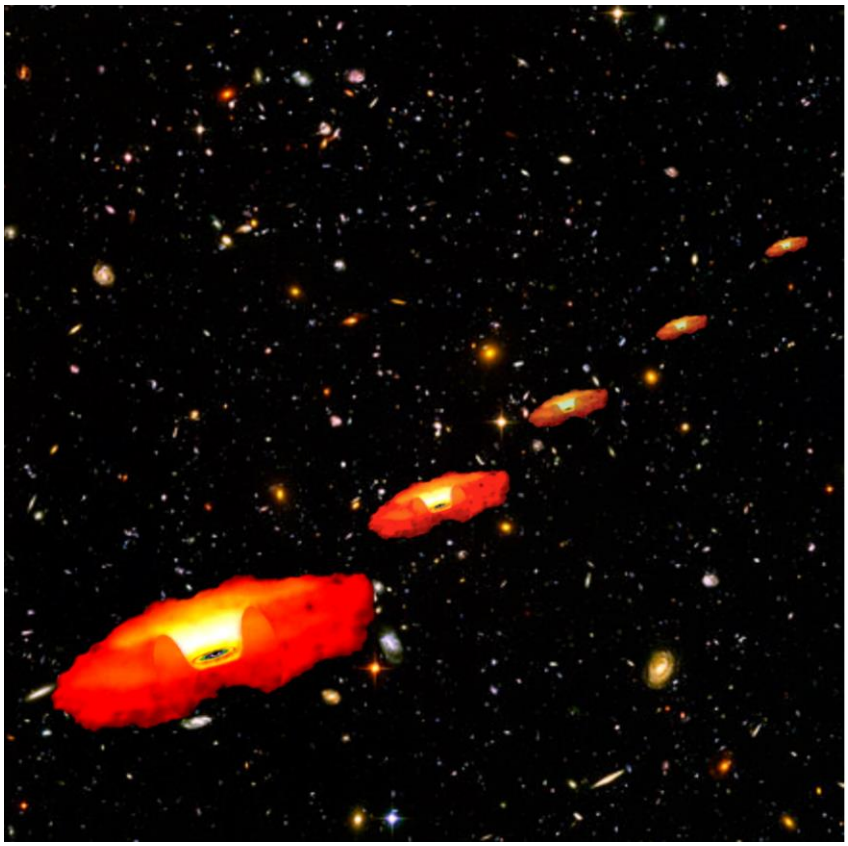
AGN Reverberation Mapping

the pc Scale Garden of Massive Black Holes



October 24-26, Lijiang, China

Institute of High Energy Physics

Yunnan Observatories

Chinese Academy of Sciences

Hotel Information

（http://lijiangwangfuhotel.vip.lechengol.com）

No. 9, South Gate Street, Dayan Ancient Town, Lijiang, Yunnan Province, China.
(云南省丽江市大研古镇南门街 9 号)

Tel: 0888-5189800

The Wang-Fu Hotel and Its Front.

Contents

Accommodation and the venue

The participants will be accommodated in Wang-Fu Hotel, and the conference will take place in He-Xi Hotel (right neighbor of Wang-Fu hotel), and unless you have made a specific arrangement to stay in another hotel.

The transportation from the airport to the hotel will be organized for those who provide the arrival details to liuhw@ihep.ac.cn, dupu@ihep.ac.cn and wangjm@ihep.ac.cn. However, just in case of unexpected difficulties, see page 5 for instruction how to get to the hotel on you own.

The hotel provides free breakfast. The workshop provides he lunch and dinner for all participants. On the other hand, you might be interested in some local food in the downtown nearby the hotel.

Breakfast: 7:00-9:00
Lunch: 12:00-14:00
Dinner: 18:30-20:30
Restaurant: Ha-zi-gu Hall, 2rd Floor, Wang-Fu Hotel

Meeting Place: He-Xi Hotel (right neighbor of Wang-Fu Hotel)

(和玺酒店)

Meeting Room on the 2rd Floor

Travel to the hotel from the airport

The transportation from the airport to the hotel will be organized for those who provide the arrival details to liuhw@ihep.ac.cn, dupu@ihep.ac.cn and wangjm@ihep.ac.cn. If you missed the organized transportation for some reason, you have to take the taxi to the old town and then walk for 300 m as the taxi cannot enter the old town. More precisely:

1) You need to take a taxi to the southern gate of the ancient town (see Figure 1 from the airport to the Hotel), please show the following note to the driver:

“司机师傅，请带我去丽江古城南门(牌坊那个门)”

“Please drive me to the southern gate of the Lijiang ancient town.”

