DENSITY INHOMOGENEITY IN THE X-RAY TAIL OF NGC7619

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Final Report

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1. 20th AAS meeting (June 2004, Denver CO.), BAAS, 2004, 15.02

2. Galaxies Viewed with Chandra Workshop (July 7-9, 2004, Cambridge)

Title: Chandra and XMM-Newton Observations of the X-ray Tail in NGC 7619:
First Direct Evidence of ICM Metal Enrichment

E. Kim, D.-W. Kim, G. Fabbiano and G. Trinchieri

abstract:
We present new observational results of NGC 7619, an elliptical galaxy with a prominent X-ray tail. With deep Chandra and XMM-Newton observations, we confirm the presence of the long hot gaseous tail extending toward the SW, which was first reported with ROSAT. However, this tail appears both narrower and less luminous in the high resolution image. We also identified a sharp discontinuity toward NE in the main galaxian halo. Both this structure and the direction of the tail are consistent with the effects of ram pressure of the hot intra-cluster medium (ICM) on the hot halo of NGC 7619, if this galaxy is moving toward NE. Our spectral analysis of the diffuse gaseous emission shows that the Iron abundance Z_{Fe} both in the core and the tail of NGC 7619 is much higher (2-3 solar) than that of the surrounding regions (<0.7 solar): this offers direct evidence of the process of metal enrichment of the ICM by stripping metal-rich hot halos from galaxies. We also resolve a large number ($\sim$20) of point-like sources in the X-ray tail. Some of them have soft X-ray spectra, reminiscent of the cooler clumps seen in the X-ray emitting halo of NGC 507 (Kim and Fabbiano 1995).

Chandra and XMM-Newton Observations of the X-ray Tail in NGC 7619

E. Kim, D.-W. Kim, G. Fabbiano (CfA)

G. Trinchieri (Oss. Astro. di Brera, Italy)

Introduction

- X-ray tails of elliptical galaxies in clusters (M86, M49, NGC7619)

  Ram pressure stripping due to the fast motion(supersonic) of the galaxy

- Ram pressure stripping

  Affect the evolution of galaxies, cluster, ISM/ICM

  Metal enrichment of ICM

- NGC 7619

  Einstein and ROSAT obs shows an extended tail with only a few point sources

Observations

- Chandra Observation

  38ksec ACIS-S mode at 19 Sep. 2003

  centered on X-ray tail on S7 chip

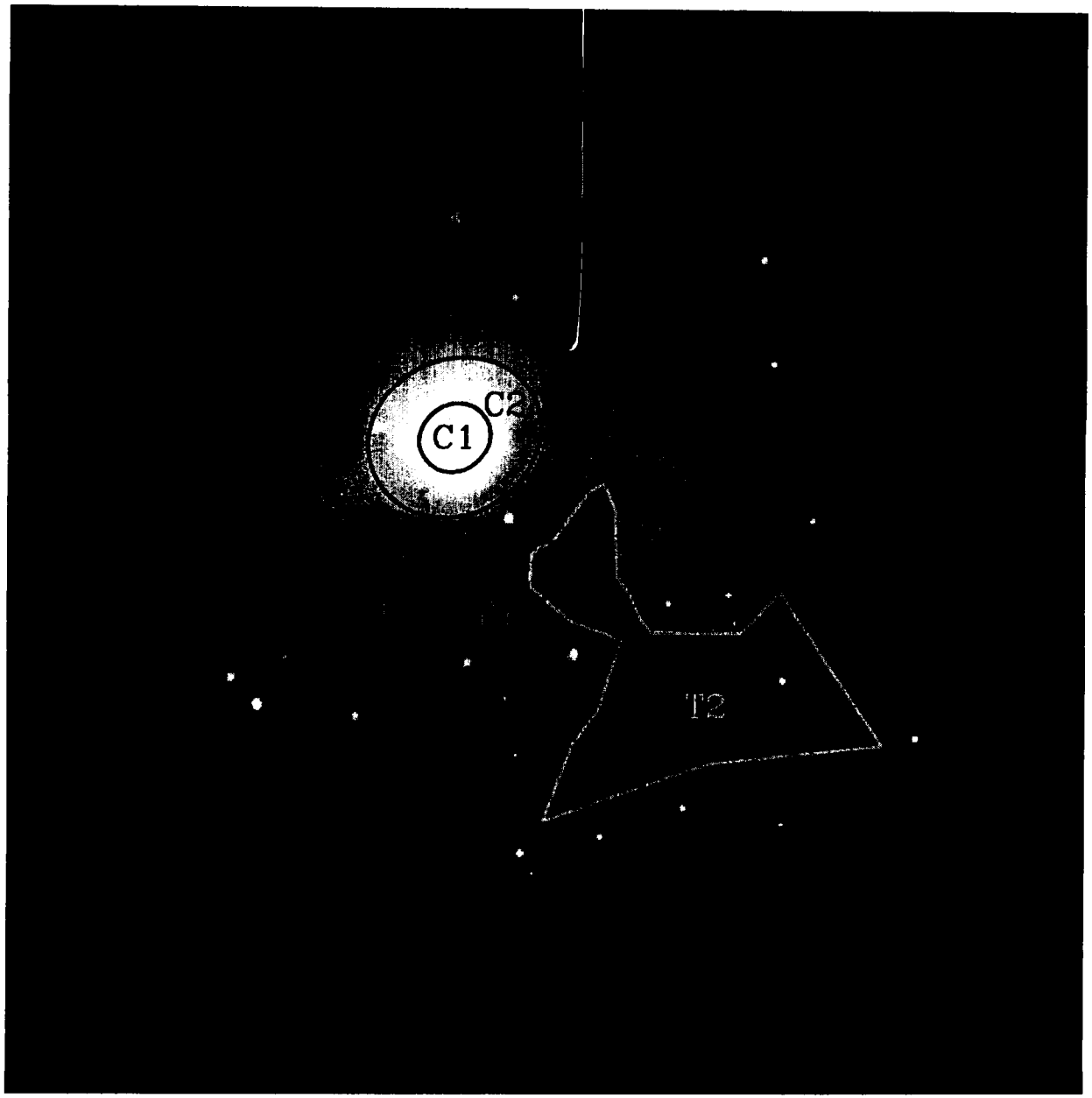
  point source photometry/fine structure

