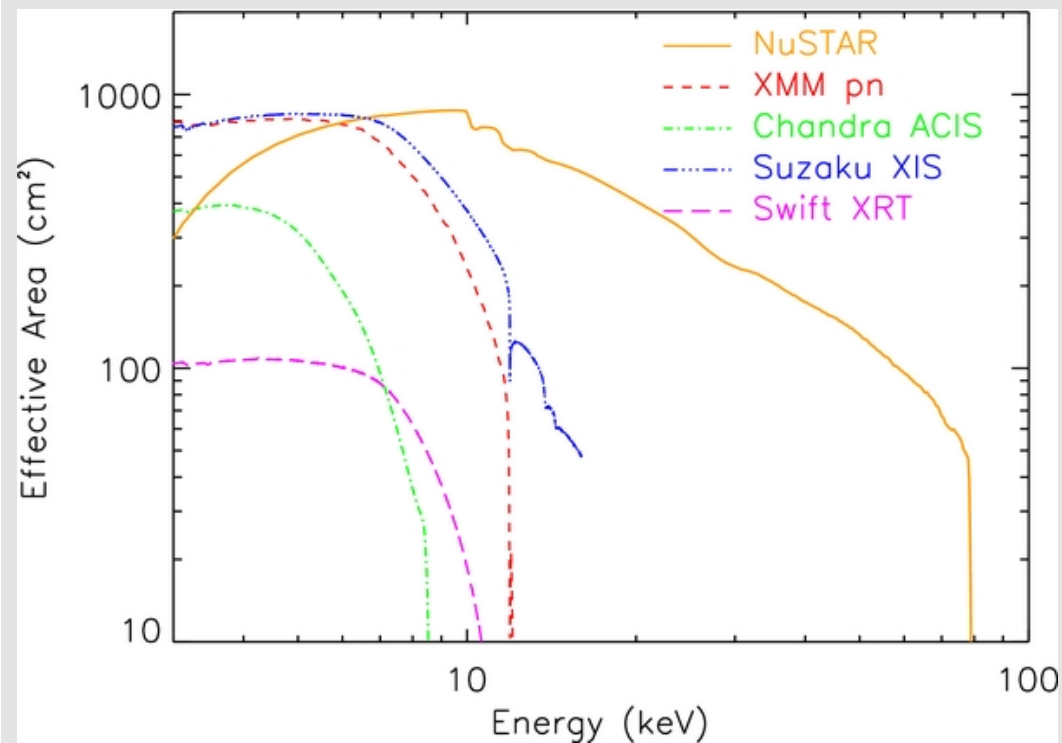
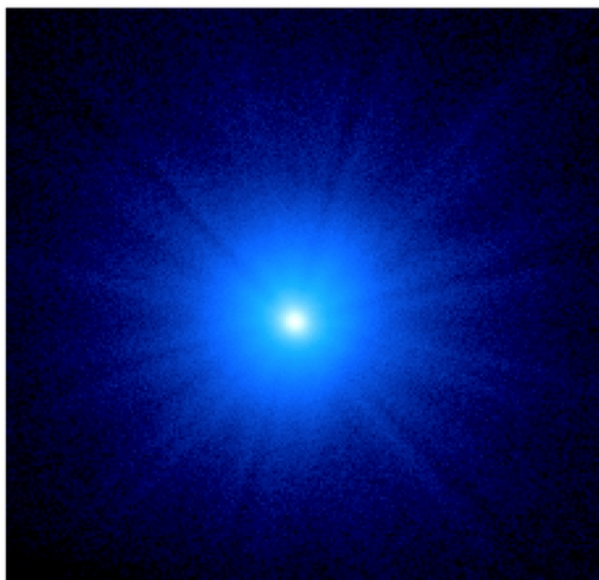
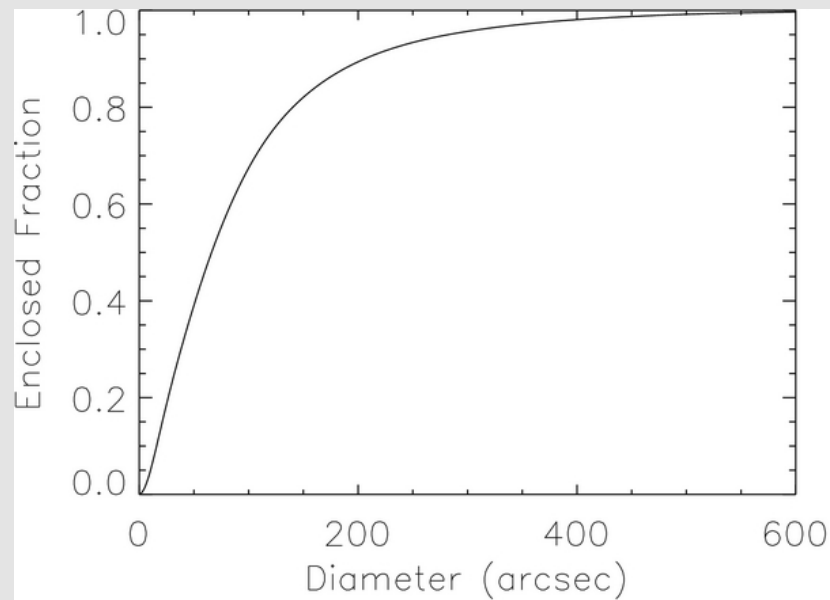


NuSTAR OBSERVATIONS OF GALAXY CLUSTERS: SEARCH FOR IC EMISSION AND HIGH T REGIONS

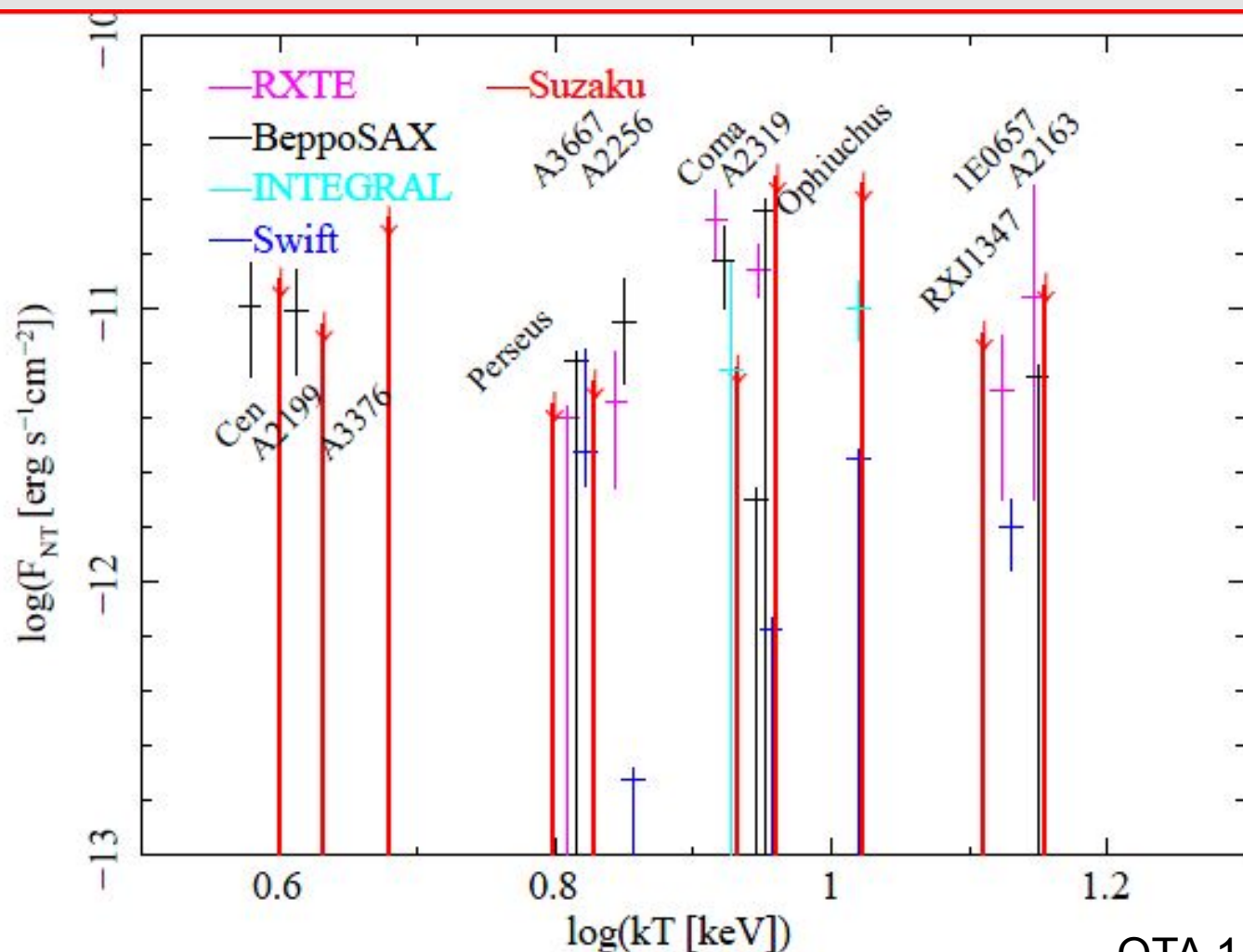
**F. Gastaldello, The Galaxy Clusters NuSTAR Team
(D. Wik), S. Molendi**

