XMM-Newton/Chandra Cross Calibration

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Introduction

- **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:**

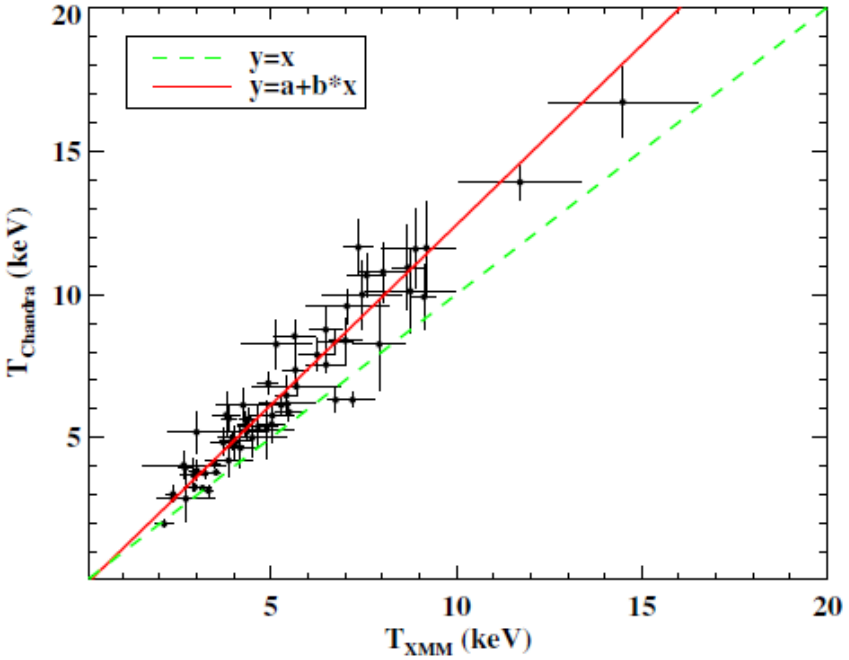
  T, M, L, S, L-M, L-T, M-T……

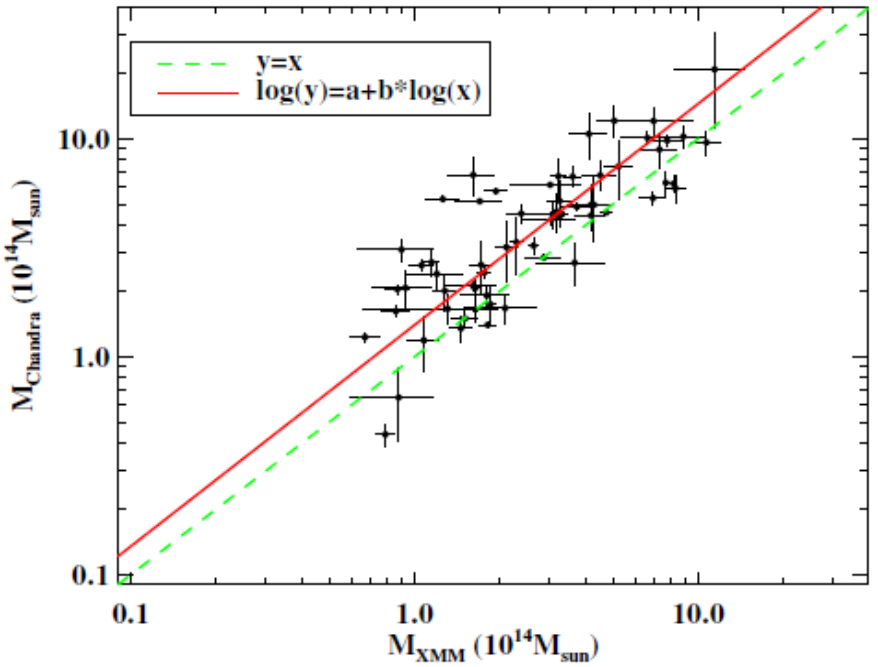
  BUT: the properties from XMM-Newton and Chandra are different
- **First, we have to find a way to combine the subsamples**

  Using subsample III (62)