- XMM-Newton observation

  41ksec exposure at 16 Dec. 2003

  Spectral analysis

NGC 7619

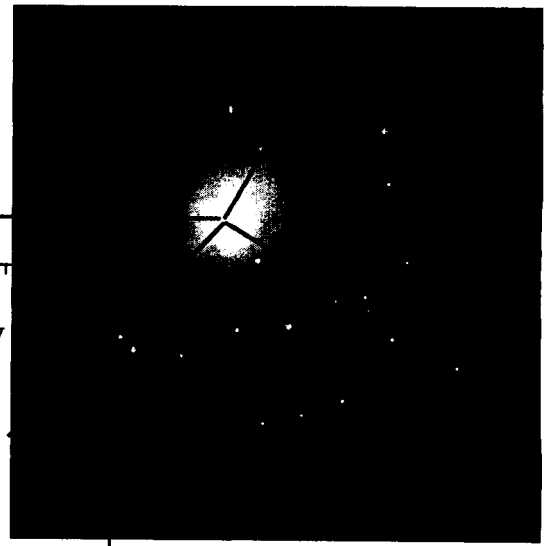


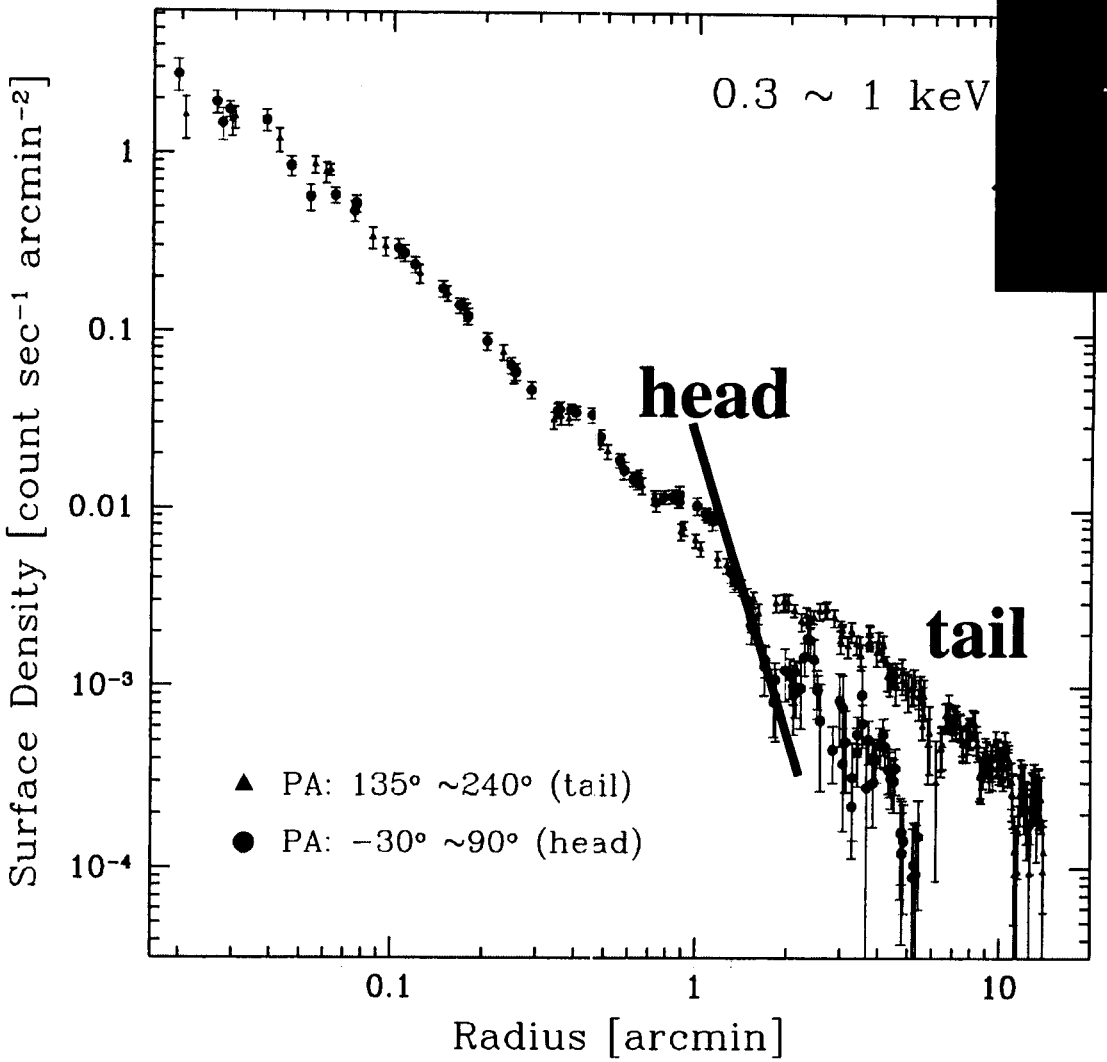
NGC 7619

andra
IS-S7

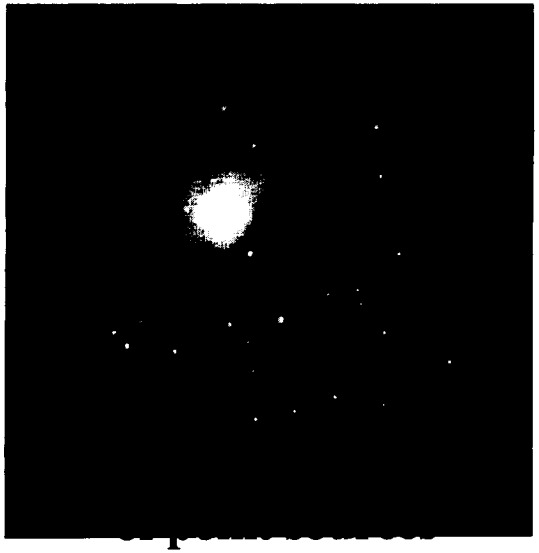
NGC 7626

