MULTI-EPOCH OBSERVATIONS OF SURVEY SOURCES

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ABSTRACT

Five objects mapped as part of a VLBI survey have been re-observed at 5 GHz, and four of them have also been observed at 10 GHz. Three of the objects show no substantial structural variations: an upper limit of 2c can be placed on the apparent relative velocities of the components. One object (0711+356) shows structural variations which are mostly simply described in terms of a superluminal contraction. The remaining object (3C371, 1807+698) shows substantial structural variations which suggest that it probably is a superluminal source. The source 0710+439 is especially interesting as it consists of a central flat-spectrum core component straddled by two compact steep-spectrum components.

SECOND-EPOCH MEASUREMENTS AT 5 GHz

In an earlier contribution to this Symposium, the results of first epoch mapping of a complete sample of sources were presented (Pearson and Readhead, this volume). Second-epoch 5-GHz maps of four of the objects are shown in Figure 1. The separations of the major components (three components in the case of 0710+439) are given in Table 1 for all the objects except 3C371, for which it was not possible to identify unambigously the knots observed in the jet at the two epochs. It is clear that 3C371 is a likely candidate for superluminal motion and more frequent observations of it are needed. Of the remaining four sources, three (0108+388, 0710+439, and 2021+614) show no significant relative motion; but in 0711+356 the separation of the two major components has decreased by 0.13±0.02 mas. Results obtained from model-fitting with a three-component model agree well with measurements from the maps. Furthermore, the change in structure can be seen directly in the visibility amplitudes and closure phases. Thus there is no doubt that the separation of these components has decreased significantly. If the change is due to real motion of the components, the source has contracted superluminally with an apparent speed of 5c, but more observations are needed to confirm this.

R. Fanti et al. (eds.), VLBI and Compact Radio Sources, 131–134.

https://doi.org/10.1017/S007418090007786X Published online by Cambridge University Press

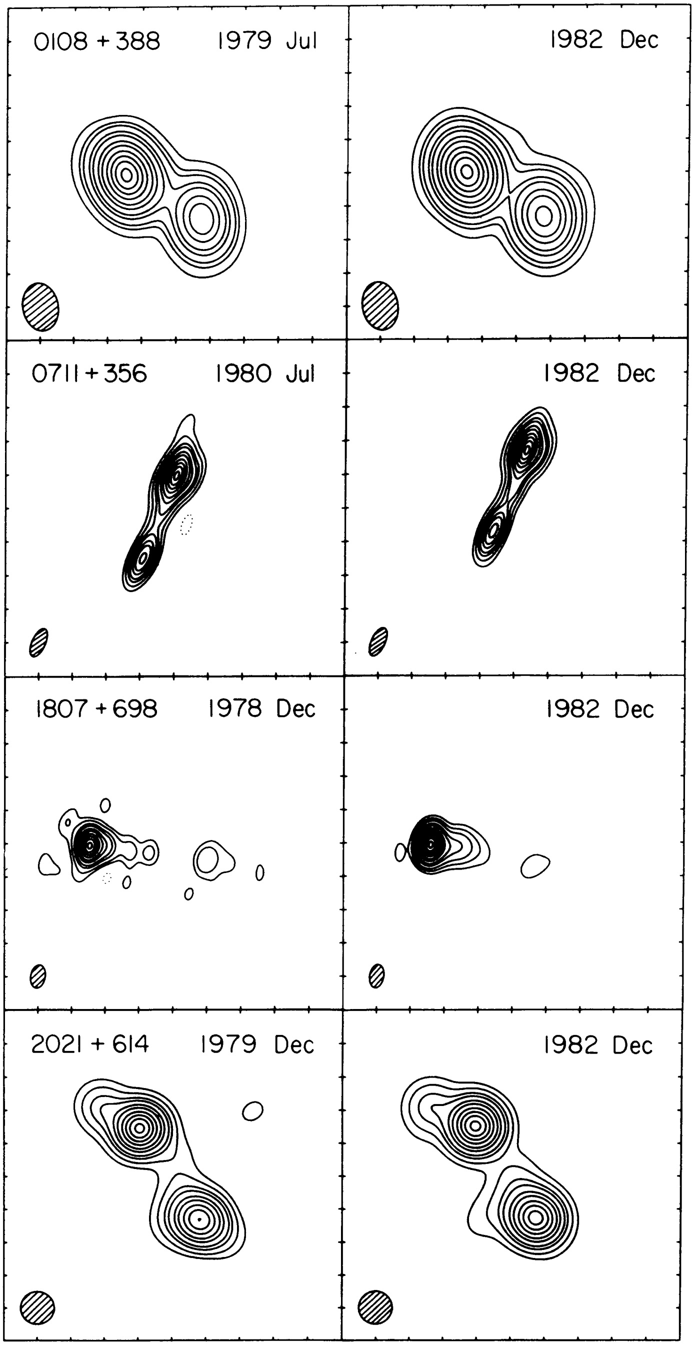

Fig. 1. 5-GHz maps of four sources at each of two epochs; the same restoring beam (indicated by the shaded ellipse) has been used for both epochs. All the boxes are 20 mas square, except those for 1807+698 which are 40 mas square.

