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From the Editor

The Active Galaxies Newsletter is produced monthly. The deadline for contributions is the last friday of the month. 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.
Rob Beswick

Abstracts of recently accepted papers

Black Hole Mass Estimates of Radio Selected Quasars

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The black hole (BH) mass in the centre of AGN has been estimated for a sample of radio-selected flat-spectrum quasars to investigate the relationship between BH mass and radio properties of quasars. We have used the virial assumption with measurements of the Hβ FWHM and luminosity to estimate the central BH mass. In contrast to previous studies we find no correlation between BH mass and radio power in these AGN. We find a range in BH mass similar to that seen in radio-quiet quasars from previous studies. We believe the reason that the low BH mass radio-loud quasars have not been measured in previous studies is due to optical selection effects which tend to miss the less optically luminous radio-loud sources.

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preprint available at http://arXiv.org/abs/astro-ph/0205171

A 10-day *ASCA* Observation of the Narrow-line Seyfert 1 galaxy IRAS 13224-3809

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We present an analysis of a 10-day continuous *ASCA* observation of the narrow-line Seyfert 1 galaxy IRAS 13224-3809. The total band (0.7−10 keV) light curve binned with 500 s reveals trough-to-peak variation by a factor ≥ 37. Rapid X-ray variability with a doubling timescale of 500 s has also been detected. The soft (0.7 − 1.3 keV) and hard (1.3 − 10 keV) X-ray band light curves binned to 5000 s reveal trough-to-peak variations by a factor ≥ 25 and ~ 20, respectively. The light curves in the soft and hard bands are strongly correlated without any significant delay. However, this correlation is not entirely due to changes in the power-law flux alone but also due to changes in the soft X-ray hump emission above the power law. The variability amplitude changes across the observation but is not correlated with the X-ray flux. The presence of a soft X-ray hump below ~ 2 keV, previously detected in *ROSAT* and *ASCA* data, is confirmed. Time resolved spectroscopy using daily sampling reveals changes in the power-law slope, with Γ_X in the range $1.74 - 2.47$, however, day-to-day variations in Γ_X are not significant. The Soft hump emission is found to dominate the observed variability on a timescale of $\sim$ *a week*, but on shorter timescales ($\sim$ 20000 s) the power-law component appears to dominate the observed variability. Flux resolved spectroscopy reveals that at high flux levels the power law becomes steeper and the soft hump more pronounced. This result is further confirmed using an earlier *ASCA* observation in 1994. The steepening of the photon-index with the fluxes in the soft and hard bands can be understood in the framework of disk/corona models in which accretion disk is heated by viscous dissipation as well as by reprocessing of hard X-rays following an X-ray flare resulting from coronal dissipation through magnetic reconnection events. Time dependent accretion disk-corona models are required to understand the observed correlation between the soft hump emission and the power-law flux.

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Variable UV Absorption in the Seyfert 1.5 Galaxy NGC 3516: The Case for Associated UV and X-ray Absorption

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We present observations of the UV absorption lines in the Seyfert 1 galaxy NGC 3516, obtained at a resolution of $\lambda/\Delta\lambda \approx$ 40,000 with the Space Telescope Imaging Spectrograph (STIS) on 2000 October 1. The UV continuum was $\sim$4 times lower than that observed during 1995 with the Goddard High Resolution Spectrograph (GHRS), and the X-ray flux from a contemporaneous *Chandra X-ray Observatory (CXO)* observation was a factor of $\sim$8 below that observed with *ASCA*. The STIS spectra show kinematic components of absorption in Lyα, C IV, and N V at radial velocities of -376, -183, and -36 km s^{-1} (components 1, 2, and 3+4, respectively), which were detected in the earlier GHRS spectra; the last of these is a blend of two GHRS components that have increased greatly in column density. Four additional absorption components have appeared in the STIS spectra at radial velocities of -692, -837, -994, and -1372 km s^{-1} (components 5 through 8); these may also have been present in earlier low-flux states observed by the *International Ultraviolet Explorer (IUE)*. Based on photoionization models, we suggest that the components are arranged in increasing radial distance in the order, 3+4, 2, 1, followed by components 5 – 8. We have achieved an acceptable fit to the X-ray data using the combined X-ray opacity of the UV components 1, 2 and 3+4. By increasing the UV and X-ray fluxes of these models to match the previous high states, we are able to match the GHRS C IV column densities, absence of detectable C IV absorption in components 5 through 8, and the 1994 *ASCA* spectrum. We conclude that variability of the UV and X-ray absorption in NGC 3516 is primarily due to changes in the ionizing flux.