**R. Barrena, W. Boschin, A. Botteon, G. Brunetti,
S. De Grandi, D. Eckert, S. Ettori, L. Feretti,
S. Ghizzardi, G. Giovannini, M. Girardi, F. Govoni,
M. Murgia, M. Rossetti, T. Venturi**

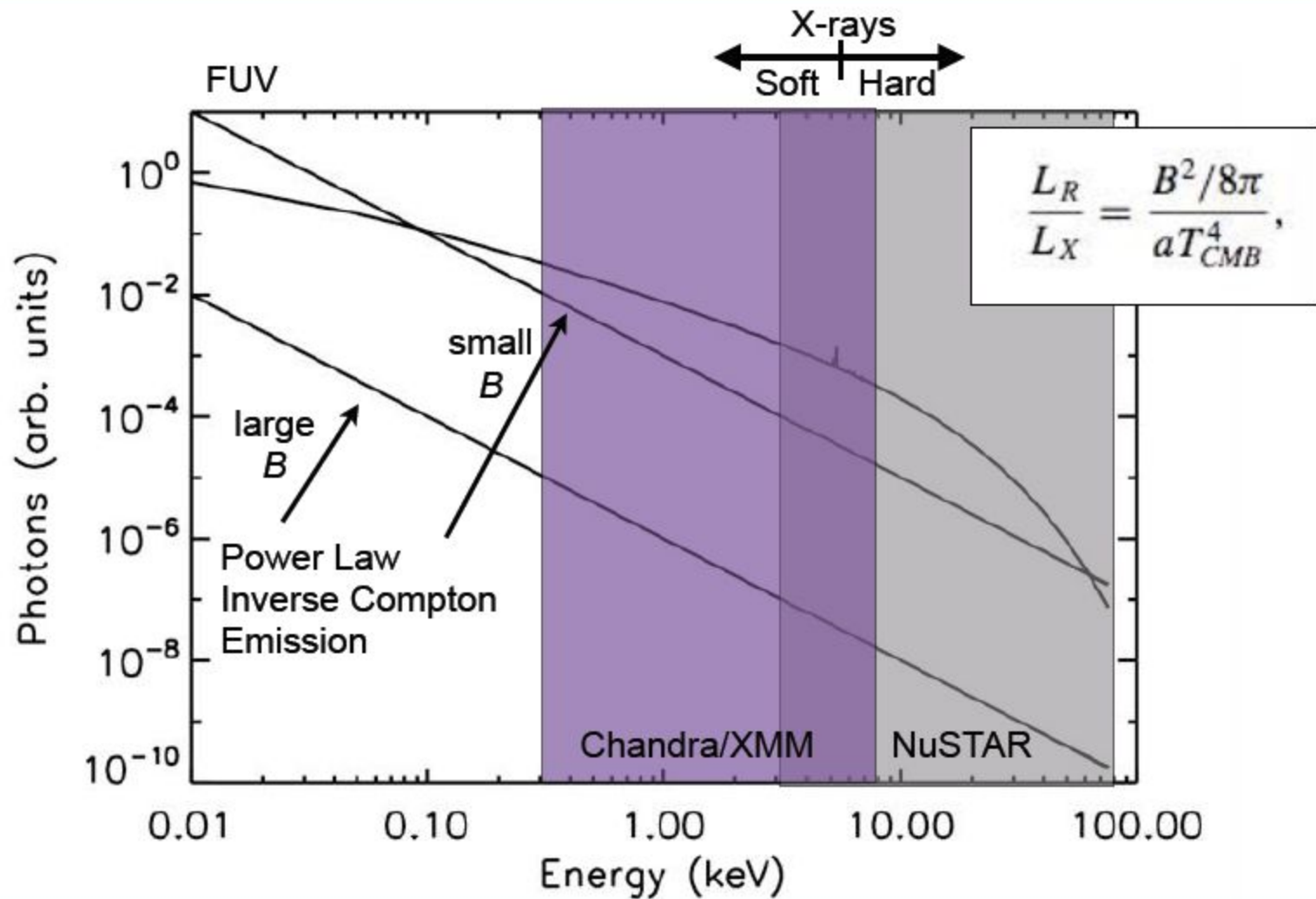
THE NuSTAR SATELLITE



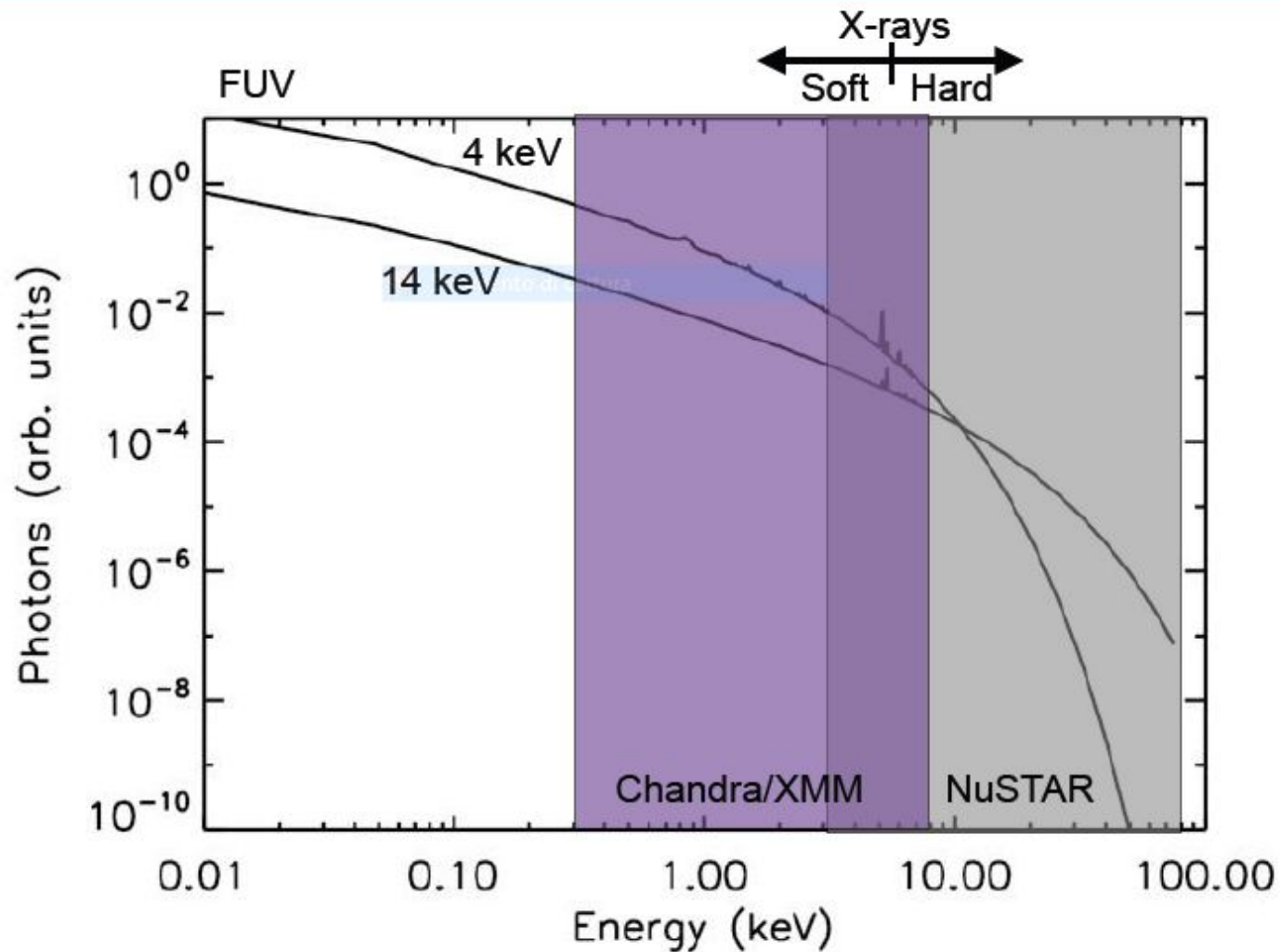
IC IN GALAXY CLUSTERS



IC IN GALAXY CLUSTERS

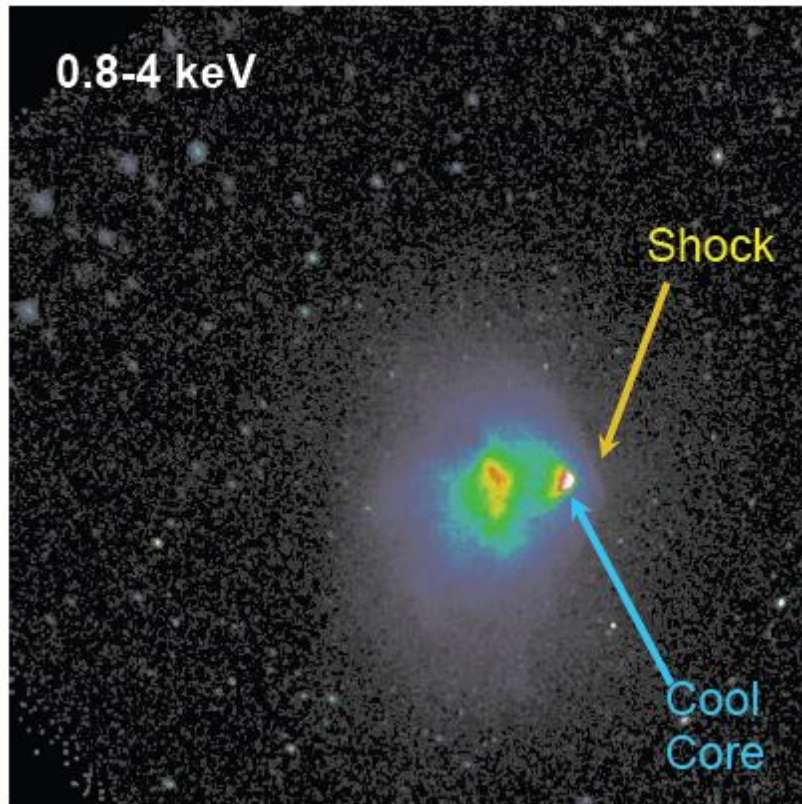


