

Clusters WG session report

IACHEC meeting, Napa, 2012

**1) Data in IACHEC
Wiki page**

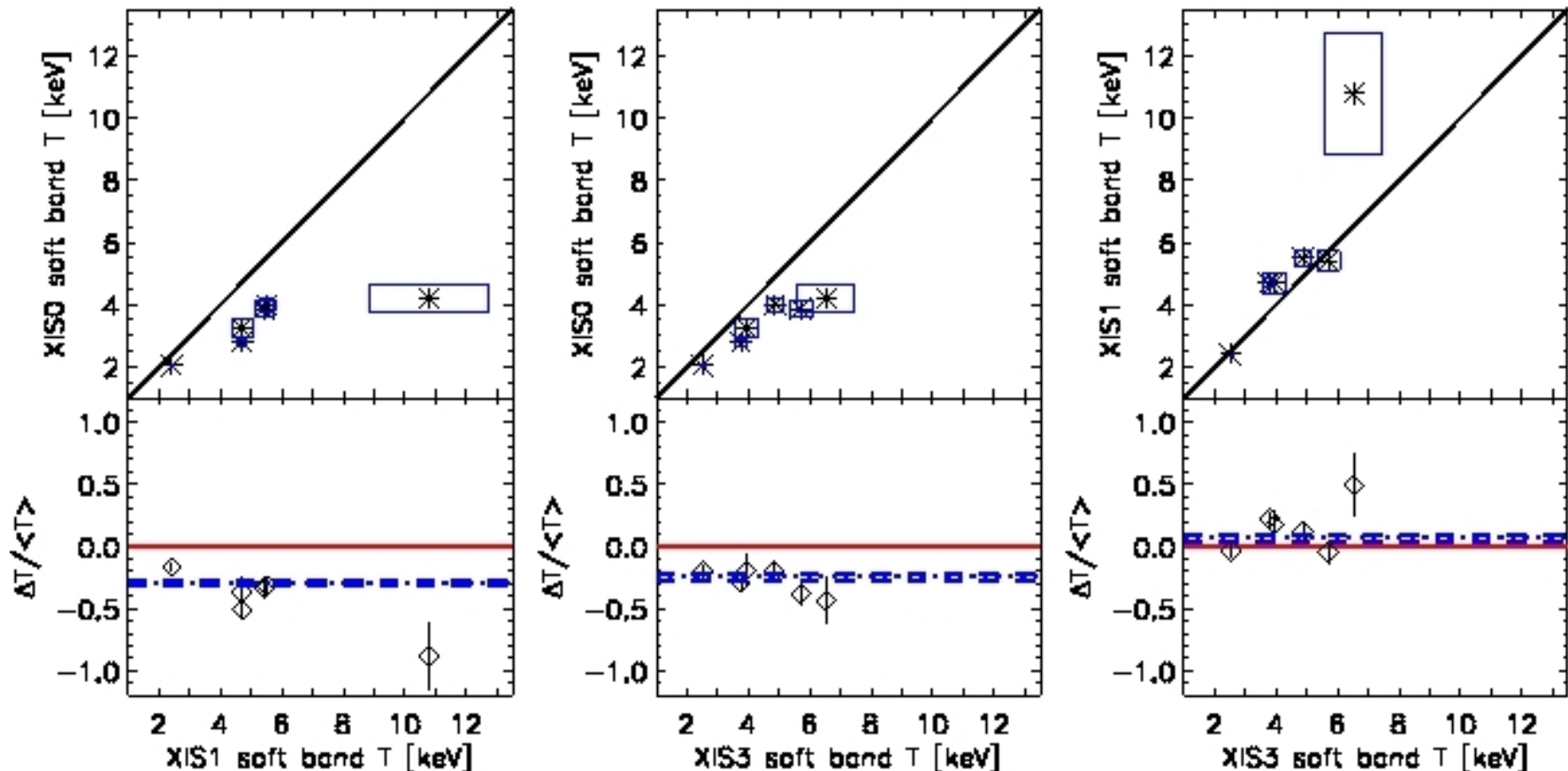
- Ideas for improving the page:
 - ★ XMM processing scripts
 - ★ Background info
 - ★ Patterns, flags
 - ★ Images
 - ★ Coordinates
 - ★ MOS1 and MOS2 separately

2) Suzaku extension

(K. Kettula et al., in prep.)