  Relations of the properties between XMM-Newton and Chandra

Temperature & Mass



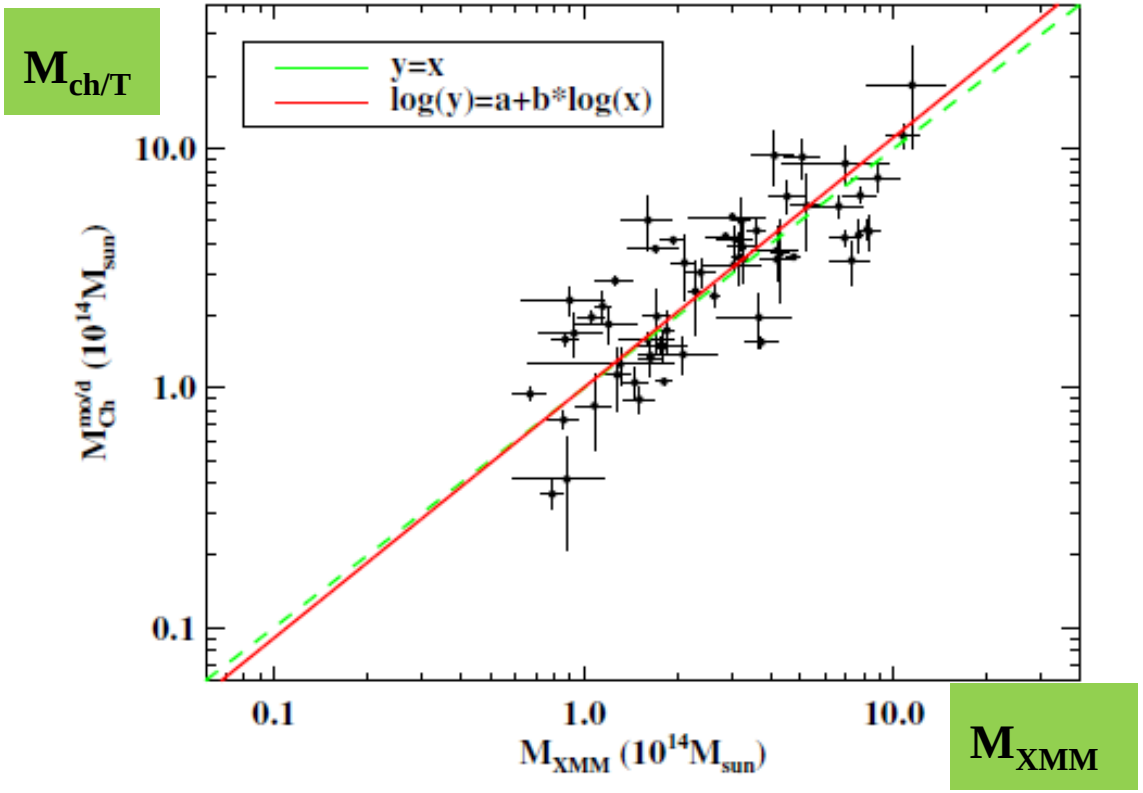


$$T_{\rm Chandra} = 1.25 \times T_{\rm XMM} - 0.13$$

$$\log_{10} M_{\rm Chandra} = 1.02 \times \log_{10} M_{\rm XMM} + 0.15$$