VERY HOT GAS IN GALAXY CLUSTERS



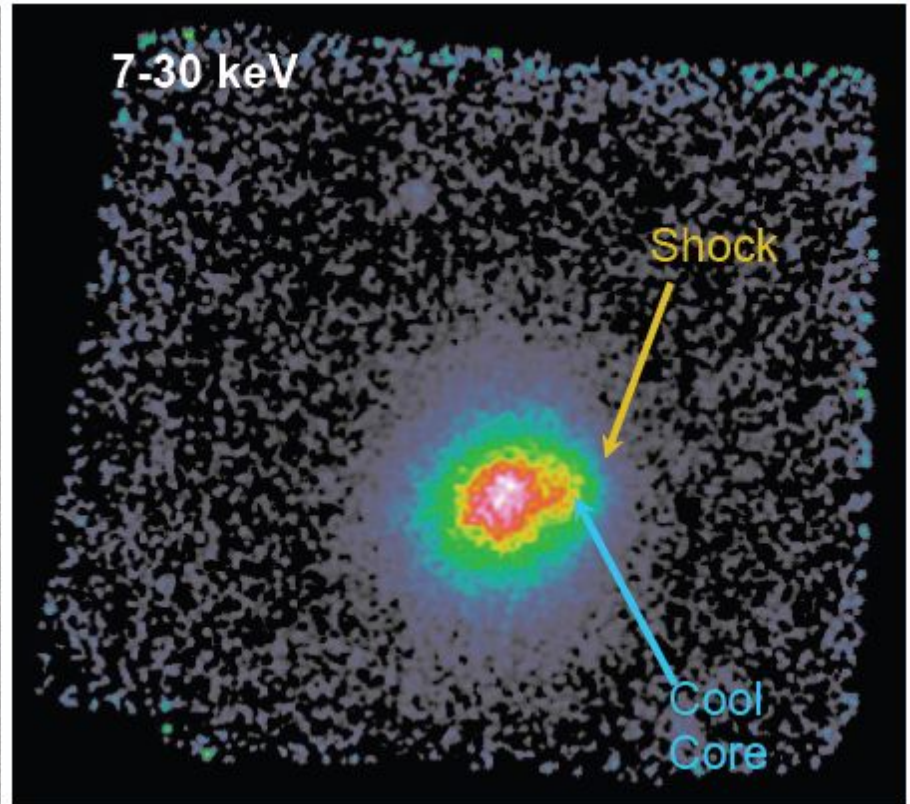
NuSTAR VIEW OF THE BULLET

Chandra ACIS
~500 ks

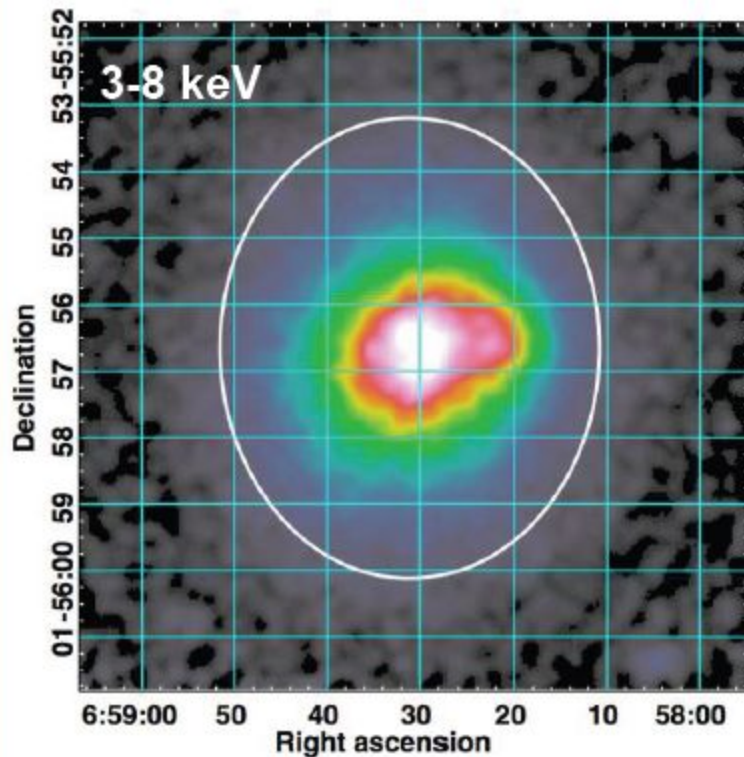


courtesy M. Markevitch

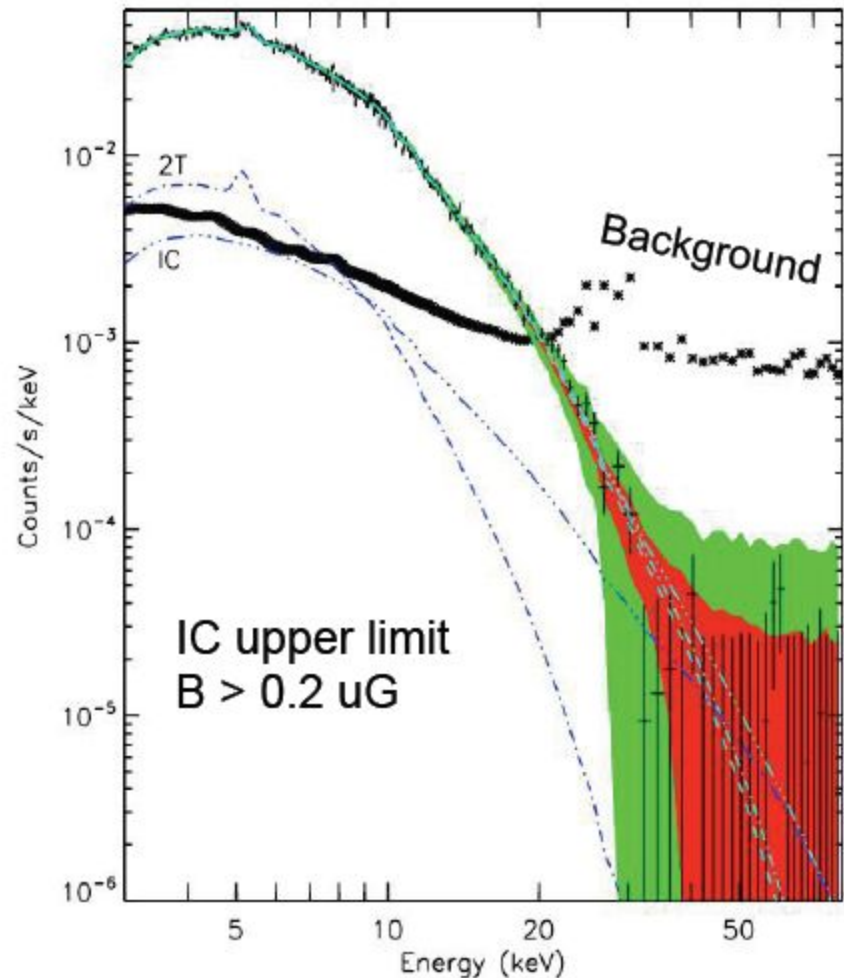
NuSTAR
266 ks (FPMA+FPMB)



NuSTAR VIEW OF THE BULLET: NO IC DETECTION

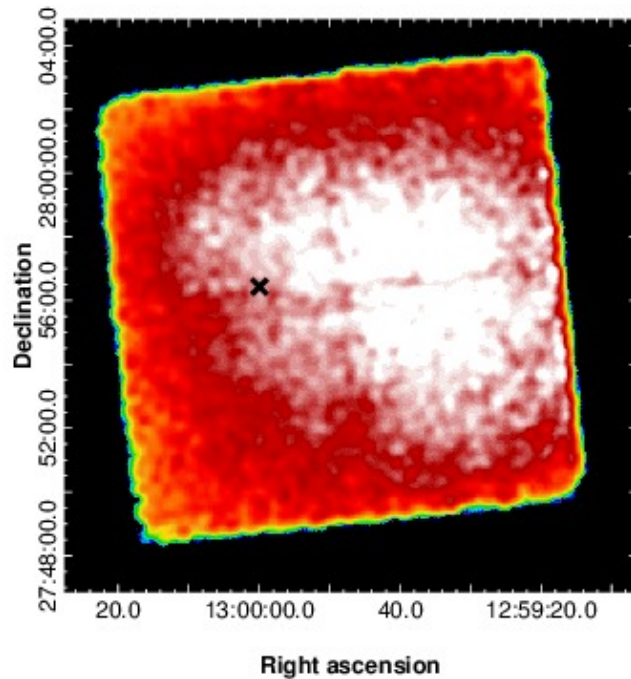


Wik et al. (2014)

