QUASAR RADIO MORPHOLOGY AND ENVIRONMENT AT $\mathbf{Z} \sim 1/2$

TRAVIS A. RECTOR, JOHN STOCKE AND ERICA ELLINGSON
Center for Astrophysics and Space Astronomy
University of Colorado - Boulder
Boulder, CO 80309-0389 USA

Abstract.

The radio morphology of thirty radio-loud quasars at $z \sim 1/2$ is studied as a function of cluster galaxy density using data available in the literature. While correlations between several morphological parameters of the radio emission are consistent with interactions with an intracluster medium (ICM), we do not see the correlation between galaxy density and quasar radio morphology expected from ICM interaction. Therefore, distorted radio morphology is **not** an indicator for the presence of a distant cluster as previously suggested. Because such correlations are found at $z \sim 0$, these results are suggestive that the rich clusters containing quasars at $z \sim 1/2$ have not yet developed a dense ICM. An inelastic collision with neighboring galaxies and intergalactic clouds can account for the morphology of several of the sources in this sample and is a viable alternative explanation.

1. Introduction

Previous studies have confirmed that a dense ICM is responsible for distorted radio sources at $z \sim 0$. Hintzen and Scott (1978, ApJ 224,L47) proposed that distorted quasars may be tracers for a dense ICM at high z. To test this hypothesis we studied a sample of 30 "classical triple" radio-loud quasars at $0.26 < z < 0.62$ to detect any correlation between the quasar-galaxy spatial covariance amplitude B_{gq} and four morphological characteristics: hotspot position in lobes, projected bending angle θ, projected physical size l, and length-asymmetry Q. Correlations between these parameters and core and total radio powers were also tested.

R. Ekers et al. (eds.), Extragalactic Radio Sources, 327–328.

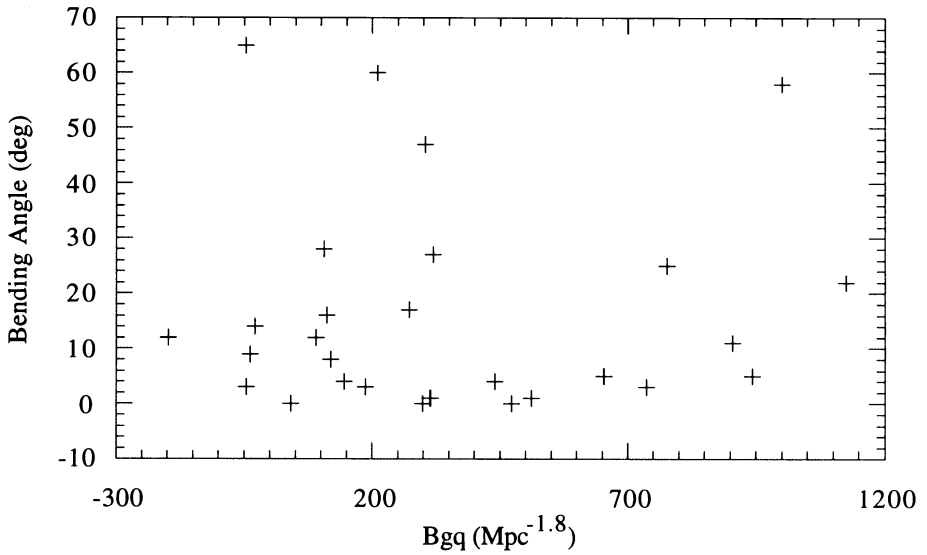

Figure 1. Projected bending angle θ as a function of B_{gq}. No correlation is present; in fact, many highly bent sources are not in dense clusters.

2. Results

A correlation was found between B_{gq} and z. This is believed to be quasar luminosity evolution; i.e. radio sources in clusters at low redshifts have faded and are now called radio galaxies (Ellingson *et al.* 1991 ApJ 371,36). Anti-correlations between l and θ and l and Q are believed to be merely projection effects. No correlation is detected between B_{gq} and θ (Fig. 1) or B_{gq} and l. This suggests that a dense ICM is not solely responsible for the distorted morphology of these quasars. No correlation is seen between radio power and morphological parameters, confirming that variations in the radio power are not responsible for the observed morphologies.

3. Conclusions

Interaction with an ICM is not the sole determinant of the extended radio morphology of a quasar; alternate mechanisms for bending sources at $z \sim 1/2$ must exist. It is incorrect to assume that quasars with distorted structure are always members of rich clusters as previously suggested. An inelastic collision between one of the lobes and a nearby galaxy halo or intergalactic cloud is a likely explanation for the "dogleg" structure seen in some of our sources (e.g. 3C 275.1; Stocke *et al.* 1985, ApJ 299, 799). These results also suggest that rich clusters of galaxies surrounding quasars at $z \sim 1/2$ do not possess a dense, hot ICM as found at $z \sim 0$.