XMM-Newton/Chandra Cross Calibration


Cluster of Galaxies Group / IHEP

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Main work: Statistical studies on X-ray properties of clusters

A cluster sample (XMM-Newton/Chandra)—164 clusters

- Chandra: 112 (subsample I)
- XMM-Newton: 124 (subsample II)
- Both: 72 (subsample III)

Studies on X-ray properties of subsamples:

- T, M, L, S, L-M, L-T, M-T......

BUT: the properties from XMM-Newton and Chandra are different

First, we have to find a way to combine the subsamples

Using subsample III (62)

Relations of the properties between XMM-Newton and Chandra
Temperature & Mass

\[ T_{\text{Chandra}} = 1.25 \times T_{\text{XMM}} - 0.13 \]

\[ \log_{10} \, M_{\text{Chandra}} = 1.02 \times \log_{10} \, M_{\text{XMM}} + 0.15 \]

Zhao H.H. et al. 2015
Mass Correction (1)

The mass difference between XMM and Chandra are mainly caused by T.

T-relation: $T_{ch} \Rightarrow T_{ch/T} \Rightarrow M_{ch/T}$

The mass difference between XMM and Chandra are mainly caused by $T$. 
Two relations are consistent, and provide the good ways to combine XMM-Newton and Chandra data (to build a large sample).
The XMM-Newton mass is consistent with the weak lensing mass. Does it mean that the XMM-Newton mass are more reliable?
Another work:

- **Abell 1835 (Li C.K. et al. 2012)**
  - A classical bright cluster with a big cool core

- **$T_{\text{XMM}} = 7.3 \text{ keV}$**
  - $T_{\text{chandra}} = 9.6 \text{ keV}$

- Fit the spectrum with the other $T$
  - Chandra: fit well
  - XMM-Newton: not fit well
  - XMM-Newton has a stronger restriction on $T$

- Mass calculation and comparison with $M_{\text{WL}}$
  - Does it mean that the XMM-Newton $T$ is more reliable?
We get the T-relation and M-relation of galaxies clusters between Chandra and XMM-newton, which can be used directly in the sample combination.

Which correction is better:

- Tch ➞ Tch/new
- Txmm ➞ Txmm/new

Thank you!