

14 May 2014
IACHEC Meeting

**XCAL NuSTAR-XMM WITH
COMA CLUSTER**

FABIO GASTALDELLO

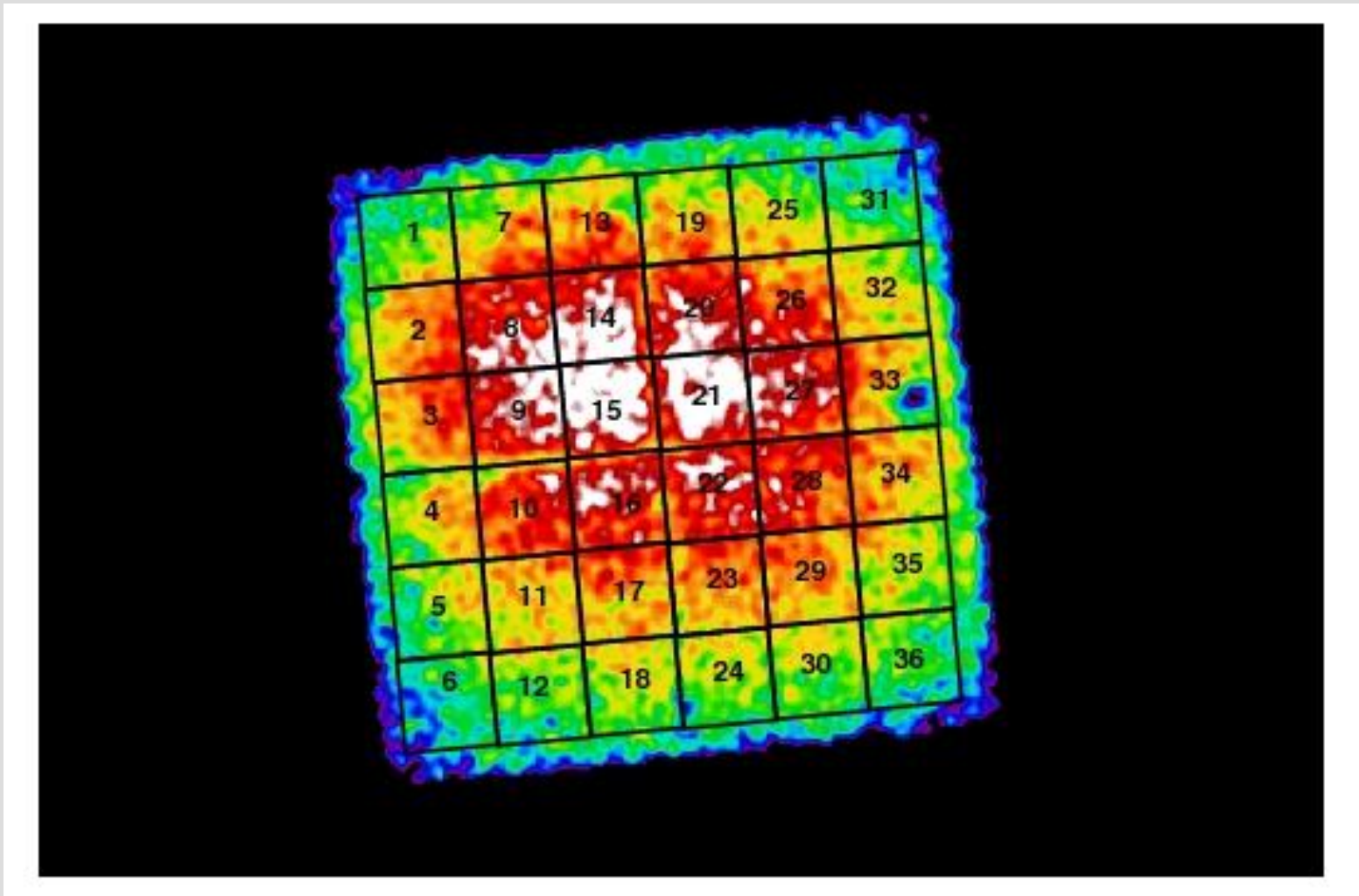
INAF, IASF-Milano

NuSTAR calibration & cluster WG

ANALYSIS

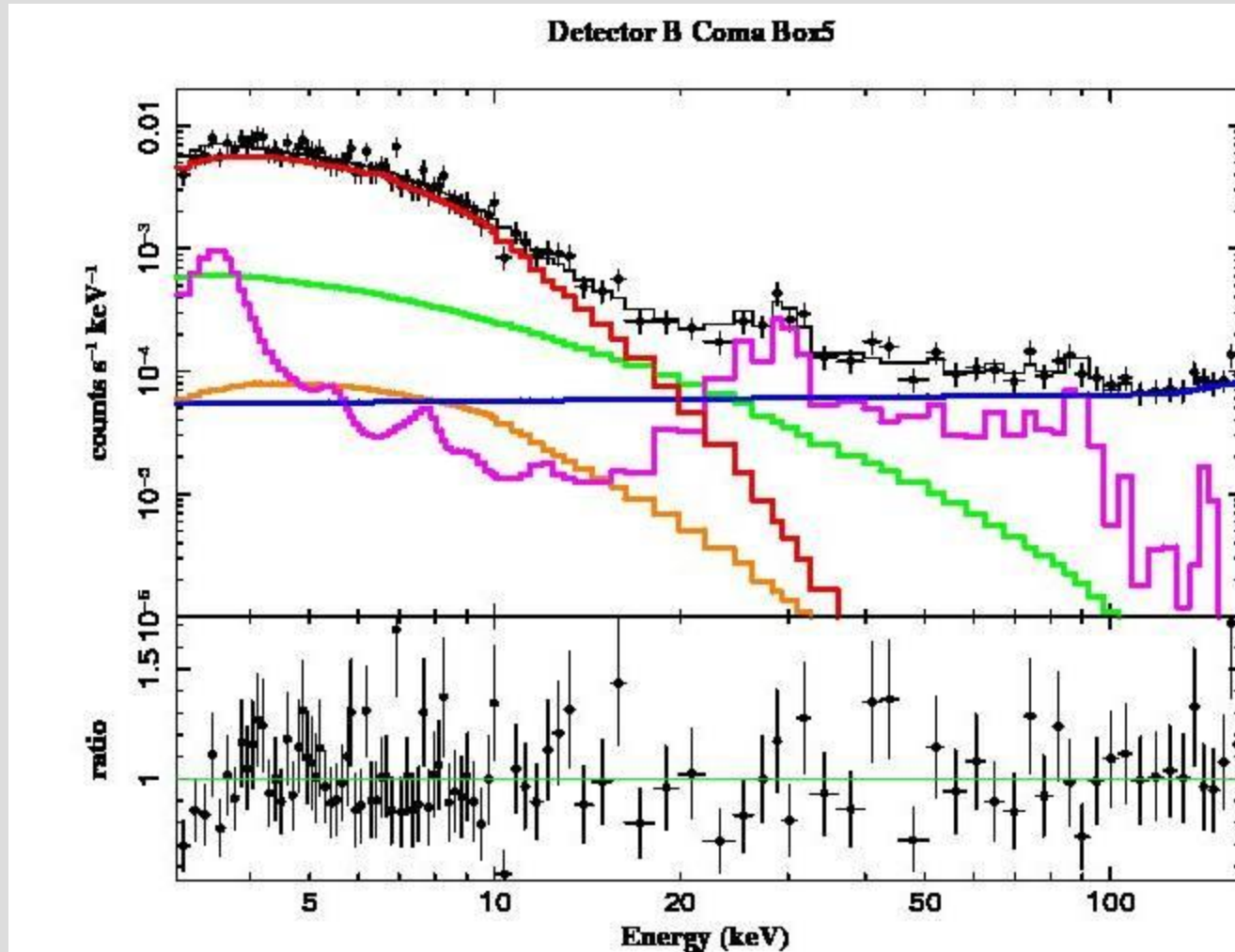
- Nearby cluster with a rather uniform high temperature distribution (7-9 keV). Its center observed mainly (but not only) for calibration purposes
- NuSTAR analysis with nustardas1.3.1 and CALDB 20132213
- XMM pn (doubles) analysis obsid 0153750101 December 2001 with SAS 12.0

