Granada, May 2008
The X-ray Universe

Evolution of the Thermodynamical and Chemical properties of the IntraCluster Medium

with I. Balestra, S. Ettori, P. Rosati, S. Borgani, J. Santos, A. Bignamini, V. Mainieri, C. Norman

Paolo Tozzi Trieste
Fe line is detected in most of the $z>1$ X-ray clusters

RXJ1252, $z=1.235$

P. Rosati et al. 2004
We select from the Chandra archive 56 clusters at z>0.3 (among them 7 clusters at z>1)
Iron abundance vs redshift

Small effect of cooling cores. When does most of the evolution occur? Use of XMM data for 0.2<z<0.8

See also Maughan et al. 2008
Fe abundance evolution and S0 fraction evolution

Calura Matteucci & Tozzi 2007
Dynamical origin of the Fe abundance evolution
Investigating the Cool Core fraction in the distant Cluster population

A2163, z=0.2

Clone, z=0.7  Clone, z=1.0

V1221, z=0.7  CIJ1415, z=1.0

Santos et al. 2008
Characterization of a CC Cluster

- Central temperature decrease: $T_{\text{central}} \sim \frac{1}{3} T_{\text{average}}$
- Central Surface Brightness (SB) excess
- Cooling time, $t_{\text{cool}}$: shorter than Hubble Time

\[ t_{\text{cool}} \propto C_{SB}^{-0.93} \]

Santos et al. 2008
Searching for cool cores in high-z clusters

Stacked Scaled Surface Brightness profiles: self similar scaling
X-ray properties of distant optically selected clusters (RCS)

Bignamini et al. 2008
No cool cores in RCS (optically selected) Clusters
The future of X-ray surveys
WFXT
psf 5''
FOV 1 sq deg

C. Norman, R. Giacconi, A. Ptak,
P. Rosati, R. Gilli, S. Borgani,
M. Paolillo, P.T., S. Allen +...
Summary

Evidence of evolution in the average Fe abundance, a factor of 2 from $z \sim 0.5$ to $z=0$. ICM was already substantially enriched at $z>1$. This evolution can be explained by the sink of low entropy, high-metallicity gas associated with small halos and/or galaxies.

Surface Brightness analysis: $C_{SB} + t_{cool}$ stacked SB profiles indicate a significant fraction of moderate CC @ $z=[0.7-1.4]$
Absence of pronounced CC at high-z
Absence of pronounced CC in optical selected high-z cluster.

To capitalize what we have learned so far with Chandra and XMM we must have soon a mission devoted to a wide area deep survey with a good spatial resolution $\sim 5''$ like WFXT. The technological challenge for the mirrors is crucial.