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Abstracts - Thesis Abstracts - Jobs - Meetings

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

Circumnuclear Dust in Nearby Active and Inactive Galaxies. I. Data

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The detailed morphology of the interstellar medium (ISM) in the central kiloparsec of galaxies is controlled by pressure and gravitation. The combination of these forces shapes both circumnuclear star formation and the growth of the central, supermassive black hole. We present visible and near-infrared *Hubble Space Telescope* images and color maps of 123 nearby galaxies that show the distribution of the cold ISM, as traced by dust, with excellent spatial resolution. These observations reveal that nuclear dust spirals are found in the majority of active and inactive galaxies and they possess a wide range in coherence, symmetry, and pitch angle. We have used this large sample to develop a classification system for circumnuclear dust structures. In spite of the heterogeneous nature of the complete sample, we only find symmetric, two-arm nuclear dust spirals in galaxies with large scale bars and these dust lanes clearly connect to dust lanes along the leading edges of the large scale bars. Not all dust lanes along large scale bars form two arm spirals, however, and several instead end in nuclear rings. We find that tightly wound, or low pitch angle, nuclear dust spirals are more common in unbarred galaxies than barred galaxies. Finally, the extended narrow line region in several of the active galaxies is well-resolved. The connection between the ionized gas and circumnuclear dust lanes in four of these galaxies provides additional evidence that a significant fraction of their extended narrow line region is ambient gas photoionized *in situ* by the active nucleus. In a future paper, we will use our classification system for circumnuclear dust to identify differences between active and inactive galaxies, as well as barred and unbarred galaxies, in well-matched subsamples of these data.

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preprint available at http://www.ociw.edu/~martini/pubs/ and astro-ph/0212396

Circumnuclear Dust in Nearby Active and Inactive Galaxies. II. Bars, Nuclear Spirals, and the Fueling of Active Galactic Nuclei

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We present a detailed study of the relation between circumnuclear dust morphology, host galaxy properties, and nuclear activity in nearby galaxies. We use our sample of 123 nearby galaxies with visible–near-infrared colormaps from the *Hubble Space Telescope* to create well-matched, "paired" samples of 28 active and 28 inactive galaxies, as well as 19 barred and 19 unbarred galaxies, that have the same host galaxy properties. Comparison of the barred and unbarred galaxies shows that grand design nuclear dust spirals are only found in galaxies with a large-scale bar. These nuclear dust spirals, which are present in approximately a third of all barred galaxies, also appear to be connected to the dust lanes along the leading edges of the large-scale bars. Grand design nuclear spirals are more common than inner rings, which are present in only a small minority of the barred galaxies. Tightly wound nuclear dust spirals, in contrast, show a strong tendency to avoid galaxies with large-scale bars. Comparison of the AGN and inactive samples shows that nuclear dust spirals, which may trace shocks and angular momentum dissipation in the ISM, occur with comparable frequency in both active and inactive galaxies. The only difference between the active and inactive galaxies is that several inactive galaxies appear to completely lack dust structure in their circumnuclear region, while none of the AGN lack this structure. The comparable frequency of nuclear spirals in active and inactive galaxies, combined with previous work that finds no significant differences in the frequency of bars or interactions between well-matched active and inactive galaxies, suggests that no *universal* fueling mechanism for low-luminosity AGN operates at spatial scales greater than ~ 100 pc radius from the galactic nuclei. The similarities of the circumnuclear environments of active and inactive galaxies suggests that the lifetime of nuclear activity is less than the characteristic inflow time from these spatial scales. An order-of-magnitude estimate of this inflow time is the dynamical timescale. This sets an upper limit of several million years to the lifetime of an individual episode of nuclear activity.

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X-ray Emission Processes in Extragalactic Jets, Lobes and Hot Spots

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This paper is a brief review of the processes responsible for X-ray emission from radio jets, lobes and hot spots. Possible photons in inverse Compton scattering models include the radio synchrotron radiation itself (i.e. synchrotron self-Compton [SSC] emission), the cosmic microwave background (CMB), the galaxy starlight and radiation from the active nucleus. SSC emission has been detected from a number of hot spots. Scattering of the CMB is expected to dominate for jets (and possibly hot spots) undergoing bulk relativistic motion close to the direction towards the observer. Scattering of infrared radiation from the AGN should be observable from radio lobes, especially if they are close to the active nucleus. Synchrotron radiation is detected in some sources, most notably the jet of M87. I briefly discuss why different hot spots emit X-rays by different emission mechanisms and the nature of the synchrotron spectra.

