

Chandra and XMM Observations of Galaxy Groups: The Influence of Central AGN at the Low End of the Cluster Mass Scale

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Abstract. *Chandra* and *XMM*, offering between them high angular resolution, substantial collecting area, and spatially-resolved spectroscopy at good spectral resolution, have given us the means to discover hitherto unanticipated phenomena, in groups as in clusters, and to explore a new set of issues that bring us closer to understanding the formation and evolution of groups and their constituent galaxies: the distribution of heavy elements, the presence of X-ray cavities and their relation to radio observations, the nature of cooling cores, and X-ray signatures of recent galaxy interactions. We here show *Chandra* and *XMM* data selected to illustrate recent results regarding some of these themes.

1. NGC 4636: an AGN outburst drives gas mixing?

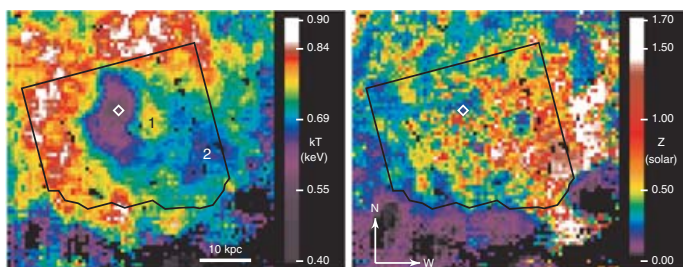


Figure 1. Maps of NGC 4636 from *XMM* data showing (left) temperature (in keV) and (right) abundance (in solar units). The images suggest that cool, high-abundance gas has been drawn from the core in earlier AGN outbursts.

2. NGC 3411: temperature anomalies from recent AGN reheating?

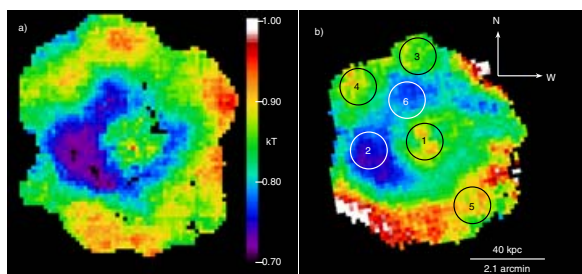


Figure 2. Temperature maps of NGC 3411 from (left) *XMM* and (right) *Chandra* data showing an unusual profile: a hot inner core surrounded by a cool shell of gas within the larger group halo. Previous AGN activity has left both heating and cooling effects visible.

References

- Jones, C., *et al.* 2002, *ApJ*, 567, L115.
Ohishi, A., Kawano, M., & Fukazawa, Y. 2003, *PASJ*, 55, 819.
Sullivan, E. O., Vrtilek, J. M., Harris, D. E., & Ponman, T. J. 2006, *ApJ.*, submitted.
Sullivan, E. O., Vrtilek, J. M., & Kempner, J. C. 2005, *ApJ*, 624, L77.