RADIO STRUCTURE AND THE IR - UV SPECTRA OF QUASARS

Beverley J. Wills and D. Wills
McDonald Observatory and Department of Astronomy
University of Texas, RLM 15.308
Austin, Texas 78712
U.S.A.

Here we present two main results that relate properties of quasar IR-to-UV spectra to the fraction of radio flux density in the compact core.

Wills and Browne (1986) have shown that there is a highly significant inverse correlation between the line widths (FWHM) of broad Hβ and R, the ratio of radio core flux density to that in the extended lobes. An updated version of their data is shown in Figure 1. In the relativistic beaming model for radio sources R is related to the angle, θ, between the radio source axis (the beam direction) and the line-of-sight. The correlation can then be interpreted as motion of the emission line gas confined predominantly to a plane perpendicular to the radio axis - perhaps in a disk. The curve in Fig. 1 shows the expected relation for a specially simple model in which $FWHM = [(4000)^2 + (13000)^2 \sin^2 \theta]^{1/2}$ km/s and the relation between R and θ is as given by Orr and Browne (1982). There must be a range of intrinsic velocity dispersion from one quasar to another.

The simple unified beaming picture requires that aspect invariant optical properties of core- and lobe-dominated sources be the same, but

1. The broad line intensity ratio Fe II (opt)/Hβ is (statistically) smaller in lobe-dominated quasars. This is probably the result of incorrect setting of the continuum level when measuring Fe II. This is because blending of broad lines then causes the Fe II strength to be underestimated more in the broader-lined quasars.
2. Boroson, Persson and Oke (1985, see also Steiner 1981) find that [O III] lines in the fuzz around quasars are significantly stronger for lobe-dominated sources. We suggest that this is still consistent with the beaming hypothesis and is the result of (i) favouring less luminous lobes for core-dominated sources in flux density limited radio surveys, where the number of sources increases markedly for fainter lobes (according to the log N - log S relation), combined with (ii) the known strong correlation between luminosity of [O III] and luminosity of the extended Kpc-scale radio structure. (This relation is strong for the less luminous AGN, and is consistent with quasar data, but as a result of selecting the most luminous objects at larger redshifts, we cannot be sure.)

The second main result is that we find a significant difference between quasars with curved and power law IR (1-5, 10 or 20 μ) spectra in the distributions of both log R and FWHM for broad Hβ (see Fig. 2 where we also give the sense of the IR curvature). The curvature is due to the presence of a flattish ("thermal") component in the optical - UV spectral region, superposed on a steep IR component. These results suggest that R tends to be larger in quasars where the steep IR component dominates. Perhaps the IR component is beamed or otherwise related to the luminosity of the compact radio core.

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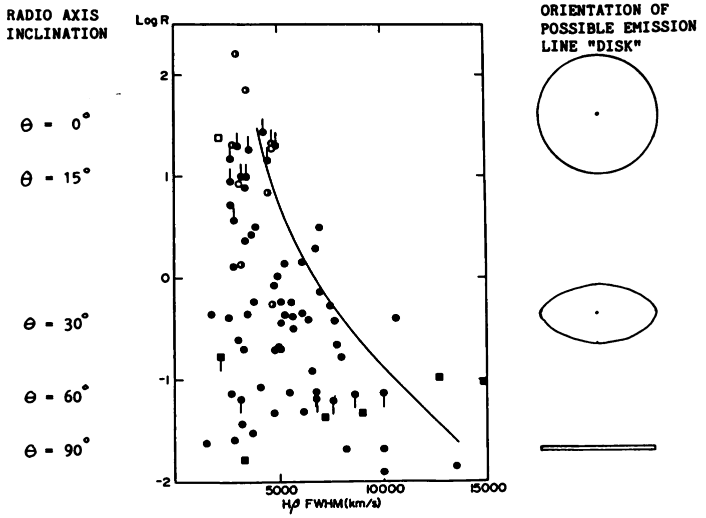

Fig. 1: The correlation between the dominance of the compact radio core, measured by R, and the line width (FWHM).

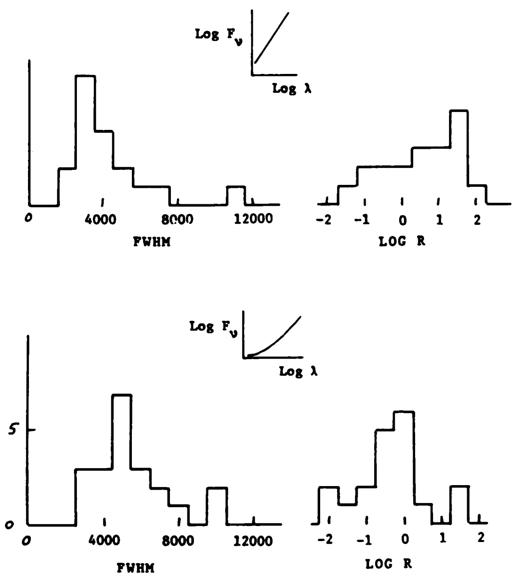

Fig. 2: Histograms of FWHM and Log R for quasars with steep and curved IR spectra.

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