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

From the Editor

Welcome to all the new subscribers, and thanks to everyone who contributed to this issue of the Active Galaxies Newsletter.

This newsletter is intended to disseminate paper abstracts, meeting announcements, job adverts and other information which may be of interest to the active galaxies community. It is produced monthly and, whilst the deadline for contributions is the last day of the month, contributions may be submitted at any time.

The Latex macros for submitting abstracts and dissertation abstracts are appended to each issue of the newsletter and are also available on the web page. Please note that the editor may reject submissions which do not use the template. As always, any suggestions or feedback regarding the newsletter are welcome.

Thanks for your continued subscription.

Megan Argo

Abstracts of recently accepted papers

Revisiting Stochastic Variability of AGNs with Structure Functions

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Discrepancies between reported structure function (SF) slopes and their overall flatness as compared to expectations from the damped random walk (DRW) model, which generally well describes the variability of active galactic nuclei (AGNs), have triggered us to study this problem in detail. We review common AGN variability observables and identify their most common problems. Equipped with this knowledge, we study ∼9000 r-band AGN light curves from Stripe 82 of the Sloan Digital Sky Survey, using SFs described by stochastic processes with the power exponential covariance matrix of the signal. We model the "subensemble" SFs in the redshift–absolute magnitude bins with the full SF equation (including the turnover and the noise part) and a single power law (SPL; in the "red noise regime" after subtracting the noise term). The distribution of full-equation SF (SPL) slopes peaks at $\gamma = 0.55 \pm 0.08$ (0.52 ± 0.06) and is consistent with the DRW model. There is a hint of a weak correlation of γ with the luminosity and a lack of correlation with the black hole mass. The typical decorrelation timescale in the optical is $\tau = 0.97 \pm 0.46$ year. The SF amplitude at one year obtained from the SPL fitting is $SF_0 = 0.22 \pm 0.06$ mag and is overestimated because the SF is already at the turnover part, so the true value is $SF_0 = 0.20 \pm 0.06$ mag. The asymptotic variability is $SF_\infty = 0.25 \pm 0.06$ mag. It is strongly anticorrelated with both the luminosity and the Eddington ratio and is correlated with the black hole mass. The reliability of these results is fortified with Monte Carlo simulations.

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The Curtain Remains Open: NGC 2617 Continues in a High State

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Optical and near-infrared photometry, optical spectroscopy, and soft X-ray and UV monitoring of the changing look active galactic nucleus NGC 2617 show that it continues to have the appearance of a type-1 Seyfert galaxy. An optical light curve for 2010–2016 indicates that the change of type probably occurred between October 2010 and February 2012 and was not related to the brightening in 2013. In 2016 NGC 2617 brightened again to a level of activity close to that of April 2013. We find variations in all passbands and in both the intensities and profiles of the broad Balmer lines. A new displaced emission peak has appeared in Hβ. X-ray variations are well correlated with UV–optical variability and possibly lead by $\sim$ 2–3 days. The K band lags the J band by about 21.5 $\pm$ 2.5 days and lags the combined $B + J$ filters by $\sim$ 25 days. J lags B by about 3 days. This could be because J-band variability arises from the outer part of the accretion disc while K-band variability comes from thermal re-emission by dust. We propose that spectral type changes are a result of increasing central luminosity causing sublimation of the innermost dust in the hollow bi-conical outflow. We briefly discuss various other possible reasons which might explain the dramatic changes NGC 2617.

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Multiwavelength campaign on Mrk 509 XV. A global modeling of the broad emission lines in the Optical, UV and X-ray bands

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We model the broad emission lines present in the optical, UV and X-ray spectra of Mrk 509, a bright type 1 Seyfert galaxy. The broad lines were simultaneously observed during a large multiwavelength campaign, using the XMM-Newton-OM for the optical lines, HST-COS for the UV lines and XMM-Newton-RGS and Epic for the X-ray lines respectively. We also used FUSE archival data for the broad lines observed in the far-ultra-violet. The goal is to find a physical connection among the lines measured at different wavelengths and determine the size and the distance from the central source of the emitting gas components. We used the "Locally optimally emission Cloud" (LOC) model which interprets the emissivity of the broad line region (BLR) as regulated by powerlaw distributions of both gas density and distances from the central source. We find that one LOC component cannot model all the lines simultaneously. In particular, we find that the X-ray and UV lines likely may originate in the more internal part of the AGN, at radii in the range 5×10^{14}-3×10^{17} cm, while the optical lines and part of the UV lines may likely be originating further out, at radii 3×10^{17}-3×10^{18} cm. These two gas components are parametrized by a radial distribution of the luminosities with a slope gamma of 1.15 and 1.10, respectively, both of them covering at least 60% of the source. This simple parameterization points to a structured broad line region, with the higher ionized emission coming from closer in, while the emission of the low-ionization lines is more concentrated in the outskirts of the broad line region.

