STRUCTURAL EVOLUTION IN THE NUCLEUS OF NGC1275

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The extremely powerful compact radio nucleus of NGC1275 is perhaps the most complex structure seen at milliarcsecond scales. Early attempts to determine its structure (Schilizzi et al. 1975) were unsuccessful, although it was evident that the structure consisted of several bright regions whose relative positions remained fixed while their intensities varied. Later observations and analysis (Pauliny-Toth et al. 1976; Preuss et al. 1979) confirmed this inference and revealed a slow expansion in a direction transverse to the primary axis of alignment.

We report here recent observations which manifest a new structural development. These measurements, performed at 2.8cm wavelength with VLBI arrays of seven stations (epoch 1979.1) and five stations (1981.1) in North America and Europe, yielded hybrid maps which we present in Fig.1 together with the models derived from earlier observations. The decline, since 1976, of the formerly dominant central feature is apparent, as is the steady growth of the northern component. The northeastwards extension of this latter component in the new maps has not been observed previously, and deviates from the alignment in position angle $\sim$-9° which otherwise prevails over a wide range of angular scales in this source.

Of particular interest is the rapid increase in the separation between the central and southern components since 1976. Considering only the two most recent epochs where the separation is most accurately and unambiguously determined, we measure an angular motion of 0.34 ± .04 milliarcsec y^{-1}, which corresponds to an (apparent) linear velocity of 0.58c (H_o = 50 km s^{-1} Mpc^{-1}). This velocity invites comparison with the "superluminal" sources (Cohen and Unwin 1982) which exhibit apparent velocities an order of magnitude greater, and are generally more distant (although the nearest, 3C120, is less than twice as distant as NGC1275). The overall morphology of the structures seen at epochs 1979.1 and 1981.1 does exhibit the "core-jet" configuration characteristic of the superluminal sources. We identify the active and extremely compact northern emission region as the core; this feature also has an inverted spectrum (Unwin, private communication). On the basis of this interpretation, we extrapolate the motion of the southern component back to

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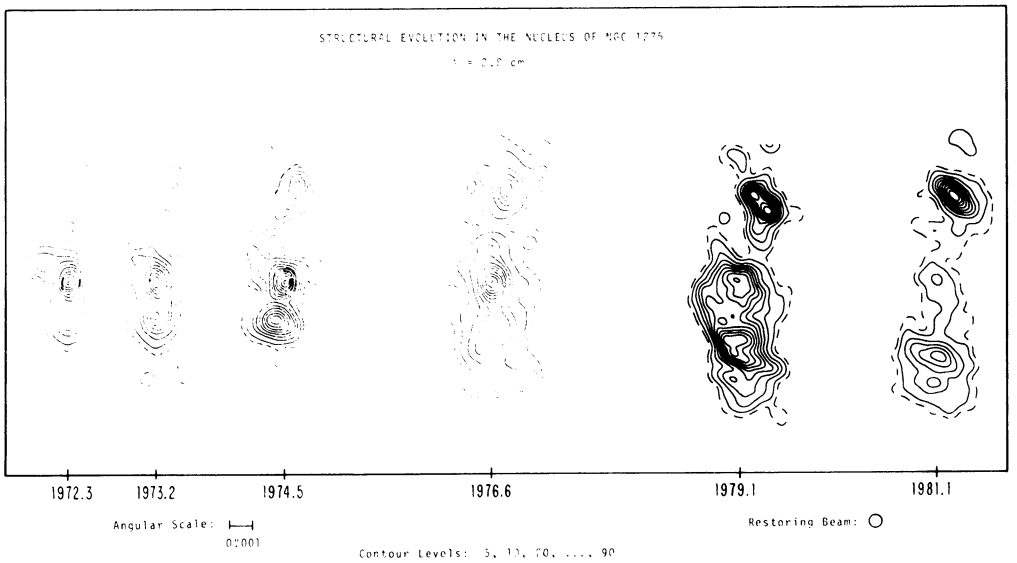

Fig. 1. Contour maps of the nucleus of NGC1275 at six epochs, aligned horizontally proportional to the epoch of observation.

coincidence with the northern, at epoch 1961.0. Studies of flux-density variations in this source (Kellermann and Pauliny-Toth 1968) show the short-centimeter-wavelength emission already rising steeply at that time; in the following 15 years the flux density increased six-fold.

The transverse expansion of the relatively more diffuse structure (Preuss et al. 1979) is seen continuing in the recent observations. We quantify this, as in earlier work, by the equivalent Gaussian width seen by a fan beam aligned with the primary source elongation. This measure increases steadily at 0.08 milliarcsec y^{-1}, corresponding to a linear velocity of $\sim$40,000 km s^{-1}; the extrapolated initial epoch of this expansion is 1961.6.

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