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From the Editor

Apologies for the slightly delayed release of the newsletter, due to my being away observing. The next issue will be back on schedule with the deadline for abstracts on the 28th April.

Cheers,

Ant.

Abstracts of recently accepted papers

The Timescales of the Optical Variability of Blazars. IV. OI 090.4

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Optical photometric observations of the blazar OI 090.4 are presented as part of an ongoing study of variations in blazars occurring on timescales of minutes to hours, which has been termed microvariability. The observations presented here reveal the existence of such variability for this blazar and provide further evidence of the class-wide nature of this phenomenon. Timescales as short as these provide important clues about the nature of blazars, and a discussion of the types of possible mechanisms responsible for producing these variations is given.

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Multi-wavelength Observations of 3C 273 in 1993-1995

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We present the results of the multi-wavelength campaigns on 3C 273 in 1993-1995. During the observations in late 1993 this quasar showed an increase of its flux for energies $\geq$ 100 MeV from about $2.1{\cdot}10^{-7}$photons cm^{-2}s^{-1} to approximately $5.6{\cdot}10^{-7}$photons cm^{-2}s^{-1} during a radio outburst at 14..5, 22 and 37 GHz. However, no one-to-one correlation of the γ-ray radiation with any frequency could be found. The photon spectral index of the high energy spectrum changed from $\Gamma_\gamma = (3.20\pm0.54)$ to $\Gamma_\gamma = (2.20\pm0.22)$ in the sense that the spectrum flattened when the γ-ray flux increased. Fits of the three most prominent models (synchrotron self-Comptonization, external inverse Comptonization and the proton initiated cascade model) for the explanation of the high γ-ray emission of active galactic nuclei were performed to the multi-wavelength spectrum of 3C 273. All three models are able to represent the basic features of the multi-wavelength spectrum. Although there are some differences the data are still not decisive enough to discriminate between the models.

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A comparison of the hard ASCA spectral slopes of broad and narrow-line Seyfert 1 galaxies

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The soft ($\approx$ 0.1–2.0 keV) X-ray spectra of narrow-line Seyfert 1 galaxies are known to be generally steeper than those of Seyfert 1 galaxies with broader optical permitted lines. This has been attributed to the presence of strong soft X-ray excesses, over the hard X-ray power law, in many narrow-line Seyfert 1s. Here we use the currently available ASCA data to systematically compare the harder ($\approx$ 2–10 keV) X-ray continua of soft ROSAT narrow-line Seyfert 1s with those of Seyfert 1s with larger Hβ FWHM. Our robust and nonparametric testing suggests, with high statistical significance, that soft ROSAT narrow-line Seyfert 1s have generally steeper intrinsic hard X-ray continua than Seyfert 1s with larger Hβ FWHM. The hard photon index trend appears similar to the previously known soft photon index trend, although with a reduced photon index spread. If the soft X-ray excesses of all Seyfert 1s are confined to below $\approx$ 1 keV they cannot directly affect the $\approx$ 2–10 keV spectra studied here. However, as suggested for the extreme narrow-line Seyfert 1 RE J 1034+393, a strong soft X-ray excess may affect the accretion disc corona which creates the underlying hard X-ray power law. If this is occurring, then more detailed study of this physical process could give clues about the formation of the underlying continua of all Seyferts. Other effects, such as intrinsic 2–10 keV continuum curvature, could also lead to the observed photon index trend and need further study.

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Molecular Gas, Morphology, and Seyfert Galaxy Activity

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We probe the cause of the elevated star formation in host galaxies of Seyfert 2 nuclei compared with Seyfert 1 hosts and with field galaxies. ^{12}CO(1–0) observations of a large sample of Seyfert galaxies indicate no significant difference in the total amount of molecular gas as a function of the Seyfert nuclear type, nor are Seyfert significantly different in this regard from a sample of field galaxies once selection effects are accounted for. Therefore, the total amount of molecular gas is not responsible for the enhanced star forming activity in Seyfert 2 hosts.

To probe how this gas in being converted more efficiently into stars in Seyfert 2 hosts than in the other galaxies, we investigate the occurrence of bars, interactions and distorted morphologies amongst Seyfert galaxies. We find a significantly higher rate of asymmetric morphologies for Seyfert 2's with respect to Seyfert 1's and field galaxies. Relative to field galaxies, the effect is at a $> 99.8\%$ confidence level. We show that the presence of asymmetric morphologies in individual Seyfert galaxies is correlated with their tendency to exhibit enhanced star forming activity. These results suggest that asymmetric morphologies are an important cause for the link between Seyfert type and star forming activity: bars and distortions in Seyfert 2 hosts are likely both to enhance star forming activity and to funnel gas into the nuclear region thus obscuring and possibly contributing to the feeding of the active nucleus.

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Complex variability pattern in NGC 4151. I. Sequences on the line-continuum diagram

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We present the first results of an 8-year spectroscopic monitoring of the Seyfert 1.5 galaxy NGC 4151 carried out with a CCD spectrograph at the 2.6-m Shajn Telescope of the Crimean Astrophysical Observatory in 1988–1995. Total of 202 Hα region spectra and 154 Hβ region spectra have formed the data set. All spectra were calibrated in flux using the narrow emission lines which were assumed to be constant over the duration of the monitoring program. A self-consistent seeing correction procedure not requiring the surface brightness distribution of the narrow-line region to be known is proposed. The seeing-corrected Hα, Hβ, and He II λ4686 integrated line fluxes and the optical continuum fluxes at 4480Å, 5120Å, 6230Å, and 6910Å are tabulated. During the monitoring program, the spectrum and luminosity of NGC 4151 have undergone dramatic changes. The broad-line fluxes grew by at least 4.6 times for the Hα, 6.5 times for the Hβ, and 9 times for the He II λ4686 lines whereas the non-thermal optical continuum at 5120Å increased by at least 4.8 times. The light curve of the He II λ4686 line strongly differs from the Hα and Hβ light curves. Moreover, there is a clearly pronounced, broad, variable emission near the observed wavelength 4540Å whose variations are not correlated with variations of the broad He II λ4686 line.

The line-continuum diagrams for NGC 4151 reveal some features which contradict the simplest AGN paradigm where a single central source of the continuum emission has a steady relationship between the visible and ionizing continuum:

(1) each of the dependences of Hα, Hβ, and He II λ4686 emission-line fluxes on the optical continuum flux split into four sequences which cover different periods of observations and differ by most parameters of the line-continuum and line-line correlations, including the time lag between the continuum and line variations;

(2) some sequences do not pass through the zero-point of both broad-line and non-thermal optical continuum fluxes, and the relative position of these sequences on the line-continuum diagram is quite different for the hydrogen and He II lines;

(3) the transition time between two successive sequences ($\sim$ 100 days or less) is much shorter than the dynamical time scale for the broad-line region ($\sim$ several years), so the spatial redistribution of the line-emitting gas is obviously not the cause of the origin of sequences (and, hence, of the changes in the emission-line lag).

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Preprint is available via anonymous ftp to astro.crao.crimea.ua (incoming/malkov/ngc4151/paper1.zip)

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