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A degeneracy in DRW modelling of AGN light curves

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Individual light curves of active galactic nuclei (AGNs) are nowadays successfully modelled with the damped random walk (DRW) stochastic process, characterized by the power exponential covariance matrix of the signal, with the power $\beta = 1$. By Monte Carlo simulation means, we generate mock AGN light curves described by non-DRW stochastic processes ($0.5 \leq \beta \leq 1.5$ and $\beta \neq 1$) and show they can be successfully and well modelled as a single DRW process, obtaining comparable goodness of fits. A good DRW fit, in fact, may not mean that DRW is the true underlying process leading to variability and it cannot be used as a proof for it. When comparing the input (non-DRW) and measured (DRW) process parameters, the recovered time-scale (amplitude) increases (decreases) with the increasing input β. In practice, this means that the recovered DRW parameters may lead to biased (or even non-existing) correlations of the variability and physical parameters of AGNs if the true AGN variability is caused by non-DRW stochastic processes. The proper way of identifying the processes leading to variability are model-independent structure functions and/or power spectral densities and then using such information on the covariance matrix of the signal in light curve modelling.

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Quasar emission lines as probes of orientation: implications for disc wind geometries and unification

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The incidence of broad absorption lines (BALs) in quasar samples is often interpreted in the context of a geometric unification model consisting of an accretion disc and an associated outflow. We use the the Sloan Digital Sky Survey (SDSS) quasar sample to test this model by examining the equivalent widths (EWs) of C IV 1550 Å, Mg II 2800 Å, [O III] 5007 Å and C III] 1909 Å. We find that the emission line EW distributions in BAL and non-BAL quasars are remarkably similar – a property that is inconsistent with scenarios in which a BAL outflow rises equatorially from a geometrically thin, optically thick accretion disc. We construct simple models to predict the distributions from various geometries; these models confirm the above finding and disfavour equatorial geometries. We show that obscuration, line anisotropy and general relativistic effects on the disc continuum are unlikely to hide an EW inclination dependence. We carefully examine the radio and polarisation properties of BAL quasars. Both suggest that they are most likely viewed (on average) from intermediate inclinations, between type 1 and type 2 AGN. We also find that the low-ionization BAL quasars in our sample are not confined to one region of 'Eigenvector I' parameter space. Overall, our work leads to one of the following conclusions, or some combination thereof: (i) the continuum does not emit like a geometrically thin, optically thick disc; (ii) BAL quasars are viewed from similar angles to non-BAL quasars, i.e. low inclinations; (iii) geometric unification does not explain the fraction of BALs in quasar samples.

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A representative survey of the dynamics and energetics of FRII radio galaxies

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We report the first large, systematic study of the dynamics and energetics of a representative sample of FRII radio galaxies with well-characterized group/cluster environments. We used X-ray inverse-Compton and radio synchrotron measurements to determine the internal radio-lobe conditions, and these were compared with external pressures acting on the lobes, determined from measurements of the thermal X-ray emission of the group/cluster. Consistent with previous work, we found that FRII radio lobes are typically electron-dominated by a small factor relative to equipartition, and are over-pressured relative to the external medium in their outer parts. These results suggest that there is typically no energetically significant proton population in the lobes of FRII radio galaxies (unlike for FRIs), and so for this population, inverse-Compton modelling provides an accurate way of measuring total energy content and estimating jet power. We estimated the distribution of Mach numbers for the population of expanding radio lobes, finding that at least half of the radio galaxies are currently driving strong shocks into their group/cluster environments. Finally, we determined a jet power–radio luminosity relation for FRII radio galaxies based on our estimates of lobe internal energy and Mach number. The slope and normalisation of this relation are consistent with theoretical expectations, given the departure from equipartition and environmental distribution for our sample.