Zhao H.H. et al. 2015

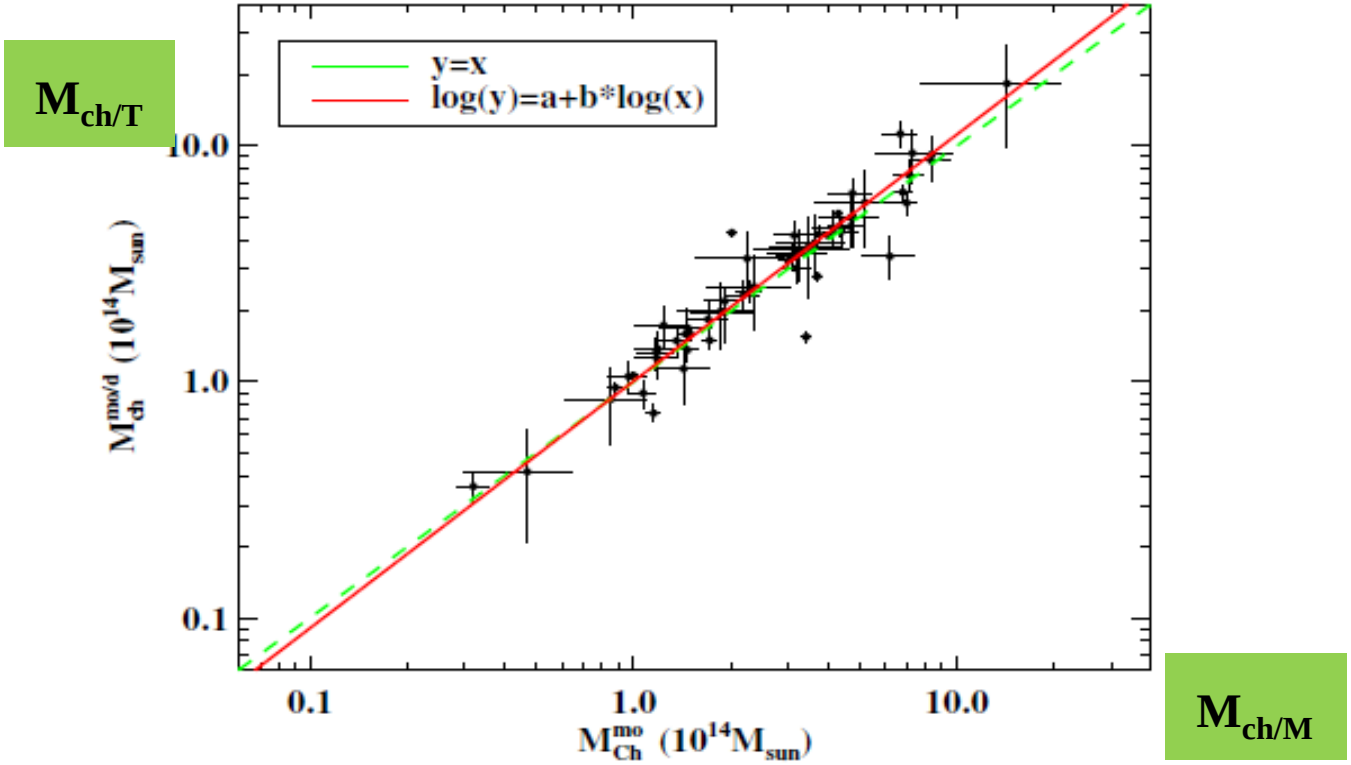
Mass Correction (1)



T-relation : T_{ch} ➔ $T_{ch/T}$ ➔ $M_{ch/T}$

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

Mass Correction (2)