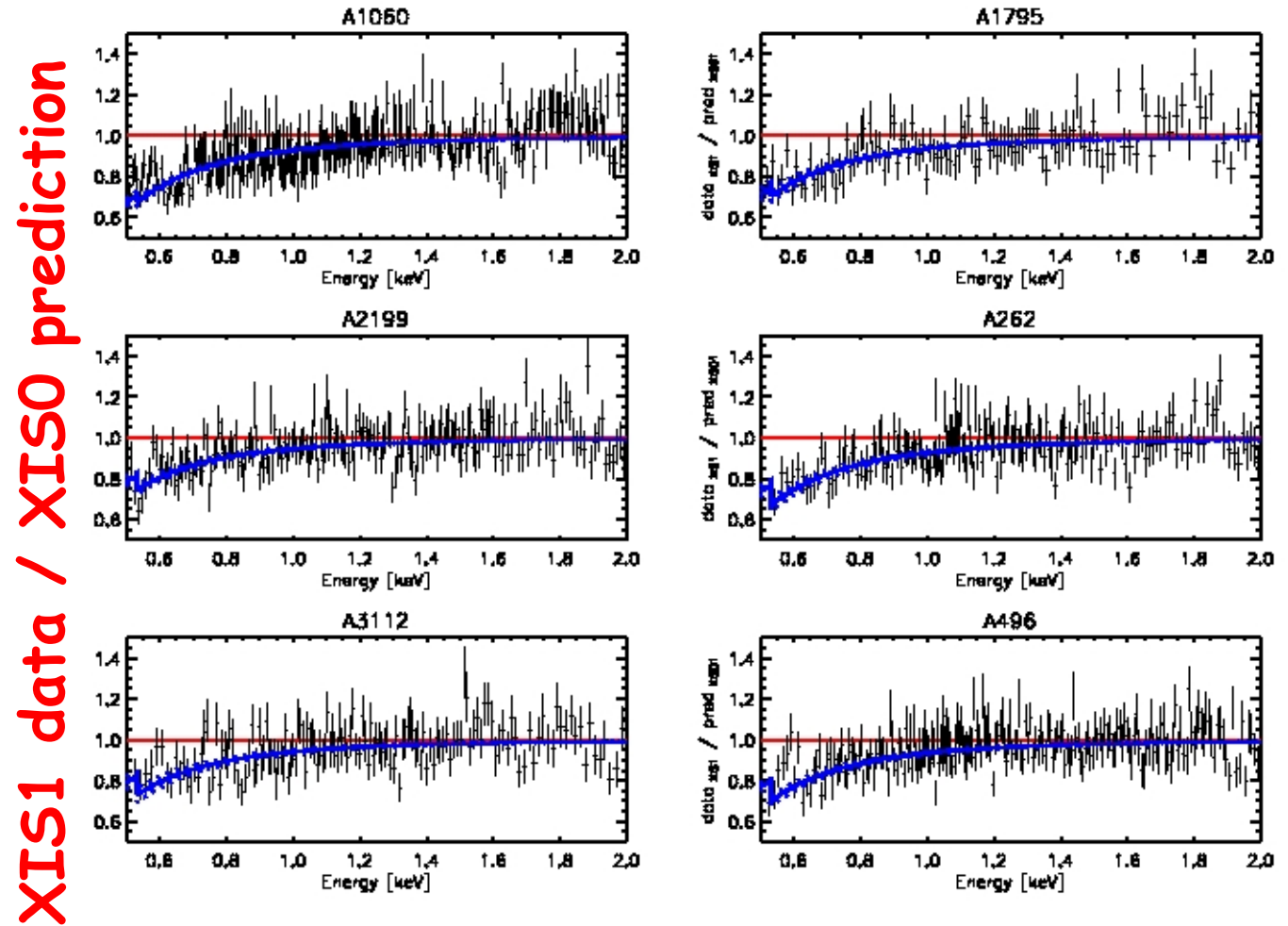
XIS soft band

- XIS1/XIS3 kT differ a bit (7%) but not very significantly (2.5σ)
- XISO yields 30% and 20% lower (10σ) temperatures. **Is this seen in other sources?**