COMA NUSTAR TEMPERATURE MAP

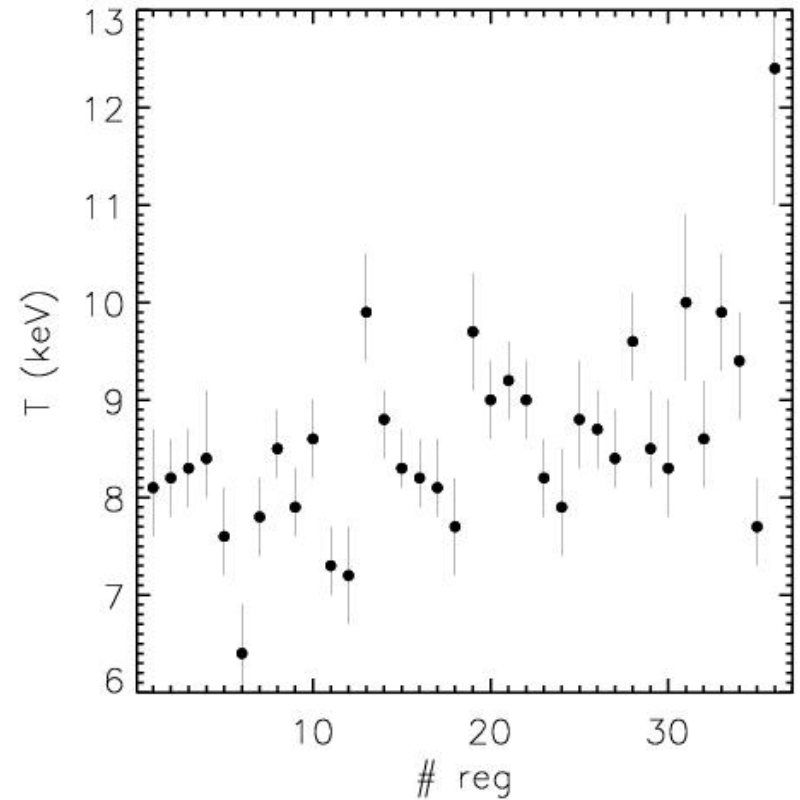
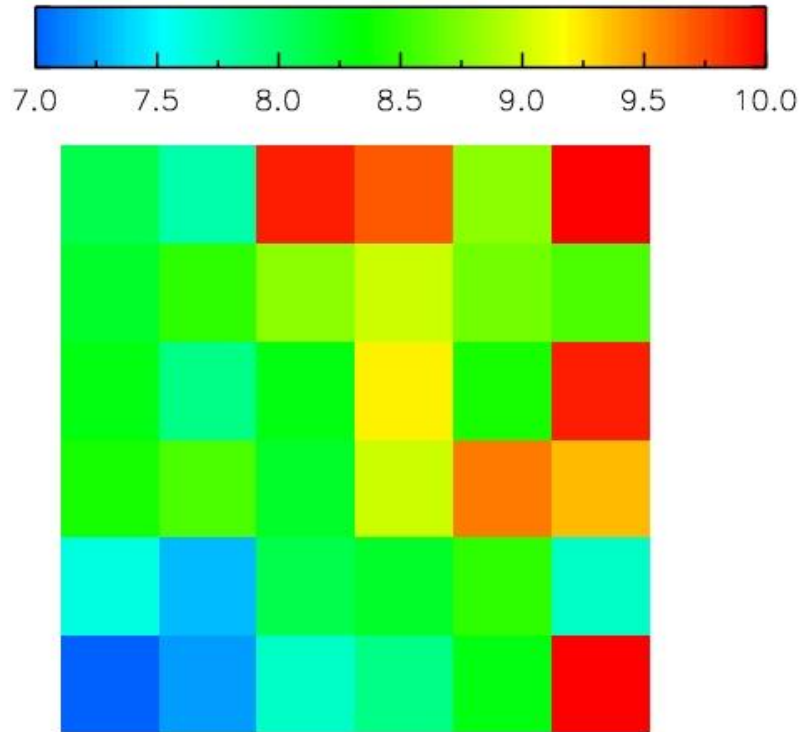


Boxes of 2 arcmin x 2 arcmin

COMA NUSTAR TEMPERATURE MAP

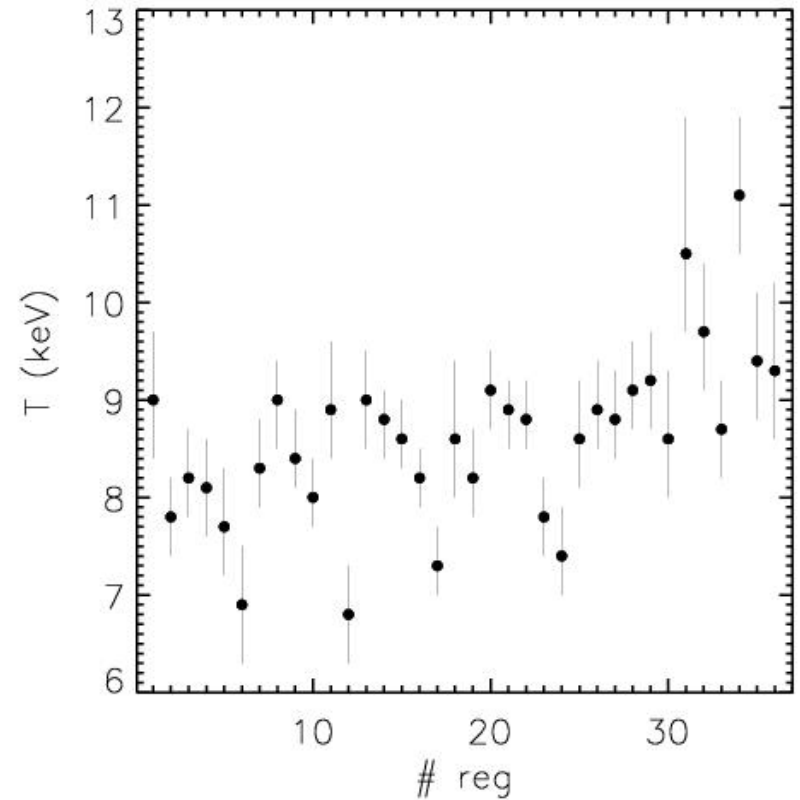
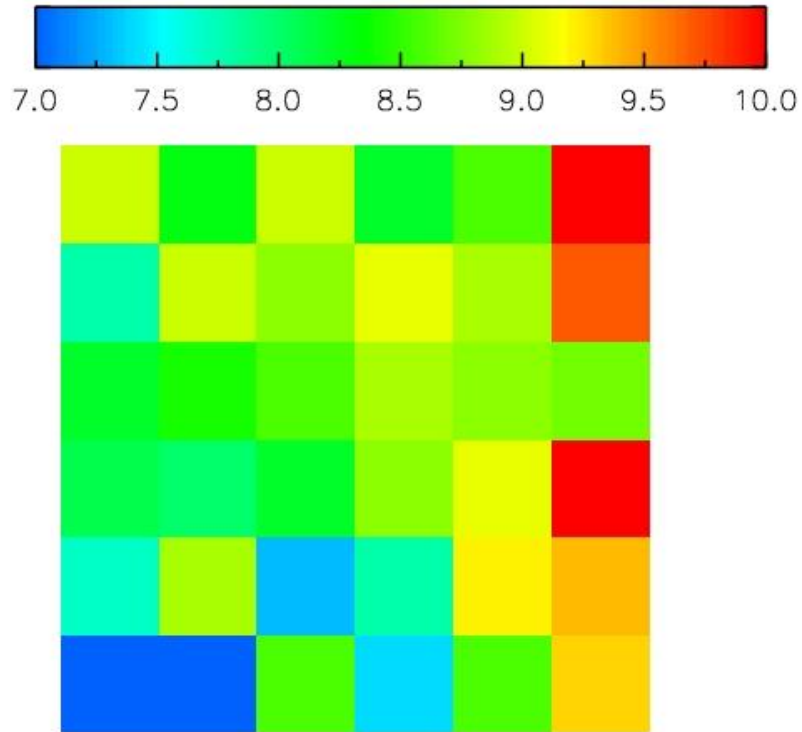


DET A 3-20 keV



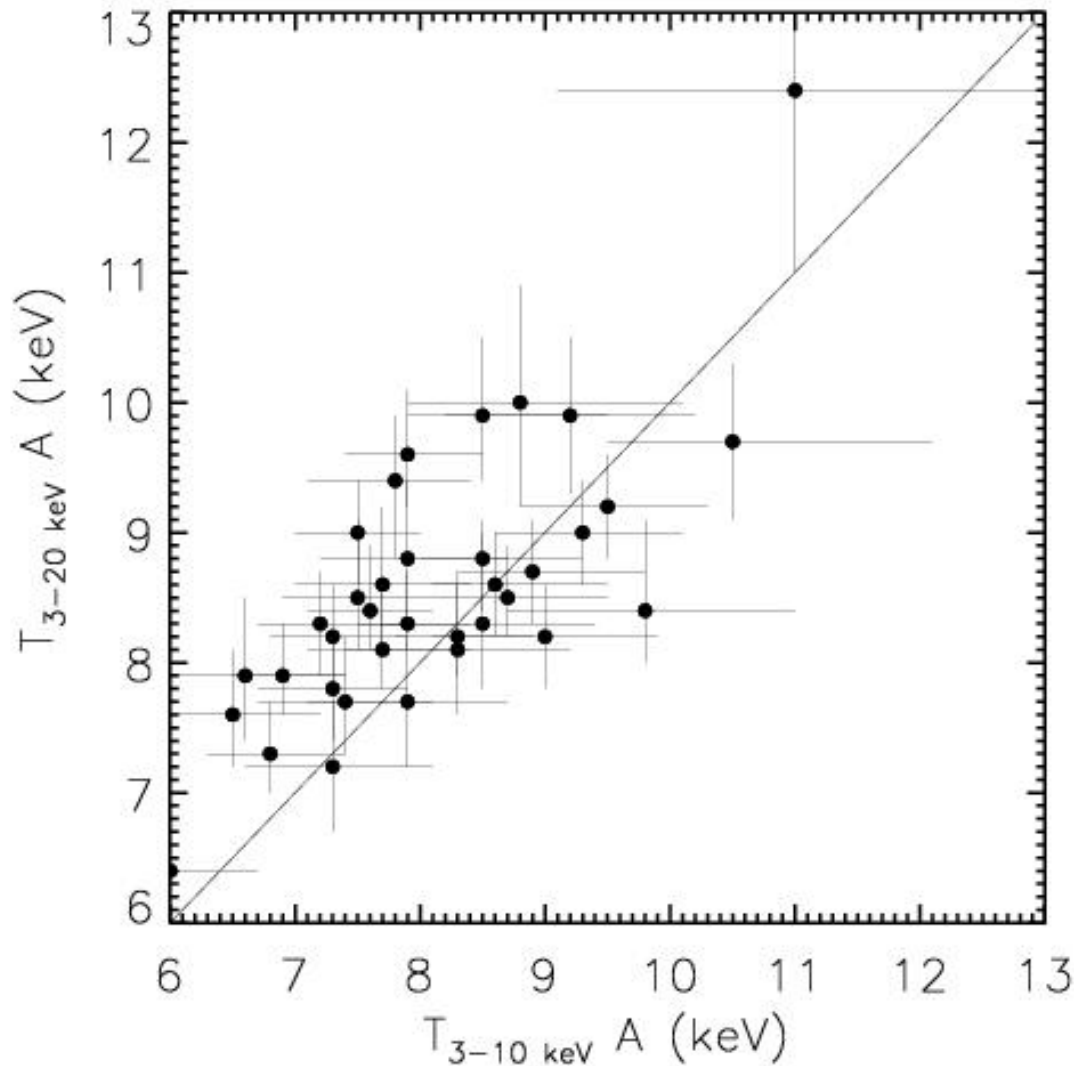
Error in T mean of 0.49 keV and stdev of 0.18 keV

