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Evolution of the Parsec-Scale Structures of OJ 287 and 3C 273

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Abstract. We have obtained 15 and 22 GHz linear polarization VLBA images of a sample of strong and rapidly variable polarized sources at six epochs over one year. We observe rapid changes, in both cores and jet components, in total intensity, both with and without associated changes in polarization. Changes in the cores are probably associated with the births of new components. Images of one quasar (3C 273) and one BL Lacertae object (OJ 287) from two epochs are shown here. No significant Faraday rotation is observed at any epoch in any position in either source.

1. Discussion

3C 273 is a classic quasar at $z = 0.158$ with a long jet visible in the radio, optical and x-ray bands. The jet magnetic field is predominantly longitudinal, with considerable structure and variation along it. We find the inner component is moving at $\beta_{app} = 5.84h^{-1}$. The core flux increased rapidly at both frequencies through the third epoch before dropping at the higher frequency at the final epoch. The core is self-absorbed and its spectrum steepens further during the second and third epochs, which may herald the birth of a new component. The polarization behavior of the core is also suggestive of an emerging component. It is unpolarized during the first epoch, polarization appears at 22 GHz by the second epoch and at 15 GHz by the third.

OJ 287 is a BL Lacertae object at $z = 0.306$ with rapid fluctuations in both total intensity and polarization at all radio wavelengths. Linear polarization VLBI images, at 5 GHz, of OJ 287 and other BL Lacertae objects show jet magnetic fields perpendicular to the structural axis (Roberts, Gabuzda, & Wardle 1987), believed to be a result of shock-induced ordering of a tangled magnetic field (Hughes, Aller, & Aller 1985). This is indeed observed in the outermost component visible in our first epoch (1996.05). However, an emerging component displays a most un-BL Lac-like *longitudinal* magnetic field. The 22 GHz images show there is negligible Faraday Rotation. The inner jet of OJ 287, therefore, exhibits electric vectors perpendicular to the jet, at least during 1996. The emerging component is stationary between our first two epochs, but between 1996.22 and 1996.58 it is separating from the core at 0.61 mas/yr ($\beta_{app} = 7.35h^{-1}$), suggesting either acceleration or a curving trajectory.

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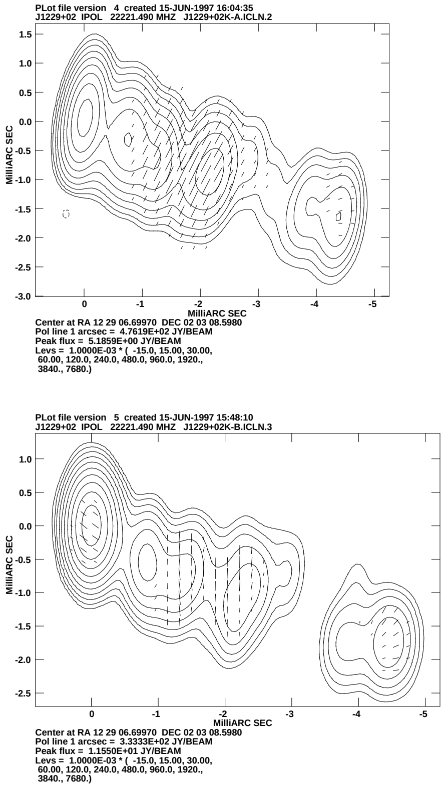

Figure 1. 22 GHz VLBA images of 3C 273 for epochs 1996.05 (left) and 1996.22 (right). Contours are logarithmic and indicate total intensity. The ticks indicate the direction of the electic field vectors. The length of the ticks is proportional to the polarized intensity.

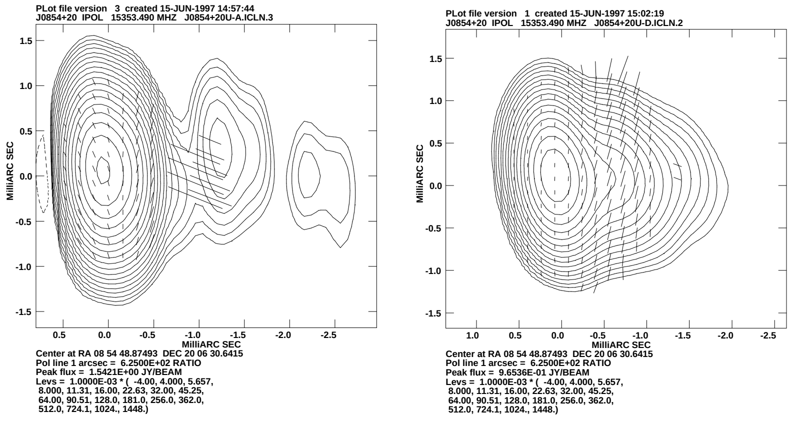

Figure 2. 15 GHz VLBA images of OJ 287, epochs 1996.05 (left) and 1996.58 (right). Contours are logarithmic and indicate total intensity. The ticks indicate the direction of the electric field vectors. The length of the ticks are proportional to the fractional polarization.