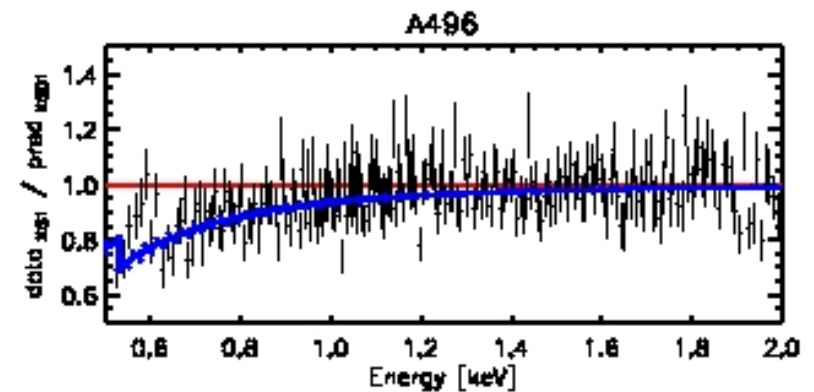
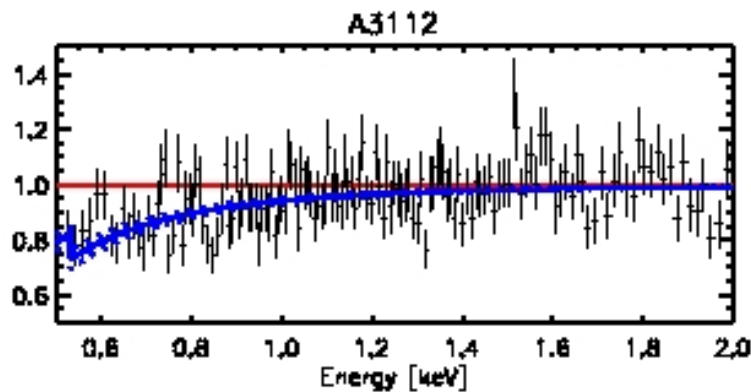
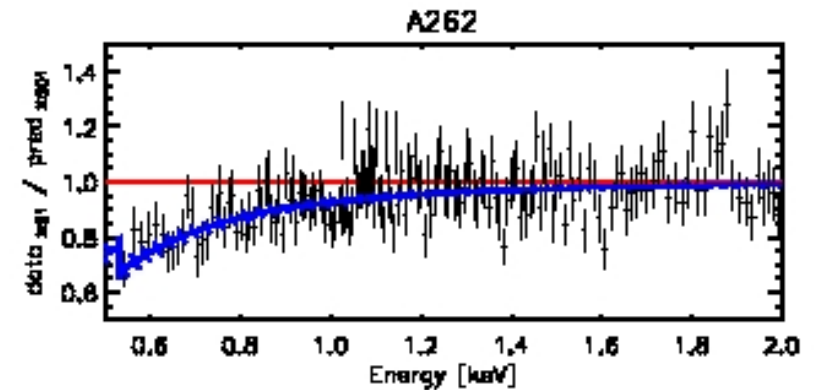
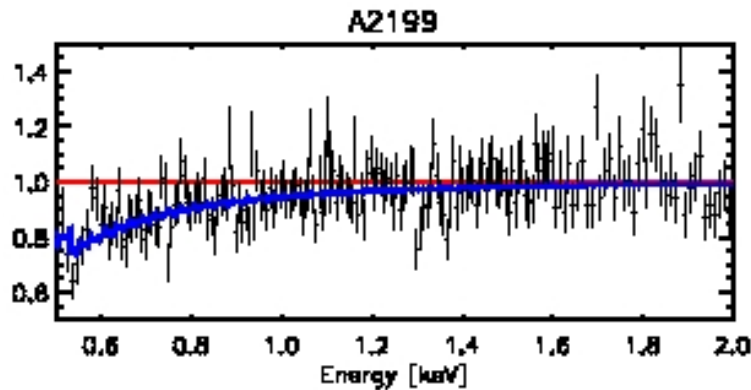
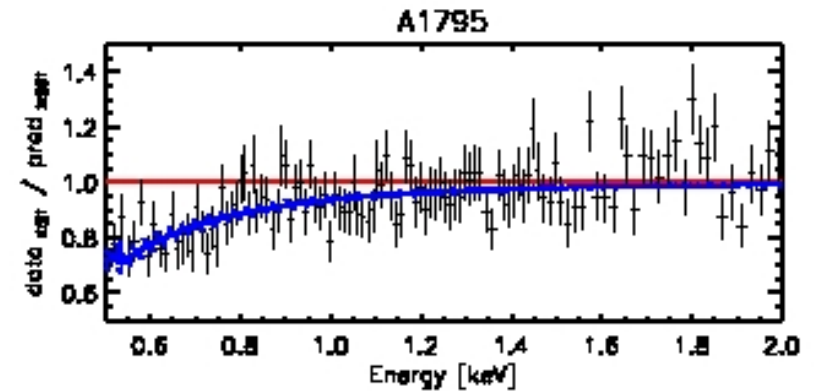
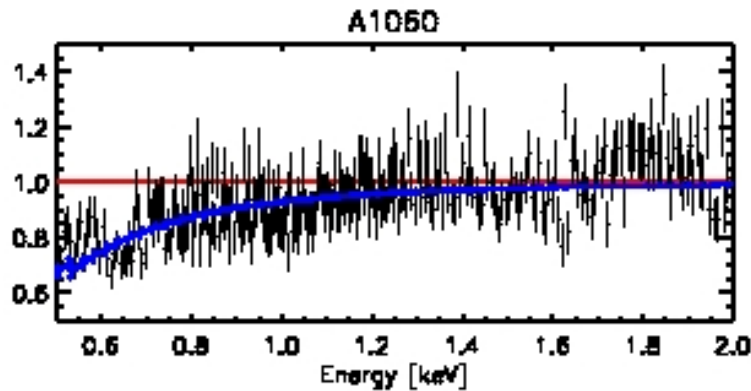
XIS1/XISO residuals

- XIS1 data divided by the best-fit XISO model folded through XIS1 response (crosses)
- Prediction too high at 0.5 keV: If XISO is correctly calibrated, XIS1 effarea is over-estimated by 20-40% at 0.5 keV



- The fits are statistically acceptable ($\text{chisq} \sim 1$) \rightarrow the energy dependence of the contaminate can explain the XIS soft band temperature discrepancies