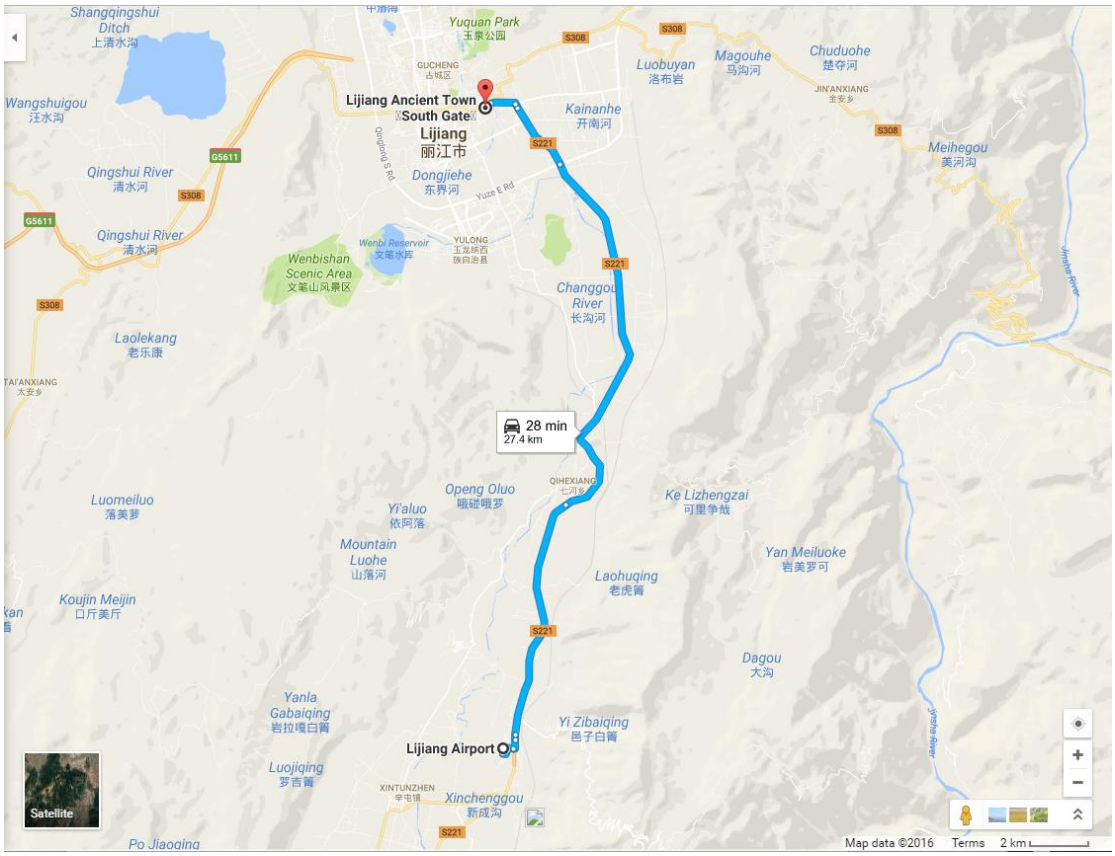


Figure 1 Map from the airport to Lijiang city

2) After arriving at the southern gate, please walk to the Hotel along the path (in grey, about 300m) in Figure 2:

Figure 2 Map around the Hotel

Public transportation:

There are airport buses available also. Two steps from the airport: 1) taking one bus to the Lan-Tian Hotel (民航蓝天宾馆); 2) taking a taxi to the Southern Gate of the ancient city and then to the Wang-Fu Hotel.

If you have any problems, please contact

Pu Du: 00-86-15210902130

Jian-Min Wang: 00-86-13661286649

Social events:

23 October (Sunday) 16:30-18:00 welcome reception at the Courtyard of the hotel

25 October (Tuesday) 19:00 Banquet in downtown of the ancient city

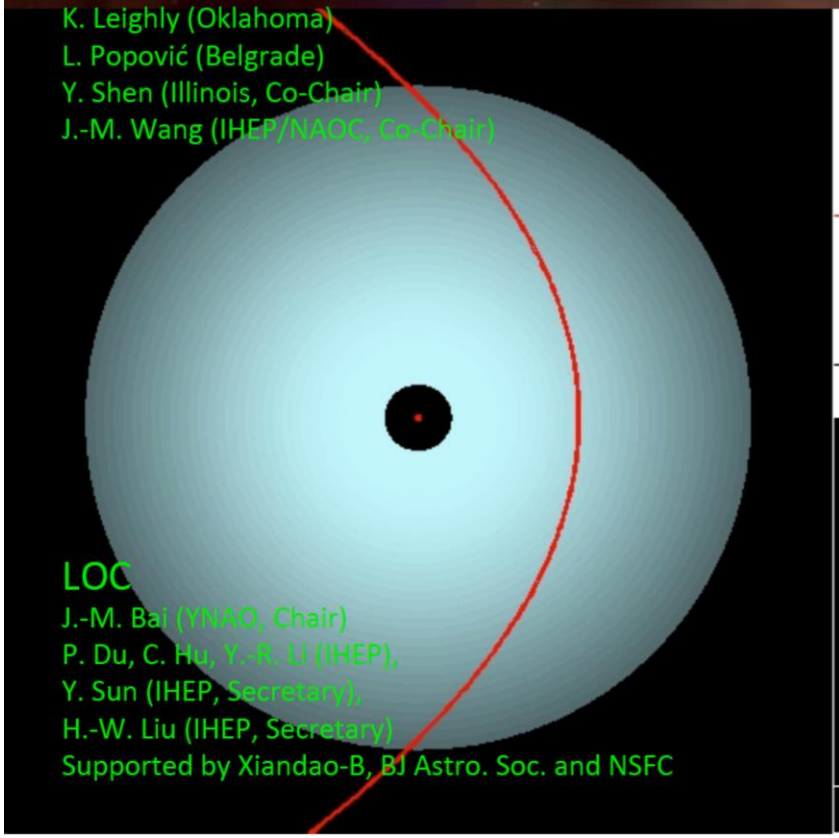
26 October (Wednesday) 15:00: to organize a tour to the observatory
(about 40mins from the Hotel).

