

OPTICAL AND VLBI POLARIZATION MEASUREMENTS OF AGN

D. C. GABUZDA

Department of Physics and Astronomy, University of Calgary

and

M. L. SITKO

Department of Astronomy, University of Cincinnati

Abstract. One of the most promising approaches to unravelling the relationship between the optical and radio emission in AGN is to obtain nearly simultaneous optical and VLBI polarization data. We have obtained such data for five AGN (0735+178, OJ 287, 1219+285, 3C 279, and BL Lac). These data suggest that there is a direct link between the optical and radio polarized emission, and that frequently the optical polarization of AGN is associated with the emergence of new VLBI components.

3C 279 is an OVV quasar, while the other four sources listed above are BL Lacertae objects. The continua of these sources and other “blazars” are dominated by nonthermal emission which is variable and highly polarized at optical–radio wavelengths. It is believed that this non-thermal emission is associated with the relativistic jets which are known to exist in these sources, but details of the jet structure and physics are still very uncertain. We use χ_{opt} , χ_c , and χ_j to refer to the optical, VLBI core, and VLBI jet polarization position angles.

In every one of the five AGN for which we have data, there is evidence for a link between χ_{opt} and either χ_c or χ_j . In each of the BL Lacertae objects, the correspondance seems to be between χ_{opt} and χ_c , while χ_{opt} in 3C 279 (which was experiencing a large polarized outburst during our observations) is aligned with χ_j in a newly emerging jet component. These results suggest a much closer connection between the optical and radio emission than has usually been expected; the most likely origin for this connection is cospatiality of the optical and radio emission regions. Our data for OJ 287, for which we have two epochs a year apart, are particularly intriguing. Between the two epochs, χ_j was roughly constant while χ_c rotated by some 60° ; this rotation in χ_c was found to be a precursor to the birth of a new VLBI component. Although there is no obvious relation between χ_{opt} and χ_c at either epoch, the difference between these two angles is the same at the two epochs; i.e., χ_{opt} appears to have experienced the same rotation as χ_c . Thus, our results for both OJ 287 and 3C 279 both point towards an association between the optical polarization and the birth and emergence of new VLBI components. We suggest that a significant amount of the optical polarization in AGN is generated in such components, many of which are probably energetic, compact relativistic shocks.

A more thorough presentation and discussion of these data will be given in a paper by Sitko & Gabuzda, to be submitted to the *Astronomical Journal* in October 1993.