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Extended mid-infrared emission from VV 114: probing the birth of a ULIRG

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We present our 5–16 μm spectro-imaging observations of VV 114, an infrared luminous early-stage merger of two galaxies VV 114E and VV 114W, taken with the ISOCAM camera on-board the *Infrared Space Observatory*. We find that only 40% of the mid-infrared (MIR) flux is associated with a compact nuclear region of VV 114E, while the rest of the emission originates

from a rather diffuse component extended over several kpc in the regions between VV 114E and VV 114W. This is in stark contrast with the very compact MIR starbursts usually seen in luminous and ultraluminous infrared galaxies. A secondary peak of MIR emission is associated with an extra-nuclear star forming region of VV 114W which displays the largest Hα equivalent width in the whole system. Comparing our data with the distribution of the molecular gas and cold dust, as well as with radio observations, it becomes evident that the conversion of molecular gas into stars can be triggered over large areas at the very first stages of an interaction. This extended star formation along with the extreme nuclear starburst observed in VV 114E can easily lead to the heating of dust grains found in the tidally disturbed disks of the progenitor galaxies and subsequently traced via their MIR emission. The presence of a very strong continuum at the 5–6.5 μm range in the spectrum of VV 114E indicates that an enshrouded active galactic nucleus (AGN) may contribute to $\sim$ 40% of its MIR flux. We finally note that the relative variations in the UV to radio spectral properties between VV 114E and VV 114W provide evidence that the extinction-corrected star formation rate of similar objects at high z, such as those detected in optical deep surveys, can not be accurately derived from their *rest-frame* UV properties.

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Sub-arcsecond Atomic Hydrogen Absorption in the Seyfert Galaxies NGC 7674 & NGC 7469

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Neutral hydrogen has been studied on subarcsecond scales in two Seyfert galaxies, NGC 7469 and NGC 7674. The 1.4 GHz continuum emission from these sources agree with higher frequency measurements and shows linear, triple source in NGC 7674 and a compact source surrounded by a weak ring of radio emission in NGC 7469. In both of these sources we detect deep localised HI absorption in front of a single continuum component.

In the case of NGC 7674 the HI absorption is only seen against the central component and has a peak optical depth of 0.21 ± 0.03, a linewidth of $114 \pm 7\,\mathrm{km\,s^{-1}}$ and a heliocentric velocity of $8623\pm5\,\mathrm{km\,s^{-1}}$. The integrated HI absorption against the central component corresponds to a column density of $5.0\pm0.7\times10^{21}$ atoms $\mathrm{cm^{-2}}$. We interpret the lack of HI absorption against the east and west components ($\tau < 0.07$ & 0.06) as evidence that the HI is localised within the central few hundred parsecs, similar to the HI observed against the nucleus of NGC 4151, $\times10^{5}\,\mathrm{M_{\odot}}$. We speculate that this HI may be associated with a dusty torus. GMRT results show extended emission and give a rest velocity of $8699\pm20\,\mathrm{km\,s^{-1}}$.

The HI absorption against NGC 7469 shows a single deep feature against the strong central component. The line has a peak optical depth 0.25, a linewidth of $65\pm6\,\mathrm{km\,s^{-1}}$ of $4843\pm5\,\mathrm{km\,s^{-1}}$. The integrated column density is $3.6\pm0.4\times10^{21}$ atoms $\mathrm{cm^{-2}}$. Unfortunately the other components in NGC 7469 are too weak to set significant limits to the HI optical depth, and hence, unlike NGC 7674, it is not possible to constrain the size of the absorbing gas.