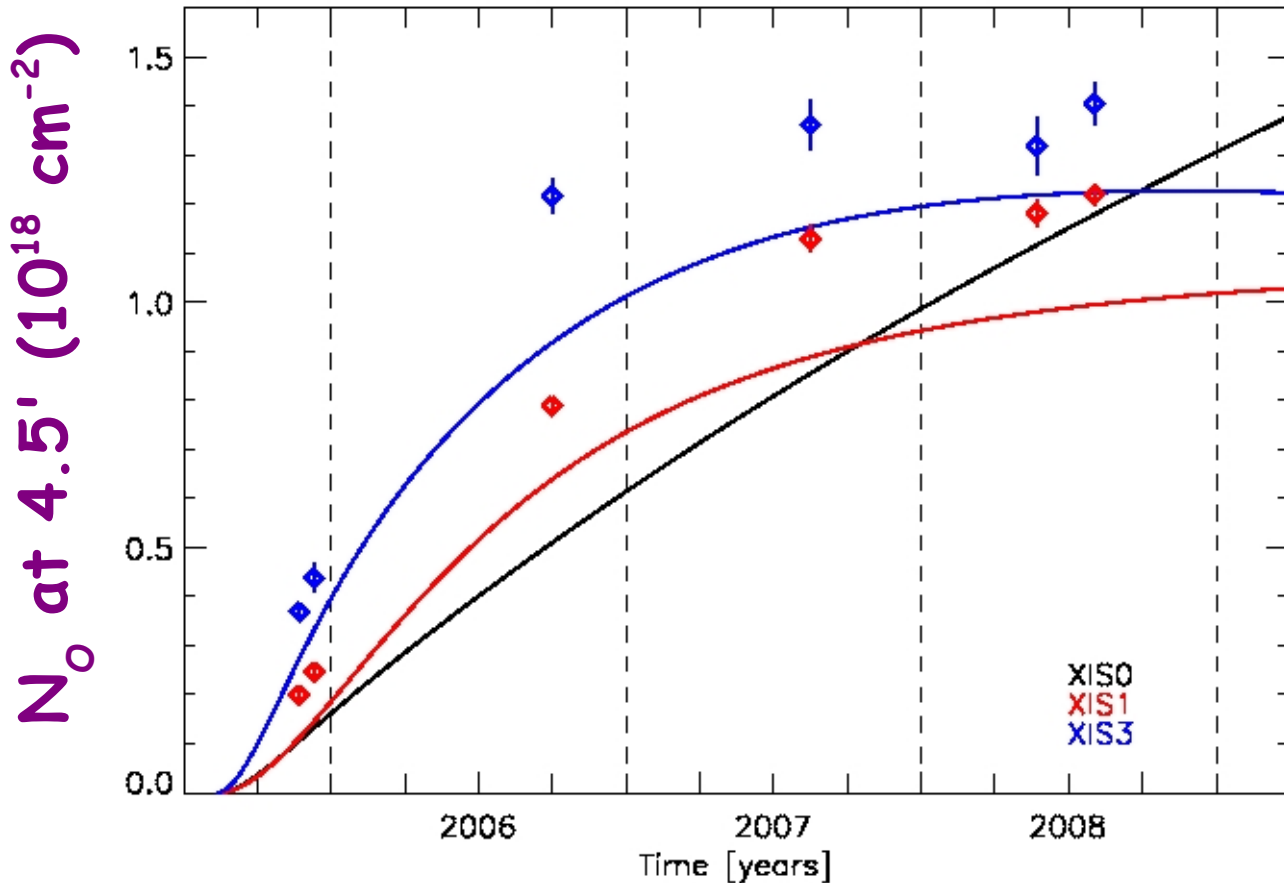
MODIFIED / ORIGINAL XIS1 ARF



- The resulting ΔN_O values $1-3 \times 10^{17} \text{ cm}^{-2}$ are quite high... **IS**

THIS ACCEPTABLE?

- The curves show the implemented O column density in CALDB 20110608 at 4.5 arcmin distance from the center of the FOV **(IT WOULD BE VERY USEFUL TO HAVE THE ACTUAL O COLUMN VALUE AS A KEYWORD IN THE HEADER)**



- The data points show the required O columns, if XIS0 is correct
- These contradict the direct O measurements of 1E010?**

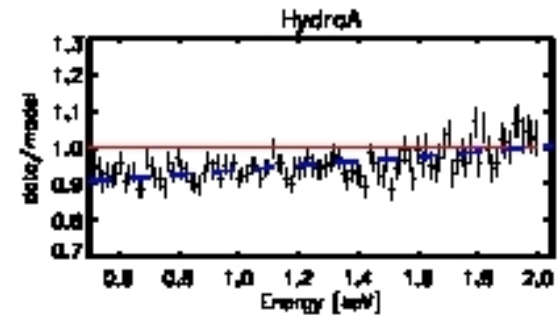
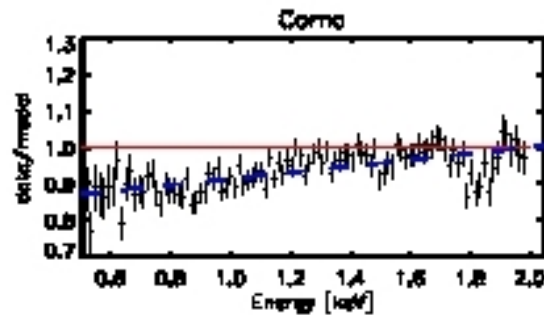
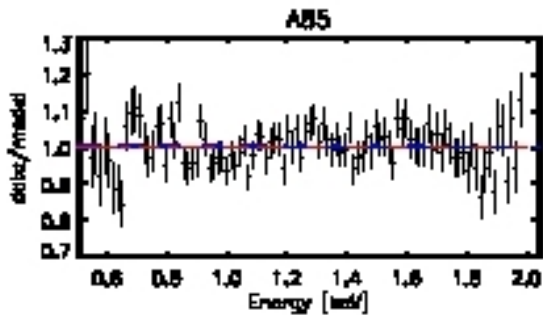
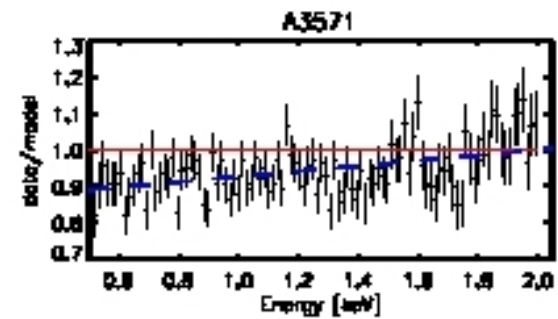
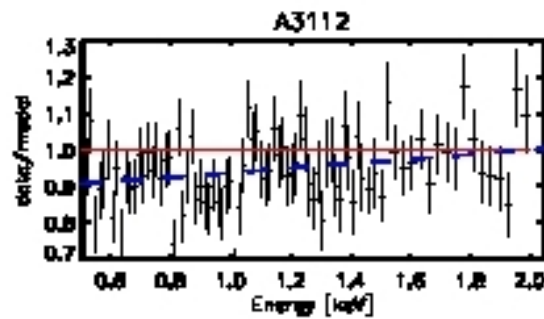
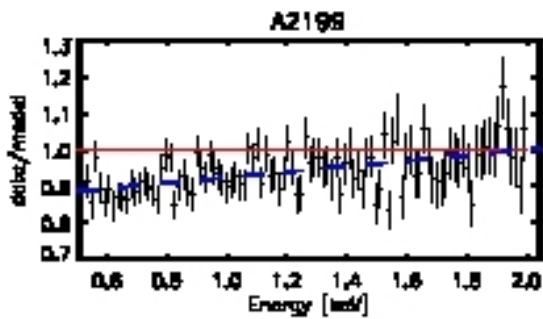
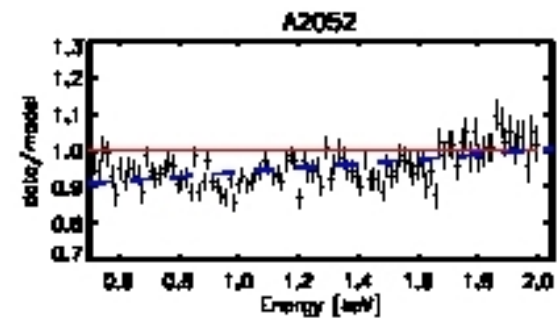
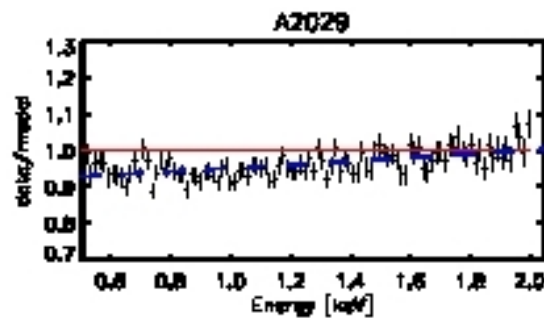
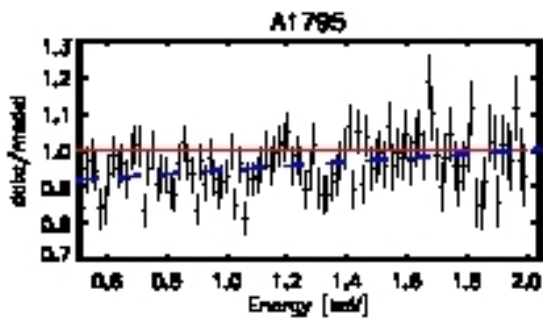
- Use XIS1, instead of XISO as a reference instrument, because XIS1 contaminate is best measured. Is it?
- Check Suzaku extraction regions
- Check XIS1 gain
- Check XIS1 bad regions
- Check NXB normalisation with the > 10 keV band count rate, like XMM
- Check how XIS Crab results (Eric) and Ishida et al 2011 compare with clusters
- PSF scatter from central cool region to 3-6 annulus evaluated soon (Eric)
- Larry will provide ACIS data for some of the clusters for comparison
- Circulate new draft within a month for comments
- Aim for submission in May