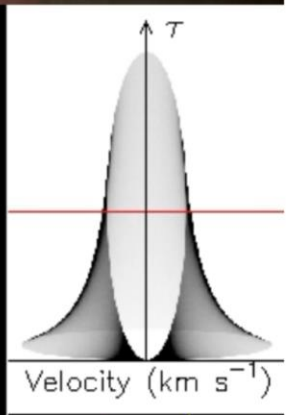
AGN Reverberation Mapping: the pc Scale Garden of Massive Black Holes

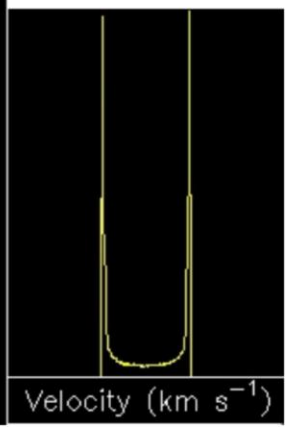
October 24-26, Lijiang, China http://indico.ihep.ac.cn/e/AGN

SOC

A. Barth (UC, Irvine)
B. Czerny (CAMK, Co-Chair)
L.C. Ho (KIAA, PKU)
S. Hoenig (Southampton)
W. Kollastchny (Göttingen)
K. Horne (St. Andrew)
K. Leighly (Oklahoma)
L. Popović (Belgrade)
Y. Shen (Illinois, Co-Chair)
J.-M. Wang (IHEP/NAOC, Co-Chair)







LOC

J.-M. Bai (YNAO, Chair)
P. Du, C. Hu, Y.-R. Li (IHEP),
Y. Sun (IHEP, Secretary),
H.-W. Liu (IHEP, Secretary)

Supported by Xiandao-B, BJ Astro. Soc. and NSFC

Sessions:

1. BLR RM
2. Torus RM
3. RM for co-evolution
4. RM for cosmology

Invited talk with*: 30min and 5min for questions
Contributed talk: 15min and 5min for questions

Program

MONDAY (October 24)
10:00 Opening Remarks: Jin-Ming Bai & Jian-Min Wang

BLR RM

10:15-12:00 Chaired by B. Czerny
10:15-10:50 M. Gaskell* (27)
Changing the reverberation mapping paradigm - the path for future progress

10:50-11:20 coffee break

11:20-11:40 J.-M. Wang
Super-Eddington accreting massive black holes project: overview

11:40 -12:00 F. Zhu (19)
On the UV/optical variations of active galactic nuclei

12:00- 14:00 lunch

14:00-16:45 Chaired by M. Gaskell
14:00-14:35 K. Horne* (16)
Velocity-delay mapping methods with application to NGC 5548

14:35-15:10 L. Popovic* (14)
Variability in AGN polarized spectra - a view to the BLR and torus structure

15:10-15:45 P. Du* (32)
Reverberation mapping of super-Eddington accreting massive black holes

15:45-16:00 coffee break

16:00-18:10 Chaired by L. Popovic

16:00-16:35 C. Hu* (31)

Fe II reverberation in active galactic nuclei

16:35—17:10 S. Gallagher* (36)

Quasar RM with the Maunakea Spectroscopic Explorer

17:10-17:30 M. Xiao (29)

Application of the maximum entropy method to sample of SEAMBH2012

17:30-18:05 L. Pei* (37)

Optical emission-line analysis from the AGN STORM program

18:05-18:40 Y. Shen* (38)

The Sloan Digital Sky Survey reverberation mapping (SDSS-RM) project

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09:35-09:55 U. Sawangwit (15)

High-z quasar black hole mass with photometric RM at 2.4m TNT

09:55-10:15 W. J. Liu (24)

A comprehensive study of BAL quasars. I. Prevalence of He I* absorption line multiplets in low-ionization objects

10:15-10:45 coffee break

10:45 -11:55 Chaired by W. N. Brandt

10:45-11:20 M. Brotherton* (26)

What do we really know about the broad-line region?