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The X-ray and Mid-Infrared luminosities in Luminous Type 1 Quasars

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Several recent studies have reported different intrinsic correlations between the AGN mid-IR luminosity ($L_{\rm MIR}$) and the rest-frame $2-10$ keV luminosity ($L_{\rm X}$) for luminous quasars. To understand the origin of the difference in the observed $L_{\rm X}-L_{\rm MIR}$ relations, we study a sample of 3,247 spectroscopically confirmed type 1 AGNs collected from Boötes, *XMM*-COSMOS, *XMM*-XXL-North, and the SDSS quasars in the *Swift*/XRT footprint spanning over four orders of magnitude in luminosity. We carefully examine how different observational constraints impact the observed $L_{\rm X}-L_{\rm MIR}$ relations, including the inclusion of X-ray non-detected objects, possible X-ray absorption in type 1 AGNs, X-ray flux limits, and star formation contamination. We find that the primary factor driving the different $L_{\rm X}-L_{\rm MIR}$ relations reported in the literature is the X-ray flux limits for different studies. When taking these effects into account, we find that the X-ray luminosity and mid-IR luminosity (measured at rest-frame $6\mu m$, or $L_{6\mu m}$) of our sample of type 1 AGNs follow a bilinear relation in the log-log plane: $\log L_X = (0.84\pm0.03)\times\log L_{6\mu m}/10^{45}{\rm erg~s^{-1}}+(44.60\pm0.01)$ for $L_{6\mu m} < 10^{44.79}{\rm erg~s^{-1}}$, and $\log L_X = (0.40\pm0.03)\times\log L_{6\mu m}/10^{45}{\rm erg~s^{-1}}+(44.51\pm0.01)$ for $L_{6\mu m} \geq 10^{44.79}{\rm erg~s^{-1}}$. This suggests that the luminous type 1 quasars have a shallower $L_{\rm X}-L_{\rm MIR}$ correlation than the approximately linear relations found in local Seyfert galaxies. This result is consistent with previous studies reporting a luminosity-dependent $L_{\rm X}-L_{\rm MIR}$ relation, and implies that assuming a linear $L_{\rm X}-L_{\rm MIR}$ relation to infer the neutral gas column density for X-ray absorption might overestimate the column densities in luminous quasars.

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Constraints on the optical polarization source in the luminous non-blazar quasar 3C 323.1 (PG 1545+210) from the photometric and polarimetric variability

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We examine the optical photometric and polarimetric variability of the luminous type 1 non-blazar quasar 3C 323.1 (PG 1545+210). Two optical spectro-polarimetric measurements taken during the periods 1996−98 and 2003 combined with a V-band imaging polarimetric measurement taken in 2002 reveal that (1) as noted in the literature, the polarization of 3C 323.1 is confined only to the continuum emission, that is, the emission from the broad line region is unpolarized; (2) the polarized flux spectra show evidence of a time-variable broad absorption feature in the wavelength range of the Balmer continuum and other recombination lines; (3) weak variability in the polarization position angle (PA) of ~ 4 deg over a time-scale of 4−6 years is observed; and (4) the V-band total flux and the polarized flux show highly correlated variability over a time-scale of one year. Taking the above-mentioned photometric and polarimetric variability properties and the results from previous studies into consideration, we propose a geometrical model for the polarization source in 3C 323.1, in which an equatorial absorbing region and an axi-asymmetric equatorial electron-scattering region are assumed to be located between the accretion disc and the broad line region. The scattering/absorbing regions can perhaps be attributed to the accretion disc wind or flared disc surface, but further polarimetric monitoring observations for 3C 323.1 and other quasars with continuum-confined polarization are needed to probe the true physical origins of these regions.

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Growing supermassive black holes in the late stages of galaxy mergers are heavily obscured