**3) Chandra/XMM soft
band temperature
problems**

ACIS data / pn model



- ACIS data / pn model exhibit a linear trend with energy
- In pn effarea is correct, ACIS effarea too high by $\sim 10\%$ at 0.5 keV



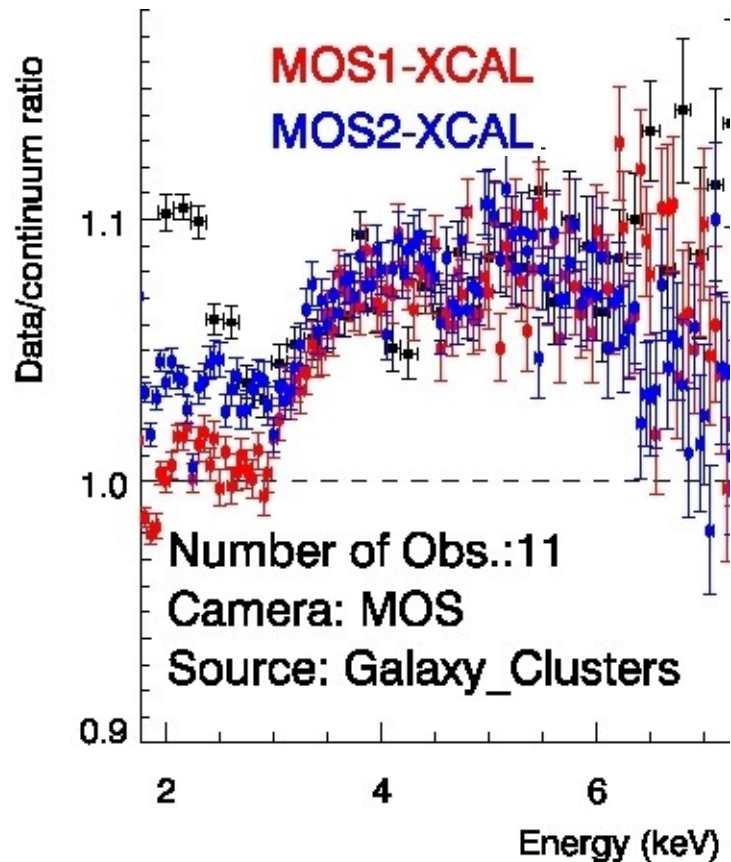
- Not a contamination issue, because behaviour constant with time
- Neither XMM nor Chandra has much room for adjustment
- Confirm the systematic effects with different objects? Read better Ishida 2011 paper