DET B 3-20 keV



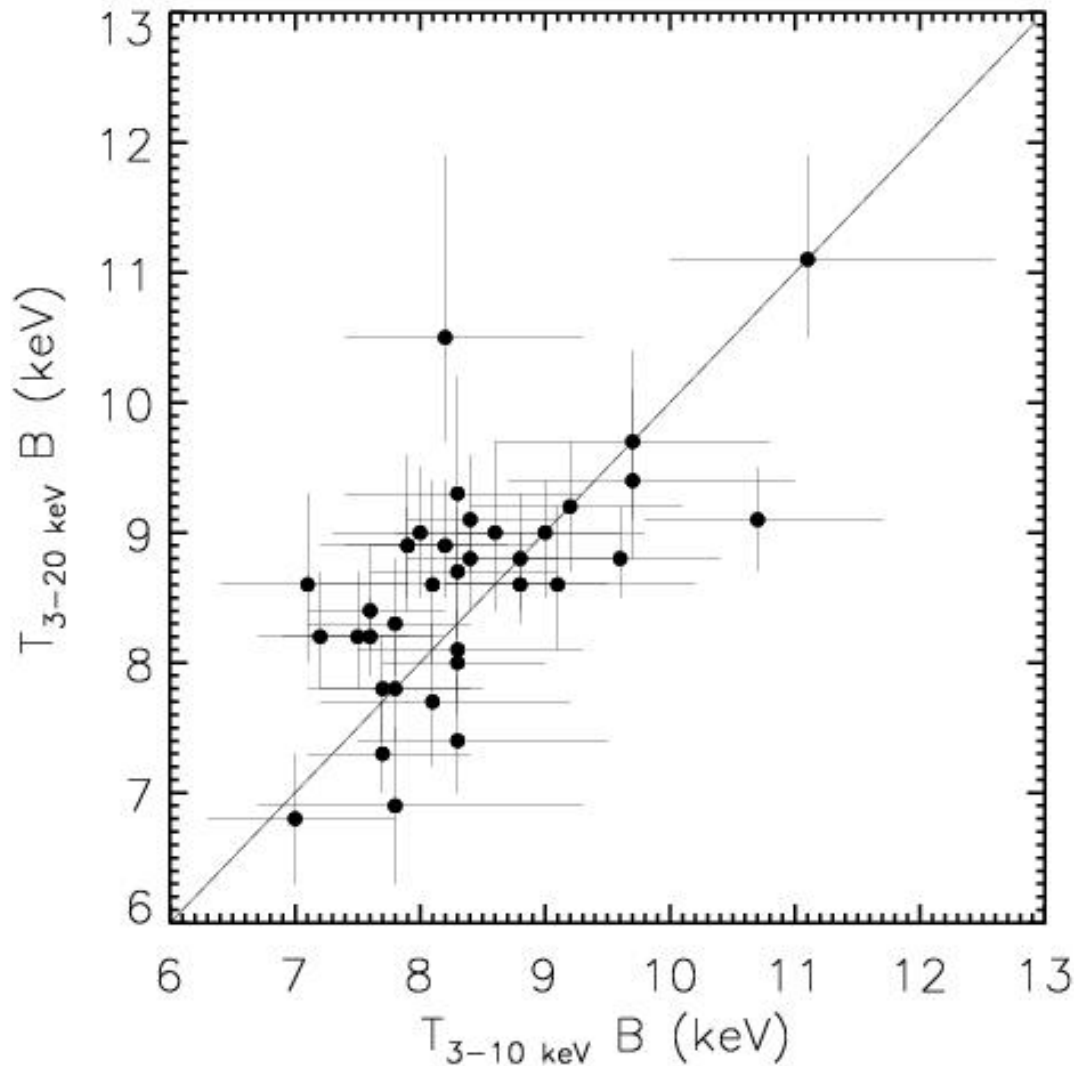
Error in T mean of 0.51 keV and stdev of 0.16 keV

COMPARISON T A 3-10 – 3-20 keV



Mean of the
ratio 3-20/3-10
1.062 with
stdev 0.092

COMPARISON T B 3-10 – 3-20 keV



CHECK WITH CHANDRA

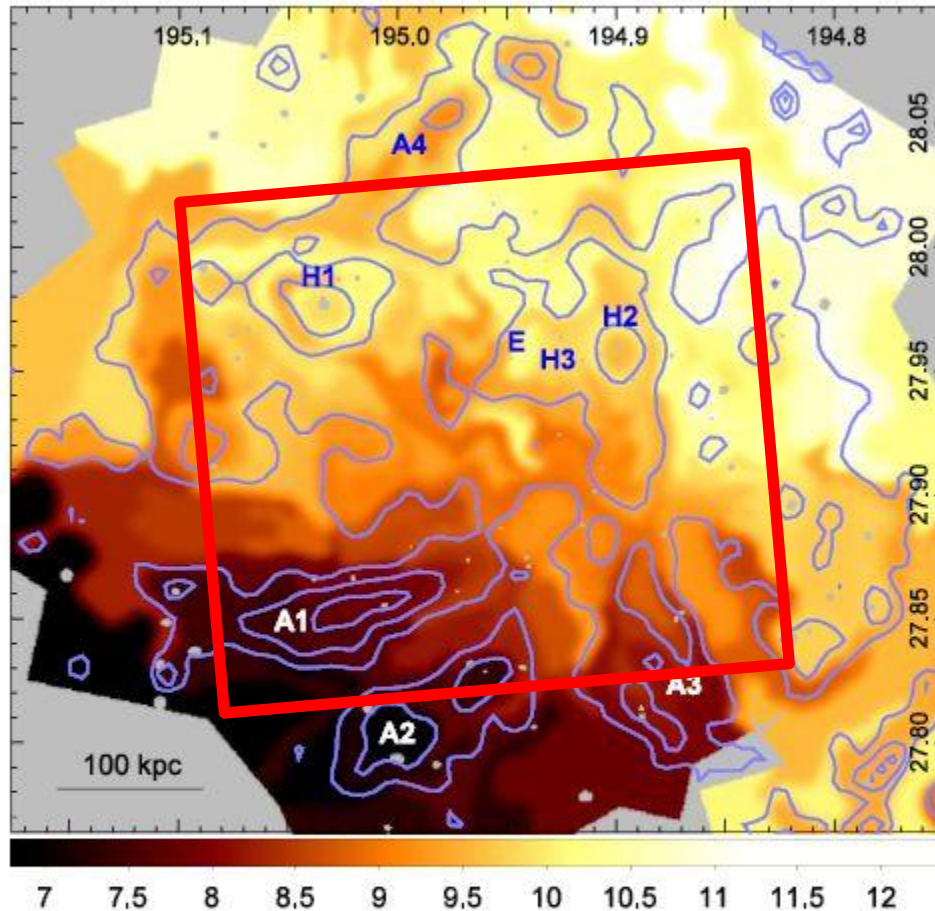
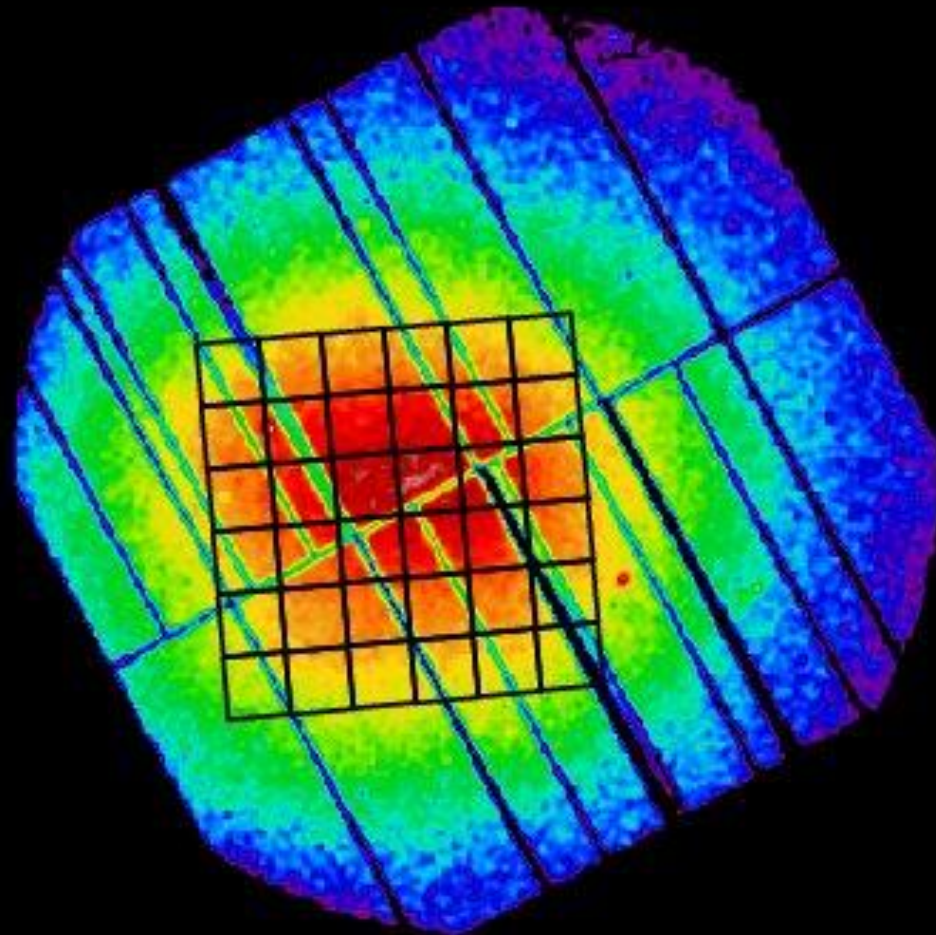