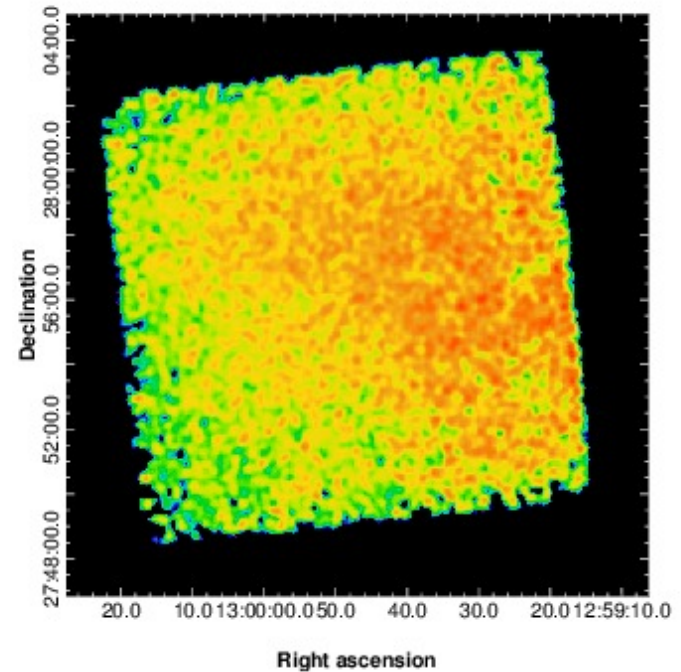


COMA CENTER OBSERVATION

3-10 keV

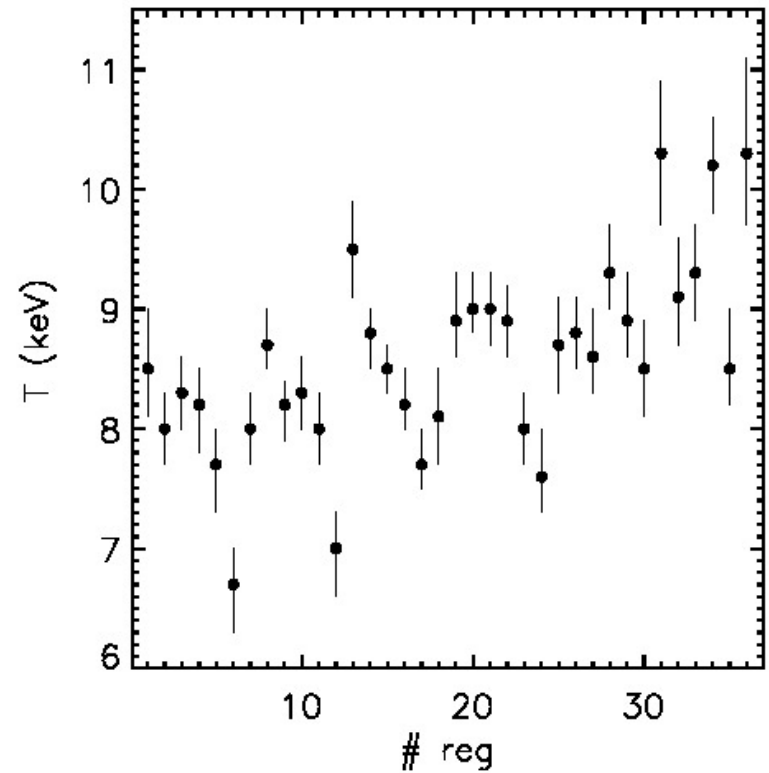
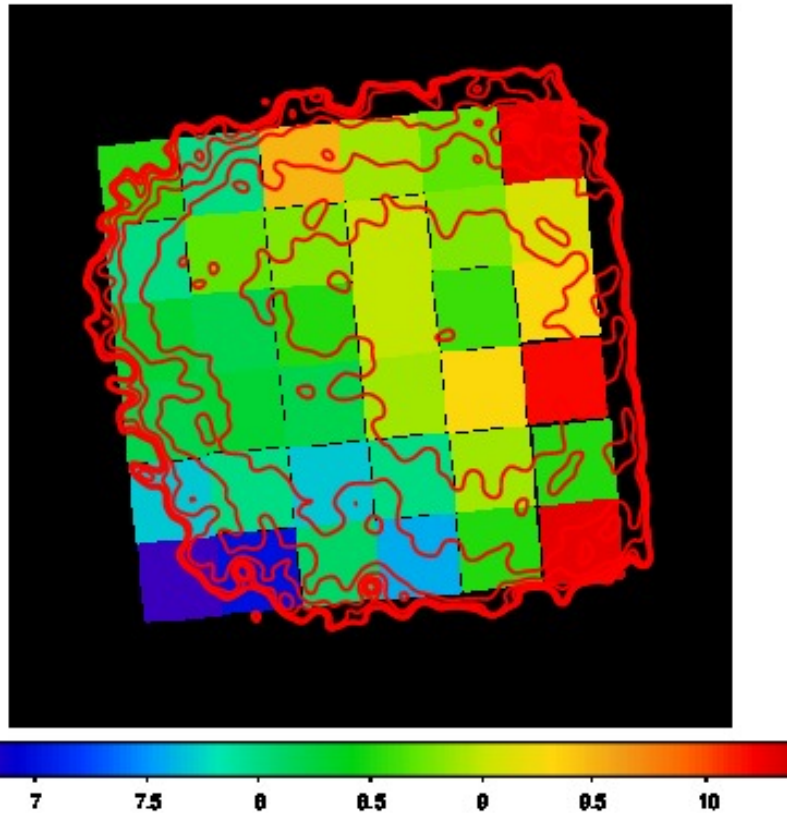


