Poor Groups Around Strong Gravitational Lenses

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Abstract. Poor groups are common and interactive environments for galaxies, and thus are important laboratories for studying galaxy evolution. Unfortunately, little is known about groups at $z \geqslant 0.1$, because of the difficulty in identifying them in the first place. Here we present results from our ongoing survey of the environments of strong gravitational lenses, in which we have so far discovered six distant ($z \geqslant 0.5$) groups of galaxies. As in the local Universe, the highest velocity dispersion groups contain a brightest member spatially coincident with the group centroid, whereas lower-dispersion groups tend to have an offset brightest group galaxy. This suggests that higher-dispersion groups are more dynamically relaxed than lower-dispersion groups and that at least some evolved groups exist by $z \sim 0.5$. We also compare the galaxy and hot gas kinematics with those of similarly distant clusters and of nearby groups.

1. Results

6 of the 8 lens galaxies lie in groups (MG0751, BRI0952, PG1115, B1422, MG1654 and B2114) and 3 of these are newly discovered (BRI0952, MG1654 and B2114). We have increased group membership by a factor of 2 to 4 for the previously known groups and improved their velocity dispersions (σ) and centroid measurements. Intragroup medium (IGM) is detected in two groups (PG1115 and B1422), consistent with the local T_x - σ relation (**?**). The groups found using this method span a wide range of $\sigma \sim 100 - 500 km\ s^{-1}$ and are selected independent of mass. The brightest group galaxy (BGG) has early type morphology and is not the lens in all but two cases. BGGs are distributed like other group members and are not at the centroid for low-σ groups but are central in high-σ groups (MG0751 and PG1115).

2. Conclusions

We have defined a new sample of 6 poor groups at intermediate redshifts using an ongoing survey of the environments of strong gravitational lenses. The groups are selected independent of mass and thus span a wide mass range. We find that dynamically evolved poor groups with a relaxed IGM, high early type fraction and a central giant elliptical exist by $z_l \sim 0.5$. There are also dynamically young groups, whose dominant giant elliptical, early type fraction and IGM are still evolving. We expect the sample to grow up to ~ 15 by the completion of the survey.

References

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