A large X-ray sample of fossil groups

Eric D. Miller[1], Eli Rykoff[2], Renato de Alencar Dupke[3,4], Claudia Mendes de Oliveira[5], Timothy McKay[4] and Benjamin Koester[6]

[1]MIT Kavli Institute, [2]UCSB, [3]ON/MCT, [4]U. Michigan, [5]USP, [6]U. Chicago
email: milleric@space.mit.edu

Abstract. We present Chandra snapshot observations of the first large X-ray sample of optically identified fossil groups. For 9 of 14 candidate groups, we are able to determine the X-ray luminosity and temperature, which span a range typical of large ellipticals to rich groups of galaxies. We discuss these initial results in the context of group IGM and central galaxy ISM evolution, and we also describe plans for a deep X-ray follow-up program.

Keywords. galaxies: clusters: general, X-rays: galaxies: clusters, surveys

Fossil groups (FGs) are systems dominated by a single, giant elliptical galaxy, yet their X-ray emission indicates a deeper cluster-scale gravitational potential. They are thought to be old, undisturbed galaxy groups, however these systems may be younger or more active than previously thought (see Dupke *et al.* in these proceedings). These results are complicated by the small number of FGs with deep X-ray data.

To address this, we have constructed a sample of 15 FG candidates from the maxBCG cluster catalog (Koester *et al.* 2007), using the criteria $0.09 < z < 0.15$, $L_{\mathrm{BCG}} > 9 \times 10^{11} L_{\odot}$, and $\Delta i > 2.0$ between the BCG and second ranked galaxy within $R_{200}/2$ (see Figure 1). We have obtained 5–10 ksec *Chandra* snapshot observations of 14 targets, and we detect diffuse X-ray emission from 11 of them at $> 90\%$ confidence, measuring T_X for 9 of these. One detection is shown in Figure 2. The measured L_X and T_X are similar to what is expected for groups of galaxies. Deep follow-up with *XMM* is necessary to measure T_X profiles, surface brightness profiles, concentration, and abundances, thereby constraining the formation mechanism of these peculiar but numerous systems.

References

Koester, B. P. 2007, *ApJ*, 660, 239
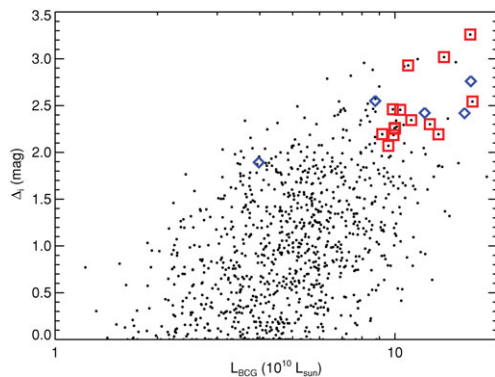
Figure 1. Magnitude differential vs. BCG luminosity for all maxBCG clusters with $9 < N_{200} < 25$; open squares identify the 15 FG candidates. Diamonds show known FGs.
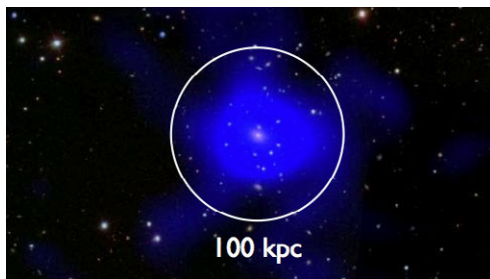
Figure 2. SDSS J0856+0553, a $z = 0.09$ FG candidate. The X-ray image is plotted over the SDSS g, r, i composite image.