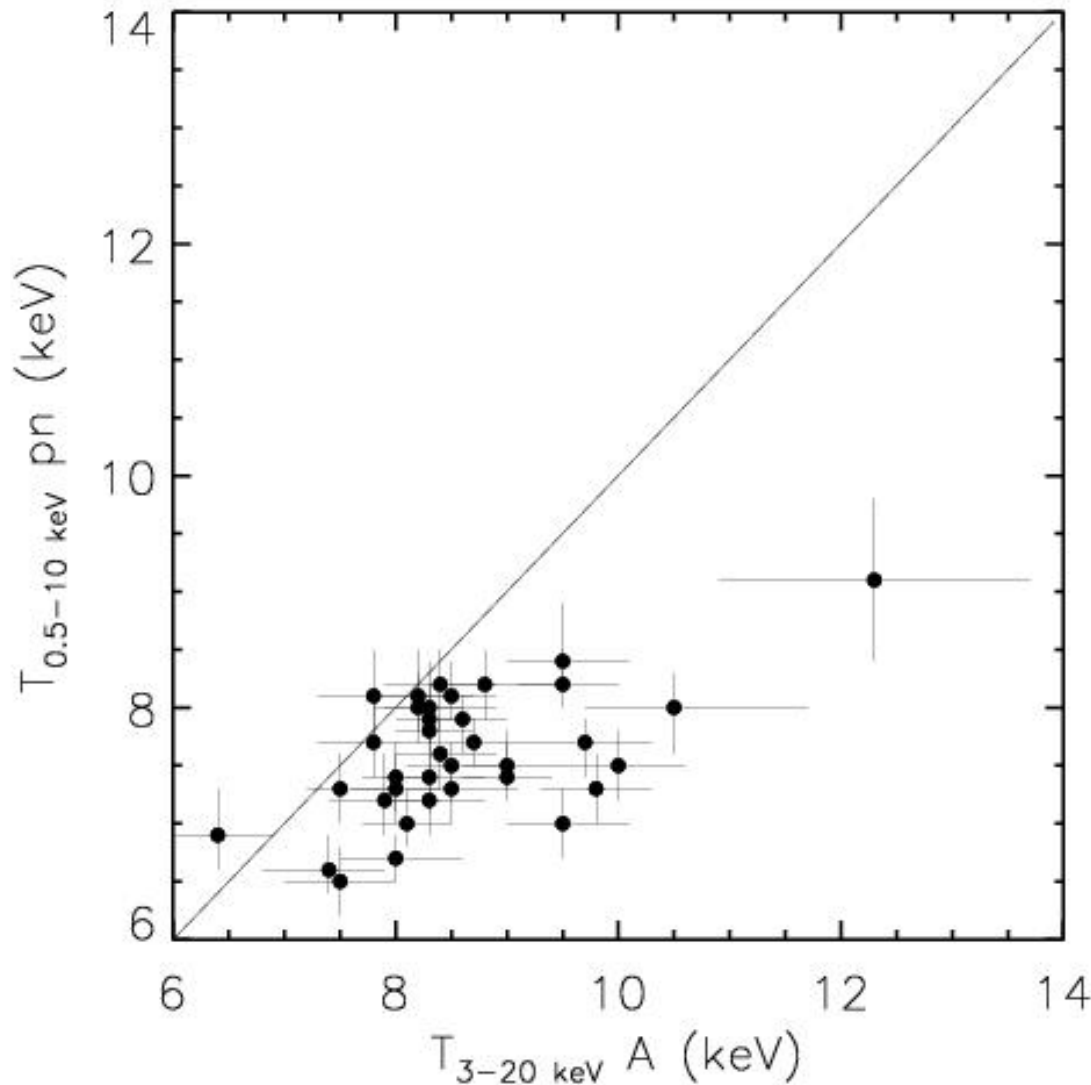
Fig. 3. Temperature map. Emission-weighted ICM temperature (keV), calculated by spectral fitting. The contours show lines of constant surface brightness enhancement in an unsharp-masked map with levels of 0, 3.5 and 7%.

SANDERS+13

COMPARISON WITH XMM pn

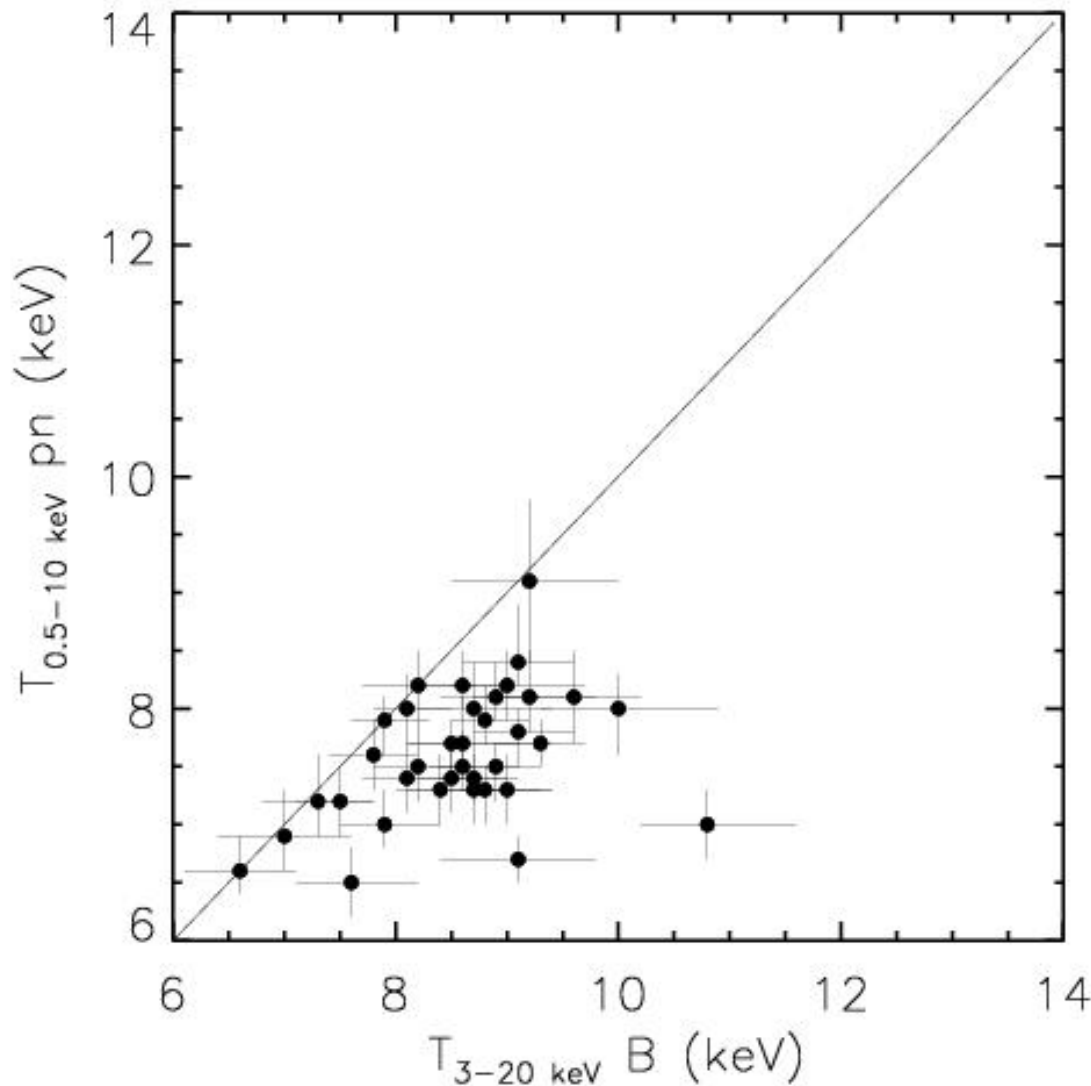


COMPARISON T A 3-20 keV-pn 0.5-10 keV



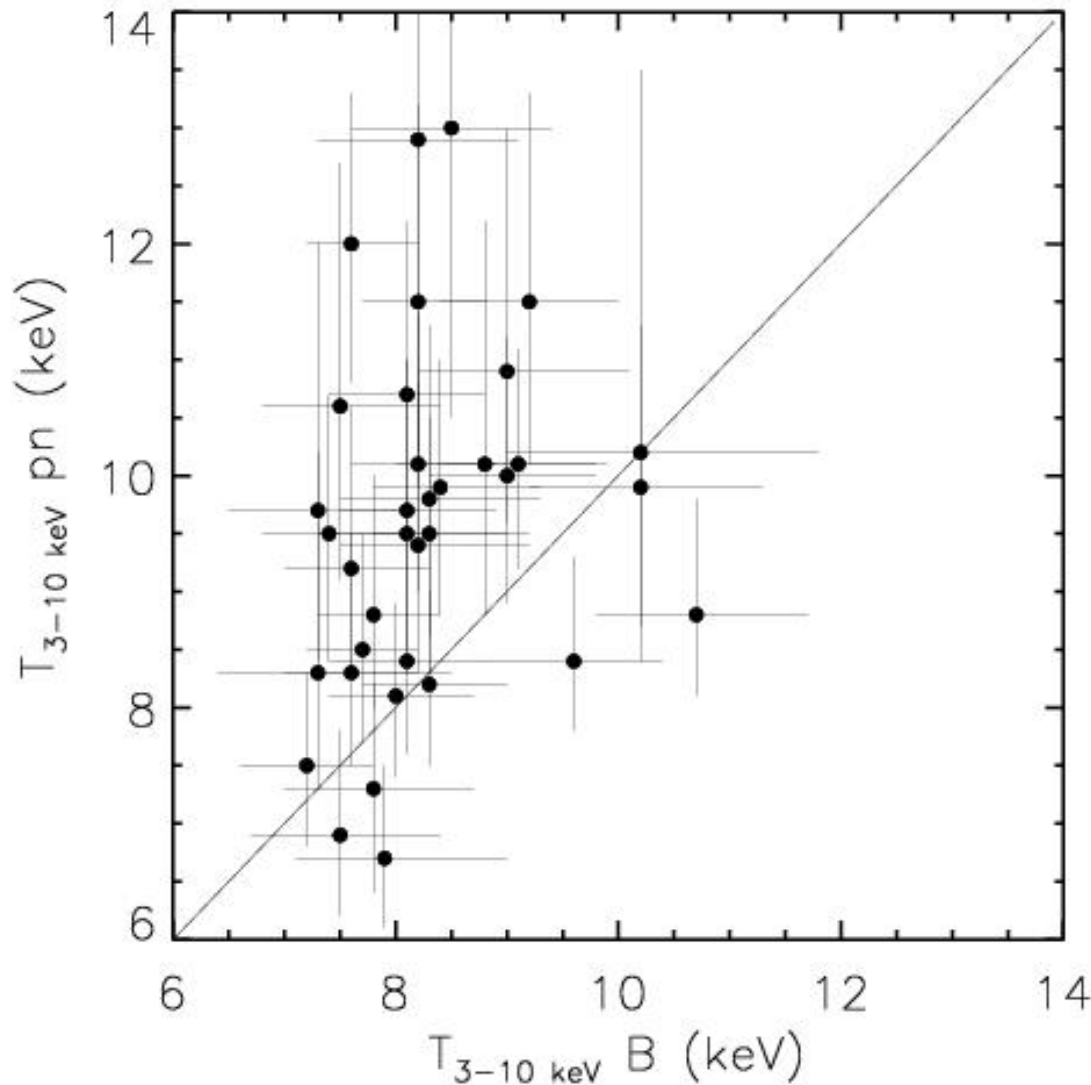
Mean of the
ratio pn/A
0.892 with
stdev 0.084