11:20-11:55 A. Laor* (18)

Radiation pressure confinement and the structure of the inner torus

11:55-12:05 M. Kim (20)

Optical and IR reverberation mapping of QSOs with SPHEREx

12:00 – 14:00 lunch

14:00-15:15 Chaired by A. Laor

14:00-14:35 Y.-R. Li* (28)

Dynamical modeling of BLR and black hole mass measurements of AGNs

14:35-14:55 T. Waters (22)

Calculation of echo images from first principles: self-consistently combining photoionization modeling and astrophysical fluid dynamical simulations

14:55-15:15 S. Weerasooriya (23)

Constraining the parameters of a disk-wind model

15:15-15:45 coffee break

15:45-18:10 Chaired by D. Chelouche

Torus RM

15:45-16:20 V. Oknyansky* (13)

Relative wavelengths independence of IR lags in NGC 4151 during 2010-2015

Coevolution

16:20-16:55 W. N. Brandt* (12)

Exceptional X-ray weak quasars and their implications for accretion flows, winds and BLR

16:55-17:15 X.-B. Wu (17)

BH mass of the most luminous quasar in the early Universe

17:15-17:50 B. Luo* (25)

Coevolution of AGNs and their host galaxies in the 7 Ms CDF-S

17:50 -18:25 L. C. Ho* (30)

Uncertainties in black hole mass measurements

WEDNESDAY (October 26)

Cosmology

09:00-10:45 Chaired by S. Gallagher

09:00-09:35 E. Cackett* (21)

Accretion disk RM, and measuring distances to AGN

09:35-10:10 T. Minezaki* (33)

Dust reverberation of AGNs and its cosmological application: recent results from the MAGNUM project

10:10-10:45 A. King* (35)

OzDES reverberation mapping project

10:45-11:25 coffee break

11:25 Keith Horne

Summary talk and discussion

End of the workshop

Exceptional X-ray Weak Quasars and Their Implications for Accretion Flows, Winds, and Broad Line Regions

William BRANDT (Penn State University)
Bin LUO (Nanjing Univ.)
Patrick HALL (York Univ.)
Jianfeng WU (Univ. Michigan)

Abstract: Actively accreting supermassive black holes (SMBHs) are found, nearly universally, to create luminous X-ray emission. However, there are apparent X-ray weak exceptions to this rule that are now providing novel insights, including many weak-line quasars (WLQs). We have been systematically studying such X-ray weak quasars with Chandra observations and near-infrared spectroscopy, and I will report results on their remarkable properties and describe implications for models of the accretion disk/corona, quasar winds, and emission-line formation. We have found evidence that many of these WLQs have geometrically thick inner accretion disks, likely due to high Eddington ratios, that shield the high-ionization broad line region from the relevant ionizing continuum. This basic model can economically explain, in a unified manner, the weak lines and diverse X-ray properties of WLQs. Such shielding may, more generally, play a significant role in shaping the broad distributions of quasar emission-line equivalent widths and blueshifts. An expectation of our model is that WLQs should be more common at high redshift, and they may serve as a signature of rapid SMBH growth at early cosmic times. I will end by discussing some promising ongoing studies that are extending these ideas.

Relative Wavelengths Independence of IR Lags in NGC 4151 During 2010-2015

Victor OKNYANSKY (Sternberg Astronomical Institute)
Natalia METLOVA (SAI MSU Russia)
Olga TARANOVA (SAI MSU)
Victor SHENAVRIN (SAI MSU)
Martin GASKELL (University of California, Santa Cruz, USA)
Di-Fu GUO (School of Space Science and Physics, Shandong University, Weihai, China)

Abstract: We investigate the correlation between infrared (JHKL) and optical (B) fluxes of the variable nucleus of the Seyfert galaxy NGC 4151 using partially published data for the last 6 years (2010-2015.). Here we are using the same data as in Oknyansky et al. (2014a,b), but include also our new optical data: photoelectrical observations obtained with 0.6-m telescope SAI, CCD observations obtained using the 1.0-m telescope at Weihai Observatory of Shandong University. We also add new JHKL observations obtained using 1.25-m telescope ZTE SAI and published optical and NIR photometric data from Schnuelle (2015). We find that the lag of flux in HKL have the same 37 ± 3 days lags relative to optical variations. Variability in the J and HKL bands is not quite simultaneous, perhaps due to the differing contributions of the accretion disk radiation in these bands. The lag found for the K band compared with the B band is not significantly different from earlier values obtained for the period 2000-2009. However, finding approximately the same lags in all IR bands for 20010--2015 differs from previous results at some earlier epochs when the lag increased with increasing wavelength. About almost the same lags in different IR bands are found very common feature for active nuclei (Oknyansky et al. 2015). In the case of NGC 4151 it appears that the relative lags between the IR bands may be different in different years depending from variations of luminosity state. The available data allow us to investigate a possible change in the lags during the test interval. We don't confirm significant change of time lags for JHL in 2013-2014 which was found by Shcnuelle at al., but we found that the AD component with the short time lag in J is became more significant during 2013-2015.

We discuss our results in the framework of the standard model where the variable infrared radiation is mainly due to thermal re-emission from the dusty clouds closest to the central source. There is also a contribution of some IR emission from the accretion disk, and this contribution increases with decreasing wavelength. The absence of the variations and wavelengths independence of the IR (HKL) lags can be explained by location of dust clouds farther than dust sublimation can be happen during 2010-2015.

