Investigating a Unified Model for Feedback in Cool Core Clusters

Abstract

Cluster mass functions and the evolution of the cluster mass function are useful for measuring cosmological parameters ([1], [2], [3], [4], [5]). Cluster evolution tests the effect of dark matter and dark energy on the evolution of dark matter halos, and therefore provide a complementary and distinct constraint on cosmological parameters to those tests which constrain them geometrically (e.g. supernovae ([6], [7]) and baryon acoustic oscillations ([8])).

However, clusters are a useful cosmological tool only if we can infer cluster masses – the fundamental cluster property inferred from cosmological simulations ([9]) – from observable properties such as X-ray luminosity, X-ray temperature, lensing shear, optical luminosity, and galaxy velocity dispersion. Empirically, the relationship of mass and these observable properties is well-established ([10]). However, if we could identify a "3rd parameter" – possibly reflecting the degree of relaxation in the cluster – we could improve the utility of clusters as cosmological probes.

The general process of galaxy cluster formation through hierarchical merging is well understood, but many details, such as the impact of feedback sources on the cluster environment and radiative cooling in the cluster core are not. My thesis research has focused on studying these details via X-ray properties of the ICM in clusters of galaxies. I have paid particular attention to ICM entropy distribution, the process of virialization, and the role of AGN feedback in shaping large scale cluster properties.

Statement of Problem

Background and Relevance to Previous Work

General Methodology and Procedure

Explanation of Techniques

Expected Results, Significance, and Application

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