COMPARISON T B 3-20 keV-pn 0.5-10 keV



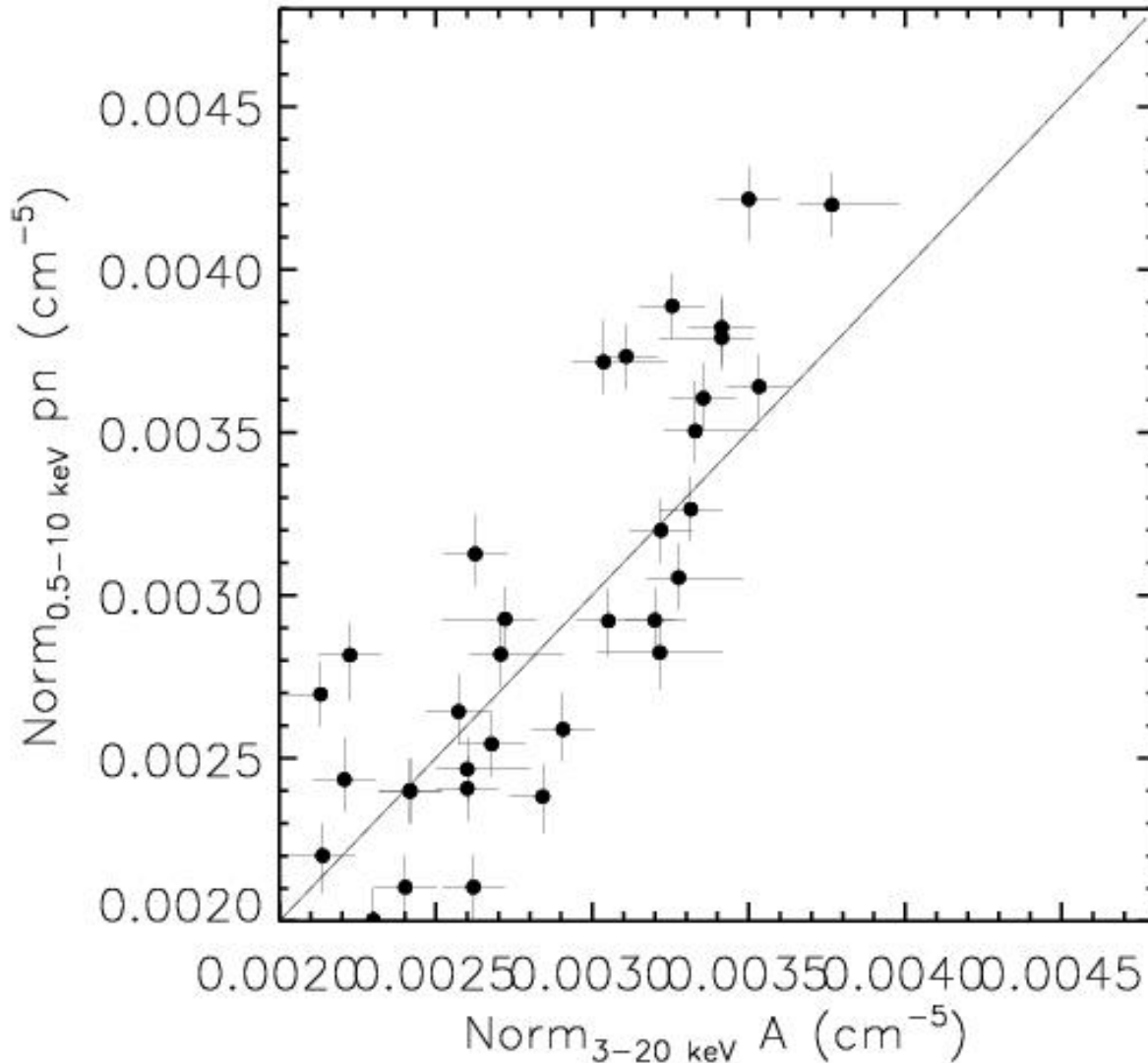
Mean of the
ratio pn/B
0.893 with
stdev 0.077

COMPARISON T B-pn 3-10 keV



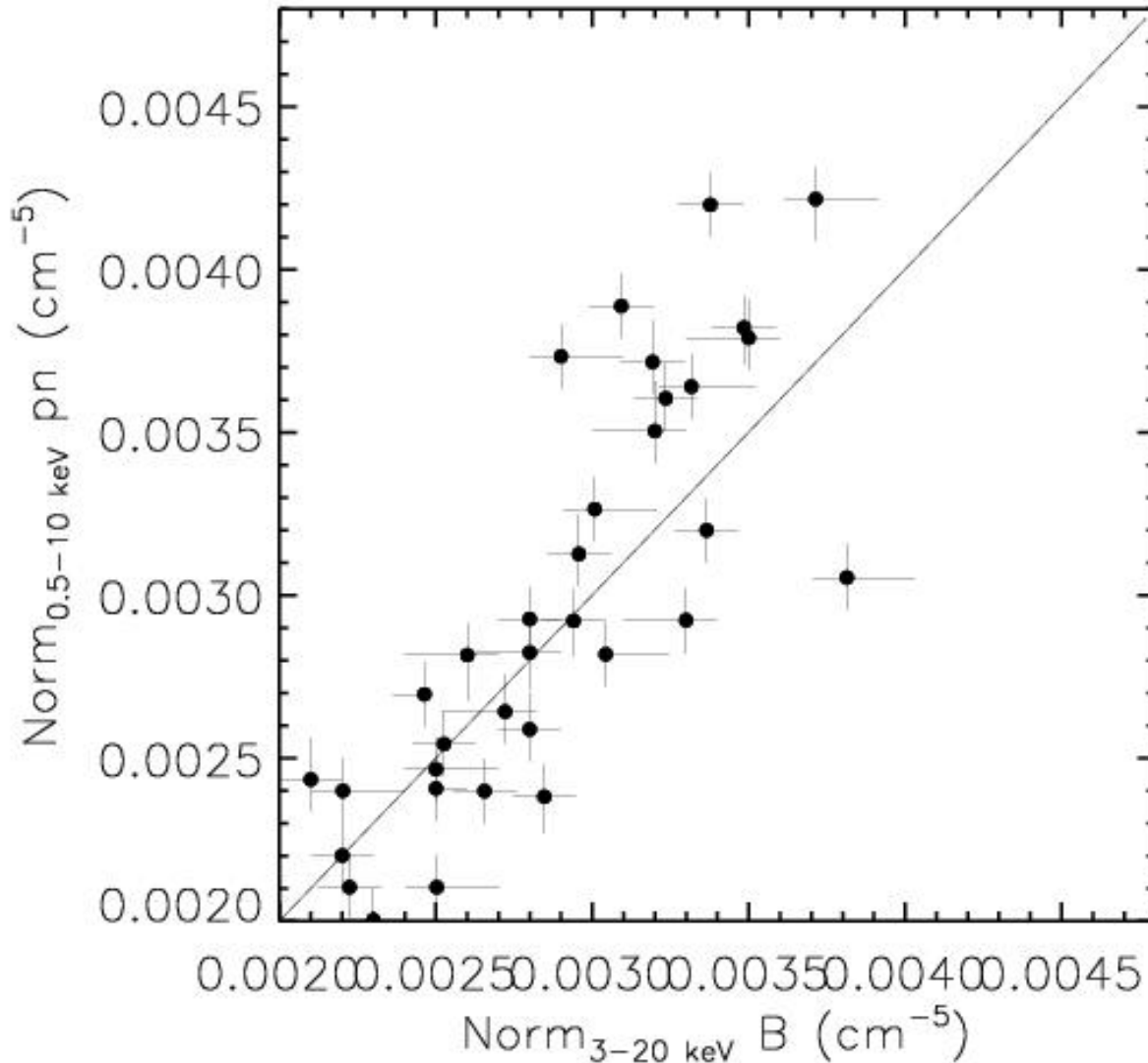
Mean of the
ratio pn/B
1.156 with
stdev 0.189