10-20 keV



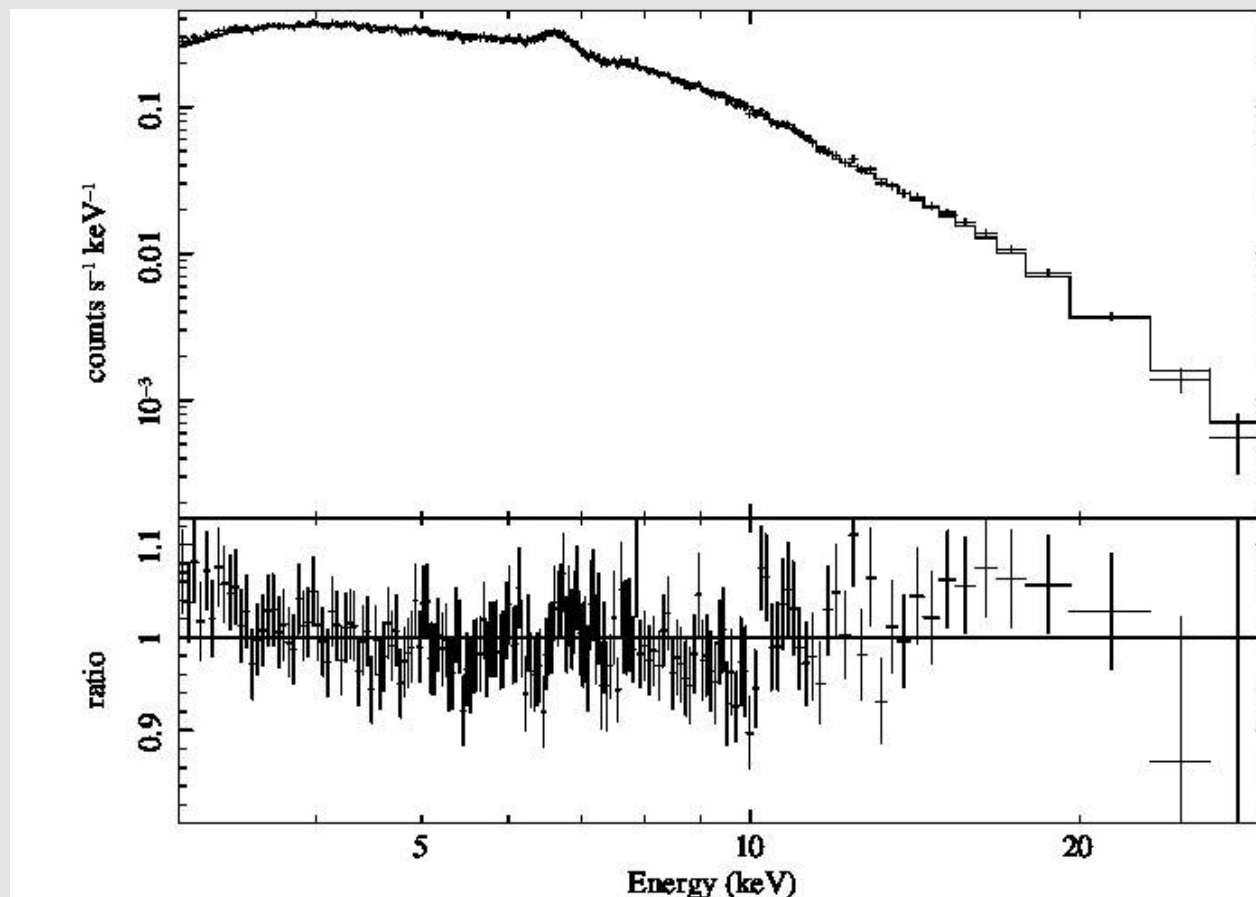
GASTALDELLO+15

COMA TEMPERATURE MAP



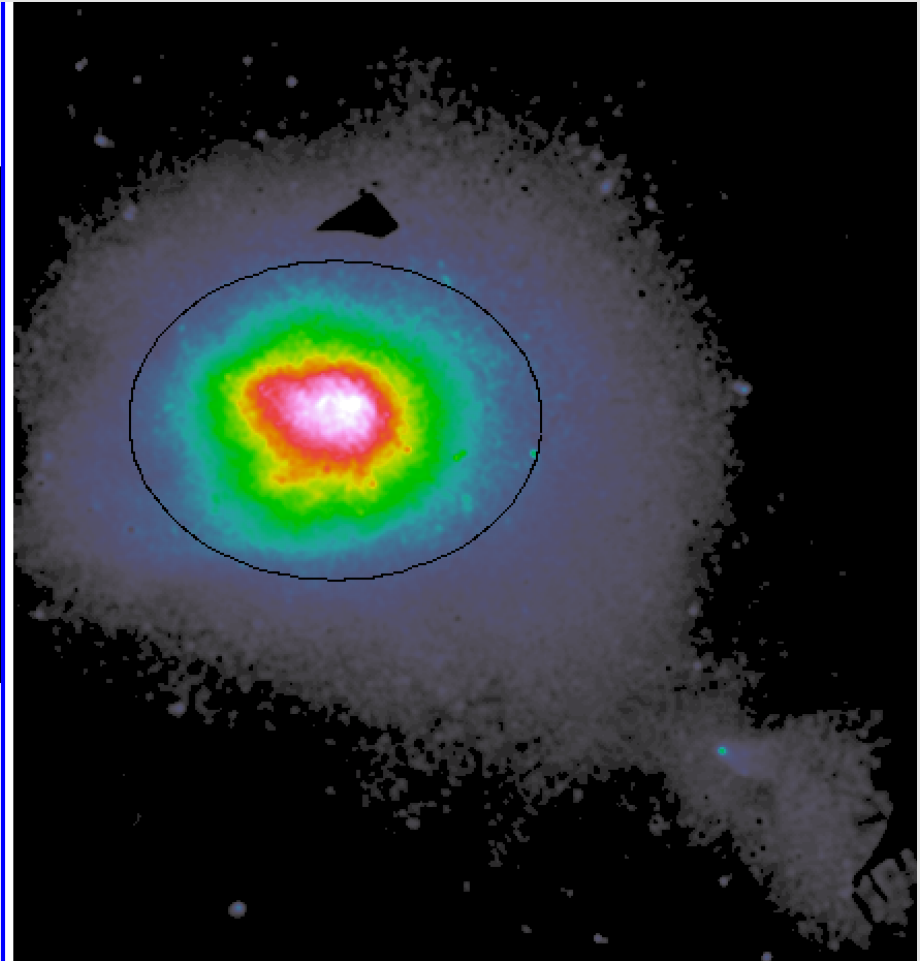
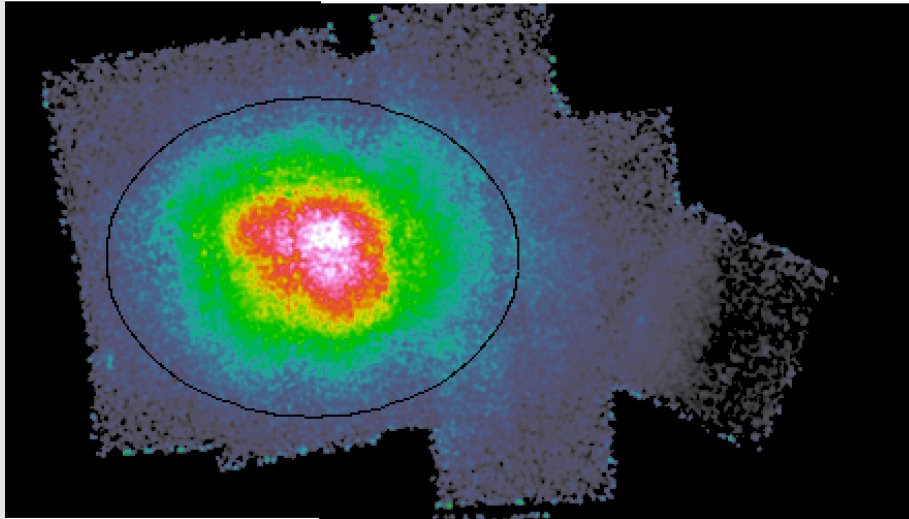
GASTALDELLO+15

CONSTRAINTS ON IC

