SUPERLUMINAL MOTION IN THE QUASAR 3C 279

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We present the results of a program of monitoring structure changes in the radio core of the quasar 3C 279 ($z = 0.538$) using VLBI. In all, nine hybrid maps have been made from observations at frequencies of 5, 11, and 22 GHz, during the period 1981 - 1985. The VLBI structure shows many similarities with other 'superluminal' radio sources, e.g. 3C 273 (Unwin et al. 1985), such as alignment with a kiloparsec-scale jet, a one-sided spectral distribution, and superluminal motion. The proper motion measured from our observations is $v/c \approx 2$, only one quarter of the previously published rate.

The observations consisted of full tracks using at least 5 VLBI stations, and we made good maps from every session. These maps show the source to be basically a double, and resolve the core of the kiloparsec-scale jet seen by the VLA (de Pater and Perley 1983) into two components B1 and B2 which define an axis in P.A. -130°, within 10° of the large-scale jet. For one 5-GHz epoch we used 9 stations, including Hartebeesthoek (South Africa). The long baselines to this southern telescope greatly improved the north-south resolution. which is usually very poor for sources at such low declination (-5°). Our map, made with a 0.9 x 2 milliarcsec beam, shows for the first time that the VLBI structure is very narrow perpendicular to the jet axis.

Comparisons between maps made at the three frequencies show that the NE component (B1) is the 'core' of 3C 279, as it has a higher turnover frequency than the SW component (B2), which is probably a 'knot' moving with the VLBI jet. At 5 GHz, weak emission with a still-lower turnover is seen beyond B2. As with other superluminal sources, the spectral distribution defines the sense of the jet to be toward the outer jet, and it suggests a continuous connection between the different scales.

Slow proper motion is seen between B1 and B2 at all three frequencies. To minimize systematic effects, we model-fitted the visibility data using a pair of circular gaussians to derive the

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separations. The results are plotted in Figure 1, and the straight line represents an expansion rate of $v/c = 2.3\ \underline{h}^{-1}$ (for Hubble constant $H_o = 100\ \underline{h}$ km/s/Mpc), only one quarter of the rate reported by Cotton et al. (1979) for early 1970s data. We believe that both measurements are correct and that the rate has changed. However, this does not imply deceleration, as the 'jet' component followed in the early data is not B2, and is not detected in our observations.

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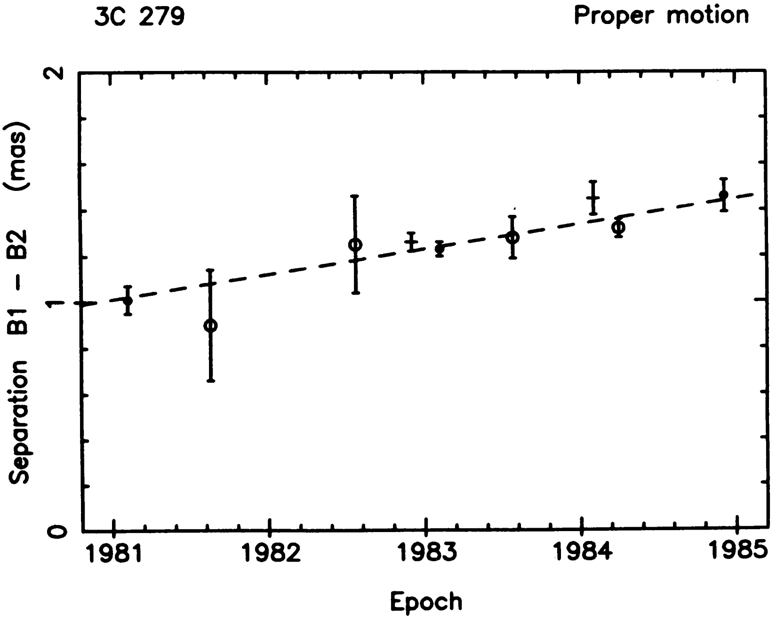

Figure 1. Separation of components B1 and B2 determined by model-fitting, vs. observing epoch. Error bars of $\pm\sigma$ represent the formal uncertainty in the model fit. (Open circles - 5 GHz; filled circles - 11 GHz; crosses - 22 GHz). The fitted straight line has a slope of 0.11 milliarcsec/yr.

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