Co-Evolution of Central Black Holes and Galaxies
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Co-Evolution of Brightest Cluster Galaxies and Galaxy Activity in the Host Clusters

Mei-Ling Huang[1] **and Lin-wen Chen**[2]

[1]Graduate Institute of Astronomy, National Central University, Jungli 320, Taiwan
Email: mlhuang@astro.ncu.edu.tw

[2]Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan

Abstract. We have identified ∼500 relatively relaxed galaxy clusters at low redshift ($z < 0.3$) from the maxBCG catalog with double radio lobes at the center; about 200 radio counterparts of brightest cluster galaxies (BCGs) of these clusters appear to be wide-angle tailed (WAT) radio sources, indicating ongoing interaction between its host galaxy and the surrounding ICM. Our analysis suggests that the radio power of WAT is positively correlated with the optical luminosities of host BCGs, and increases with redshift; whereas the cluster ellipticity-radio galaxy fraction relation shows no obvious difference between WAT and non-WAT clusters.

Keywords. galaxies: evolution, galaxies: clusters: general, radio continuum: galaxies

The maxBCG cluster catalog (Koester *et al.* 2007) at redshifts between $0.1 < z < 0.3$ is cross-correlated with the FIRST radio source catalog. By visual inspection of each cluster, we have classified 552 (out of 13K) clusters with BCGs associated with double-lobe radio sources into 7 groups (Table 1) based on the morphology of their radio counterparts: FR II, FR I, WAT, close pairs, S-shape (Merritt *et al.* 2002), X-shape (Cheung 2007), and radio galaxy (without particular features). The ellipticity and the radio galaxy fraction of WAT clusters show no differences from those of non-WAT clusters. In addition, we find that the radio power of WAT has a positive correlation with the optical luminosities of host BCGs (Figure 1), which supports that the cooling rate of hot gas in BCG depends on the mass of BCG itself. Furthermore, the output power from nuclei of BCG radio counterparts also evolves with redshift (Figure 2). We suspect some environmental effect can boost the radio power more efficiently at higher redshift.

Table 1. Morphological Classification of BCG Radio Counterparts

Type	Number
FR II	124
FR I	6
WAT	193
Close pairs	68
S-shape	28
X-shape	1
Radio galaxy	132

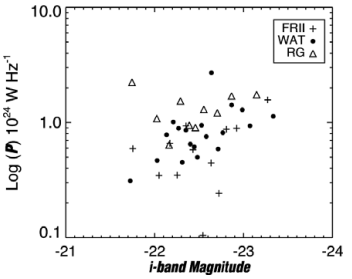

Figure 1. Relation between optical magnitudes and radio luminosities of BCGs

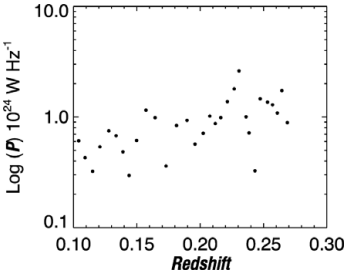

Figure 2. Radio luminosities of BCGs as a function of redshift.

References

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