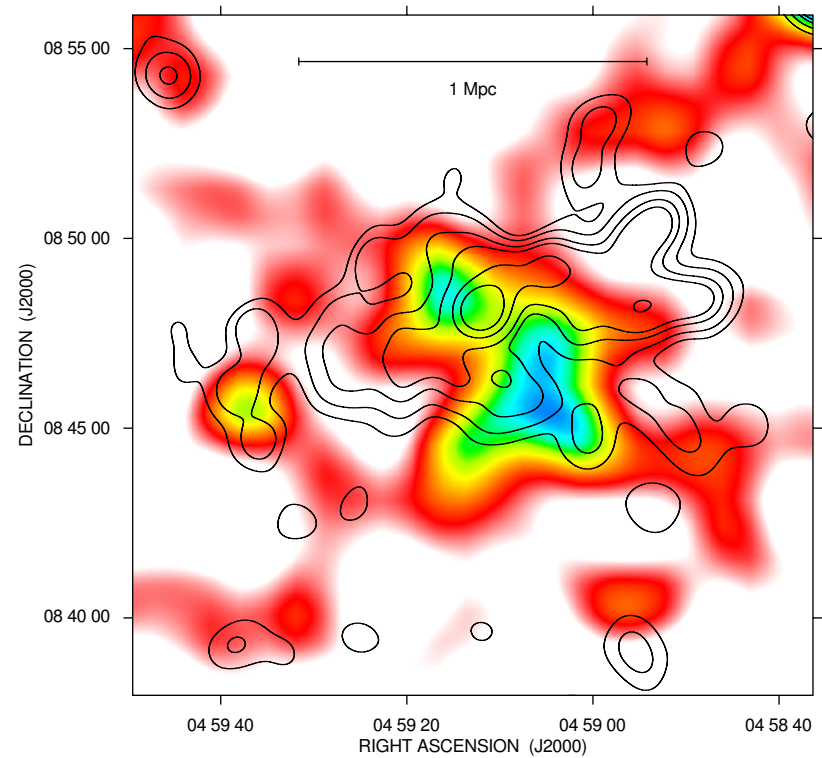
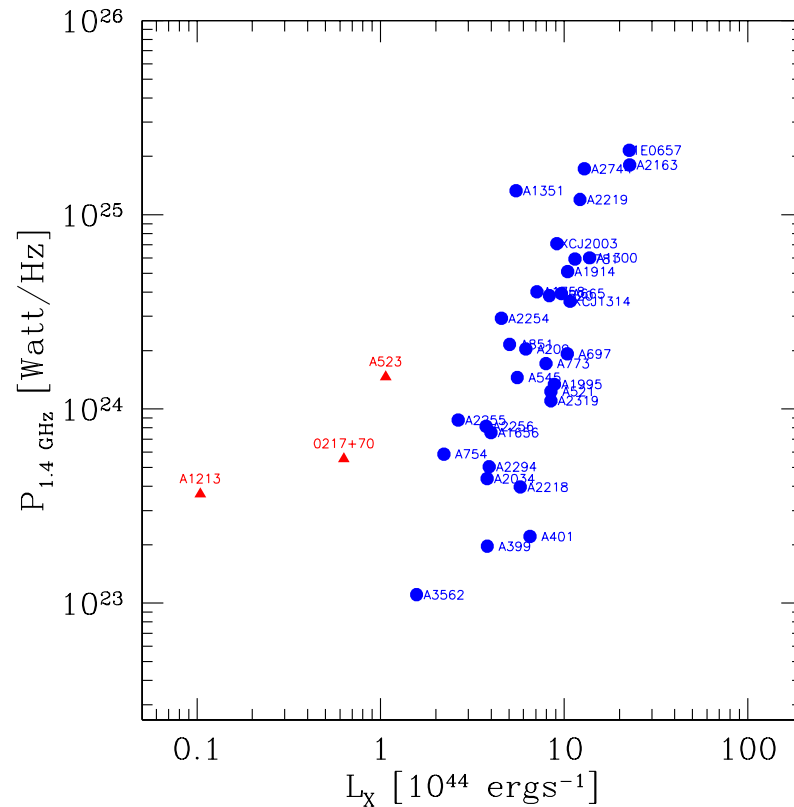


90% upper limit no more stringent than recent results with non-imaging instruments. Mosaic more useful than central bright pointing