Variability in AGN Polarized Spectra - a View to the BLR and Torus Structure

Luka POPOVIC (Astronomical Observatory, Belgrade, Serbia)
Victor AFANASIEV (Special Astrophysical Observatory, Russia)
Alla SHAPOVALOVA, (SAO, Russia)
Dragana ILIC (Department of Astronomy, Faculty of Mathematics, University of Belgrade, Serbia)

Abstract: Spectropolarimetry has been known as a powerful tool for probing the innermost part of active galactic nuclei (AGNs). The polarized light provides information about the radiation that is coming from the center of an AGN and from the scattering region assumed to be between the central source and the observer. Moreover, the variability in the polarized light is of particular interest, since a time-dependent variation of the polarized broad-line flux and profile as well as correlation between the polarized and non-polarized continuum and broad lines can give more information about the innermost structure of type 1 AGNs. Here we present results of monitoring of two type 1 AGNs, 3C390.3 and Mrk 6, that show different type of variability in polarized light.

High-z Quasars Black Hole Mass with Photometric Reverberation Mapping at 2.4m TNT

Utane SAWANGWIT (National Astronomical Research Institute of Thailand)
Grittiya PONGSUPA (Chiang Mai University)

Abstract: The mass of supermassive black holes (SMBHs) of high redshift (z) quasars is crucial for understanding SMBH-galaxy co-evolution. The traditional method, spectroscopic reverberation mapping (SRM), would fail for most high-z quasars and is inefficient for a large quasar sample. Photometric reverberation mapping (PRM) has been recently proposed in order to utilize the up-coming high cadence, large sky coverage and deep photometric survey of the next generation large telescopes such as LSST. In this talk, I will give a brief review and highlight our on-going work of observational campaign at the 2.4m Thai National Telescope (TNT) to provide a proof-of-concept for such a technique. Our campaign aims to determine the size of Broad Line Region (BLR) around 10-15 high-z quasars which is essential to determine the central SMBH mass. The quasar sample used in our study was selected from SDSS-III BOSS in the sky regions accessible by the TNT during Thai dry season (November - April). The SDSS spectra were used to select spectroscopically confirmed quasars with redshift $0.8 < z < 1.2$. Furthermore, we used the spectral Radius-Luminosity (R-L) relation calibrated from low-z AGNs to select quasars with BLR size ≤ 60 light-day suitable for the length of TNT observing season. We are completing the second observing season last April. The data have been analyzed and we will report the results of our study in the talk.

Velocity-Delay Mapping Methods with Application to NGC 5548

Keith HORNE (SUPA, University of St. Andrews)

Abstract: I will discuss methods and results of velocity-delay mapping of the broad emission lines in NGC5548 based on 6 months of HST and MDM spectroscopic monitoring during the 2014 STORM campaign.

Black Hole Mass of the most Luminous Quasar in the Early Universe

Xue-Bing WU (Peking University)

Abstract: After we discovered the most luminous quasar SDSS J0100+2802 at redshift 6.3 with the Lijiang 2.4m telescope, we carried out the near-IR spectroscopic observations on it with the LBT, Gemini and Magellan telescopes. The high quality single epoch near-IR spectrum enables us to measure the Mg II emission line accurately and estimate its black hole mass to be 12 billion solar masses, based on the canonical R-L relation. This is the most massive black hole ever discovered in the cosmic dawn, and sets strict constraints on the seed black hole mass and its early growth.

Radiation Pressure Confinement and the Structure of the Inner Torus

Ari LAOR (Technion)

Abstract: Photoionization models include the transfer of energy from the radiation to the illuminated matter, but often neglect the momentum transfer. This momentum transfer can determine the density structure of the photoionized gas, leading to a single solution. I will discuss the implications of this effect to the observed emission and absorption properties of Active Galactic Nuclei, and it's possible relevance to various other systems.
Dust in the accretion disk atmosphere is subject to a large radiation pressure which can elevate it to a large h/r. We study the physical properties of the dust, given the local conditions, and present the derive h/r as a function the AGN and the gas properties. We show that a radially narrow torus structure is formed, where the inner face is the source of the broad emission lines, and the outer face is the source of the 3-5 mic emission bump.

On the UV/optical Variations of Active Galactic Nuclei

Fanfei ZHU (University of Science and Technology of China: USTC)
Junxian WANG (USTC)
Zhenyi CAI (USTC)
Yuhan SUN (USTC)

Abstract: AGNs often show coordinated variations in UV/optical bands, with the short wavelength variations leading the long wavelength ones. The accretion disk illuminated by the central X-ray source may respond rapidly to X-ray variation, thus yield well coordinated variations in different bands (and slightly lagged variations at longer wavelength). Though still facing significant difficulties, such reprocessing model is widely adopted in literature. We present a new challenge from observations to such reprocessing model that it is unable to produce the observed timescale dependent color variation in AGNs/quasars.

Optical and IR Reverberation Mapping of QSOs with SPHEREx

Minjin KIM (KASI)
Woong-seob JEONG (KASI)

Abstract: SPHEREx is a proposed SMEX mission, planned to conduct spectral imaging survey to cover 0.75-5 um with a spectral resolution of R~40. We will briefly present the overview and current status of the SPHEREx project. SPHEREx survey will uniquely provide the variability information of bright QSOs, both in continuum and fluxes of emission lines, which enables us to investigate the central structures of the QSOs through the reverberation mapping method.

