Statistical Results from the First Caltech-Jodrell Bank VLBI Survey

T.J. Pearson, W. Xu, A.C.S. Readhead (Caltech), P. N. Wilkinson, A. Polatidis (NRAL, Jodrell Bank)

In the Pearson-Readhead (PR) and Caltech-Jodrell (CJ) surveys we have made millisecond-resolution images at λ8 and λ18 cm of the cores of 127 radio sources from a complete sample of 200 objects with total λ6 cm flux density ≥ 0.7 Jy. This large sample is suitable for a variety of statistical studies, including the following.

(1) The distribution of PA, the difference in position angle between parsec-scale and kiloparsec-scale structure, is bi-modal with peaks at 0° and 90°, confirming the result found in a smaller subsample by Pearson and Readhead. We discuss the differences in properties of the two types of object, and interpret the distribution in terms of relativistic beaming of helical jets (cf. Conway & Murphy 1993, ApJ, 411, 89).

(2) We present the θ-z (angular size-redshift) diagram for this sample, and compare it with the results of Kellermann (1993, Nature, 361, 134) which showed evidence for a deceleration parameter q0 = 0.5. In contrast to Kellermann, we find that the angular displacement between the unresolved nucleus and the 2% contour in the jet does not depend on redshift in the way expected for a standard measuring rod, and that most parsec-scale jets have a self-similar, scale-free structure that cannot be used for cosmological inferences.

Inferences from Superluminal Motion Statistics

R.C. Vermeulen, M.H. Cohen (Caltech)

We present an up-to-date compilation of internal proper motion measurements. We demonstrate how their statistics, and those of future large homogeneous samples, may be used to infer the distribution of Lorentz γ factors, and how superluminal motion statistics may impact AGN unification studies. The current data are derived from inhomogeneous observations, but none-the-less suggest that there is either a wide spread of γs in quasars, or that there are separate bulk and pattern γs, or both; the simplest model, without separate pattern velocities, and identical or similar γ in all quasars, is now ruled out.

There is a well-defined upper envelope in the μ-ν diagram, as indeed predicted by beaming models. Its shape currently suggests that whether the universe is closed, or the Lorentz factors increase with redshift. Second-epoch observations of the Caltech-Jodrell VLBI survey are in progress. They will allow a detailed study of the distribution of Lorentz factors in narrow redshift bins, from which evolution of γ on parsec scales, if any, will be apparent. Thereafter, intercomparison of the statistics between redshift bins will allow q0 to be constrained.

Spectropolarimetry of Seyfert 2 Galaxies with Obscured Broad-Line Regions

H. D. Tran (UCO/Lick Observatory)

We present high signal-to-noise ratio spectropolarimetric observations of ten Seyfert 2 galaxies currently known to harbor obscured broad-line regions (BLRs). The data, covering the spectral range λ3200–7400 Å at moderate resolution, were obtained with the Keck double spectrograph in combination with the CCD polarimeter on the Shane 3-m telescope at Lick Observatory. They indicate that electron scattering is the dominant mechanism responsible for the nuclear polarizations in 9 of the 10 galaxies in the sample, although a substantial contribution from dust scattering and/or transmission is likely in at least 4 objects. In only one case, NGC 7674, does the observed polarization suggest that dust scattering is the dominant cause of the observed nuclear polarization.

The corrected continuum polarizations display, in all galaxies but NGC 1068, a rise in the amount of polarization in the broad wings of Hβ and Hα, while the polarization position angle remains more or less the same between the broad-line wings and continuum. In a majority of the objects, the polarization electric vectors are essentially perpendicular to the radio structure axis and/or the position angle of the extended ionization cones or jets. The polarized broad lines tend to be redshifted relative to the galactic nucleus. These observational results strongly suggest that the obscuring torus picture with the general scattering geometry proposed for NGC 1068 is basically correct, but in addition to the scattered (hence polarized) continuum the substantial unpolarized component F_{\text{d}} underlying the total observed continua of these Seyfert 2 galaxies. The continuum polarizations after the removal of this diluting component are generally very high (≥ 15%), and in accord with those expected from the obscuring torus/scattering electron model. Available evidence also suggests that F_{\text{d}} may represent the optically thin thermal radiation from the scattering region itself. Barring strong selection effects, polarized BLRs appear to be found predominantly in multiple, perhaps interacting systems of galaxies, indicating that perturbing or merging processes may play an important role in the existence and/or detection of hidden BLRs in Seyfert 2 galaxies at some stages of their evolution.

Slt Spectra of Second Byurakan Survey Galaxies

D.E. Osterbrock, A. Martel (UCO/Lick Observatory, UCSC)

Slt spectra have been obtained at Lick Observatory of 18 Seyfert galaxy candidates from the Second Byurakan Spectral Sky Survey (SBS). The great majority of them turned out to be Seyfert galaxies. The classifications and redshifts of all the galaxies are reported. Measuremets of the intensity ratios of the emission lines used in classifying the galaxies are tabulated and plotted on diagnostic diagrams. The spectra of seven of the galaxies are described in detail. In general, our classification and redshift measurements are in very good accord with those of Lipovetsky, Stepanian, and their collaborators at the Special Astrophysical Observatory, showing that their results can be used in conjunction with the Lick results with little if any systematic difference between the two data sets. The importance of the SBS as a source of new Seyferts bridging the gap between low-redshift Seyfert galaxies and high-luminosity QSOs is also emphasized.

An Emission Line Imaging Survey of Seyfert Nuclei in Early-type Host Galaxies as a Test of Unified Models

J. S. Mulchaey, A. S. Wilson (STScI/University of Maryland), Z. Tsvetanov (Johns Hopkins University)

Preliminary results from an emission line imaging survey of a complete sample of Seyfert nuclei in early-type host galaxies will be presented. The sample is defined to include all known Seyfert nuclei with total magnitude m ≤ 14.5 and recessional velocities ≤ 10,000 km s^{-1} residing in E and S0/a host types. Each galaxy in the sample is being imaged in the emission lines of [OIII]λ5007 and Hα. The aim of this survey is to determine the incidence of "ionization cones" in Seyfert galaxies and test the idea that the difference between the two types of Seyferts is due to different aspect angle. To facilitate this goal, the emission-line images will be compared to simulations of cones of various opening and viewing angles.

Session 101: Evolved Stars, Supernova Remnants

Oral Session, 2:15–3:45 pm
Salons A/B

101.01
Models of Evolved Carbon-Rich Circumstellar Envelopes: Effects of Grain Surface Chemistry

S. D. Doty & C. M. Leung (Rensselaer)

Circumstellar envelopes (CSEs) are rich chemical environments. In an effort to explain observations, many models of these sources have been constructed. Both the chemistry (e.g., Glassgold & Huggins, 1984; Nejad & Millar, 1987) and photoprocesses (e.g., Glassgold, et al., 1987; Cherchneff et al., 1993) have...