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Variability of the Broad Balmer Emission Lines in 3C 390.3 from 1992 to 2000

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We describe the results of an optical spectral monitoring campaign on the Seyfert galaxy 3C 390.3 carried out with a CCD spectrograph at the 2.6 m Shajn Telescope of the Crimean Astrophysical Observatory in 1992–2000. Light curves for the Hα and Hβ emission lines and for the continuum in both the Hα and Hβ spectral regions are given. The lag between the continuum and Hβ emission-line variations (specifically the cross-correlation centroid τ_{cent}) is found to be $\tau_{cent} = 89^{+12}_{-10}$ days, more than twice the lag found in an earlier investigation by Dietrich et al. We attribute this discrepancy to the difference between continuum autocorrelation functions for these two time series, which have very different durations. We show that a single emission-line transfer function is able to reproduce both cross-correlation results. The recovered transfer function for the Hβ line has a peak at a lag of 20 days, a tail that extends up to 300 days, and little or no correlation near zero lag. We find that the Hα line, which varies with a markedly lower amplitude than Hβ, has a lag of $\tau_{cent} = 162^{+32}_{-15}$ days. We find no significant difference in lag between the blue and red wings of either Hα and Hβ, effectively ruling out kinematics dominated by simple radial motion. However, emission-line profile variations were clearly detected over the duration of the monitoring campaign. The mean and rms profiles computed for three selected time intervals are significantly different and show no correlation between profile width and continuum flux. Over the duration of the campaign, the red central part of the line profiles strongly decreased with respect to the total line flux. Moreover, the red bump nearly completely disappeared, while the blue bump has become more prominent. We find some discrete profile features appear to propagate across the line profile, and we see such features moving in both directions, blue to red and vice versa. Variations in two profile segments at line-of-sight velocity $\pm(7500\text{–}9500)\,km\,s^{-1}$ are found to be poorly correlated with variations in the continuum or in other profile segments. Our conjecture is that the observed evolution of the Balmer-line profiles in 3C 390.3 may be result of the rotational redistribution of matter in a Keplerian disk and changes in the relative strength of an additional line component that dominates in the red central part of the profile. We conclude that the evolution of the broad-line profiles in 3C 390.3 in the context of the current models of the broad-line region remains unclear.

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light curves available at http://www.crao.crimea.ua/~sergeev/papers.php3

Determining Central Black Hole Masses in Distant Active Galaxies

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An empirical relationship, of particular interest for studies of high-redshift active galactic nuclei (AGNs) and quasars, between the masses of their central black holes and rest-frame ultraviolet (UV) parameters measured in single-epoch AGN spectra is presented. This relationship is calibrated to recently measured reverberation masses of low-redshift AGNs and quasars. An empirical relationship between single-epoch rest-frame optical spectrophotometric measurements and the central masses is also presented. The UV relationship allows reasonable estimates of the central masses to be made for high-redshift AGNs and quasars for which these masses cannot be directly or easily measured by the techniques applicable to the lower luminosity, nearby AGNs. The central mass obtained by this method can be estimated to within a factor of 3 for most objects. This is reasonable given the intrinsic uncertainty of a factor of less than 2 in the primary methods used to measure the central masses of nearby inactive and active galaxies, namely, resolved gas and stellar kinematics in the underlying host galaxy and reverberation-mapping techniques. The UV relationship holds good potential for being a powerful tool for studying black hole demographics at high redshift as well as statistically studying the fundamental properties of AGNs. The broad-line region size-luminosity relationship is key to the calibrations presented here. The fact that its intrinsic scatter is also the main source of uncertainty in the calibrations stresses the need for better observational constraints to be placed on this relationship. The empirically calibrated relationships presented here will be applied to quasar samples in forthcoming work.

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