Accretion Disk Reverberation Mapping, and Measuring Distances to AGN

Edward CACKETT (Wayne State University)

Abstract: Irradiation of the accretion disk by X-ray/EUV photons should lead to time lags wavelength-dependent continuum emission as the hotter, inner parts of the disk will see the variable irradiating flux before the cooler, outer parts of the disk. Assuming a standard thin accretion disk, the lags, τ, are predicted go like $\lambda 4/3$. One can also show that under standard disk assumptions, combining the wavelength-dependent lags with the observed disk flux leads to a measure of the distance to the AGN. However, applying this model to a sample of nearby Seyferts leads to distance estimates a factor of $\sim$2 too large. Recently, there has been a significant improvement in wavelength-dependent lag measurements from high-cadence monitoring and a picture is emerging that the accretion disk sizes are a factor of 2 larger than predicted by the standard disk model. If this difference can be understood and calibrated, then this method is potentially very powerful. To sheds some light on the potential origin of this difference, I will present recent Hubble Space Telescope observations of wavelength-dependent continuum lags in NGC 4593.

The Calculation of Echo Images from First Principles: Self-consistently Combining Photoionization Modeling and Astrophysical Fluid Dynamical Simulations.

Daniel PROGA (University of Nevada, Las Vegas)
Timothy WATERS (University of Nevada Las Vegas)

Abstract: The formalism for constructing echo images from dynamical models of the broad line region (BLR) in AGN is reviewed. Developing realistic BLR models requires performing radiation hydrodynamical or magnetohydrodynamical simulations to determine the global dynamics and local properties of the gas as well as running photoionization models to calculate the ionization structure and responsivity of the gas. We discuss the assumptions and methods used to self-consistently combine these modeling efforts, which has only recently become feasible. Upon convolving the resulting echo images with an observed continuum light curve, model selection becomes possible by making a direct comparison with observed line light curves. This forward modeling approach serves as an alternative scheme for 2D reverberation mapping, as it bypasses the need to employ inversion methods to reconstruct echo images from observations.

Constraining the Parameters of a Disk-wind Model

Sandamali WEERASOORIYA (University of Nevada, Las Vegas)
George RHEE (University of Nevada, Las Vegas)
Daniel PROGA (University of Nevada, Las Vegas)
Timothy WATERS (University of Nevada, Las Vegas)

Abstract: We explore the feasibility of constraining the parameters of a disk-wind model of the AGN broad line region using a maximum likelihood analysis of the predicted line emission. We show using this method that we can constrain the inclination angle of the disk and responsivity of the emitting gas. We assume that one of the models is the observed model and compare it to the others. Using model curves for the AGN continuum emission and predicted curves for the line emission we are able to recover the model parameters of the observation successfully.

A Comprehensive Study of Broad Absorption Line Quasars. I. Prevalence of He I* Absorption Line Multiplets in Low-ionization Objects

Wen-Juan LIU (YNAO)
Hongyan ZHOU (PRIC)

Abstract: Neutral helium multiplets, He I3189, 3889, 10830, are very useful diagnostics for the geometry and physical conditions of the absorbing gas in quasars. So far only a handful of He I detections have been reported. Using a newly developed method, we detected the He Il3889 absorption line in 101 sources of a well-defined sample of 285 MgII broad absorption line (BAL) quasars selected from SDSS DR5. This has increased the number of He I BAL quasars by more than one order of magnitude. We further detected He I3189 in 50% (52/101) of the quasars in the sample. The detection fraction of He I BALs in MgII BAL quasars is ~35% as a whole, and it increases dramatically with increasing spectral signal-to-noise ratio (S/N), from ~18% at S/N ~ 10 to ~93% at S/N ~ 35. This suggests that He I BALs could be detected in most MgII LoBAL quasars, provided the spectra S/N is high enough. Such a surprisingly high He I BAL fraction is actually predicted from photoionization calculations based on a simple BAL model. The result indicates that He I absorption lines can be used to search for BAL quasars at low z, which cannot be identified by ground-based optical spectroscopic surveys with commonly seen UV absorption lines. Using He I λ3889, we discovered 19 BAL quasars at $z < 0.3$ from the available SDSS spectral database. The fraction of He I* BAL quasars is similar to that of LoBAL objects.

Coevolution of AGNs and Their Host Galaxies in the 7 Ms CDF-S

Bin LUO (Nanjing Univ.)
William BRANDT (The Pennsylvania State University)
Yongquan XUE (University of Science and Technology of China)

Abstract: Deep X-ray surveys are the most efficient method of identifying reliable and quite complete samples of distant AGNs, including obscured systems otherwise difficult to find. The 7 Ms Chandra Deep Field-South Survey is the deepest X-ray survey conducted to date, and it is arguably the most intensively studied multiwavelength deep-survey region in the entire sky. We present X-ray source catalogs for the 7 Ms Chandra Deep Field-South, and discuss some of the science studies on the coevolution of AGNs and their host galaxies. Reverberation mapping observations on some of these AGNs will provide crucial BH parameters for studies of links between SMBH accretion and star formation.

