Towards combined analysis of the most distant massive galaxy clusters with XMM and Chandra

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XMM-Newton: the next decade
Why this region?

High z: comparison with local sample

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- High Mass: N(M) sensitive to high mass objects
- Gravitationally dominated clusters

-cosmology
- evolution of gravitational processes

Our sample

Chandra and XMM combination

Results and future prospects

Our sample

M_{500}^{yz} [10^{14} M_\odot] vs Redshift

- ESZ/PSZ1/PSZ2
- SPT

XMM LP (PI M. Arnaud) complemented with Chandra LP (PI P. Mazzotta) and archive
Observational challenges

X-ray observations of high Z clusters suffer from:

Cosmological dimming

$$S_x \propto (1 + z)^{-4}$$

Chandra

SPT-CLJ2146-4632  @z~1

Chandra

MS1455.0+223  @z~0.26
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\( \text{Chandra} \)

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\( \text{XMM-Newton} \)

bigger effective area...

...but AGN confusion problem
**Chandra and XMM combination: imaging**

What do we gain for the imaging?

We gain:

- Information on large scale structure
- Presence of substructures
- Characterization of the core, choose of the center
Chandra and XMM combination: imaging

What do we gain for the imaging?
What do we gain for the imaging?

XMM-Newton and Chandra combination is fundamental to investigate morphological status and XMM PSF is sufficient for \( <w> \).
Chandra and XMM combination: 1D

With Chandra we probe the core @ R<0.1R500

With XMM-Newton we probe the outskirts @ R~R500
Profiles are consistent! No PSF issues so…
We combine the profiles fitting simultaneously a parametric profile

Vikhlinin et al 2006
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Combination of Chandra and XMM-Newton is fundamental to efficiently probe the core and the outskirts

We combine the profiles fitting simultaneously a parametric profile
Hints of evolution? Taking as reference the REXCESS sample

No clear signs of evolution for $n_e$. Deviations due to dynamical status
Hints of evolution? Taking as reference the REXCESS sample


Entropy profiles are, on average, lower than local sample at $R \sim R_{500}$

Results and future prospects

Same behavior in the K-M plane at high $R$
Future prospects

We presented a new method to efficiently analyse high redshift clusters. Science coming in! BUT we need to populate the sample and apply the same strategy to spectroscopic analysis.

Combination of XMM-Newton deep observations and shorter Chandra brings fundamental information...

...working on combining also spectroscopic information, i.e. temperature profiles!

Martino et al (2014)
Thank you!