To be published in the proceedings of the Bologna conference "The Physics of Relativistic Jets in the Chandra and XMM Era", New Astronomy Review

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preprint available at astro-ph/0301125

The Correlation between X-ray spectral slope and FeKalpha line energy in radio-quiet active galactic nuclei

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A significant correlation between FeKα line energy and X-ray spectral slope has been discovered among radio-quiet active galactic nuclei. The ionization stage of the bulk of the FeKα emitting material is not the same in all active galactic nuclei and is related to the shape of the X-ray continua. Active galactic nuclei with a steep X-ray spectrum tend to have a fluorescence FeKα line from highly ionized material. In the narrow-line Seyfert 1 galaxies with steeper X-ray spectrum ($\Gamma_X \geq 2.1$), the FeKα line originates from highly ionized material. In the Seyfert 1 galaxies and quasars with flatter X-ray spectrum ($\Gamma_X \leq 2.1$), bulk of the FeKα emission arises from near neutral or weakly ionized material. The correlation is an important observational characteristic related to the accretion process in radio quiet active galactic nuclei and is driven by a fundamental physical parameter which is likely to be the accretion rate relative to the Eddington rate.

Astrophysical Journal Letters

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preprint available at http://xxx.lanl.gov/abs/astro-ph/0211234

The X-ray-faint Emission of the Supermassive Nuclear Black Hole of IC 1459

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Chandra observations of the supermassive black hole in the nucleus of IC 1459 show a weak (L_X=8×10^{40}erg s^{-1}, 0.3-8 keV), unabsorbed nuclear X-ray source, with a slope $\Gamma = 1.88\pm0.09$, and no strong Fe-K line at 6.4 keV (EW<382 eV). This describes a normal AGN X-ray spectrum, but lies at 3×10^{-7} below the Eddington limit. The SED of the IC 1459 nucleus is extremely radio loud compared to normal radio-loud quasars. (kT$\sim$0.5-0.6 keV) with an average density of 0.3 cm^{-3}, within the central $\sim$180 pc radius, which is comparable to the gravitational capture radius, r_A $\sim$140 pc. We estimate that for a standard AGN efficiency of 10%, the Bondi accretion would correspond to a luminosity of $\sim6\times10^{44}$erg s^{-1}, nearly four orders of magnitude higher than L_X. not the high radio/X-ray ratio. A jet model fits the radio-100μm and X-ray spectra well. The total power in this jet is $\sim$10% of L$_{Bondi}$, implying that accretion close to the Bondi rate is needed.

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preprint available at astro-ph/0301297

Is there really a Black Hole at the center of NGC 4041? - Constraints from gas kinematics

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We present HST/STIS spectra of the Sbc spiral galaxy NGC 4041 which were used to map the velocity field of the gas in its nuclear region. We detect the presence of a compact ($r \simeq 0.''4 \simeq 40$ pc), high surface brightness, rotating nuclear disk co-spatial with a nuclear star cluster. The disk is characterized by a rotation curve with a peak to peak amplitude of $\sim$ 40 km s^{-1} and is systematically blueshifted by $\sim 10 - 20$ km s^{-1} with respect to the galaxy systemic velocity. With the standard assumption

of constant mass-to-light ratio and with the nuclear disk inclination taken from the outer disk, we find that a dark point mass of $(1^{+0.6}_{-0.7})\times 10^7$ $M_\odot$ is needed to reproduce the observed rotation curve. However the observed blueshift suggests the possibility that the nuclear disk could be dynamically decoupled. Following this line of reasoning we relax the standard assumptions and find that the kinematical data can be accounted for by the stellar mass provided that either the central mass-to-light ratio is increased by a factor of ~ 2 or that the inclination is allowed to vary. This model results in a 3σ upper limit of 6×10^6 $M_\odot$ on the mass of any nuclear black hole. Overall, our analysis only allows us to set an upper limit of 2×10^7 $M_\odot$ on the mass of the nuclear BH. If this upper limit is taken in conjunction with an estimated bulge B magnitude of -17.7 and with a central stellar velocity dispersion of $\simeq 95$ km s^{-1}, then these results are not inconsistent with both the $M_{\rm BH}$-$L_{\rm sph}$ and the $M_{\rm BH}$-$\sigma_\star$ correlations. Constraints on BH masses in spiral galaxies of types as late as Sbc are still very scarce and therefore the present result adds an important new datapoint to our understanding of BH demography.

