An X-Ray Flux-Limited Sample of Galaxy Clusters: Physical Properties and Cosmological Implications

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1 The Sample

The cluster sample has been compiled from surveys exploiting the ROSAT All-Sky Survey (RASS, [1]), mainly the REFLEX [2], [3] and the NORAS [4] cluster surveys. The clusters have been reanalysed mostly on higher exposure PSPC pointed observations [5]. Exclusion of the galactic band ($|b_{\rm II}| \geq 20°$) leaves 63 clusters above the adopted flux limit $f_{\rm X,lim}(0.1 - 2.4\,{\rm keV}) = 2.0 \cdot 10^{-11}{\rm erg/s}$.

2 Results

Gravitational masses have been calculated assuming the intracluster gas to be in hydrostatic equilibrium. The mass function (Fig. 1) [6] has been derived for three different cluster radii. We find good agreement for a fixed outer radius of $3\,h_{50}^{-1}$ Mpc compared with the result by Bahcall & Cen (1993) [7]. However, using outer radii depending on the overdensity (r_{200}, r_{500}), which we prefer, yields significantly different results. Integration of the mass function shows that only a small fraction of the total mass in the Universe is bound in galaxy clusters. In Fig. 2 we show that the X-ray luminosity selection applied in a flux-limited sample is effectively selecting the clusters by their gravitational mass since there exists a good correlation between these two quantities [8].

References

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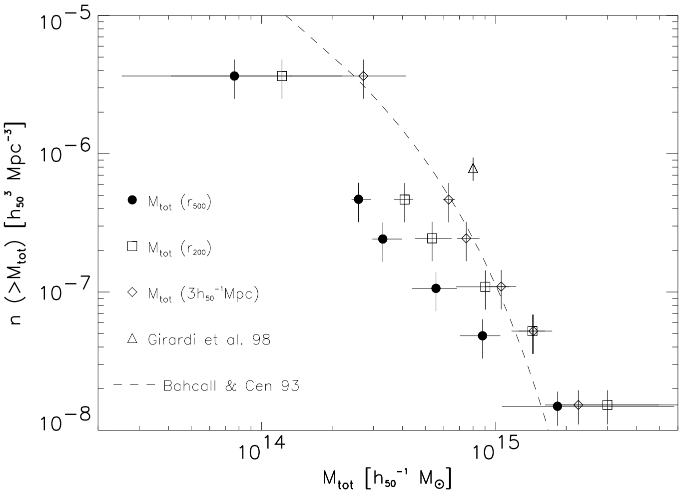

Figure 1: Gravitational mass function for 63 galaxy clusters.

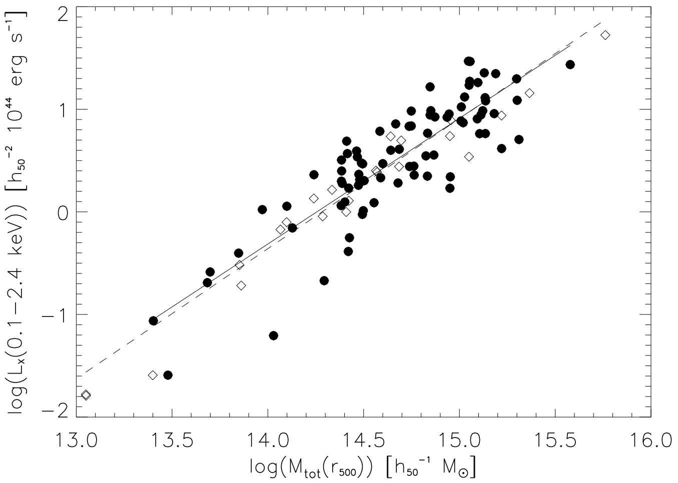

Figure 2: X-ray luminosity – gravitational mass relation for 106 galaxy clusters.