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TABLE 1 - LIMITS ON RELATIVE MOTION

Object	ID	z	Epoch	Separation (mas)	Δ (σ) (mas)	v/c (σ) (apparent)
0108+388	EF	-	1979 Jul	5.13	0.08 (0.06)	1.5 (1.0)*
			1982 Dec	5.21		
0710+439	G (21m)	-	1980 Jul	8.28	0.05 (0.04)	1.3 (1.0)*
			1982 Dec	8.33		
			1980 Jul	23.78	0.12 (0.06)	3.0 (1.5)*
			1982 Dec	23.90		
2021+614	G (20m)	0.23	1979 Dec	6.47	0.05 (0.04)	0.20 (0.15)
			1982 Dec	6.52		
0711+356	Q (18m)	1.62	1980 Jul	5.30	-0.13 (0.02)	-5 (1)
			1982 Dec	5.17		

Velocities calculated assuming H_o = 55 km/(s.Mpc), q_o = 0.05, and using measured redshifts where available; (*) indicates z = 1 assumed.

10-GHz OBSERVATIONS AND SOURCE CLASSIFICATION

The objects mapped in the VLBI survey were divided into different morphological classes. Two of the objects (0711+356 and 2021+614) appeared at first to belong to the class of double objects, and were classified as such, but the observations at 10 GHz revealed that they are probably asymmetric, since one of the dominant components has a flat spectrum ($\alpha \geq -0.5$) while the other has a steep spectrum ($\alpha \leq -0.5$). The full-resolution 10-GHz maps also show that the more compact features have the flatter spectra.

0710+439

Perhaps the most interesting structure is that of 0710+439. Maps of this object at both 5 GHz and 10 GHz are shown in Figure 2. Figure 2 also shows profiles along the long axis of the source at 5 GHz and 10 GHz. It is not possible to align the maps so that the peaks of all three components coincide at both frequencies. If the two outer components are aligned (as in Fig. 2), the central component becomes an asymmetric one-sided jet, with a compact flat-spectrum core at the southern end and a steep-spectrum jet pointing north towards the stronger of the two outer components. An alternative is to align the central component, in which case the northern edges of the other two components must have flat spectra. This alternative appears less likely, because for the southern component it would contradict our observation that flat-spectrum components are generally more compact than steep-spectrum components. The maps therefore suggest that in 0710+439 the center of activity coincides with the southern end of the central component, and that the other two components are enhanced features in two oppositely directed jets of emitted material. This indicates that the basic ejection mechanism is two sided in at least some sources; it was pointed out in an earlier contribution that a similar structure is found in 3C390.3.

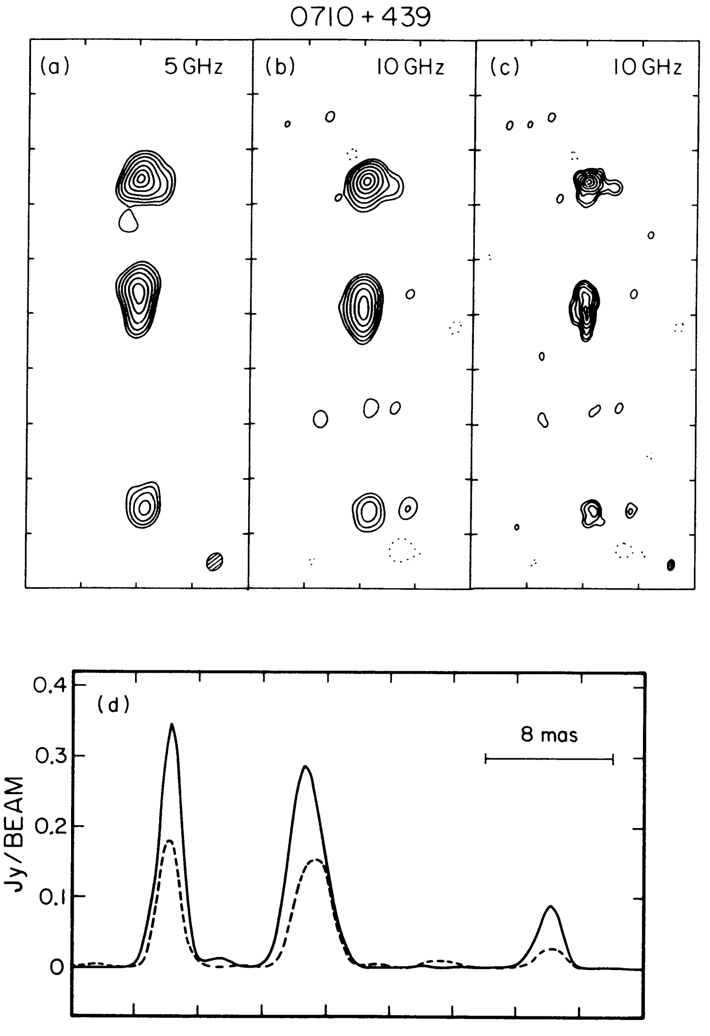

Fig. 2. Maps of 0710+439 (a) at 5 GHz, 1982 December; (b) at 10 GHz, 1982 February, displayed with the same resolution as (a); (c) at 10 GHz, with full resolution; each box is 16 x 40 mas. (d) Profiles along the north-south axis of the maps in (a) and (b); solid line: 5 GHz, dashed line: 10 GHz.

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