HELICAL MOTION AND NON-ADIABATIC EXPANSION IN THE JET OF 3C345

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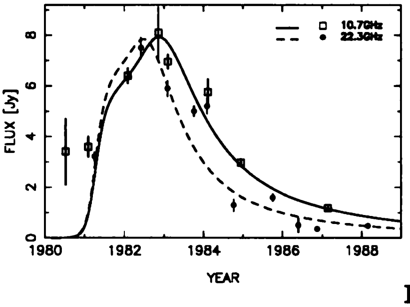
We developed a kinematic jet model for the motion and flux density evolution of the high frequency VLBI jet components C4 and C5 in the quasar 3C345 (Zensus et al. 1994) assuming the conservation of three basic quantities: the Lorentz factor, the angular momentum, and the opening angle of the jet. This model is a simplified description of the helical motion in a conical jet expected from the magnetodynamical model of Camenzind (1986) which is based on a black hole surrounded by a magnetized accretion disc. Our best fit yields Lorentz factors of 5.7 and 5.0 for components C4 and C5, respectively, and an angle between the jet axis and the observer's line of sight of 7.5°. These values are very close to those obtained by Unwin & Wehrle (1992) from component motion further out. An intrinsic bending of the jet axis is necessary to account for the common bent path of all jet components at core separations larger than about 4 mas. We found that differential Doppler boosting alone is not able to explain the flux density variations of component C4. A non-adiabatic expansion model of an inhomogeneous plasma cloud combined with differential Doppler boosting on a helical path fits the flux density evolution (Steffen et al. 1994). We find that the expansion in the decreasing part of the lightcurve is slower than expected from adiabatic expansion.



Flux density evolution of component C4 and a model using a non-adiabatic expansion of a plasma cloud in a tangled magnetic field compared with the data. Filled circles (dashed line) respresent the data (model) at 22.3 GHz and the open squares (solid line) show the data (model) at 10.7 GHz. The Doppler boosting factor has a maximum in 1981.25.

References

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