ANOMALOUS EJECTION IN SS433 +

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A series of MERLIN observations at λ 6 cm of the peculiar object SS433 were made during the spring/summer of 1982. The maps obtained by hybrid mapping show that an elongated structure was formed, extending to $\sim$1 arcsec in length before evolving into two symmetrically placed knots of radio emission straddling a central unresolved core. The structures can be compared with the loci of radio emission expected on the twin jet model for SS433. The knots C and D clearly visible on the map of 820514 (= JD2445104, Figure 1) fit the locus well and were ejected on JD2445085 $\pm$2 at the same time as a strong outburst in the X band total power (Johnston et al. 1983). Knots A and B were ejected earlier but do not lie on the expected locus, even if allowance for the nodding motions proposed by Katz et al. 1982 is made.

We can try and explain this anomalous ejection as follows:-

(i) Ejection in an unusual direction,
(ii) Ejection with a high velocity - a locus with velocity 0.4c instead of the normal 0.26c will fit the observed structure in figure 1.
(iii) Bending subsequent to initial ejection. This requires a pressure gradient $\frac{dP}{dz} = \frac{u(\gamma\beta)^2}{R}$ where u is the energy density of the knot, γ the Lorentz factor, β = v/c and R the radius of curvature. If this is caused by static gas pressure then a pressure gradient (assuming equipartition in the knot) such that $\Delta(nT) > 10^8$ K cm^{-3} over the distance from the observed to the expected position is needed. This can easily be supplied by the X-ray emitting gas close to SS433.
(iv) Acceleration of the knots after initial ejection.

Margon (private communication) finds that there was no unusual optical behaviour during our observations. If, as seems likely, that the early stage of ejection/radio knots is closely associated with the moving optical clouds then (ii) can be ruled out, and (i) can only occur if the anomalous ejection is in the plane of the sky.

Explanation (iii) requires similar conditions on both sides of the

+ Discussion on page 458

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object (knots A and B) and also any pressure gradient would have to be quickly reduced so that the following knots C and D remain unaffected, infact in a time less than the minimum sound crossing time of the gas.

The standard ephemeris gives the observed position angle some 120 days before elongation was first observed on 820420 and so would require ejection with a very low initial velocity and long radio lifetime if acceleration is to explain the results. In addition, observations with the EVN network on 9 Dec 1981 at λ6 cm also show an anomalous position angle, (Romney et al. 1983) outside the maximum range allowed by the precessing jet model.

It seems to us therefore that the most likely explanation is that the knots were ejected with the wrong position angle close to the plane of the sky, though a more detailed investigation of the relationship between the optical and radio emission is required.

REFERENCES

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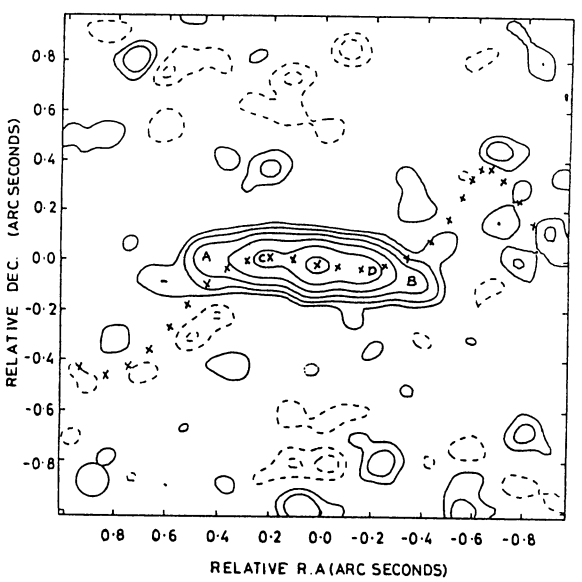

Figure 1 SS433 at λ6 cm on 820514, the beam is shown in the LH corner. Contours are at 4, 8, 16 etc. mJy/beam.

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