X–RAY PROPERTIES OF *ASCA* OBSERVED 43 CLUSTERS OF GALAXIES

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1. Introduction

Much attempts of statistical approach have been made to study the origin of heavy elements, distribution of dark matter and evolution of clusters of galaxies. Henry et al.(1991) reported a power–law relation; $L_X \propto kT^\gamma$, $\gamma \sim 2.7$. Edge and Stwert(1991) found significant scatter in the correlation using 45 clusters. David at al.(1993) reported $\gamma \sim 3.4$ using 104 clusters.

2. Results

We presented preliminary results of analyses for 43 clusters and groups of galaxies (z = 0.004–0.7). This sample is not selected under a certain criterion. For each group or cluster, we investigated the correlations of redshift and X–ray spectral parameters (using Raymond-Smith model); flux–weighted temperature kT[keV] and abundance(Fe) Ab[solar], luminosity of 2–10keV energy band L_X[erg s^{-1}].

Figure 1 shows that L_X and kT have a correlation as many previous works reported. We added the lines whose γ is 2.5, 3, 3.5 respectively.

The correlation has a significant scatter from this power–law relation. Then we ploted Ab and deviation of the relation in figure 2. At that time, we assumed γ is 3 and selected the targets whose 90% confidence error of abundance; $\delta[\log_{10}$ Fe] is smaller than 0.2. This correlation has a significant relation of 99.4% confidence level by Fisher's exact test. Scharf and

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Mushotzky(1997) have already reported about this correlation. They concluded the correlation was explained by taking into account the range of cluster formation epochs expected within a hierarchiacl universe. Our result is consistent with their correlation and gives a stronger constraint.

According to their proposition, the x–coordinate should increase with earlier cluster formation epoch and the observed correlation indicated that earlier formed cluster of galaxies has higher abundance. Generaly in a hierarchical scenario, clusters have started as a single, dominant potential well, into which many smaller clumps have fallen, or have formed by the merger of intermediate sized clumps. And it evolved by merging and/or contraction and infall of small lump of gas. The subclumps involved in the formation of luminous clusters at low redshift are themselves typically low luminosity systems, such as groups, and the abundances measured in groups are low. These observational results are consistendt with this correlation. Then we made correlations of the dispersion of Lx–kT relation and R_c, β, gas fraction and found some have correlations.

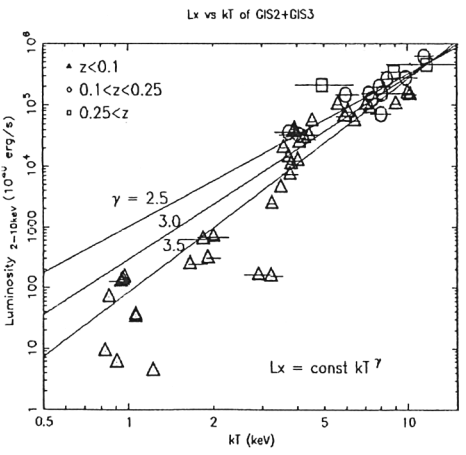

Figure 1. Correlation between L_X and kT

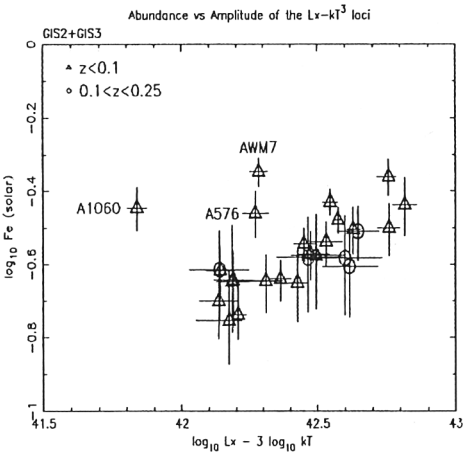

Figure 2. Correlation between Abundance and Amplitute of the L_X-kT^3 loci

References

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David, L. et al. 1993, ApJ, 412, 479
Henry, J. et al. 1991, ApJ, 372, 410
Scharf and Mushotzky 1997, ApJL