as a function of pulse duration. This effect should be observable in multi-frequency microvariability data. We present the theoretical model, model fits of our microvariability light curves, and preliminary multi-frequency microvariability observations that support this model. A further test that has yet to be carried out involves observing polarization changes in different pulses.

Title: Measurements of Coronal Properties of Seyferts with NuSTARS

Presenter: Priyanka Rani

Institution: Indian Institute of Astrophysics

Coauthors: C. S. Stalin

Abstract:
Measurements of the high-energy cut-off in the coronal continuum of active galactic nuclei have long been elusive due to the lack of high-quality of X-ray data. We present a direct measurement of the cut-off energy in the nuclear continuum of a sample of Seyfert galaxies. The high sensitivity of NuSTAR have enabled high S/N ratio spectra to be obtained from many active galactic nuclei (AGN). Spectral modeling then provides the capability to characterize the high energy cut-off of the coronal power-law continuum and other coronal parameters (temperature, optical depth, location and geometry) together with the power-law index. We also present a strong constraint on the presence of Fe K-alpha line in AGN. Details of this work will be presented.

Title: A comprehensive survey of Infrared flares in galaxies

Presenter: Tinggui Wang

Institution: University of Science and Technology of China

Coauthors: Lin Yan, Ning Jiang, Liming Dou, Chenwei Yang, Zhenfeng Sheng

Abstract:
Sparodic fueling to supermassive black holes via either TDE or accretion flow instability will cause luminous flare in UV. Dust surrounding the black hole are heated by the flare and re-radiate in near and mid-infrared, reverberating the UV flare. Motivated by the detection of dust echoes following the optical flare of TDEs, we initiate a systematic search for MIR flares in galaxies. The effort leads to the discovery of a sample of luminous MIR flares in spectroscopic normal galaxies. In this talk we will outline of our method, multi-band properties of these objects. We will all discuss the nature of these sources.

Title: Nuclear transients in OGLE and Gaia Surveys

Presenter: Lukasz Wyrzykowski presented by Szymon Kozlowski

Institution: Warsaw University Observatory

Collaboration: OGLE

Abstract:
Transients occurring close to galactic nuclei are challenging to find but potentially yield a unique insight into the environment of supermassive black holes. I will describe our systematic search for nuclear transients in the OGLE and Gaia Surveys, both in the archival and real-time data. We carefully investigated about 20 unusual transients out of hundreds detected. Among discovered objects, we found some TDE candidates (OGLE16aaa, OGLE17aaj, Gaia16aax) and a number of unusual nuclear supernovae, which could potentially mimic some of the Changing Look AGNs.