What Do We Really Know about the Broad-line Region?

Michael BROTHERTON (University of Wyoming)

Abstract: I will review some facts about quasar broad lines and what they can tell us about the broad-line region (BLR), as well as what they cannot. So far reverberation mapping and statistical studies paint an incomplete picture, but some broad strokes are clear. The BLR responds in particular ways to variations in black hole mass, accretion rate, luminosity, and orientation, all clues to a complete model of the BLR. While empirical relationships can provide more accurate and precise determinations of black hole masses and redshifts, fundamental quasar properties measured with broad lines, better understanding the BLR may lead to learning how nuclei are fueled and interact with their host galaxies.

Changing the Reverberation Mapping Paradigm - the Path for Future Progress

Martin GASKELL (University of California at Santa Cruz)

Abstract: Since the introduction of reverberation mapping by Lyutyi & Cherepashchuk (1972) it has proved to be one of our most powerful tools for understanding the structure and kinematics of the innermost regions of AGNs. Our modern picture of the broad-line region (see review of Gaskell 2009) rests on the results of reverberation mapping. Through it we have learnt that the BLR is smaller and denser than was first thought, that it is highly stratified by ionization, that it has a highly flattened distribution, and that the motions are gravitationally dominated. Despite these successes, it has been known for over 20 years that there are results that cannot be explained under the standard reverberation-mapping paradigm. I highlight these problems and show how they force us to abandon the old reverberation mapping paradigm. I discuss work by my collaborators and I on the need for (i) the abandoning assumption of axial symmetry and (ii) recognizing that essentially all AGNs are substantially reddened by internal dust with an attenuation curve that is quite flat in the ultraviolet (Gaskell et al. 2004). The consequences of these paradigm changes will be illustrated and observational tests such as spectropolarimetric reverberation mapping will be discussed.

Dynamical Modelling of Broad-line Regions and Black Hole Mass Measurements of AGNs

Yan-Rong LI (Institute of High Energy Physics) (SEAMBH collaboration)

Abstract: We employ the recently developed dynamical modelling for broad-line regions (BLRs) to analyze the RM data of broad Hβ line and the continuum time series. We incorporate non-linear response of broad emission line to the continuum. Black hole mass is self-consistently obtained without resort to the virial factor required as in the traditional RM analysis through the cross-correlation method. Instead, the virial factor is a by-product given the recovered BLR dynamics. We present the BH mass for a sample of nine high-accretion-rate AGNs monitored in 2012. The resulted black hole mass is consistent with that from the cross-correlating analysis with a virial factor of ~1.0.

Application of the Maximum Entropy Method to sample of SEAMBH2012

Ming XIAO (Yunnan Observatories) (SEAMBH collaboration)

Abstract: We recovered velocity-delay maps for the Balmer and He ii lines in five narrow line Seyfert 1 galaxies as Mrk 335, Mrk 142, Mrk 1044, IRAS 04416+1215 and IRAS F12397+3333 by applying the maximum entropy method.

Uncertainties in Black Hole Mass Measurements

Luis C. HO (KIAA, Perking University)

Abstract: I will describe current challenges in black hole mass measurements, both in active and inactive galaxies, highlighting issues related to reverberation mapping, ionized gas dynamics, and stellar dynamics. I will offer some thoughts on ways to make progress in the future.

Improving the Flux Calibration in Reverberation Mapping by Spectral Fitting: Application to the Seyfert Galaxy MCG-6-30-15

Chen HU et al. (Institute of High Energy Physics) (SEAMBH collaboration)

Abstract: We present new results on the variability of the optical Fe II emission lines in 10 AGNs observed by the Yunnan Observatory 2.4m telescope during 2012--2013. We detect statistically significant time lags, relative to the AGN continuum, in nine of the sources. This accurate measurement is achieved by using a sophisticated spectral fitting scheme that allows for apparent flux variations of the host galaxy, and several narrow lines, due to the changing observing conditions. Six of the newly detected lags are indistinguishable from the Hβlags measured in the same sources. Two are significantly longer and one is slightly shorter. Combining with Fe II lags reported in previous studies, we find a Fe II radius--luminosity relationship similar to the one for Hβ, although our sample by itself shows no clear correlation. The results support the idea that Fe II emission lines originate in photoionized gas which, for the majority of the newly reported objects, is indistinguishable from the Hβ-emitting gas. We also present a tentative correlation between the lag and intensity of Fe II and Hβand comment on its possible origin.

Reverberation Mapping of Super-Eddington Accreting Massive Black Holes

Pu DU et al. (Institute of High Energy Physics) (SEAMBH collaboration)

Abstract: Super-Eddington accreting massive black holes (SEAMBHs) are an extreme population of active galactic nuclei which have supremely high accretion rates. They could be at a stage of utmost importance in BH growth, and have many surprising physical properties in observations. And further, they are recently proposed to be a potential indicator of distances in the universe. From 2012, we are carrying out a large campaign of monitoring SEAMBHs spectroscopically using the 2.4-meter telescope at Lijiang, in Yunnan Province of China, in order to investigate the physics of their accretion disks and the nature of their broad-line regions, and further to explore the probability of using them as standard candle to measure the distances in the universe. We found that (1) their Hβtime lags surprisingly shorter than those measured in low accretion rate AGNs, (2) their luminosity turn to saturation if accretion rates are higher than a critical value, (3) it is practicable to use them to measure cosmological distances. In this talk, we will give a summary to those discoveries of our SEAMBH campaign.

