RADIO OBSERVATIONS OF MODERATELY COMPACT STEEP SPECTRUM SOURCES

Chidi Akujor
Astrophysics Group,University of Nigeria,Nsukka,Nigeria and
N.R.A.L., Jodrell Bank, U.K.
I.W.A.Browne and P.N.Wilkinson,
Nuffield Radio Astronomy Laboratories, Jodrell Bank, U.K.

1. INTRODUCTION

It is now common practice for objects with a steep radio spectrum and compact radio structure to be lumped together and called compact steep spectrum (CSS) sources (Peacock and Wall, 1982; van Breugel,1984 Fanti et al. 1985). This rather arbitrary categorisation results in the class containing sources with a wide range of structures, from core-jet or complex (e.g. 3C147,3C48), small classical doubles (e.g. 3C237, 3C241), to VLBI compact doubles (e.g. CTD93; Phillips and Mutel,1982). Some of the questions we are asking include:
(a) Are compact sources intrinsically small, or do they appear small because they are seen in projection? (b) Why are structures in compact radio galaxies and compact radio quasars different? Wilkinson et al. (1984) and Spencer et al (1988,in preparation)have shown that there appears to be a 'clear-cut' difference in morphology between quasar CSS and galaxy CSS, with quasars showing more distortions while galaxies tend to be doubles. But is this trend present even in their slightly more-extended counterparts?

2. OBSERVATIONS

As part of a programme to address some of these questions we are studying with MERLIN, VLA and WSRT a sample of 14 radio quasars and galaxies of intermediate size (LAS=4-15 arcsec), chosen from the 3CR catalogue with additional criteria that S(6cm) >0.6Jy, δ>20deg, and α >0.6. Most sources have linear sizes 20-35kpc.

3. RESULTS AND DISCUSSION

With the data we have available we have attempted a classification of the observed structures (see fig.1;Table1) into those which are 'simple' and those which are 'complex'. A definition of what is structurally complex is difficult. What we want is a criterion which

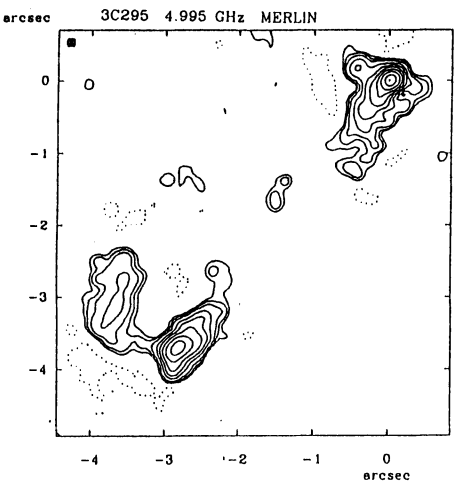
D. E. Osterbrock and J. S. Miller (eds.), Active Galactic Nuclei, 537–538.

is objective, which does not depend too strongly on the quality of the radio map, nor on the number of resolution elements across the source. We have decided to base our classification on the axial ratio, A, which is the ratio of the largest size of the source, to the size measured in the perpendicular direction. Sources with, $A \geq 4$ are called "simple", those with $A < 4$, complex. When we apply this scheme to sources which have been classified by more subjective methods we find good correspondence.

In our sample we find complex sources amongst radio galaxies as well as amongst quasars. The galaxy 3C295 is definitely complex,while 3C133 and 3C153 lie close to the borderline. Amongst quasars, 3C196, 3C270.1 and 3C380 are all complex. If we take into account other sources which meet our selection criteria and for which good maps exist it appears that on average, the quasars are more likely to be complex than radio galaxies. But, such an effect is also present in sources of much larger angular sizes (Leahy,et al.,1988; in preparation).

Is the proportion of complex sources in our sample greater or less than those in CSS samples? We find approximately 30% of our sources to be complex. Using a different classification scheme Spencer et al (1988) find that 40% of the clearly resolved sources in their CSS sample are complex. Thus the available evidence does not indicate a dramatic increase of complexity amongst the small (CSS) sources which could be attributable to the transition from sources confined by the IGM (Sizes > 20kpc) to those confined by the ISM of the parent galaxy (sizes <10kpc)

S/NO	3CR	Z	LAS "	STRUCTURE
		QSOs		
1.	19	0.871	10	complex
2.	205	1.534	18	simple
3.	254	0.734	13	simple
4.	268.4	1.40	10.9	simple
5.	270.1	1.59	8.9	complex
6.	380	0.691	15	complex
		Galaxies		
7.	19	0.482	9.6	-
8.	133	0.278	12.3	complex?
9.	153	0.277	8.5	complex?
10.	247	0.75	13	simple
11.	263.1	0.36	5.8	simple
12.	280	0.996	14.5	-
13.	295	0.46	5.3	complex
14.	324	0.5	10	simple



REFERENCES

Peacock,J.and Wall,J.V. 1982. M.N.R.A.S., 198, 843
Phillips,R.B. and Mutel,R.L.,1982. Astron.Astrophys.,106, 21
van Breugel,W., 1984. in R.Fanti et al.(eds), VLBI and Compact Radio Sources, D. Reidel, p.59
Wilkinson, P.N. et al., 1984 in R.Fanti et al (eds), VLBI and Compact Radio Sources, D. Reidel, p.25

https://doi.org/10.1017/S0074180900141920 Published online by Cambridge University Press