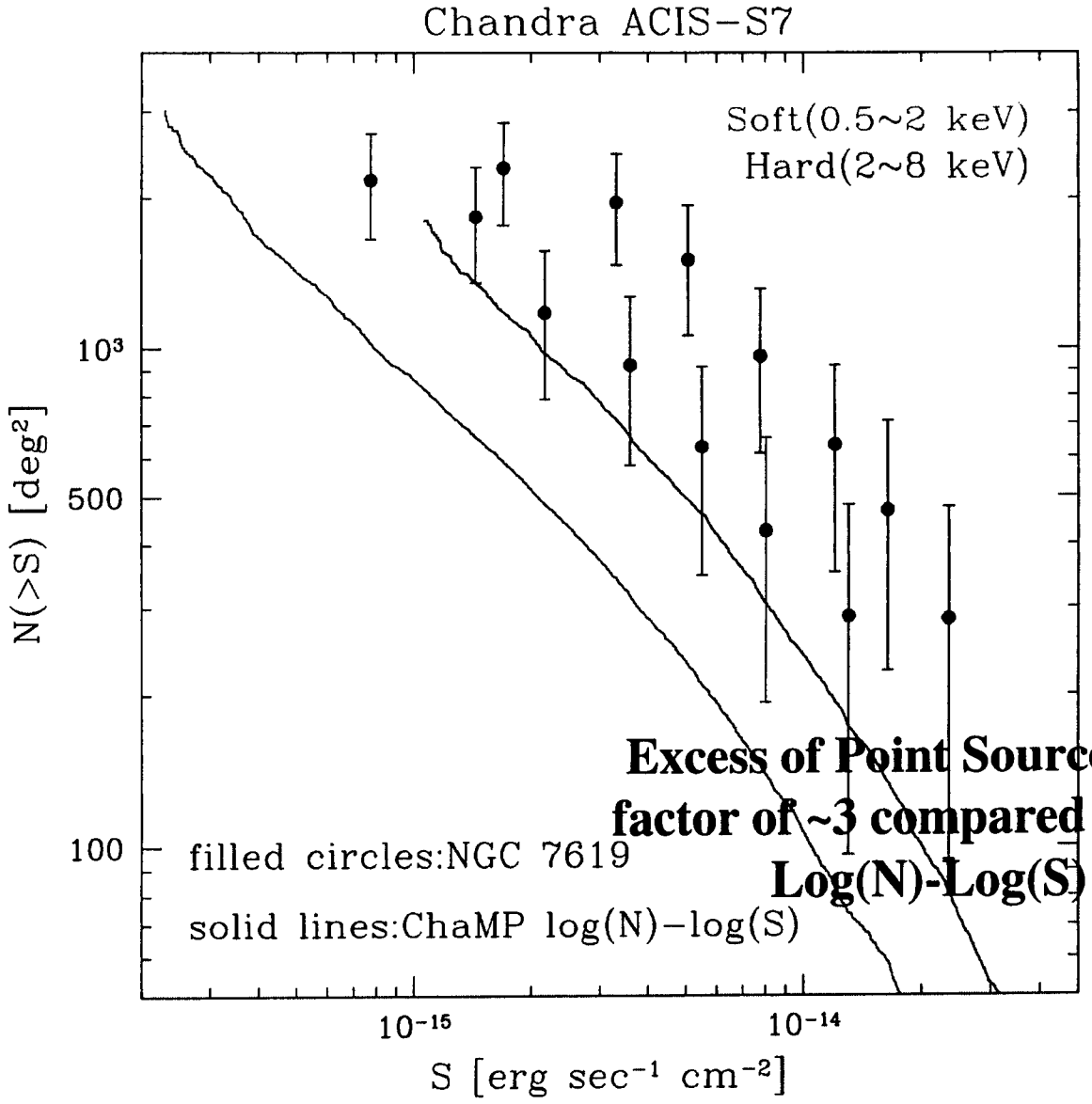
Radial Profiles





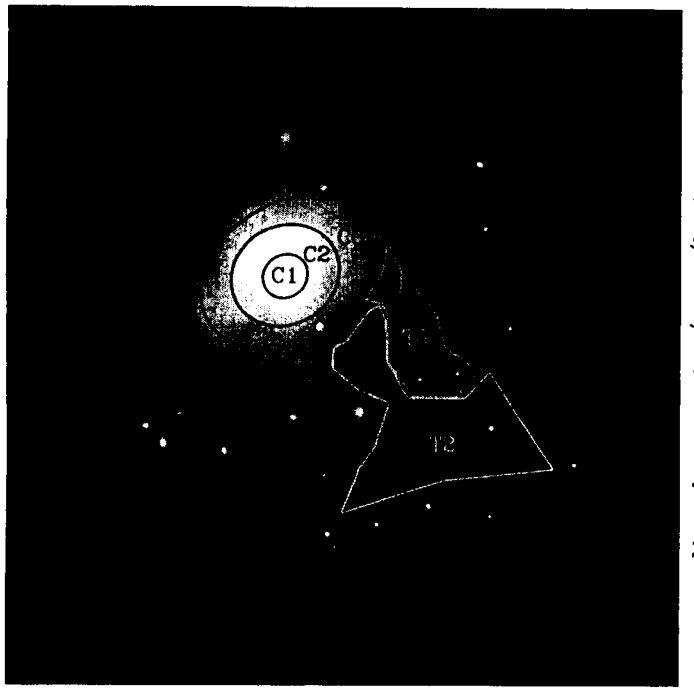
X-ray Log(N) - Log(S)