XMM

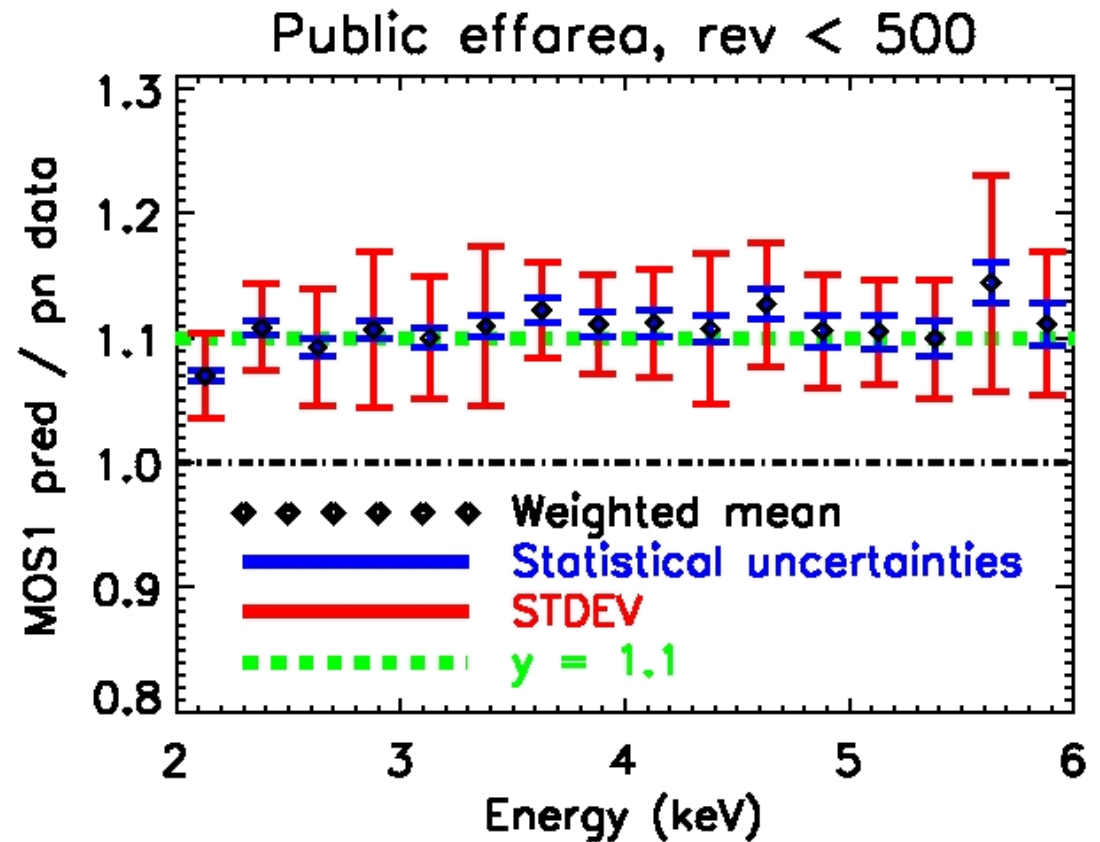
blazar/cluster

differences

CLUSTERS + BLAZARS



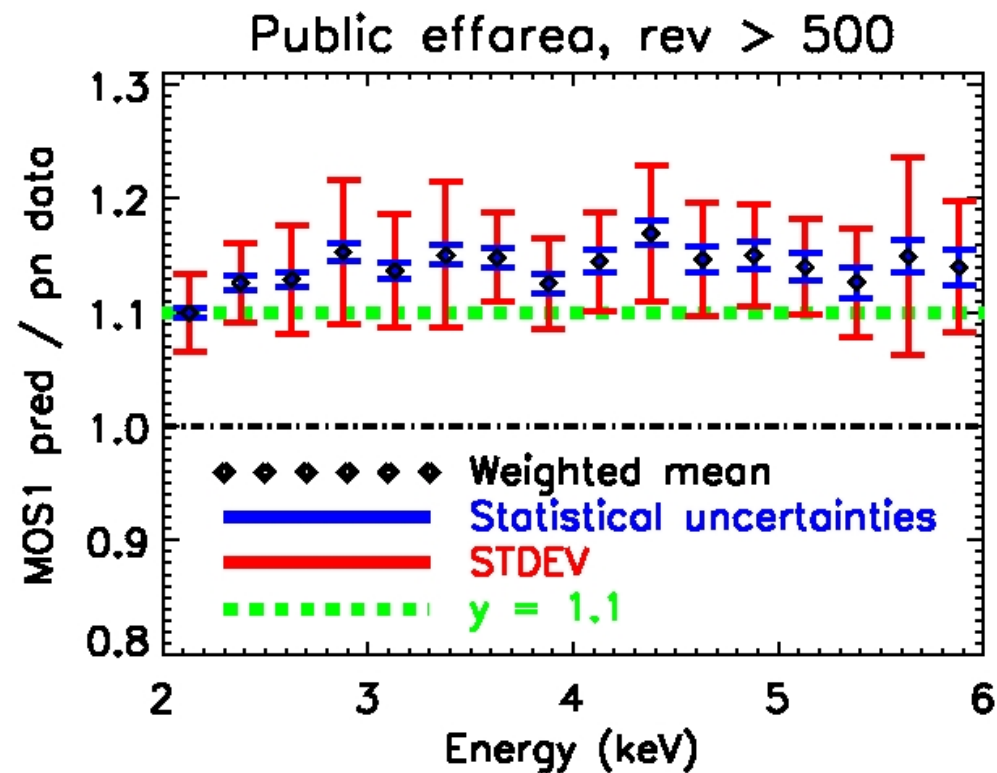
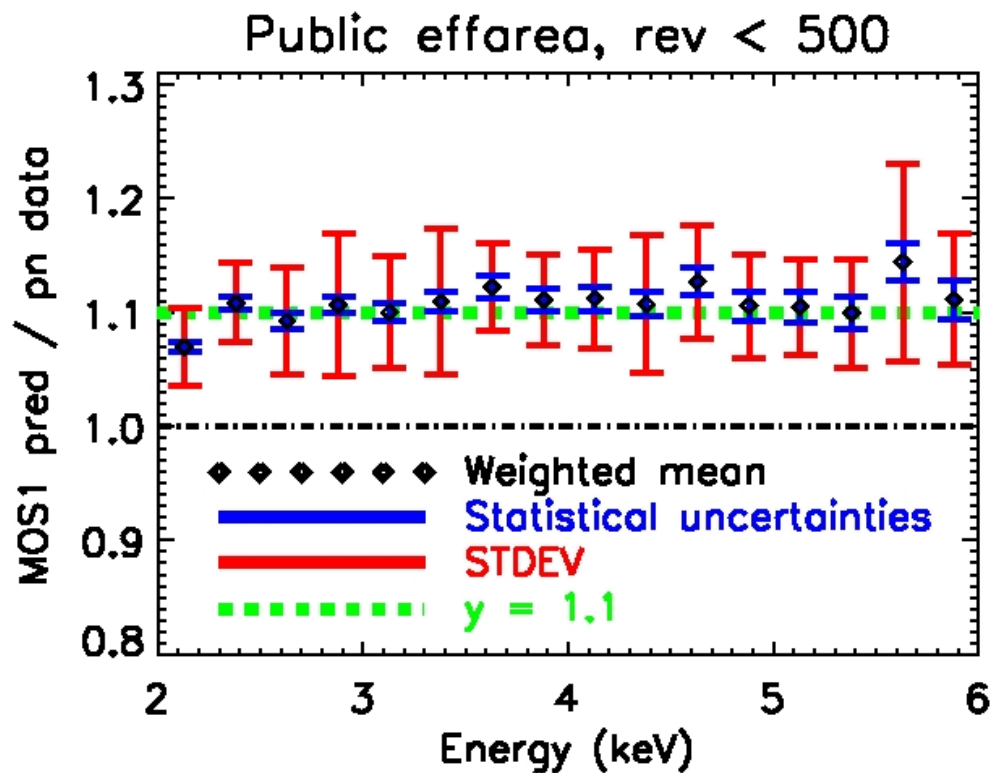
CLUSTERS



