THE EVOLUTIONARY UNIFIED SCHEME, JET ASYMMETRY, AND SUPERLUMINAL MOTION

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The evolutionary unified scheme (Vagnetti *et al.*, 1991; Vagnetti and Spera, 1994) is the first attempt to describe the radio source populations accounting at the same time for their cosmic evolution and their anisotropic phenomena. It achieves an interconnection between anisotropy and evolution through a changing balance between two optical components, an isotropic "thermal" one and a relativistic beam. It predicts an evolution of the radio-optical ratio, interpreted as a slow increase of the Lorentz factor with the cosmic time (Vagnetti *et al.*, 1991). It also predicts a link between the high and low-power unified schemes, and in particular between high and low-redshift blazars, and between high and low-redshift radio galaxies.

If this scenario is valid in this simple form, it seems that high redshift sources oriented at intermediate viewing angles, i.e. the steep-spectrum quasars, are destined to become low-power radio galaxies at low redshift. It has therefore been investigated the distribution of quasars and radio galaxies in the viewing angle–redshift plane (Vagnetti and Spera, 1994), based on the changing balance between the nuclear optical components (both isotropic and anisotropic) and the host galaxy luminosity. In fact, without invoking any obscuration mechanism, a substantial fraction of low-redshift sources at intermediate viewing angles are predicted to be seen as radio galaxies.

It is thus interesting to explore the distributions of orientation indicators such as the jet asymmetry $J = (\delta_{jet}/\delta_{counterjet})^{2+\alpha_r} = [(1+\beta\cos\theta)/(1-\beta\cos\theta)]^{2+\alpha_r}$ and the apparent transverse velocity $\beta_{app} = \beta\sin\theta/(1-\beta\cos\theta)$ separately for quasars and radio galaxies. As such parameters are also strong functions of the Lorentz factor, this is also the way to look for the predicted Γ increase.

Preliminary results are here presented for the second of three models proposed in Vagnetti and Spera (1994), which includes a distribution of Γ

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(with Γ_{max} increasing with cosmic time), but not convolutions through the luminosity functions of quasars and host galaxies, as in the most accurate model of Vagnetti and Spera (1994). Therefore the results, shown in Figure 1, are to be considered only as trends. However, the dominant effect is clearly the strong change of the shapes of the distributions of both parameters, due to transmutation of steep-spectrum quasars into radio galaxies. Substantial populations of radio galaxies with high asymmetry and superluminal motion are expected at low redshifts. The effect of the Γ increase is instead visible at the high end of the distributions, although modest and with very small numbers, such that very large samples would be required to compare the expectations to reality.

References

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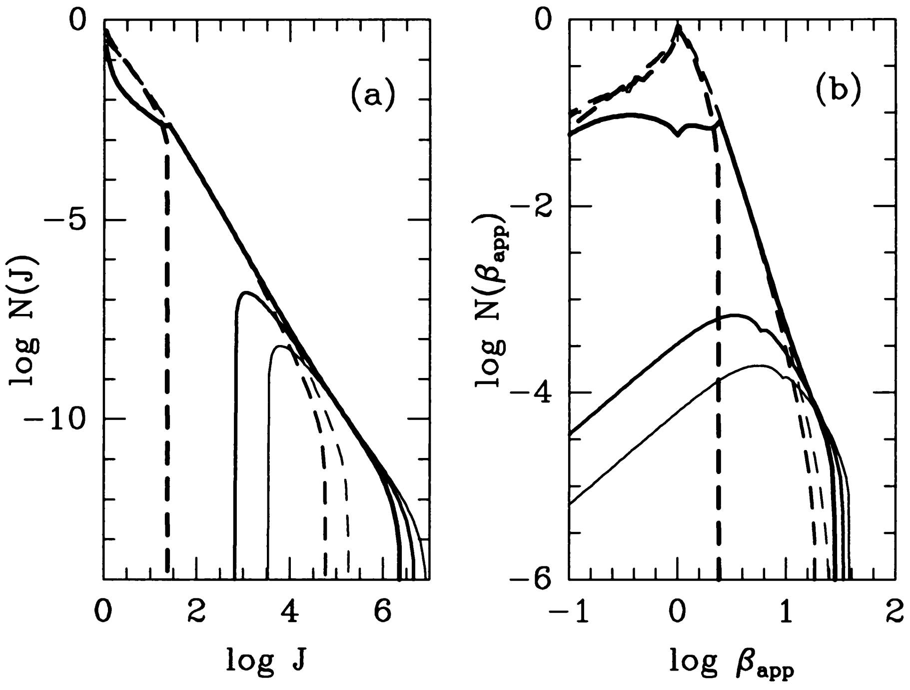

Figure 1. Predicted distributions of jet asymmetry (a) and of apparent transverse velocity (b). Continuous lines: quasars; dashed lines: radio galaxies. Lines of increasing thickness represent distributions at increasing redshift: 0, 0.2, 0.5. The ordinates represent fractions of sources normalized to the combined population quasars + radio galaxies.

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