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Mergers of galaxies are thought to cause significant gas inflows to the inner parsecs, which can activate rapid accretion onto supermassive black holes (SMBHs), giving rise to Active Galactic Nuclei (AGN). During a significant fraction of this process, SMBHs are predicted to be enshrouded by gas and dust. Studying 52 galactic nuclei in infrared-selected local Luminous and Ultra-luminous infrared galaxies in different merger stages in the hard X-ray band, where radiation is less affected by absorption, we find that the amount of material around SMBHs increases during the last phases of the merger. We find that the fraction of Compton-thick (CT, $N_{\rm H} \geq 10^{24}\,{\rm cm}^{-2}$) AGN in late merger galaxies is higher ($f_{\rm CT} = 65^{+12}_{-13}\%$) than in local hard X-ray selected AGN ($f_{\rm CT} = 27 \pm 4\%$), and that obscuration reaches its maximum when the nuclei of the two merging galaxies are at a projected distance of $D_{12} \simeq 0.4 - 10.8$ kiloparsecs ($f_{\rm CT} = 77^{+13}_{-17}\%$). We also find that all AGN of our sample in late merger galaxies have $N_{\rm H} > 10^{23}\,{\rm cm}^{-2}$, which implies that the obscuring material covers $95^{+4}_{-8}\%$ of the X-ray source. These observations show that the material is most effectively funnelled from the galactic scale to the inner tens of parsecs during the late stages of galaxy mergers, and that the close environment of SMBHs in advanced mergers is richer in gas and dust with respect to that of SMBHs in isolated galaxies, and cannot be explained by the classical AGN unification model in which the torus is responsible for the obscuration.

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Hard X-ray selected AGNs in low-mass galaxies from the *NuSTAR* serendipitous survey

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We present a sample of 10 low-mass active galactic nuclei (AGNs) selected from the 40-month *NuSTAR* serendipitous survey. The sample is selected to have robust *NuSTAR* detections at $3-24$ keV, to be at $z < 0.3$, and to have optical r-band magnitudes at least 0.5 mag fainter than an $L_\star$ galaxy at its redshift. The median values of absolute magnitude, stellar mass and 2–10 X-ray luminosity of our sample are $\langle M_r \rangle = -20.03$, $\langle M_\star \rangle = 4.6 \times 10^9 M_\odot$, and $\langle L_{2-10\mathrm{keV}} \rangle = 3.1 \times 10^{42}$ erg s^{-1}, respectively. Five objects have detectable broad Hα emission in their optical spectra, indicating black-hole masses of $(1.1 - 10.4) \times 10^6 M_\odot$. We find that $30^{+17}_{-10}\%$ of the galaxies in our sample do not show AGN-like optical narrow emission lines, and one of the ten galaxies in our sample, J115851+4243.2, shows evidence for heavy X-ray absorption. This result implies that a non-negligible fraction of low-mass galaxies might harbor accreting massive black holes that are missed by optical spectroscopic surveys and $<$ 10 keV X-ray surveys. The mid-IR colors of our sample also indicate these optically normal low-mass AGNs cannot be efficiently identified with typical AGN selection criteria based on *WISE* colors. While the hard ($>$ 10 keV) X-ray selected low-mass AGN sample size is still limited, our results show that sensitive *NuSTAR* observations are capable of probing faint hard X-ray emission originating from the nuclei of low-mass galaxies out to moderate redshift ($z < 0.3$), thus providing a critical step in understanding AGN demographics in low-mass galaxies.

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Limitations on the recovery of the true AGN variability parameters using Damped Random Walk modeling

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Context: The damped random walk (DRW) stochastic process is nowadays frequently used to model aperiodic light curves of AGNs. A number of correlations between the DRW model parameters, the signal decorrelation timescale and amplitude, and the physical AGN parameters such as the black hole mass or luminosity have been reported. Aims: We are interested in whether it is plausible to correctly measure the DRW parameters from a typical ground-based survey, in particular how accurate the recovered DRW parameters are compared to the input ones. Methods: By means of Monte Carlo simulations of AGN light curves, we study the impact of the light curve length, the source magnitude, cadence, and additional light on the DRW model parameters. Results: The most significant finding is that currently existing surveys are going to return unconstrained DRW decorrelation timescales, because typical rest-frame data do not probe long enough timescales or the white noise part of PSD for DRW. The experiment length must be at least ten times longer than the true DRW timescale, being presumably in the vicinity of one year, meaning a minimum 10-years-long AGN light curves (rest-frame). The DRW timescales for sufficiently long light curves are typically weakly biased, and the exact bias depends on the fitting method and used priors. The DRW amplitude is mostly affected by the photometric noise (so the source magnitude or the signal-to-noise ratio), cadence, and the AGN host light. Conclusions: Because the DRW parameters appear to be incorrectly determined from typically existing data, the reported correlations of the DRW variability and physical AGN parameters from other works seem unlikely to be correct. In particular, the anti-correlation of the DRW timescale with redshift is a manifestation of the survey length being too short. Application of DRW to modeling typical AGN optical light curves is questioned.

