THE COMPACT RADIO STRUCTURE OF SS433.

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A campaign of VLBI observations of SS433 using the European network was begun in January 1980 and since October 1980 has continued at intervals of about two months except for the last two observations which were 6 days apart, see Table 1. The results of the first two epochs have been published in Nature (ref. 1), and those of the following six epochs are being prepared for publication.

Table 1: Observations of SS433.

Epoch (JD)	Date	Telescopes*	Wavelength (cm)
2444248	Jan. 80	E, W, K	6
393	June 80	E, W, C	6
517	Oct. 80	E, W	6
589	Dec. 80	E, W, J	21
651	Feb. 81	O, E, J	18
705	Apr. 81	O, E, W, J	6
750	May 81	O, E, W	6
756	June 81	O, E, W	6

* C: Chilbolton, E: Effelsberg, J: Jodrell Bank, K: Knockin (UK), O: Onsala, W: Westerbork.

Some conclusions from this work are:

(a) The trajectories (ref. 2, and independently by Fejes) of the three-dimensional kinematic model based on optical emission line data (ref. 3) are in reasonable agreement with the observed radio structures. The curvature is well-fitted, but the features (blobs) in the structure are more symmetrically spaced about the apparent centre than expected in the model from the finite travel time of the radiation from the back to the front of the source (see Fig. 1). However there is obviously uncertainty as to the exact centre of the structure.

(b) There is no evidence of the previously reported lag of the

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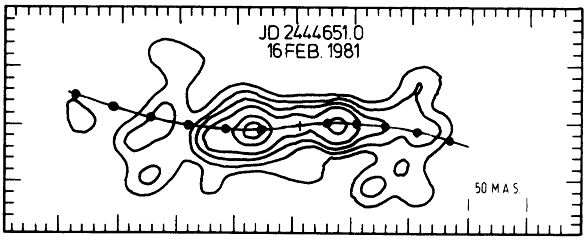

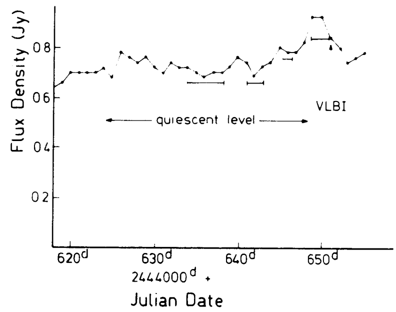

Figure 1: The 18 cm compact structure of SS433. North is up, east to the left. The restoring beam was 24 m.a.s. Also drawn is the expected trajectory from the kinematic model, with dots every 4 days.

Figure 2: The flux density of SS433 at 11 cm as a function of Julian Date, from measurements with the Green Bank interferometer. Horizontal bars indicate apparent ejection times of blobs in the structure.

radio structure behind the trajectory predicted from the kinematic model. The earlier reports (ref. 1,5) were presumably influenced by insufficient spatial resolution and limitations in the modelfitting of the structure. At a number of epochs, some features in the structures lie ahead of or behind their predicted positions on one side of the centre but not the other (e.g. Fig. 1). This may be evidence that the "jitter" discussed by Margon (ref. 4) in the pointing or phasing of the beams in the optical, is also affecting the radio.

(c) There is no strong correlation between the occurrence of a peak in radio flux density and the interpolated birth date of a pair of radio emitting blobs. Figure 2 shows the flux density variations at λ11cm in the period leading up to and including the February observation.

(d) The dominant energy loss mechanism in the structure on the tens of m.a.s. scale is clearly not synchrotron radiation. For example, from the measured sizes and flux densities of the components at separations of $\sim$40 m.a.s. in the February 1981 data, and assuming a turnover frequency of 300 MHz (ref. 6), synchrotron lifetimes of $\sim$10 years are derived. If the turnover at 300 MHz is caused by some other mechanism than synchrotron self absorption then the synchrotron lifetimes are increased still further (ref. 7). Presumably the dominant loss mechanism is adiabatic expansion but this has yet to be convincingly demonstrated.

REFERENCES

1. Schilizzi, Miley, Romney and Spencer (1981) Nature 290, 318.
2. Hjellming and Johnston (1981) Ap. J. 246, L 141.
3. Abell and Margon (1979) Nature 279, 701.
4. Margon (1981) Univ. of Washington, preprint.
5. Niell, Lockhart and Preston (1981) to be published in Ap. J.
6. Seaquist, Gilmore, Nelson, Payten and Slee (1980) Ap. J. 241, L 77.
7. Hjellming and Johnston (1981) Nature 290, 100.

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