Astrophysical Journal, in press

E-mail contact: marconi@arcetri.astro.it,
preprint available at http://arxiv.org/abs/astro-ph/0211650

Resolved Mid-IR Emission in the Narrow Line Region of NGC 4151

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We present subarcsecond resolution mid infrared images of NGC 4151 at 10.8 micron and 18.2 micron. These images were taken with the University of Florida mid-IR camera/spectrometer OSCIR at the Gemini North 8 m telescope. We resolve emission at both 10.8 micron and 18.2 micron extending $\sim$ 3.5" across at a P.A. of $\sim$ 60 degrees. This coincides with the the narrow line region of NGC 4151 as observed in [OIII] by the Hubble Space Telescope. The most likely explanation for this extended mid-IR emission is dust in the narrow line region heated by a central engine. We find no extended emission associated with the proposed torus and place an upper limit on its mid-IR size of ≤ 35 pc.

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preprint available at http://arxiv.org/abs/astro-ph/0212307

Jobs

Three Postdoctoral Vacancies and One PhD Opening [1,2,3]

ENIGMA Network

Structure and Radiation Processes of AGN through multi-frequency analysis

[1] Landessternwarte Heidelberg, Königstuhl, 69117 Heidelberg, Germany
[2] MPI für Radioastronomie, Auf dem Hügel 69, 53121 Bonn, Germany
[3] Tuorla Observatory, Väisäläntie 20, 21500 Piikkiö, Finland

Within the newly established European Research Training Network ENIGMA on "Structure and Radiation Processes of AGN through multi-frequency analysis" we seek to fill three postdoctoral positions. They will be hosted by three of the eight European research institutions working within this project.
The network has been established to carry out research in the following areas:

- Numerical simulations and analytical modeling of Blazar jets to study:
  particle acceleration and radiation mechanisms,
  magnetohydrodynamic flows,
  jet physics in Blazars.
- Multi-frequency observations of radio-loud AGN to study:
  radio/optical Intra-Day variability,
  relationships between structural and flux density variability,
  relations in different high-energy bands (X-ray, γ-rays, and VHE radiation with Cerenkov telescopes).
- Advanced statistical methods for time-series and applications to astrophysical models.
- Developing high-precision photometric routines in different waveband regimes.
- Developing reliable robotic systems for automated ground-based monitoring of AGN.

Postdocs will work in their host team and within this active and interacting network of empirical and theoretical research. They are encouraged to spend part of their time at other institutes during their appointment. They will have access to unique observational facilities and will profit from a strong training program involving hardware-related aspects, observational strategies in all waveband regimes, and theoretical research.

Questions regarding the research program can be directed to the network coordinator, S. Wagner.

The three positions will become available between March 2003 and May 2003. The positions are available for up to three years. Competitive salaries will be paid, differing according to local regulations. Additional support will be available for extended visits to other partner institutions within the network, network meetings and conferences.

The PhD position is at the Landessternwarte Heidelberg. It is a three year position on a specific topic within the research goals of the network. The candidate may be enrolled in the PhD program at the University of Heidelberg. All fees in its graduate course will be covered. Applications will be reviewed starting March 1, 2003 until the position is filled. The position should start preferably with the summer term (April 2003), but no later than with the beginning of the winter term (October 2003).

According to the rules of the EC, the positions are open to young researchers, holding a passport of a member or associate state of the European Union. German citizens may only apply to the position in Finland, Finnish citizens may only apply to the positions in Germany. Further details are given by the regulations of the EC programme (http://www.cordis.lu/improving/networks/faq.htm#q5).

Applications should include a curriculum vitae, a publication list, a summary of current research interests as well as a list of topics of interest or institutes which they would prefer to join. Two letters of reference should also be arranged for. The review of applications will start in the end of February 2003, and will continue until all positions are filled. Material should be sent to Landessternwarte Heidelberg, S. Wagner, Königstuhl 12, 69117 Heidelberg, Germany, swagner@lsw.uni-heidelberg.de.

Further positions will become available during the next months.

The Active Galaxies Newsletter is available on the World Wide Web. You can access it via the University of Manchester home page :- http://www.ast.man.ac.uk/~rb/agn/
If you move or your e-mail address changes, please send the editor your new address. If the Newsletter repeatedly bounces back from an address then that address is deleted from the mailing list.