COMPARISON norm A 3-20 pn 0.5-10 keV



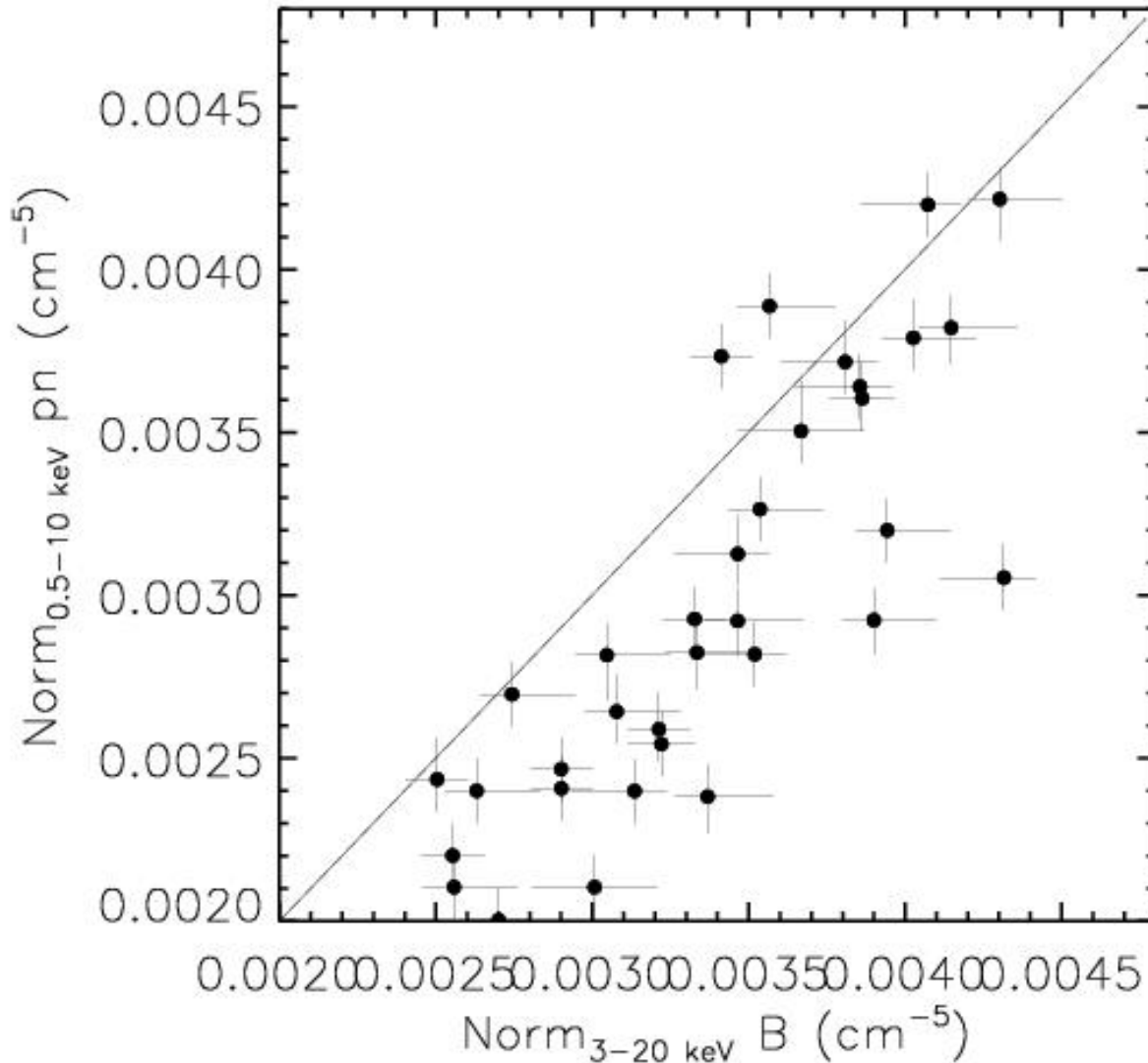
Mean of the
ratio A/pn
0.986 with
stdev 0.137

COMPARISON norm B 3-20 pn 0.5-10 keV



Mean of the
ratio B/pn
0.967 with
stdev 0.135

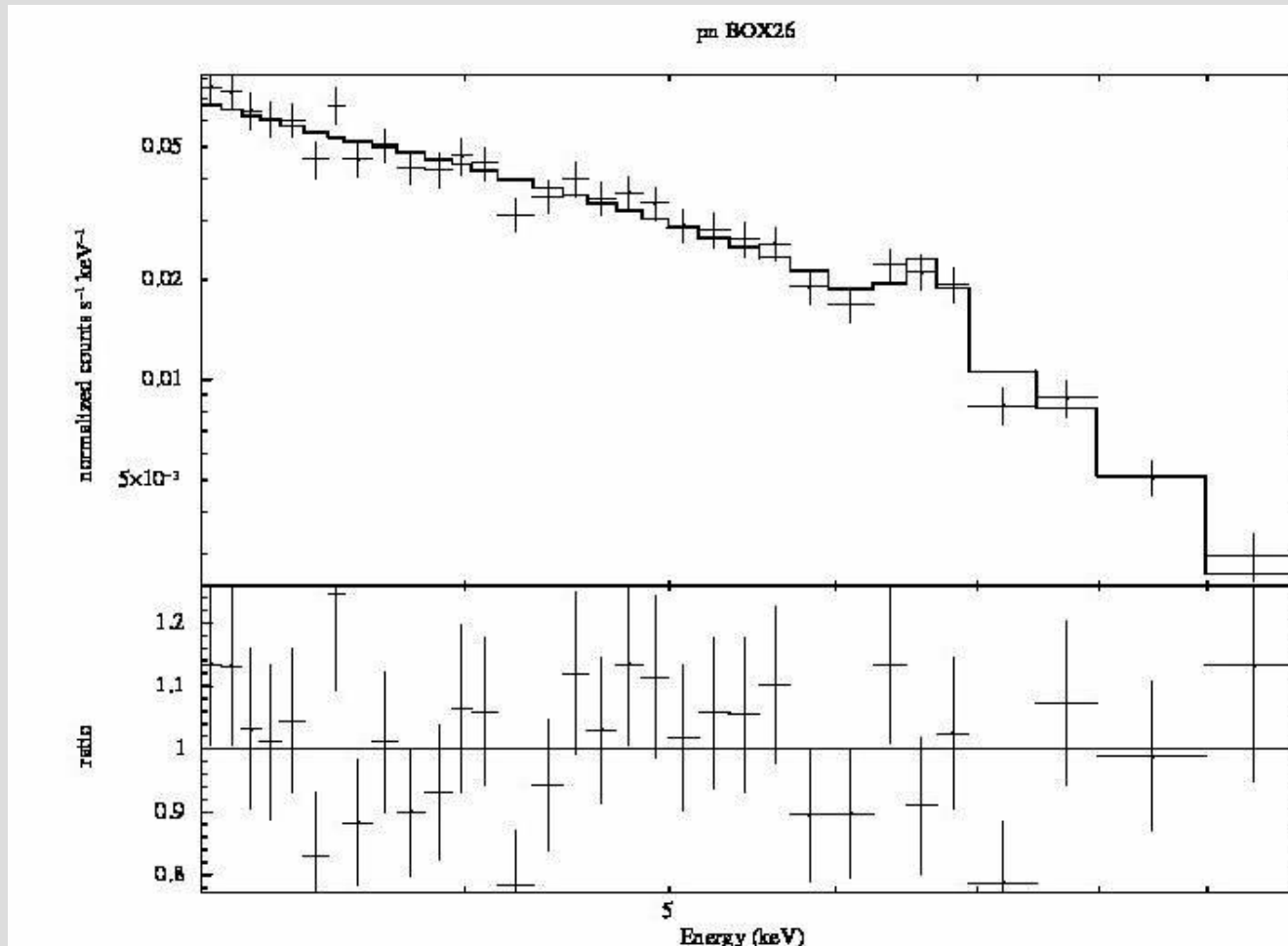
COMPARISON norm B 3-20 pn 0.5-10 keV



With nustardas
1.2.0 and caldb
20130509

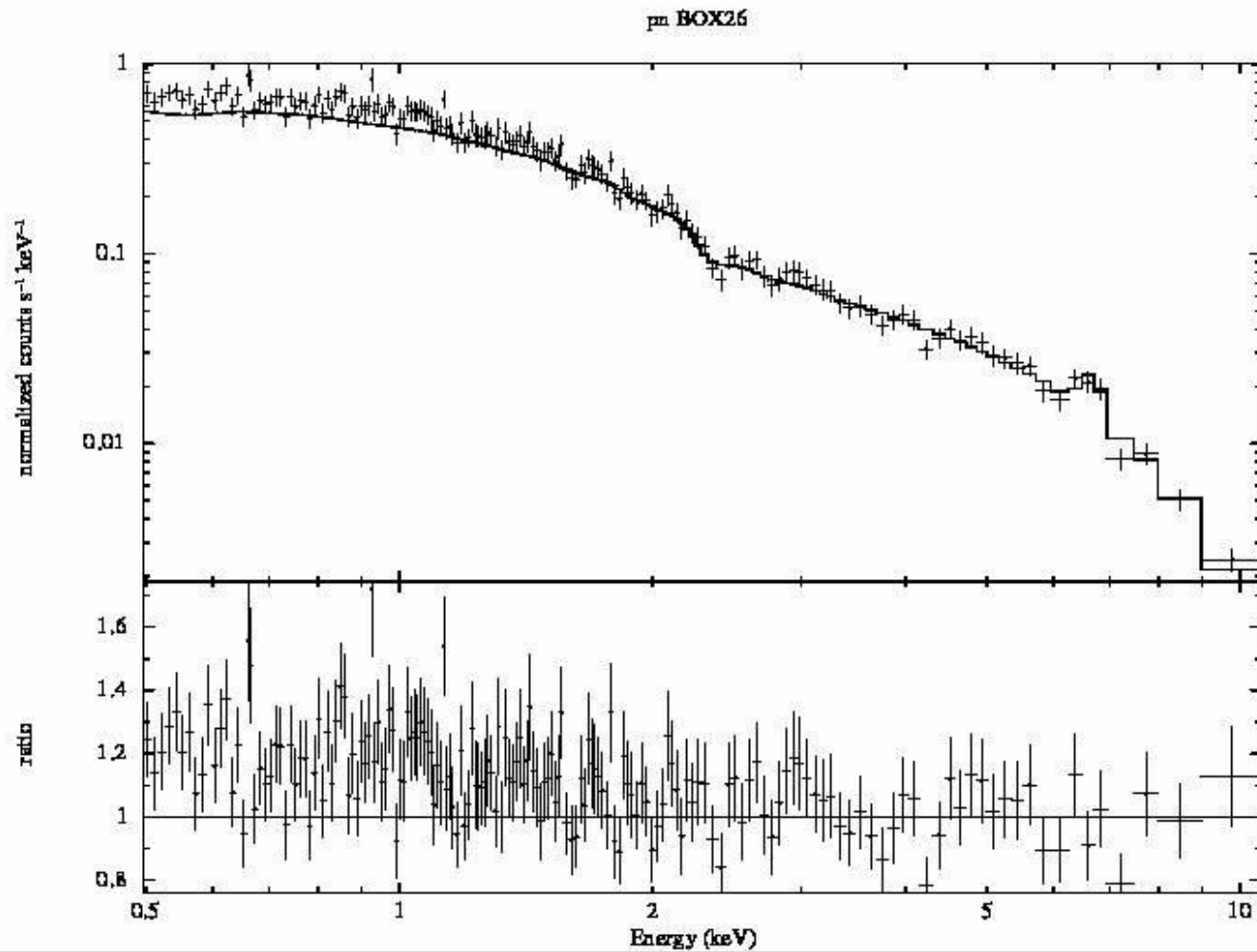
Mean of the
ratio B/pn
1.147 with
stdev 0.158

