IAU Colloquium 164: Radio Emission from Galactic and Extragalactic Compact Sources
ASP Conference Series, Vol. 144, 1998
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Two Stationary Components in the High-Redshift Quasar 1338+381

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Abstract. VLBI observations of the high-redshift quasar 1338+381 reveal a source with two well defined components that are stationary and possibly, a weaker component that moves in between at a very high superluminal speed.

We present VLBI maps of the high-redshift quasar 1338+381 (z=3.1) at five epochs shown in Figure 1 with the same circular beam (1.87 mas). These maps at 8.4 GHz reveal an extended structure of 1338+381 with two main components, as suggested by the S-shape radio spectra of this source (Machalski & Condon 1979). We used MODELFIT (CIT package) to determine at each epoch the parameters of a two-Gaussian component model as summarized in Table 1.

Table 1. Two-component model-fitting results for 1338+381.

Epoch	Component	S (mJy)	Separation (mas)	Position Angle (°)	size (mas)
1992.70	a	81.1 ± 6.4	—	—	0.33 ± 0.07
	b	29.6 ± 5.9	4.00 ± 0.09	-162.4 ± 2.0	0.0
1993.30	a	90.8 ± 6.0	—	—	0.82 ± 0.21
	b	42.5 ± 3.6	3.60 ± 0.07	-163.3 ± 1.2	0.0
1993.52	a	89.3 ± 8.6	—	—	0.0
	b	44.8 ± 8.5	3.44 ± 0.20	-163.3 ± 2.4	0.0
1993.73	a	96.7 ± 4.5	—	—	0.84 ± 0.11
	b	45.0 ± 3.9	3.55 ± 0.08	-162.4 ± 0.8	0.0
1994.41	a	73.0 ± 8.3	—	—	0.52 ± 0.06
	b	69.1 ± 6.1	3.60 ± 0.01	-158.5 ± 0.1	0.49 ± 0.05

These two components appear to be stationary over the two-year span of the observations and their mean separation is 3.64 ± 0.09 mas. However, there is an apparent slight contraction of 0.4 ± 0.1 mas between September 1992 (1992.70) and September 1993 (1993.73) and the separation remains constant afterwards. This effect is reminiscent of the contraction of the quasar 4C 39.25 discussed by Shaffer (1984) and Marcaide et al. (1985). It is noticeable also that the flux densities ratio of the two components increases from 35% in September 1992 to almost unity in May 1994. Precisely, the eastern component of Figure 1 has slightly decreased in flux density while the western component has dramatically increased by a factor 2.5.

The VLBI maps of 1338+381 in September 1992 (1992.70) and in May 1994 (1994.41) have a smaller synthesized beams than in Figure 1. The September 1992 map with its true synthesized beams (1.8 x 0.6 mas^2) shows a third weak component between the two main components. This third component cannot be traced at the following epochs (1993.30, 1993.52, 1993.73) possibly because of lack of angular resolution but it is not present also in the May 1994 map whose true synthesized beam is 1.3 x 0.5 mas^2 and comparable to the September 1992 beam. It is noticeable, however, that the two components of the May 1994 map are clearly more complex than the restoring beam at this epoch. It suggests that the third weak component of September 1992 might have migrated and merged

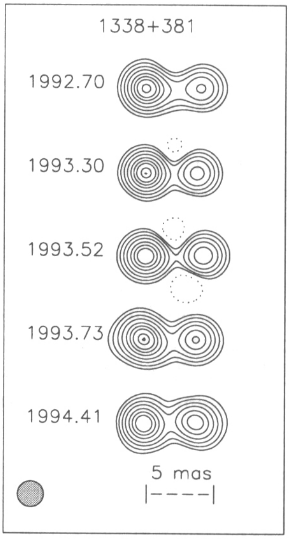

Figure 1. VLBI maps of 1338+381 at five epochs with the same circular restoring beam of 1.87 mas. All maps have been rotated counter-clockwise by 73°. Contour levels represent −4,4, 8,15,25,40,55,70,90,99% of 74.7 mJy/beam.

with one of the stationary components. This possible scenario would imply the very high apparent linear velocity of $27 \pm 14\ h^{-1}$ c for this third weak component and this will be discussed in detail elsewhere. This scenario is consistent with the apparent slight contraction and the increased flux density of the western component mentioned above, caused by the merging of a traveling component with this stationary component, à la 4C 39.25.

Acknowledgments. We are grateful to Drs M.I. Ratner and N. Bartel for having supported the May 1994 VLBI session on the source 1338+381 studied in this paper.

References

Machalski, J., & Condon, J. J. 1979. *AJ*, **84**, 164–175.

Marcaide, J. M. et al. 1985. *Nature*, **314**, 424.

Shaffer, D.B. 1984. *VLBI and Compact Radio Sources; IAU Symposium 110*, eds. Fanti, Kellerman & Setti (Dordrecht: Reidel), 365–374.

https://doi.org/10.1017/S0252921100044511 Published online by Cambridge University Press