ACTIVE EXTRAGALACTIC RADIO SOURCES WHICH SHOW SIGNATURES OF SHOCKS IN COMPACT JET STRUCTURES

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We have analyzed the cm-wavelength flux and polarization observations of four active objects (3C 279, OT 081, BL Lacertae, and 3C 446) for which the data exhibit signatures of shocks. Common characteristics of these sources are: high degrees of polarization, large changes in the polarized flux during outbursts; and stable position angles of the electric vector over long periods.

In 3C 279, OT 081 and BL Lac shock regions in the jet flow apparently dominate the integrated polarization from the source. Observational evidence for this are: 1) during highly polarized outbursts the position angles are parallel to the observed VLBI structures (evidence for an axial compression in the jet flow), and 2) the sources exhibit large, rapid fractional changes in polarized flux. During quiescent phases the polarization electric vector is often perpendicular to the VLBI structure (90 degrees from the orientation during bursts).

In 3C 446 the position angle has remained nearly constant, perpendicular to the orientation of the VLBI structure (Cohen et al., unpublished 1986 map), showing that the magnetic field component parallel to the jet dominates the integrated polarization of the source. We interpret the large downward excursions in polarization during outbursts in this source as being produced by shocked components in the jet.

Figure 1 shows a fit to the highly polarized bursts in BL Lac using a new model code which solves the radiative transfer equations (1977, Ap.J., 215, 236) following Jones & O'Dell, for a shocked adiabatically expanding jet with cellular magnetic field domains (see Hughes, Aller, & Aller, this meeting for model details). The model parameters required to fit both the total flux density and polarization evolution are consistent with those invoked to account for the VLBI structure evolution in this object (Phillips and Mutel this meeting). Figure 2 shows a fit of this new model to our OT 081 data using four shock events. This source is considerably more complex than BL Lac both because of a higher opacity in the emitting region and because of the overlap in time of the bursts. Both the data and the model predictions indicate that the polarization variations in this object are very rapid.

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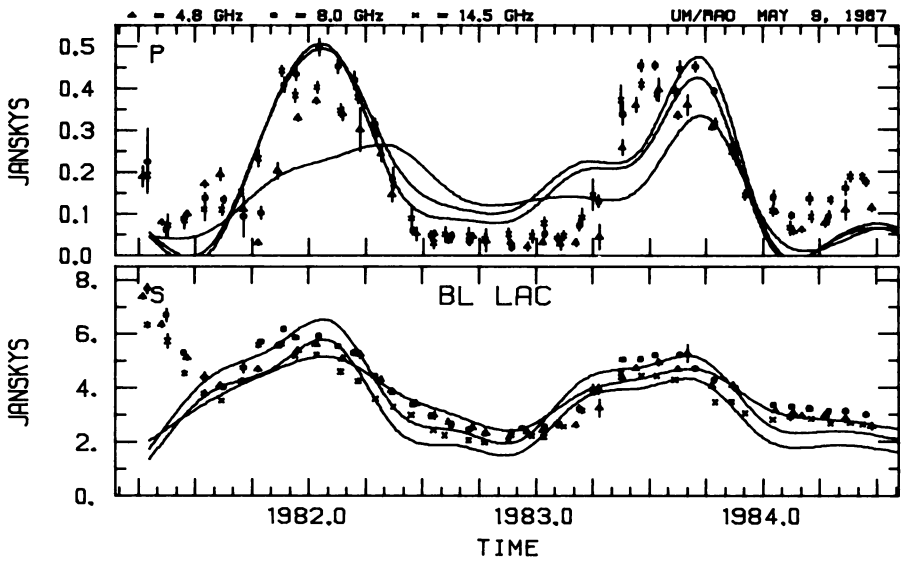
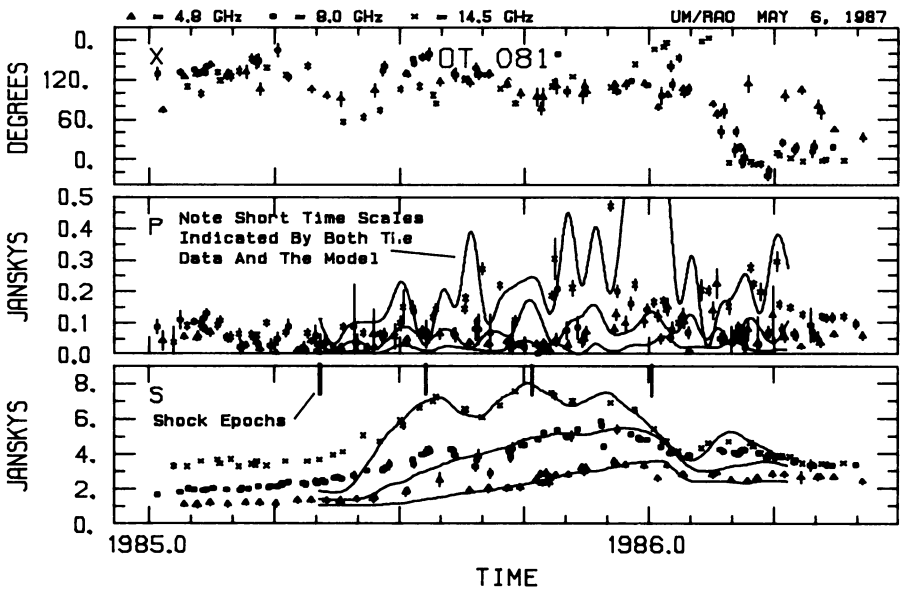


BL Lac. Numerical Simulation Model Of Shocks Forming In A Preexisting Jet Flow



OT 081. Fit Of Shocked-Jet Model To Daily Observations

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