Dust Reverberation of AGNs and Its Cosmological application: Recent Results from the MAGNUM Project

Takeo MINEZAKI (University of Tokyo)

Abstract: The Multicolor Active Galactic Nuclei Monitoring (MAGNUM) project conducted a large systematic survey of dust reverberation of AGNs from 2000 to 2008 by using a 2-meter dedicated telescope to obtain many new results on the inner structure of AGNs and the cosmology: the radius-luminosity relation for the inner edge of the dust torus (Minezaki et al. 2004; Suganuma et al. 2006; Koshida et al. 2014), the interband time lag for the accretion disk and the dust torus (Minezaki et al. 2006; Tomita et al. 2006), the time variation of the dust lag (Koshida et al. 2009; 2014), and the determination of the Hubble constant (Yoshii et al. 2014). Collaborative studies on the reverberation mapping of the accretion disk and the broad emission-line region were also carried out. We will review the results from the MAGNUM project focusing on the dust reverberation and its cosmological application.

An Overview of Photometric Reverberation Mapping

Doron CHELOUCHE (University of Haifa)

Abstract: Photometric reverberation mapping (PRM) will be reviewed emphasizing the different analysis schemes used, and highlighting some of the results obtained thus far using both narrow- and broad-band photometry. In addition, two new simple methods for time-lag determination will be presented, which are applicable to both spectroscopic and photometric reverberation mapping: a method based on multivariate correlation analysis, and a method based on data-complexity measures. The former method has the advantage of being applicable to cases with little-to-no spectroscopic information, while the latter approach has the advantage of being free of model assumptions (e.g., data interpolations), and independent of binning in correlation space. If time allows, preliminary results from a new PRM survey at the Wise Observatory will be present

OzDES Reverberation Mapping Project

Anthea King (University of Melbourne)

Abstract: As part of the Australian Dark Energy spectroscopic Survey (OzDES) a large-scale, six year long reverberation mapping study of 771 quasars is being carried out, in the 30 deg^2 area of the Dark Energy Survey (DES) supernova fields. The monitored quasars have redshifts ranging between $0.1<z<4.9$ and have apparent AB magnitudes between $16.4<i<21.7$ mag. The aim of the survey is to measure black hole masses for a broad range of AGN and constrain the radius-luminosity (*R-L*) relationship for the emission lines: Hβ, Mg II, and C IV. We have just started our forth year of data collection. I will present an overview of the survey and its progress to date.

Quasar Reverberation Mapping with the Maunakea Spectroscopic Explorer

Sarah Gallagher (University of West Ontario)

Abstract: The Maunakea Spectroscopic Explorer (MSE) is the planned next generation incarnation of the 3.6-m Canada-France-Hawaii Telescope. It will be a transformative, 11-m diameter, dedicated observatory that can simultaneously obtain spectra of thousands of targets over a large field of view. In recognition of its scientific promise, an ambitious quasar reverberation-mapping program has been chosen as one of the science cases driving the design specifications for the observatory. I will describe the planned scope and science goals of the reverberation-mapping program and current progress on the facility and instrument design.

Optical Emission-Line Analysis from the AGN STORM Program

Liuyi Pei (University of Illinois at Urbana-Champing)

Abstract: The 2014 AGN STORM campaign is one of the most intensive multi-wavelength reverberation mapping programs to date and has produced many significant results. I will present the data and analysis from the ground-based spectroscopic portion of this campaign and discuss our findings. Specifically, we recovered optical emission line lags with respect to simultaneously observed UV and optical continua, as well as high quality velocity-resolved Hβ lags. We also observed a significant decrease in the responsivity of the optical emission lines halfway through the campaign, and also found the Hβ lag to be much shorter than expected given the AGN's luminosity during this campaign. This dataset is of the highest quality ever obtained for reverberation mapping, and further detailed analysis will enable significant advances in our understanding of the AGN internal structure.

The Sloan Digital Sky Survey Reverberation Mapping (SDSS-RM) Project

Yue SHEN (University of Illinois at Urbana Champing)

Abstract: The SDSS-RM project is one of the first large-scale reverberation mapping programs using a multi-object spectrography (MOS) to simultaneously monitor ~850 quasars over a broad range in redshift and luminosity. Started in 2014, SDSS-RM plans to carry out spectroscopic monitoring with the SDSS-BOSS spectrograph through ~2019, accompanied by dedicated photometric monitoring with other facilities. SDSS-RM is a pilot program to test the potential of MOS-RM in the coming era of massive time-domain imaging surveys and MOS surveys, but is also capable of delivering important AGN science on its own. I will summarize the current status of the program and present several highlights on early science results from SDSS-RM.

Summary

Keith Horne (University of St. Andrew)