- Clusters do not show the steep rise of residuals at 3.0-4.0 keV as blazars do → trouble

Public effarea, pre/post rev 500

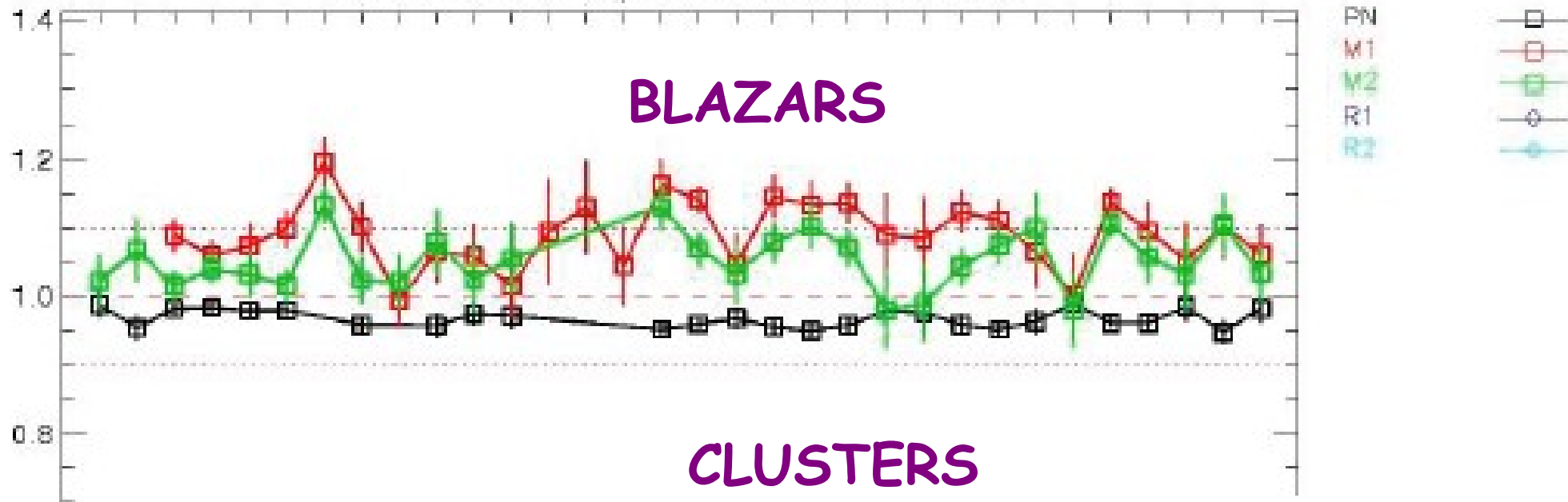
- Clusters show no steep rise at 3-4 keV, i.e. clusters and blazars behave differently with the public effarea at rev > 500
- Clusters yield 5% higher MOS1/pn fluxes at rev > 500 than in rev < 500. A **similar trend perhaps in M. Smith's blazar sample.**



