SPECTRAL INDEX ASYMMETRIES IN LOW-Z RADIO GALAXIES

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1. Introduction

In recent years a number of correlations have been observed between the large-scale properties of FRII radio galaxies and quasars. Some correlations find their simplest explanations in terms of environmental effects, others in terms of beaming/orientation effects. The problem, however, is that there is an implied correlation between these different *types* of effects. This is a report on work underway to investigate this directly and exclude the confusion introduced by use of different samples.

The correlations relevant to this work are:

1 counter-jet side $\longleftrightarrow$ most rapidly depolarized lobe: explained by beaming theories with the counter-jet side further from us, and viewed through more Faraday medium. (Garrington *et al.*, 1991), 39/47 sources.

2 short side $\longleftrightarrow$ most rapidly depolarized lobe: explained as an environmental effect with shorter lobe behind denser Faraday medium. (Liu & Pooley, 1989), 7/10 sources.

3 most rapidly depolarized lobe $\longleftrightarrow$ steeper spectrum: not simply explained in terms of orientation and beaming effects but implies an intrinsic source asymmetry. (Liu & Pooley, 1989), 11/12 sources.

4 counter-jet side $\longleftrightarrow$ steeper lobe spectrum (Garrington *et al.*, 1991), 36/47 sources.

The correlations with depolarization [1,2 & 3] are compatible only if the *counter-jet side* also correlates with *short side* and *steeper lobe spectrum*. Whilst the Garrington-Laing effect [1] is naturally explained as an

R. Ekers et al. (eds.), Extragalactic Radio Sources, 395–396.

https://doi.org/10.1017/S0074180900081213 Published online by Cambridge University Press

orientation effect, it is hard to see why either lobe length or lobe spectrum should depend strongly on orientation (i.e. jet sidedness).

Observationally it is found that the correlation of jet side with lobe length is very weak (Scheuer, 1995). The correlation of jet side with lobe spectrum was found by Garrington *et al* [4], but they had insufficient resolution to rule out the possibility that this was simply due to a Doppler-boosted hot-spot on the jet side.

The challenge is to disentangle the intrinsic, environmental and orientation effects. To this end we have selected two different samples, one high-powered quasar sample (Bridle *et al.*, 1994, J.Dennett-Thorpe *et al.*, in prep.) and one low-power sample. Beaming models indicate that the first sample should be dominated by orientation effects whilst in the second intrinsic and environmental effects should be dominant.

2. Results

Twelve $z < 0.15$ low-powered sources with detectable jets (from Black, 1991) now have suitable multi-array VLA observations at two frequencies (archival and new data). To date six sources have been analysed. Asymmetries, although small, are apparent in the spectra of these sources, both in the integrated flux and in regions of similar surface brightness.

There is *no* correlation between jet side and spectral index difference. This rules out explanations purely in terms of orientation (e.g. Blundell & Alexander, 1994). This is expected for standard models in a sample dominated by NLRG, but the continued existence of asymmetries indicates that they are not caused solely by differential ages or Doppler effects.

Although the sample size is small there is a strong correlation between *lobe area* and *spectrum* (5/6 sources): lobes with the larger surface area have a flatter spectrum throughout the source. We also note however that there is *not* a strong correlation with lobe length.

The spectral index and surface brightness (dependent differently on geometry, injection spectra and magnetic field history) do not show a one-to-one correspondence so the correlations presented here represent crude averages. The data will be analysed in various other ways and a third frequency added to a number of sources.

References

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