The Entropy-Feedback Connection and Quantifying Cluster Virialization

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Entropy has been shown to be of vital importance in 1) understanding the feedback mechanisms active within clusters and 2) the role of the cluster environment on galaxy formation. Our presented work focuses on tying together feedback mechanisms with the breaking of self-similar relations expected in cluster and galaxy formation models. We also examine a metric to quantify the degree of cluster virialization which may in turn reduce scatter in scaling relations, thus increasing clusters utility in cosmological studies.

We have assembled a library of entropy profiles for > 80 clusters in the *Chandra* Data Archive (CDA) covering a broad mass and morphological range. We will be presenting these profiles and discussing the interconnection of central entropy with radio luminosity and Hα emission. We will describe the distribution of central entropy for our sample and briefly discuss what can be learned about the timescale of feedback mechanisms from this distribution.

We will also present recently completed work for which we explore the band-dependence of the inferred X-ray temperature of the ICM for 179 clusters selected from the CDA. We compare the X-ray temperatures inferred for single-temperature fits of global spectra when the energy range of the fit is 0.7-7.0 keV (full) and when the energy range is 2.0/(1+z)-7.0 keV (hard). We find, on average, the hard-band temperature is significantly higher than the full-band temperature. Upon further exploration, we find the ratio $\mathrm{T}_{HFR} = \mathrm{T}_{2.0-7.0}/\mathrm{T}_{0.7-7.0}$ is enhanced preferentially for clusters which are known merger systems and for clusters which are isothermal. Cool core clusters tend to have best-fit hard-band temperatures that are statistically consistent with their best fit full-band temperatures.