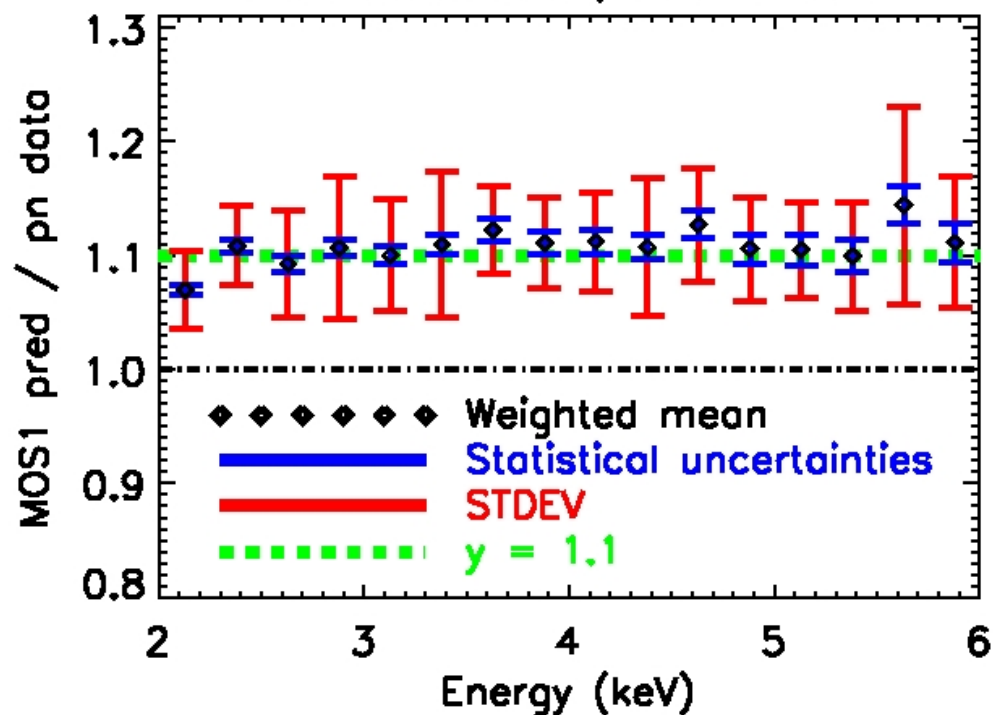
Normalised Flux, 4.00 - 10.00 keV Band

BLAZARS

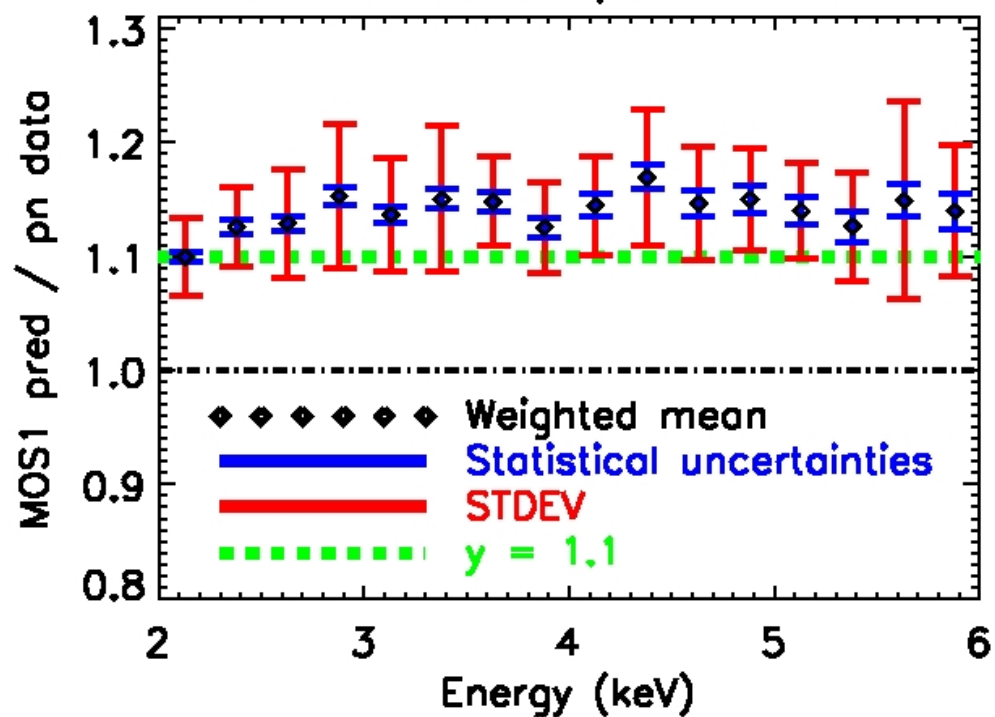
CLUSTERS



Public effarea, rev < 500



Public effarea, rev > 500



- Jukka and Matteo will investigate blazar/cluster difference in detail in May or June
- M. Smith will help in the analysis
- Check cluster fluxes for each cluster as a function of time. Does the MOS flux increase and pn remain constant as suggested by blazars?
- Look at blazar residuals object-by-object, and as a function of time
- Cluster temperatures tell about the effarea shape around the cut-off, blazar power-law indices in the full band. Investigate.
- Hot SN?

NuStar

- Discussion with NuStarr people (Kerstin, Karl, Fiona) about adding some clusters into calibration program
- Agreement that Coma, A1795 and A2029 will be observed
- These are hottest clusters in the IACHEC sample, well observed with many different X-ray missions
- The brightest central regions covered within a few arcmin to minimise vignetting

Other

- 12th Commandment: When IACHEC papers written, circulate with WG chairpersons prior to submission to check the consistence with other results