XMM pn BROADBAND FIT

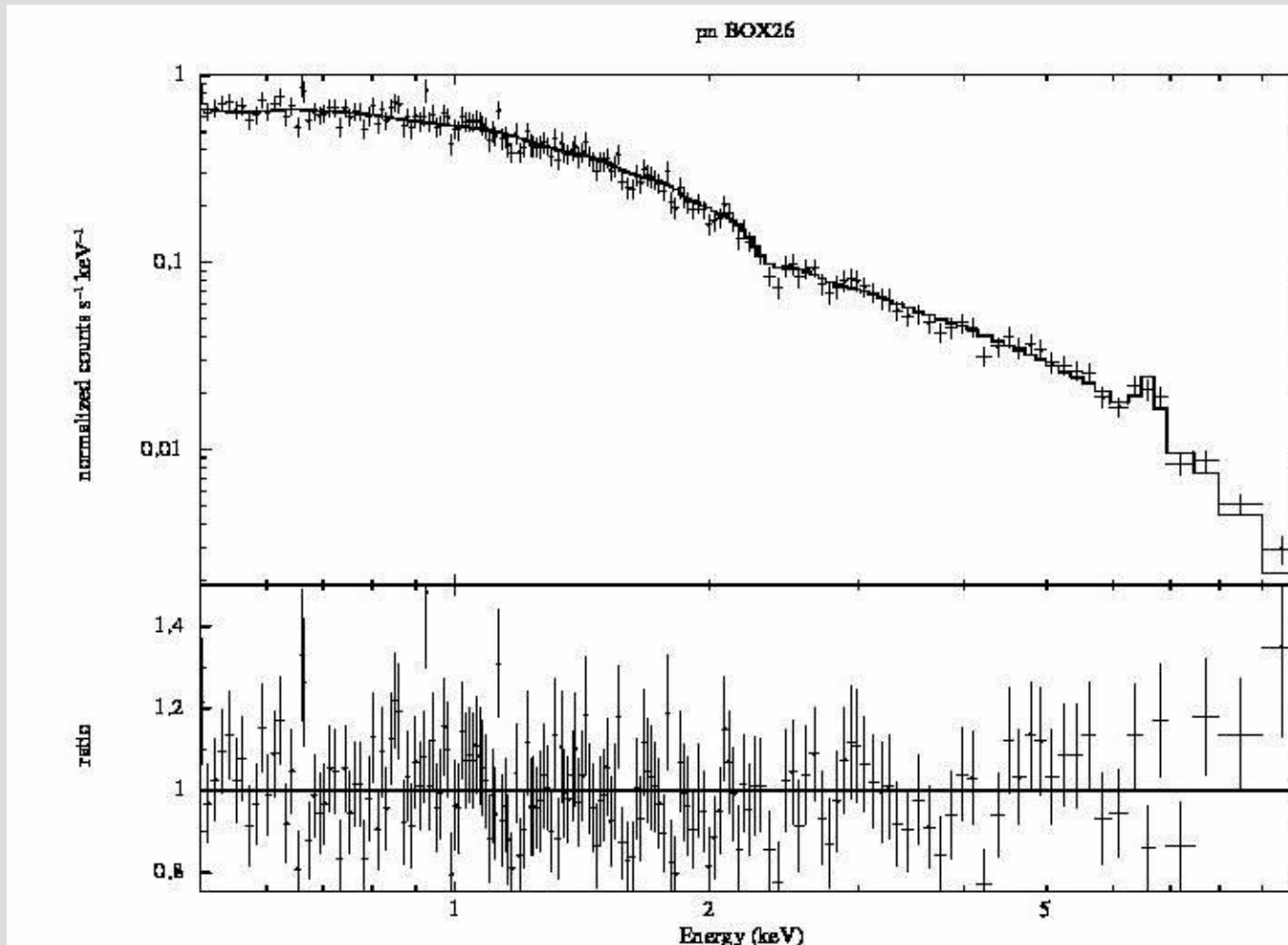


105/120 10.0 ± 1.1 norm 3.1 ± 0.1 E-03 3-10 keV

XMM pn BROADBAND FIT



XMM pn BROADBAND FIT



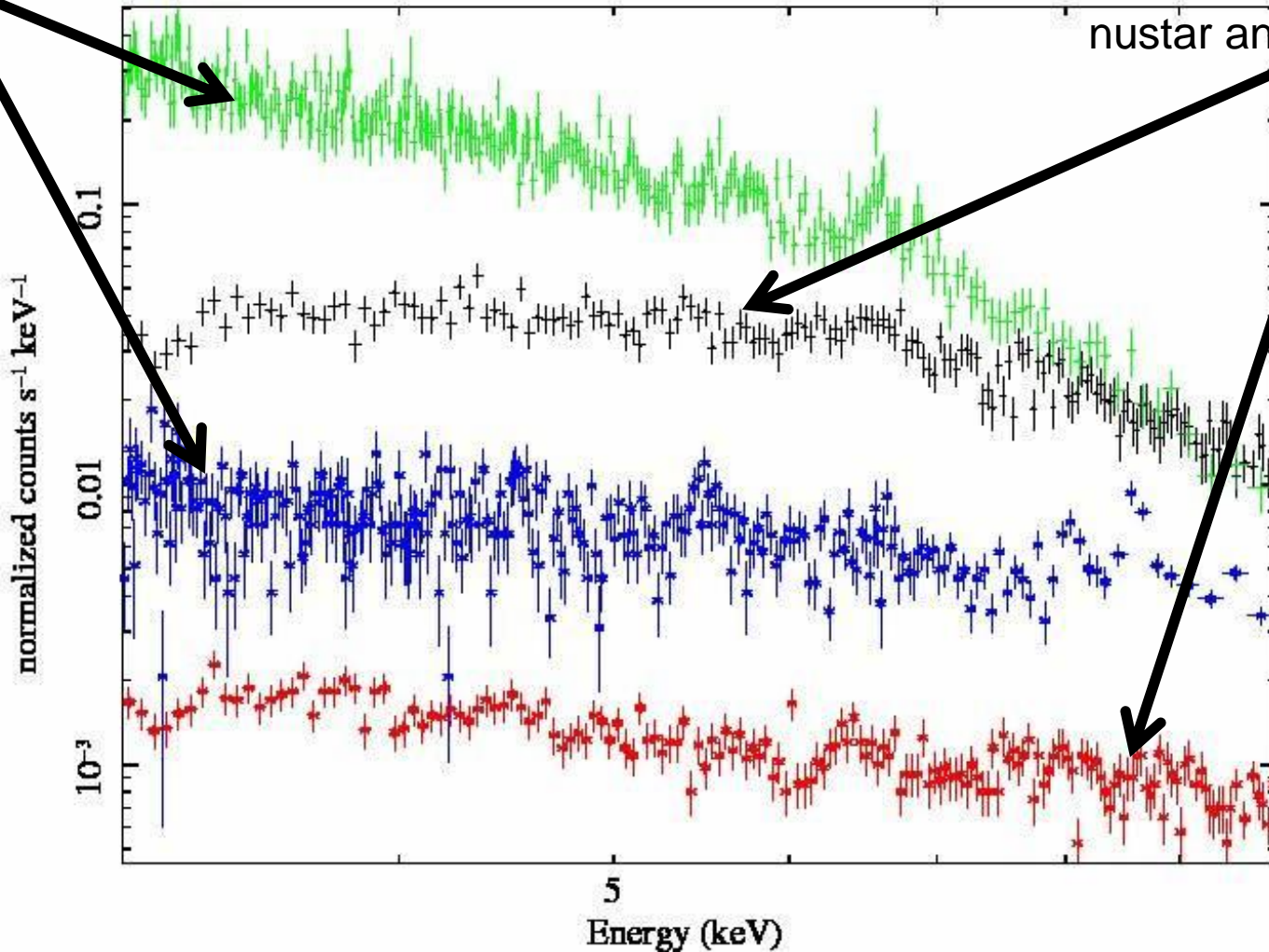
105/120 7.5 ± 0.3 norm $3.5 \pm 0.1 \text{ E-03}$ 0.5-10 keV