COMA MOSAIC



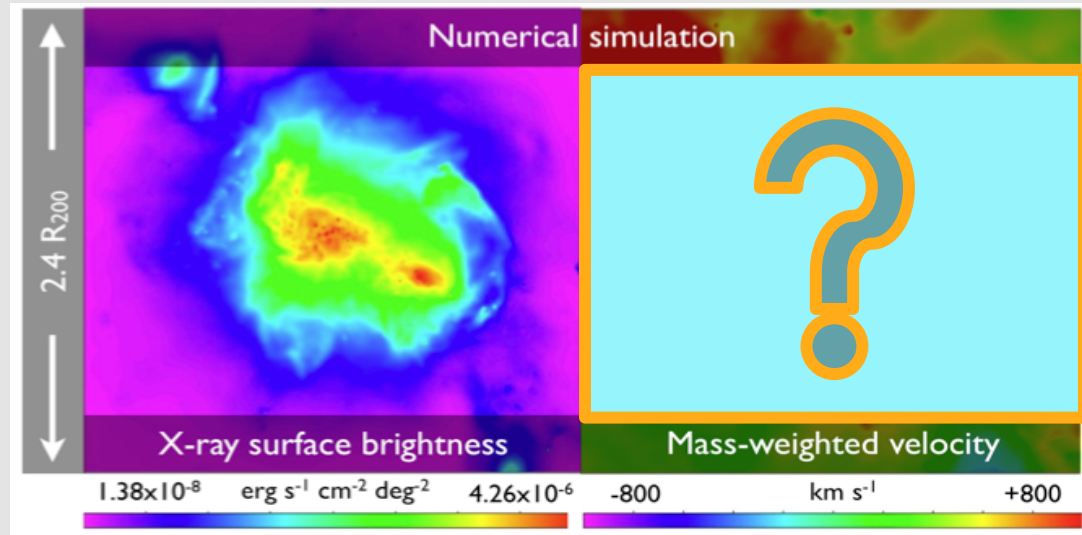
**COMING NEXT: A523, A2163, A754,
A665**



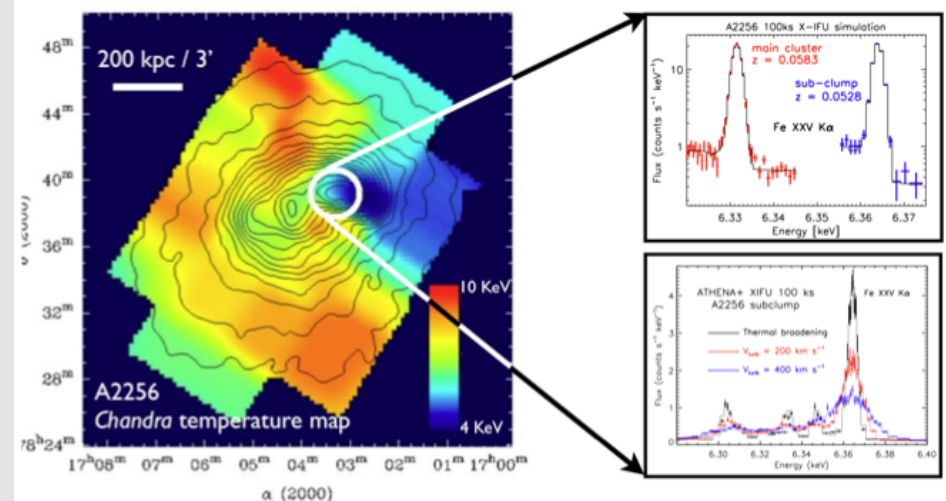
Giovannini+11

Future on X-ray galaxy clusters: *Athena*

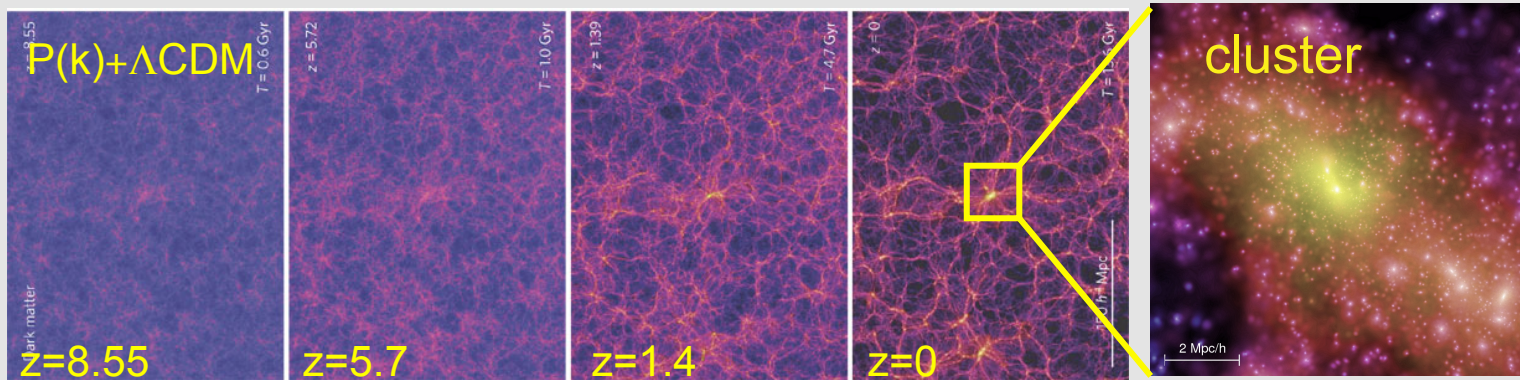
(see Nandra et al. arXiv:1306.2307; Ettori-Pratt et al. arXiv:1306.2322)



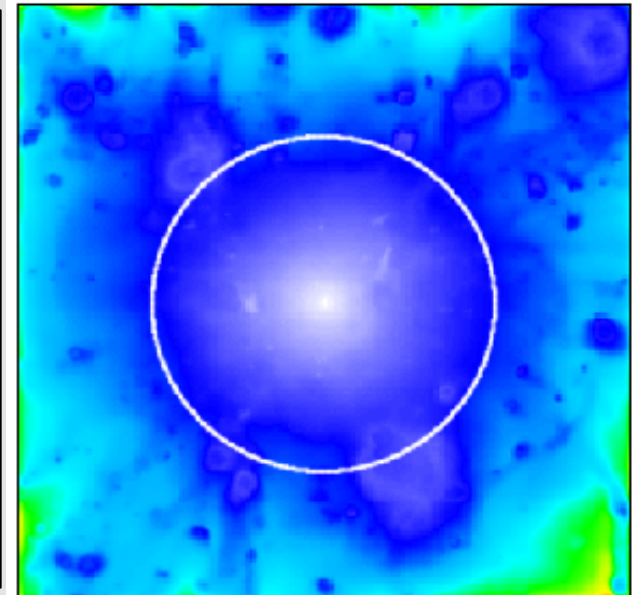
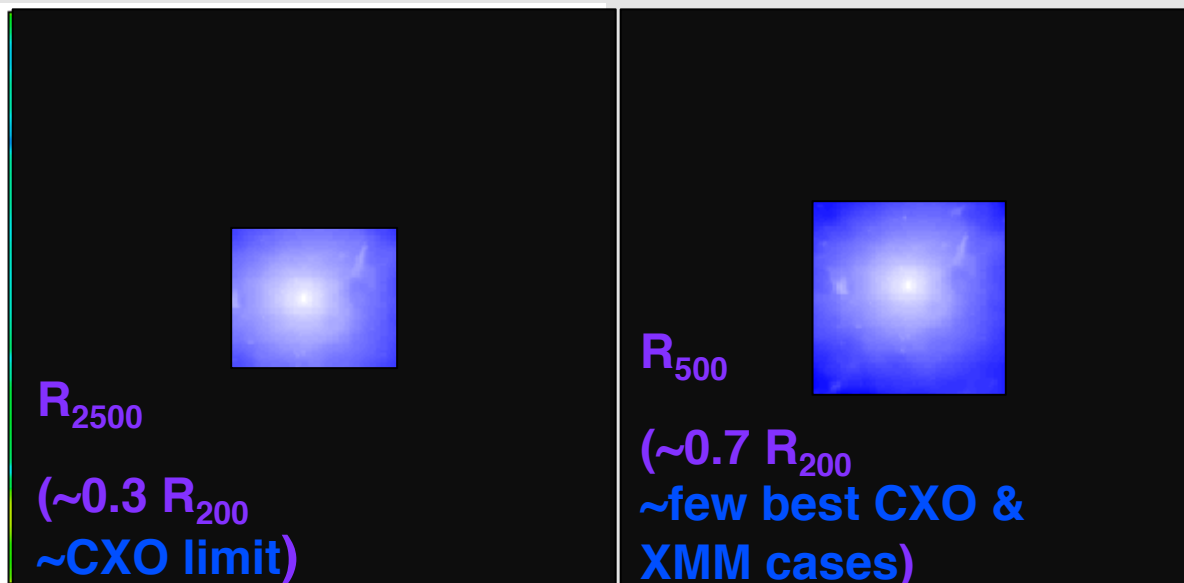
Bulk motion and turbulent broadening of FeXXV Ka line.
With 100k-sec X-IFU exposure, velocities of 10 km/s can be detected at the cluster centre, and 50 km/s at $0.25 R_{500}$ (3σ c.l.) at a spatial resolution of $0.1 R_{500}$