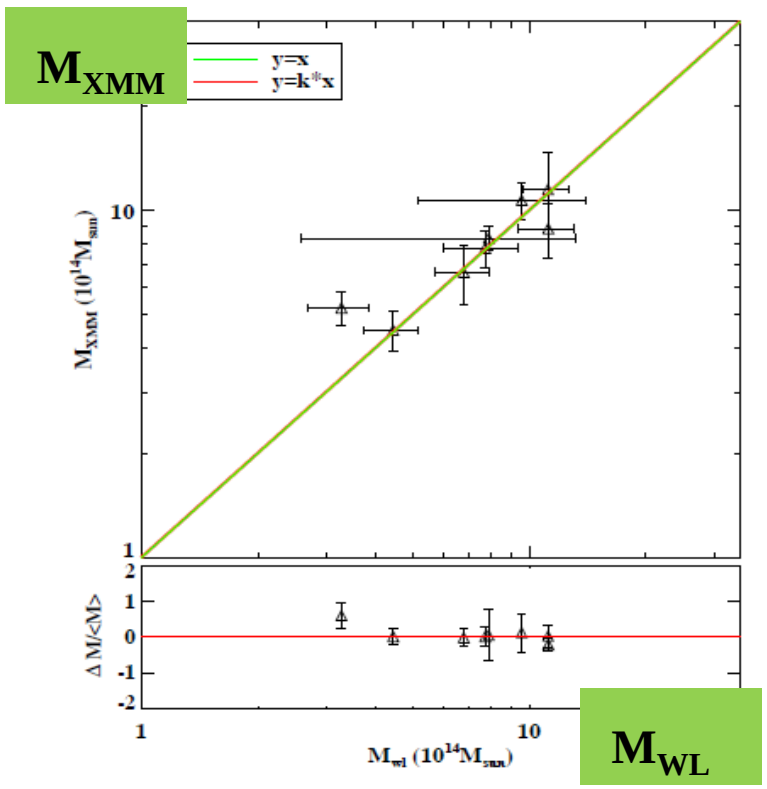


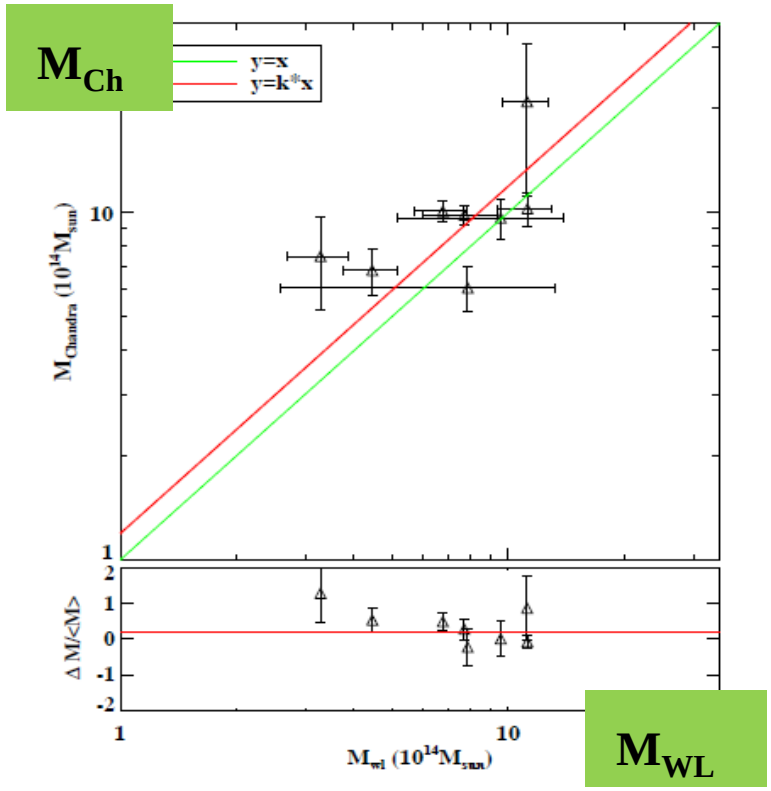
T-relation: T_{ch} ➔ $T_{ch/T}$ ➔ $M_{ch/T}$

M-relation: ➔$M_{ch/M}$

Two relations are consistent, and provide the good ways to combine XMM-Newton and Chandra data (to build a large sample).

Comparison with M_{wl}



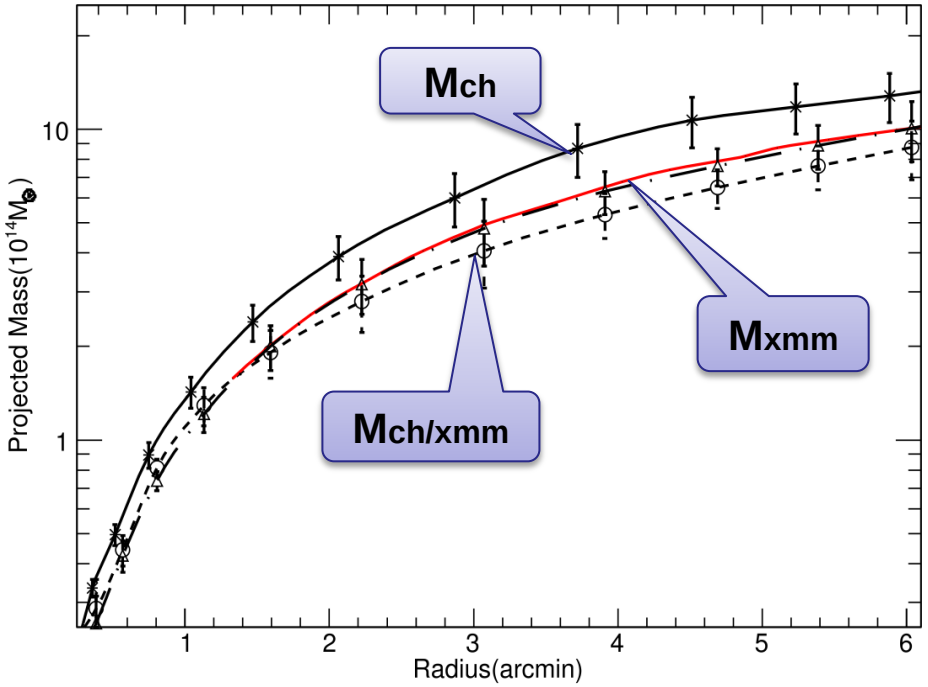


The XMM-Newton mass is consistent with the weak lensing mass.

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_{XMM} = 7.3 keV
  $T_{chandra}$ = 9.6 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_{WL}
  Does it mean that the XMM-Newton T is more reliable?

Conclusion

- 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!