COMPARISON WITH XMM pn

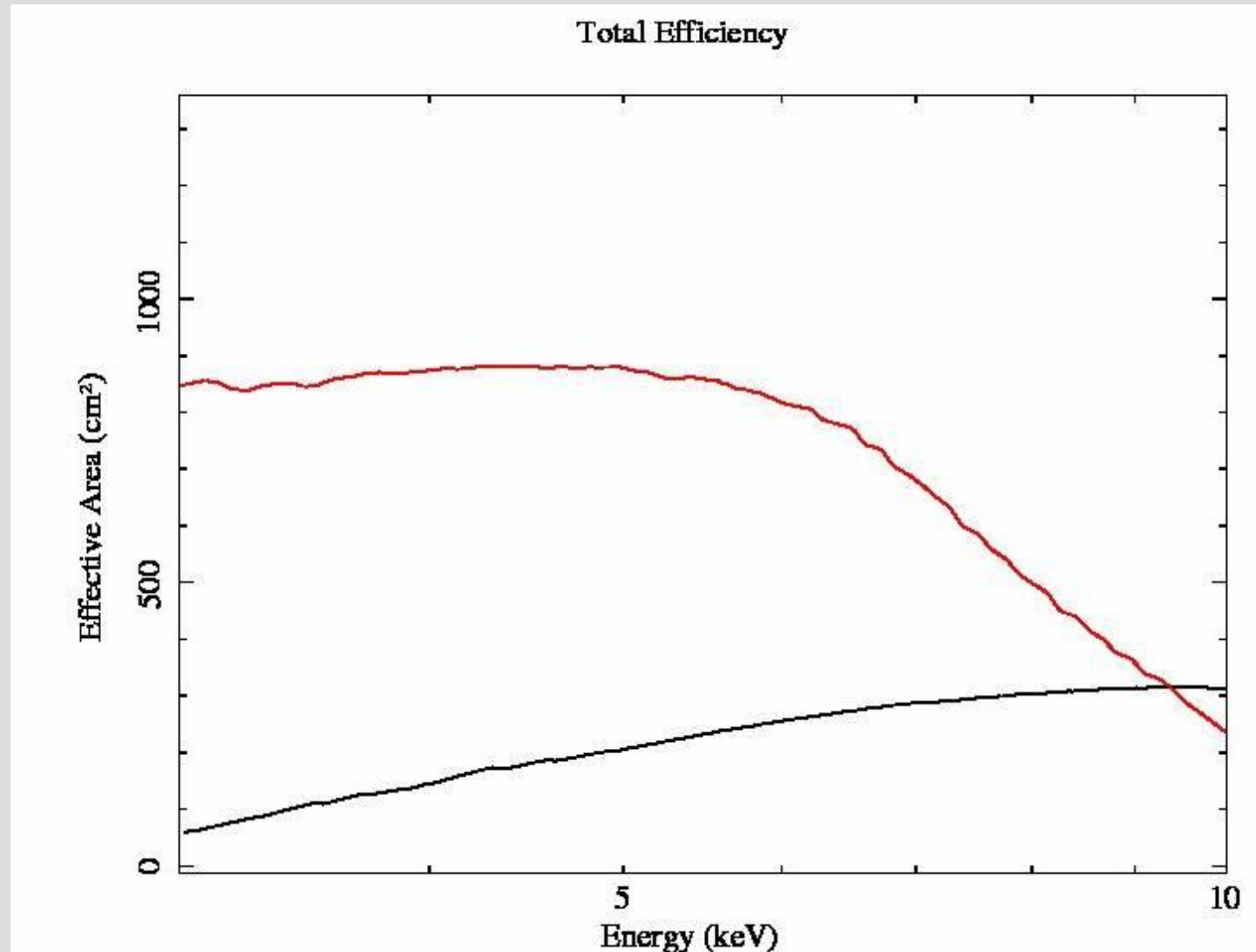
pn and its bkg

data

nustar and its bkg

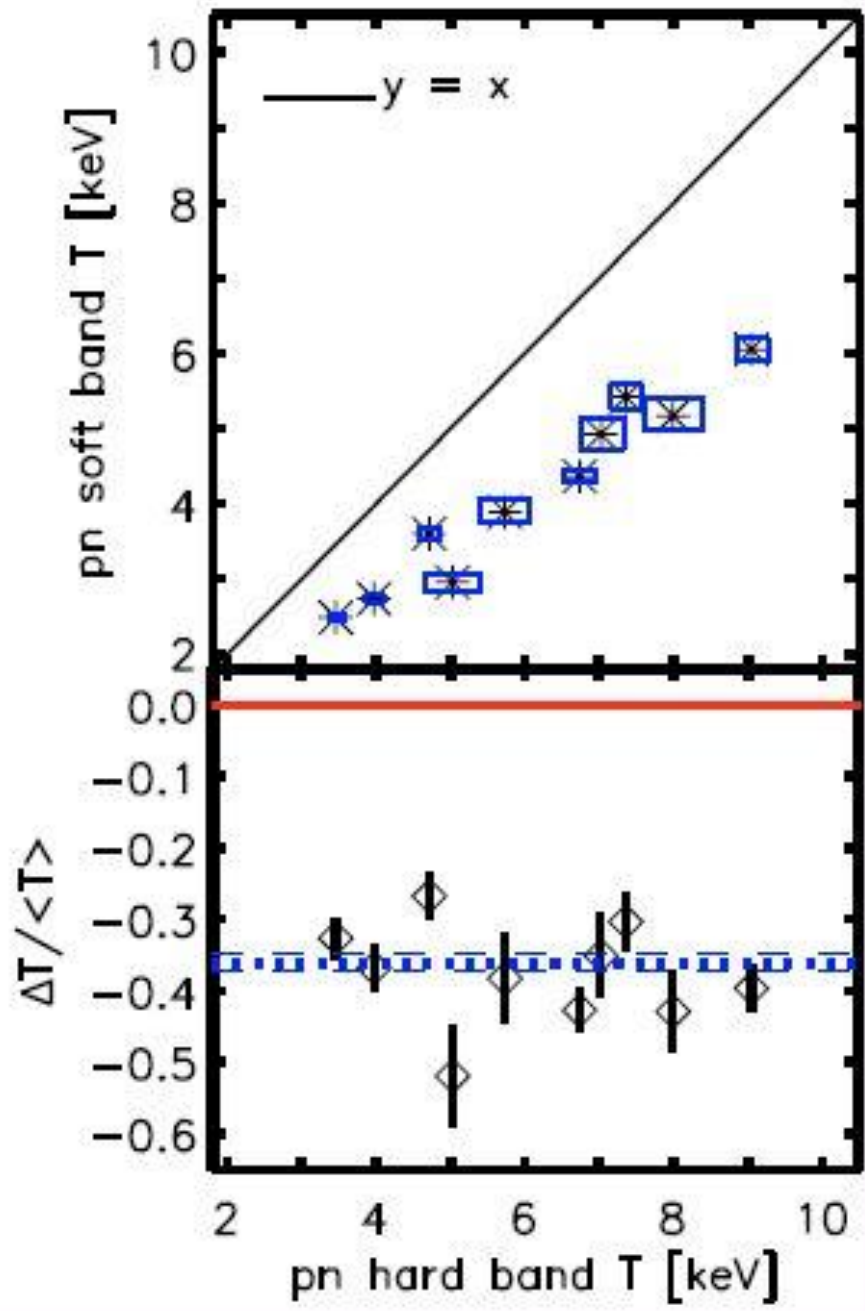


COMPARISON WITH XMM pn

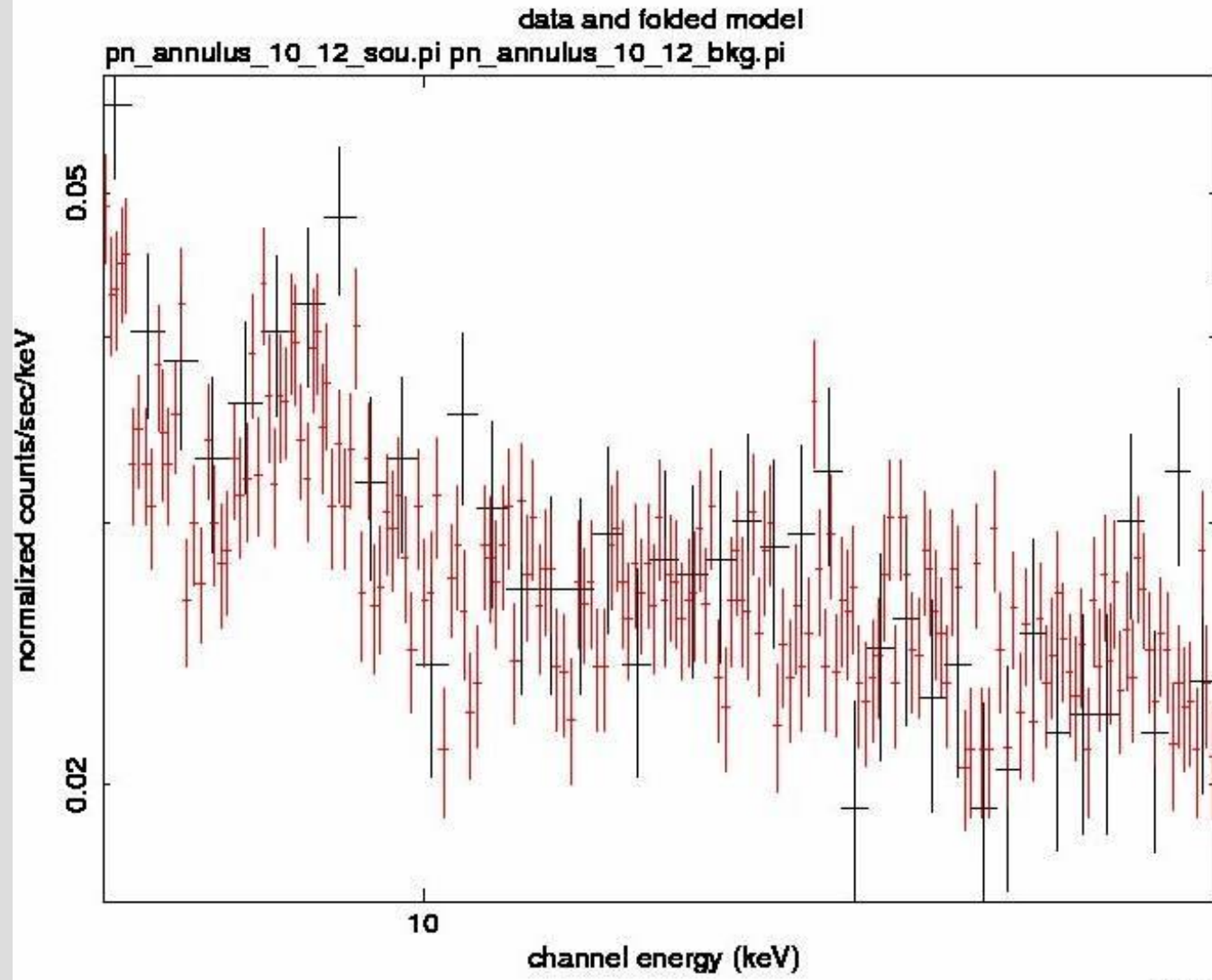


SUMMARY

- Nustar has the capabilities to constrain well hot thermal plasmas like the 8-9 keV emission in Coma
- Comparison with XMM pn still stresses the problems with cluster broad band fitting (Nevalainen+10)
- Future work: more XMM observations, fit in various energy band (2-7 keV), Fe line ratios



NEVALAINEN+10



greta 11-Jul-2013 14:58