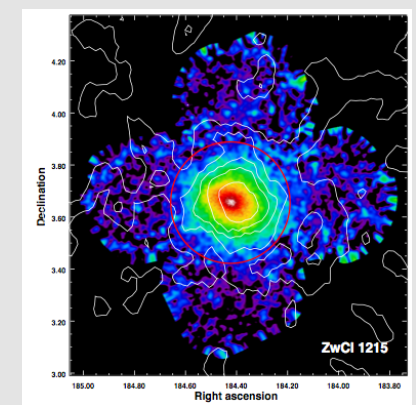
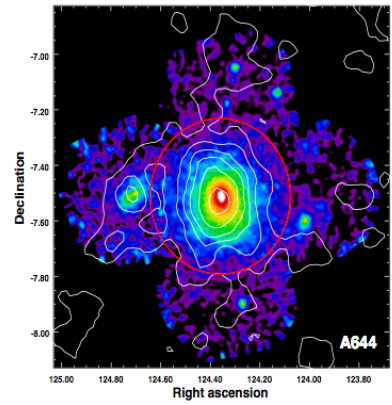
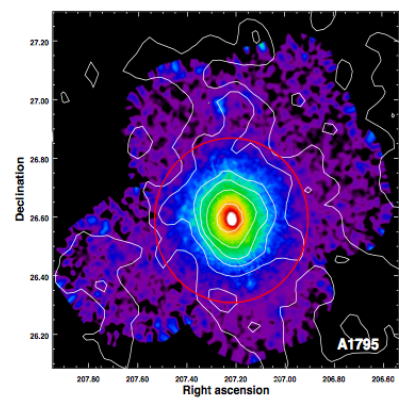
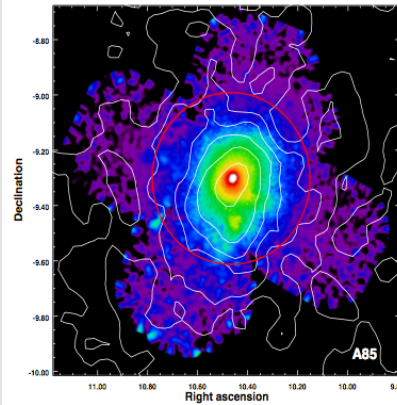
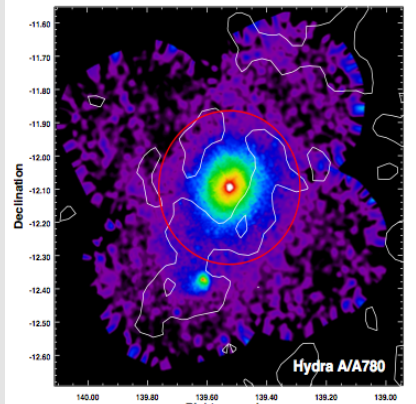
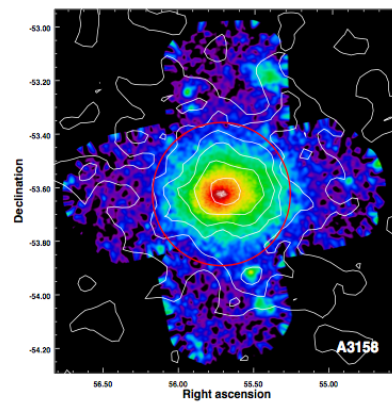
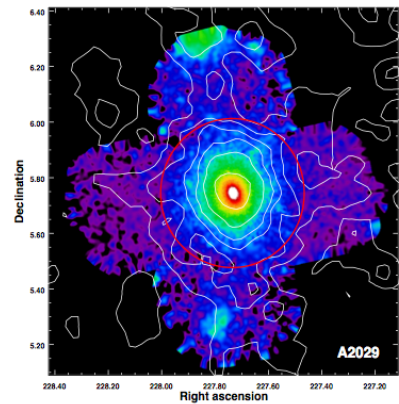
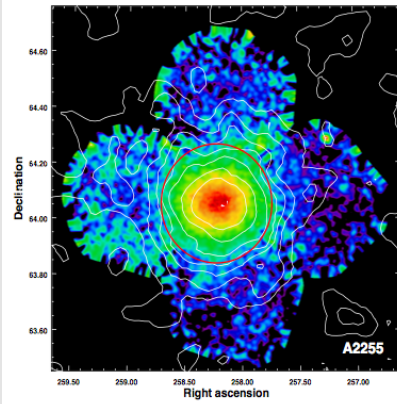
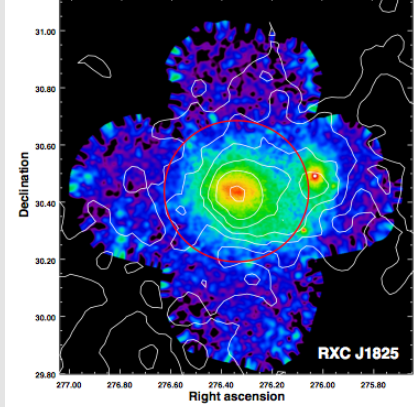
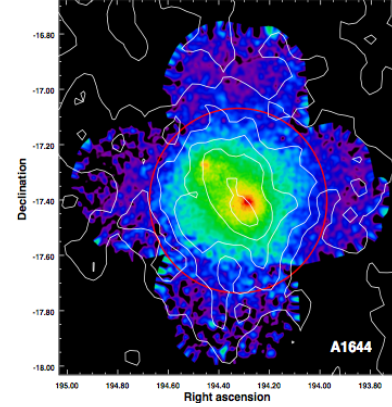
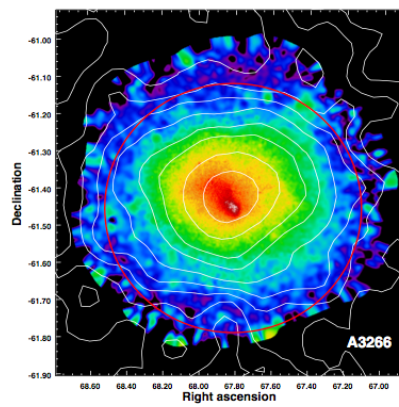
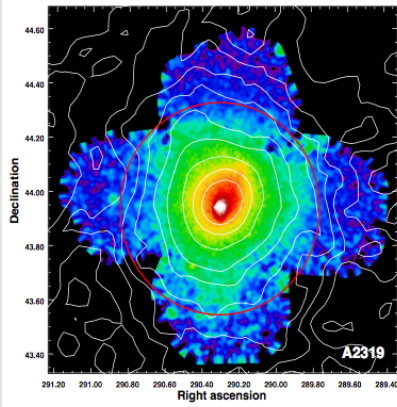
Structure formation in the Universe



We know how the gravity forms structures on cluster scales.
 X-rays (SZ) provide a direct probe of the thermalized gas
 in a cluster's potential.



X-COP



X-COP: A2142

