Structural Variability in the Core of 3C147

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ABSTRACT. We have observed the core of the steep spectrum compact quasar 3C147 at a wavelength of 6 cm with an intercontinental VLBI array. The three observing epochs cover a period from 1981.25 to 1984.8. The core of 3C147 exhibits a complex, nonlinear, and asymmetric structure. It shows structural variability as well as variations of individual components. The observed changes in separation corespond to an apparent velocity of 2.6 ±1.0 c (H_0 = 50 km s^{-1} Mpc^{-1}; q_0 = 0.5). In addition a map from the 3-station observation in 1978 is presented.

1. Introduction

3C147 is a compact ($\lesssim$ 1"), steep spectrum radio source identified with a quasar at z = 0.545. The arcsecond radio structure is two-sided and asymmetric with a bright 'core' $\lesssim$0.008" (60 pc) at the end of a jet ~0.2" in length pointing to the South West (p.a. ~ -130°). A larger elongated feature extends ~0.5" to the North East of the bright core in p.a. ~25° (e.g. Wilkinson et al. 1984).

2. VLBI Observations of the Core of 3C147 at 6 cm

We made high resolution VLBI observations at 6 cm wavelength in 1978.19 (3 stations), 1981.25 (5 stations, Preuss et al. 1982), 1982.95 (9 stations, Preuss et al. 1984), and 1984.80 (7 stations). The data from all four epochs were processed and reprocessed using the MPIfR Global Fringe Fitting procedure (Alef and Porcas 1986). As a result the phase quality was considerably improved and the signal could be detected on the weaker baselines in the broad and deep minima down to ~1σ. This enabled us to obtain maps of higher reliability than before.

The core structure of 3C147 is complex and non-linear with considerable "off-axis" structure (see fig.). The brightest component A is at the NE end of the core region. The structure is variable along the curved line connecting components A, B, and C. The spacing between A and B appears to have increased by about one-third of a beamwidth during the 3.55 year interval (1981 - 1984), corresponding to an apparent velocity of ~2.4 c. It should be noted that superluminal motion was predicted by Simon et al. (1983) on the basis of the observed low frequency variability and the low

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ratio of measured to expected (SSC) X-ray emission. The map from the first epoch in 1978 which was made from observations of three stations only and is therefore not very reliable does not confirm this picture. This map, however, agrees with the trend seen in the three later epochs: the overall appearance of the structure changes from linear with a sideways distortion to a strongly bent morphology. The separation of the components A and D remains constant. The resolution achieved by our 6 cm observations is not sufficient to allow a detailed analysis of the complicated morphology and kinematics of 3C147. Observations at higher frequencies are certainly needed to understand this unique source.

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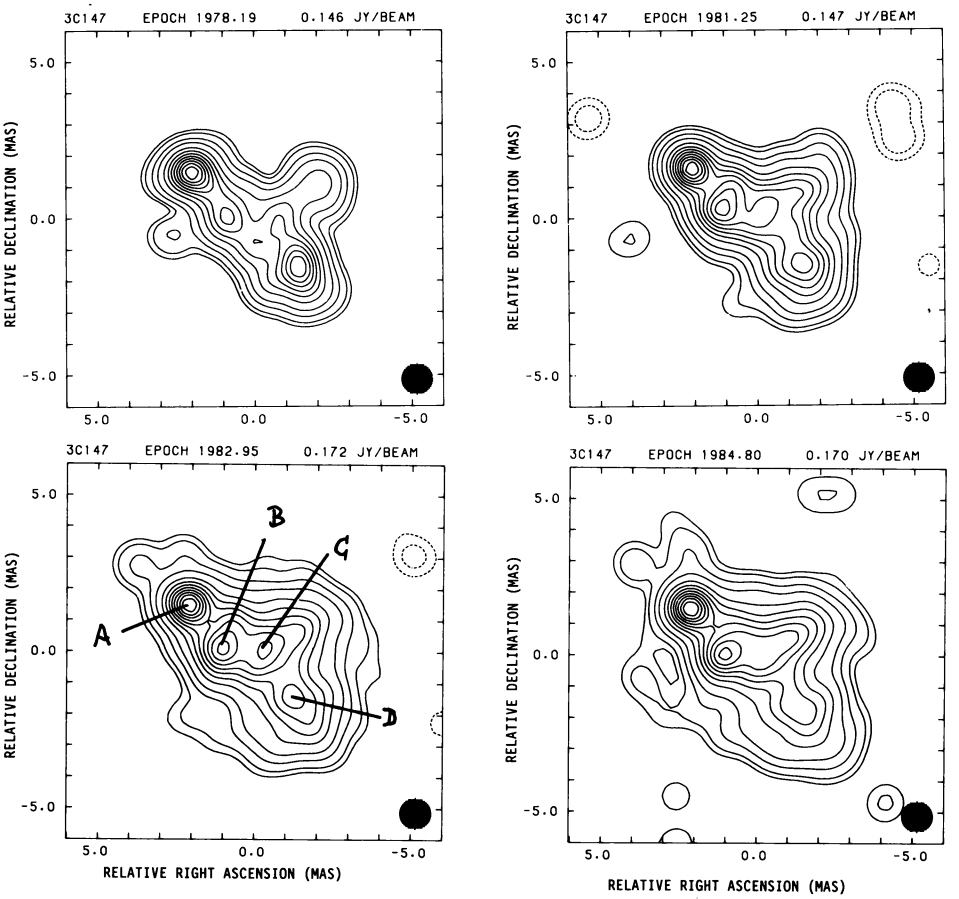

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