4C 18.68: A QSO WITH PRECESSING RADIO JETS?

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The radio source 4C 18.68, identified with the 16.5 m QSO 2305+187 ($z = 0.313$), was observed at 20 cm and 6 cm with the VLA in its highest-resolution configuration (A) on April 25, 1981, as part of a programme to map the radio structure of quasars for which optical structure has been mapped using the Canada-France-Hawaii telescope. The radio structure is remarkable, showing complex, curved structure at 6 cm resolution embedded in a halo $\sim$ 60 kpc across ($H_0 = 100$ km/sec/Mpc, $q_0 = 0$) seen most clearly in the 20 cm map. The polarisation is low ($\sim$ 8% maximum at 6 cm) and follows the curved structure quite closely,

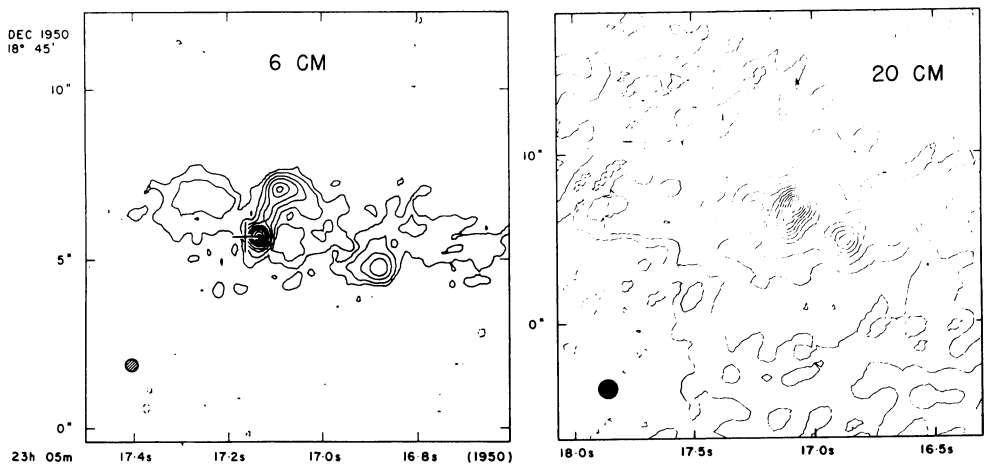

Figure 1: VLA maps of 4C 18.68 at 6 cm and 20 cm. Beam size as indicated. Scale: 1" = 2.8 kpc ($H_0 = 100$ km/sec/Mpc, $q_0 = 0$). Contour levels at: -1, 1, 2, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90% of peak brightness. Peak brightness: 0.08 Jy/beam area at 6 cm and 0.13 Jy/beam area at 20 cm. Optical QSO position and error bars indicated on 6 cm map.

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showing the magnetic field direction to be along the curved structure. The central source has a flat spectrum, while the spectrum of the structure generally steepens with distance from the centre.

We believe that this structure may represent the path traced out by the material flung out in a precessing or rotating beam inclined at a moderate angle to the line of sight. The large number of free parameters involved make it difficult to fit a unique model, but preliminary model-fitting has been done using a programme kindly provided by Dr. P.C. Gregory. We find, assuming that the emission has been roughly constant and equal in opposite directions (which is by no means necessarily the case), that the details of the geometry of the inner structure and the ratio of the intensities on the two sides of the source can be fit with a moderately relativistic jet velocity (0.5-0.7 c) at a cone angle of $\sim 20°$ about an axis inclined at about 50° to the line of sight. This jet velocity and the scale of the structure then give a period of $\sim 5 \times 10^4$ years, consistent with the possible presence of two interacting massive bodies in the central source.

The outer structure of the source is, however, not well explained by this model and if, in addition, the constraint of equal emission in opposing directions is removed, a wider range of jet velocities and inclinations is possible. A fuller account of this work is being published elsewhere.

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