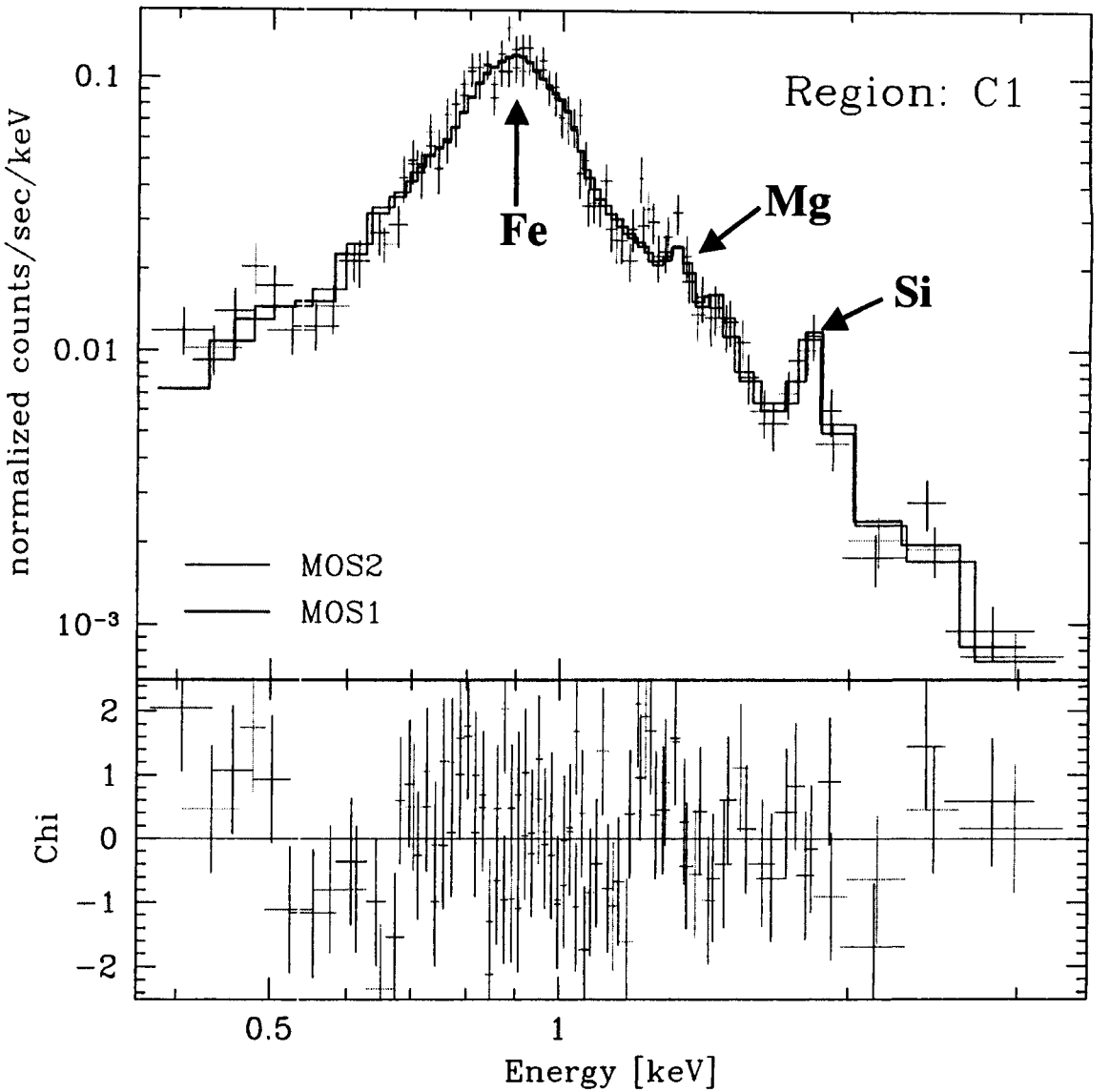




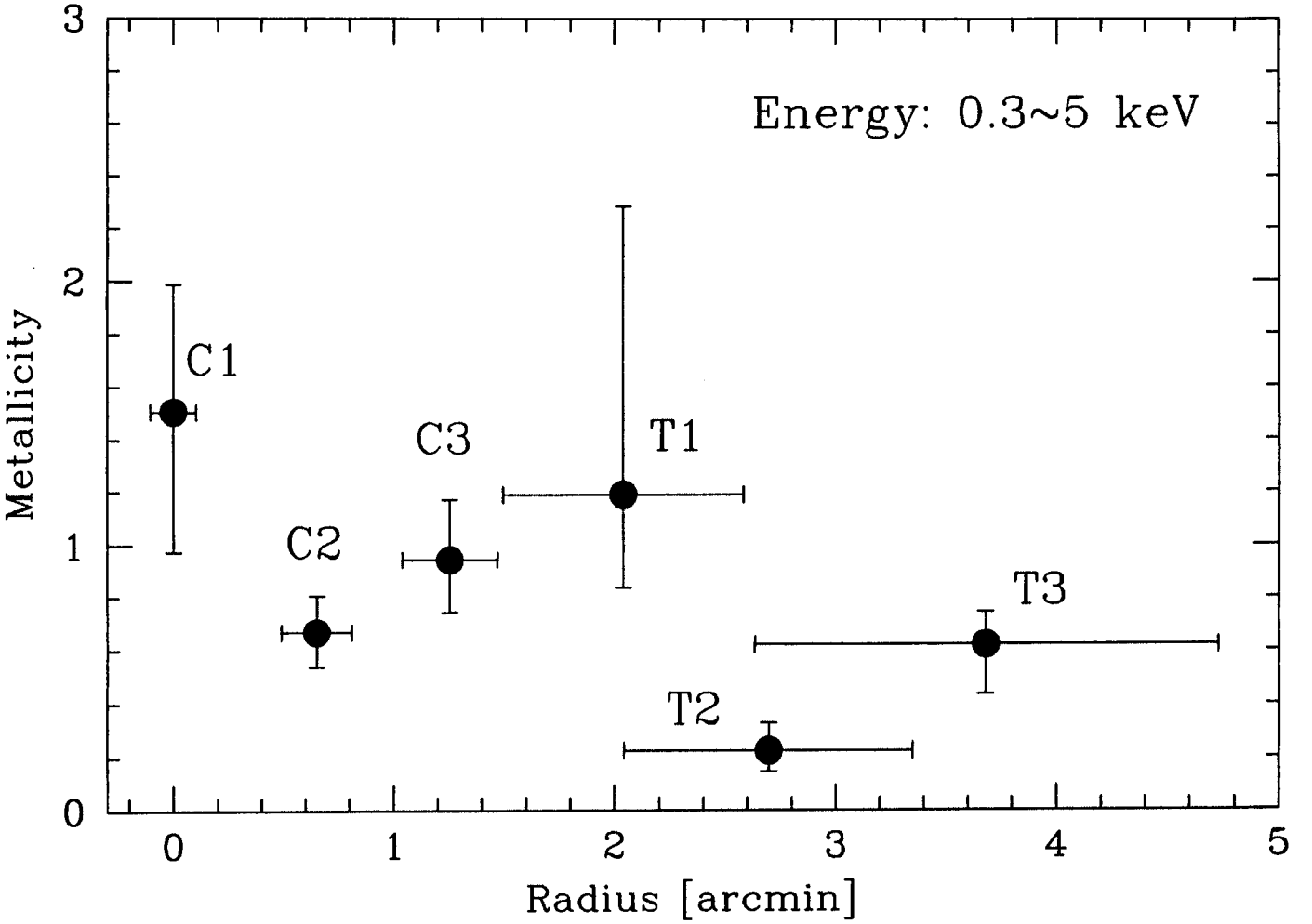
Excess of Point Sources by a factor of ~3 compared to field Log(N)-Log(S)

X-ray Spectrum





Metallicity Distribution



Conclusion

- Chandra & XMM-Newton Obs. of NGC 7619
- Identification of a sharp frnt head and a clear extended tail behind the moving direction
- Significant excess of point sources by a factor of ~3 compared to the field (e.g. CHaMP)
- Higher metallicity in a tail region ($Z = 1 \sim 2\ Z_{sun}$)

  Suggestive on-going metal enrichment of ICM