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A physically-based model of the ionizing radiation from active galaxies for photoionization modeling

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We present a simplified model of Active Galactic Nucleus (AGN) continuum emission designed for photoionization modeling. The new model OXAF reproduces the diversity of spectral shapes that arise in physically-based models. We identify and explain degeneracies in the effects of AGN parameters on model spectral shapes, with a focus on the complete degeneracy between the black hole mass and AGN luminosity. Our re-parametrized model OXAF removes these degeneracies and accepts three parameters which directly describe the output spectral shape: the energy of the peak of the accretion disk emission $E_{\rm peak}$, the photon power-law index of the non-thermal emission Γ, and the proportion of the total flux which is emitted in the non-thermal component $p_{\rm NT}$. The parameter $E_{\rm peak}$ is presented as a function of the black hole mass, AGN luminosity, and 'coronal radius' of the OPTXAGNF model upon which OXAF is based. We show that the soft X-ray excess does not significantly affect photoionization modeling predictions of strong emission lines in Seyfert narrow-line regions. Despite its simplicity, OXAF accounts for opacity effects where the accretion disk is ionized because it inherits the 'color correction' of OPTXAGNF. We use a grid of MAPPINGS photoionization models with OXAF ionizing spectra to demonstrate how predicted emission-line ratios on standard optical diagnostic diagrams are sensitive to each of the three OXAF parameters. The OXAF code is publicly available in the Astrophysics Source Code Library.

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Code available at: ascl:1611.011

On the Accretion Rates and Radiative Efficiencies of the Highest Redshift Quasars

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We estimate the accretion rates onto the supermassive black holes that power 20 of the highest-redshift quasars, at $z \gtrsim 5.8$, including the quasar with the highest redshift known to date – ULAS J1120 at $z = 7.09$. The analysis is based on the observed (rest-frame) optical luminosities and reliable "virial" estimates of the BH masses of the quasars, and utilizes scaling relations derived from thin accretion disk theory. The mass accretion rates through the postulated disks cover a wide range, $\dot{M}_{\rm disk} \simeq 4 - 190\, M_\odot\, {\rm yr}^{-1}$, with most of the objects (80%) having $\dot{M}_{\rm disk} \simeq 10 - 65\, M_\odot\, {\rm yr}^{-1}$, confirming the Eddington-limited nature of the accretion flows. By combining our estimates of $\dot{M}_{\rm disk}$ with conservative, lower limits on the bolometric luminosities of the quasars, we investigate which alternative values of η best account for all the available data. We find that the vast majority of quasars ($\sim$ 85%) can be explained with radiative efficiencies in the range $\eta \simeq 0.03 - 0.3$, with a median value close to the commonly assumed $\eta = 0.1$. Within this range, we obtain conservative estimates of $\eta \gtrsim 0.14$ for ULAS J1120 and SDSS J0100 (at $z = 6.3$), and of $\gtrsim 0.19$ for SDSS J1148 (at $z = 6.41$; assuming their BH masses are accurate). The implied accretion timescales are generally in the range $t_{\rm acc} \equiv M_{\rm BH}/\dot{M}_{\rm BH} \simeq 0.1 - 1$ Gyr, suggesting that most quasars could have had $\sim 1 - 10$ mass e-foldings since BH seed formation. Our analysis therefore demonstrates that the available luminosities and masses for the highest-redshift quasars can be explained self-consistently within the thin, radiatively efficient accretion disk paradigm. Episodes of radiatively *inefficient*, "super-critical" accretion may have occurred at significantly earlier epochs (i.e., $z \gtrsim 10$).

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Evidence that the AGN dominates the radio emission in $z \sim 1$ radio-quiet quasars

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In order to understand the role of radio-quiet quasars (RQQs) in galaxy evolution, we must determine the relative levels of accretion and star-formation activity within these objects. Previous work at low radio flux-densities has shown that accretion makes a significant contribution to the total radio emission, in contrast with other quasar studies that suggest star formation dominates. To investigate, we use 70 RQQs from the *Spitzer-Herschel* Active Galaxy Survey. These quasars are all at $z \sim 1$, thereby minimising evolutionary effects, and have been selected to span a factor of ~ 100 in optical luminosity, so that the luminosity dependence of their properties can be studied. We have imaged the sample using the Karl G. Jansky Very Large Array (JVLA), whose high sensitivity results in 35 RQQs being detected above $2\,\sigma$. This radio dataset is combined with far-infrared luminosities derived from grey-body fitting to *Herschel* photometry. By exploiting the far-infrared–radio correlation observed for star-forming galaxies, and comparing two independent estimates of the star-formation rate, we show that star formation alone is not sufficient to explain the total radio emission. Considering RQQs above a 2-σ detection level in both the radio and the far-infrared, 92 per cent are accretion-dominated, and the accretion process accounts for 80 per cent of the radio luminosity when summed across the objects. The radio emission connected with accretion appears to be correlated with the optical luminosity of the RQQ, whilst a weaker luminosity-dependence is evident for the radio emission connected with star formation.

