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***Abstract*:** We analyse the properties of substructures within dark matter halos (subhalos) using a set of high-resolution numerical simulations (see poster "Chemical enrichment of the ICM in a hierarchical merger model", by De Lucia et al.) of the formation of structure in a ΛCDM universe.

The subhalo mass function:

The substructure mass function depends at most weakly on the mass of the parent halo, as already suggested by Moore et al. (1999).

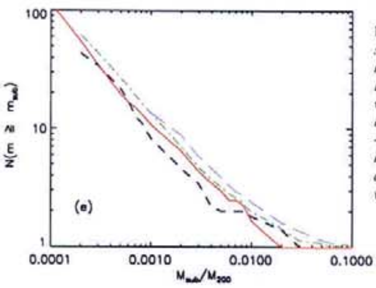


Figure 1: *Cumulative subhalo mass function for halos with different mass. Black line is for halos with mass ~10^{14} $M_\odot$, red line is for halos with mass ~10^{15} $M_\odot$, green line is for halos with mass ~10^{13} $M_\odot$ and blue line is for halos with mass ~10^{12} $M_\odot$.*

The spatial distribution of substructures:

The subhalo profiles are 'anti-biased' relative to the dark matter, in agreement with previous results by Ghigna et al. (2000). We also find that the radial number density profiles are steeper in low mass halos than in high mass halos. This suggests that subhalos have been more efficienctly destroyed in the dense inner cores of massive clusters.

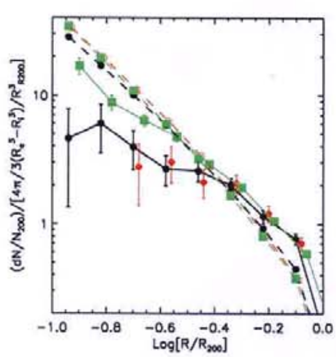
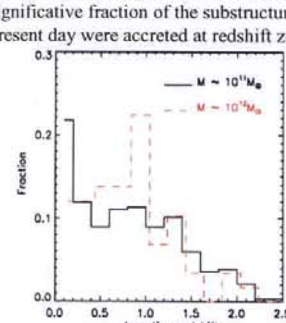


Figure 2: *Radial distribution of substructures in halos of different mass. Black line is for halos with mass ~10^{15} $M_\odot$, red line is for halos with mass ~10^{14} $M_\odot$, green line is for halos with mass ~10^{13} $M_\odot$. Dashed lines show the corresponding dark matter profiles.*

Subhalo histories:

Measuring the merger tree for each substructure we find that a significative fraction of the substructures residing in clusters at the present day were accreted at redshift z~1.



This implies that a significant fraction of present-day 'passive' cluster galaxies should have been still outside the cluster progenitor and more active at z~1.

Figure 3: *Distribution of accretion redshifts for subhalos residing in clusters at present-day.*

The mass accretion function:

Low mass subhalos are in place earlier than the more massive ones, as expected in a hierarchical cosmology. Tidal stripping is effective on short time-scales. The longer the substructure spends in a more massive halo, the larger is the destructive effect of tidal stripping.
Field and cluster subhalos have remarkably similar histories suggesting that the efficiency of the tidal stripping is largely independent of the mass of the parent halo.
Our results hint that substructures are constantly erased in the cluster and are being replenished by newly infalling halos.

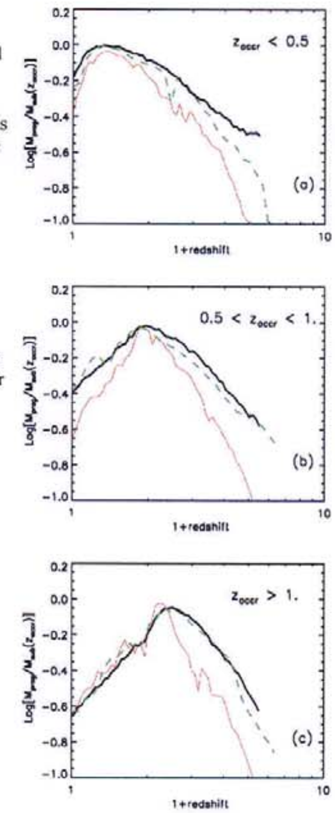
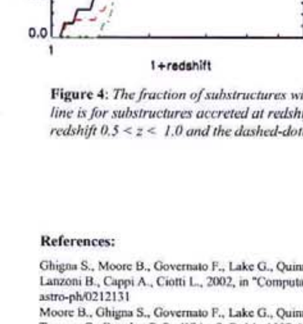


Figure 4: *Average mass accretion history for subhalos residing in clusters at redshift zero (solid lines) and subhalos in field (dashed line). The histories are normalised to the mass of the subhalo at the accretion time. The black and green line are for subhalos with mass ~10^{11} $M_\odot$: the red line is for subhalos with mass ~10^{12} $M_\odot$.*

Merging histories:



About 80 % of the subhalos with mass ~10^{12} $M_\odot$ and residing in the cluster at present-day have had at least one major merger at redshift below 2. The fraction is almost independent of the accretion time. These results suggest that a large fraction of subhalos in our cluster sample will host early-type galaxies with a significant bulge component.

Figure 4: *The fraction of substructures with at least one major merger event at redshift z_m<z. The solid line is for substructures accreted at redshift < 0.5, the dashed line is for substructures accreted at redshift 0.5 < z < 1.0 and the dashed-dotted line is for substructures accreted at redshift > 1.0*

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