MONITORING THE JET IN CENTAURUS A AT 0.1 PARSEC RESOLUTION

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Abstract. Centaurus A is the closest active extragalactic radio source, at a distance of approximately 3.5 Mpc, and is identified with the peculiar elliptical galaxy NGC 5128. As such it is a very important target for observations of the small-scale (sub-parsec) and large-scale (kpc) structures in extragalactic jets. Here we present Mk-II VLBI observations made at 8.4 GHz over a 4.3 year period from early 1991 until mid-1995, as well as a 4.8 GHz observation that was co-eval with one of the 8.4 GHz observations. All of the observations were made with the SHEVE array except for the last observation which was made with the VLBA. The dual-frequency observations identify the core of the radio source, while the multi-epoch observations show the complex structural evolution at a resolution of 0.1 pc. Subluminal motion of $\approx 0.15c$ is evident. Structural changes are observed on time scales shorter than four months.

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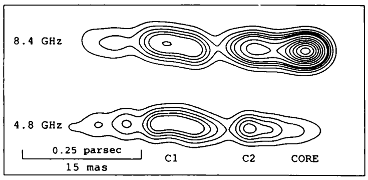

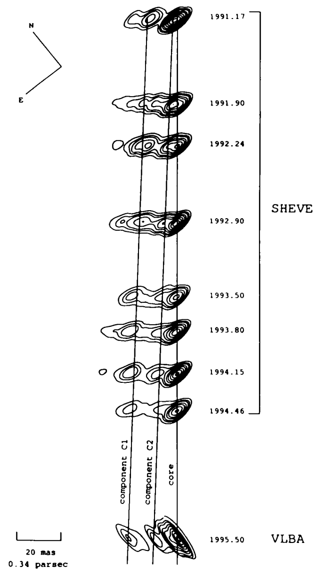

Figure 1.

In November 1992 two observations of Centaurus A were made approximately three days apart, one at 4.8 GHz and the other at 8.4 GHz. Figure 1a shows the two images resulting from these observations. The brightest feature in the 8.4 GHz image is almost completely absent in the 4.8 GHz image, whereas there is a good coincidence between other features in the two images. On the basis of this result the brightest feature at 8.4 GHz is a highly inverted spectrum component and the other main features seen in both images (C1 and C2) are steeper spectrum components. These identifications naturally point to the inverted spectrum component as the core of the radio source, with C1 and C2 being components within a sub-parsec-scale jet. The highly inverted spectrum of the core may be due to synchrotron self-absorption, although free-free absorption may also be involved (see paper by Jones *et al.* in these proceedings).

Having identified the core of the radio source we can now examine the evolution of the sub-parsec-scale structure with multi-epoch monitoring observations. Figure 1b presents the results of such a monitoring campaign, giving us a quantitative description of how the various components in the radio source changed their relative positions, dimensions, and flux densities over a 4.3 year period. The images are vertically aligned so the core remains stationary, with slanted lines superposed onto components C1 and C2 to indicate a motion of 0.15c. Note that C1 appears to undergo significant internal evolution during the series of observations, particularly between 1991.17 and 1992.24. This rapid fading and brightening of a component ≈ 4.5 mas (0.25 ly) in extent could be explained if the apparent jet flow speed is actually greater than 0.74c (true jet flow speed >0.59c).