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Space Telescope and Optical Reverberation Mapping Project. V. Optical Spectroscopic Campaign and Emission-Line Analysis for NGC 5548

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We present the results of an optical spectroscopic monitoring program targeting NGC 5548 as part of a larger multi-wavelength reverberation mapping campaign. The campaign spanned six months and achieved almost daily cadence with observations from five ground-based telescopes. The Hβ and He IIλ4686 light curves lag that of the 5100 Å optical continuum by $4.24^{+0.37}_{-0.37}$ days and $0.80^{+0.36}_{-0.35}$ days, respectively. The Hβ lag relative to the 1158 Å ultraviolet continuum light curve measured by the *Hubble Space Telescope* is roughly ∼50% longer than that measured against the optical continuum, and the lag difference is consistent with the observed lag between the optical and ultraviolet continua. This suggests that the characteristic radius of the broad-line region is ∼50% larger than the value inferred from optical data alone. We also measured velocity-resolved lags for Hβ and found a complex velocity-lag structure with shorter lags in the line wings, indicative of a broad-line region dominated by Keplerian motion. The responsivity of both the Hβ and He 2 lines decreased significantly halfway through the campaign, a phenomenon also observed for C 4 , Lyα, He 2 (+ O 3]), and Si 4 (+ O 4]) during the same monitoring period. Finally, given the optical luminosity of NGC 5548 during our campaign, the measured Hβ lag is a factor of five shorter than the expected value implied by the $R_{\rm BLR} - L_{\rm AGN}$ relation based on the past behavior of NGC 5548.

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Meetings

AGN Winds on the Georgia Coast

Jekyll Island, Georgia, USA
June 25 - 29, 2017

Webpage: `http://www.astro.gsu.edu/AGNWinds`
Email: `agnwinds@astro.gsu.edu`

Update: Abstract submission and hotel reservations are now open for the conference. Please go to the following web site to submit your abstract (due March 31) and reserve your hotel room (due April 28): http://www.astro.gsu.edu/AGNWinds . Additional details about the conference, including registration dates, are provided. Questions can be sent to agnwinds@astro.gsu.edu.

We invite you to attend and participate in the conference "AGN Winds on the Georgia Coast" (http://www.astro.gsu.edu/AGNWinds). The conference will be held at Jekyll Island Club Hotel from Sunday, June 25 - Thursday, June 29, 2017, approximately 6 years after the last AGN Winds conference in Charleston, SC. Since then, observations of AGN across the electromagnetic spectrum have continued to reveal complex physical processes driven by AGN outflows at all size scales. This progress warrants a specialized meeting to summarize these developments and promote the discussion and exchange of new ideas.

Specific topics at the conference include:
- Observations of AGN outflows across the electromagnetic spectrum
- Locations and geometries of outflows from accretion disks to host galaxies
- Spatially resolved observations of outflows
- Molecular outflows and their impact
- Connection to AGN feeding - inflows and accretion
- Physical constraints on the outflowing gas and acceleration mechanisms
- Simulations and energetics of AGN winds
- Effects of AGN winds on their environments, feedback

The meeting will consist of 15 - 20 minute contributed talks over 3 1/2 days (Monday - Thursday afternoon) plus poster sessions over this entire period (reception on Sunday evening). A significant amount of time will be set aside for poster presentations, one-hour group discussions, and informal conversations during lunch and other breaks. We strongly encourage students and postdoctoral associates to come and present their work, and will set aside a number of time slots for the above. We anticipate about 80 participants. The meeting will be held at an historic resort hotel, Jekyll Island Club Hotel (http://www.jekyllclub.com), which will set aside a block of rooms at reduced rates. Sharing of rooms will help to further reduced the costs.