Massive galaxy groups at $0<z<1.6$

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In the local universe

- Environment important

  Determines galaxy color, morphology, star formation

- But – difficult to observe at higher redshift

  Observing time expensive, uncertain for anything except clusters (most galaxies live in groups)

- Instead of observing individual halos – statistical analysis

  No accurate (spec) redshifts needed, ideal for photometric surveys

  Can go to higher redshift more easily

  No information about individual halos

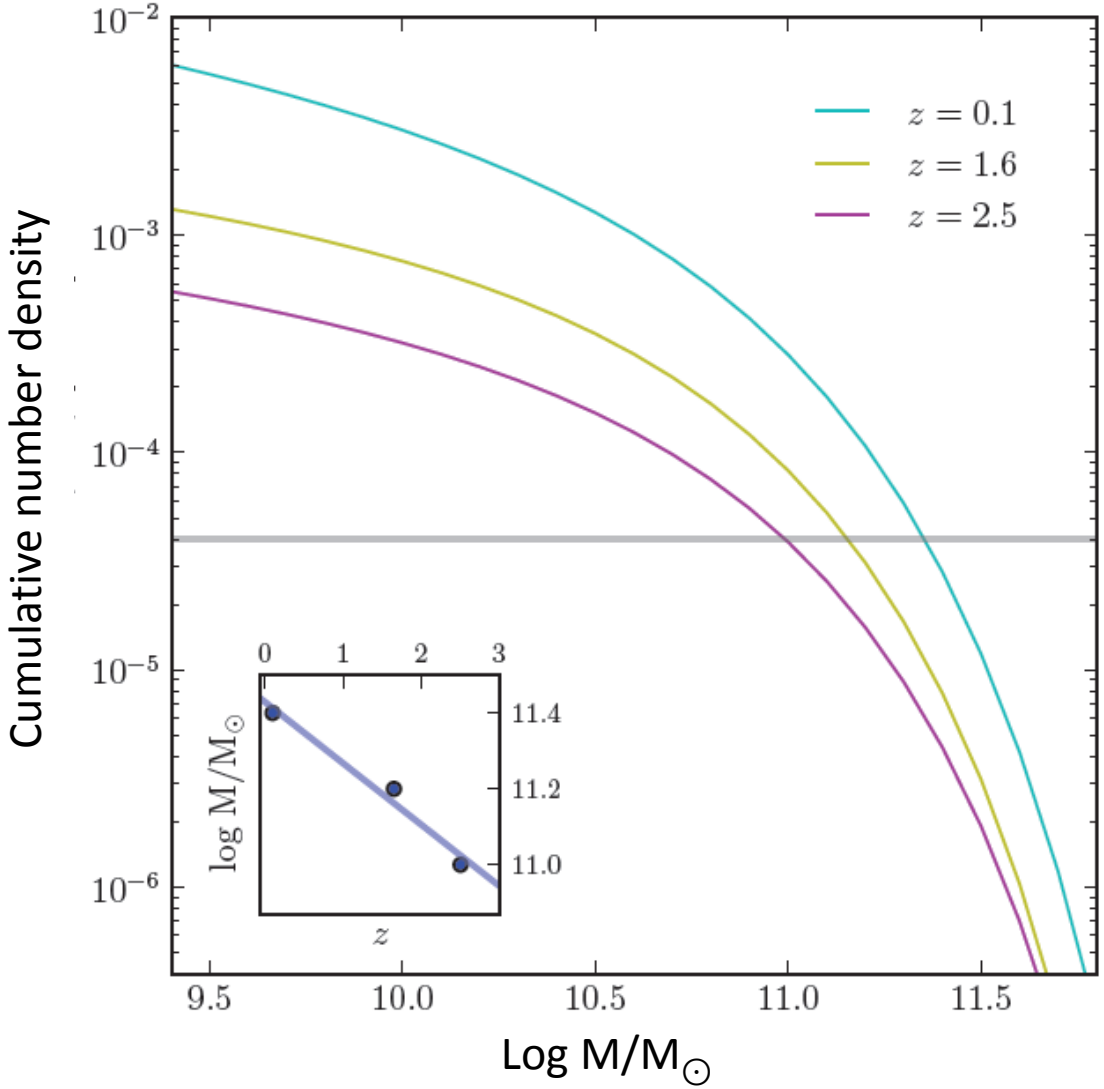
At higher redshift

What environments do massive galaxies live in?

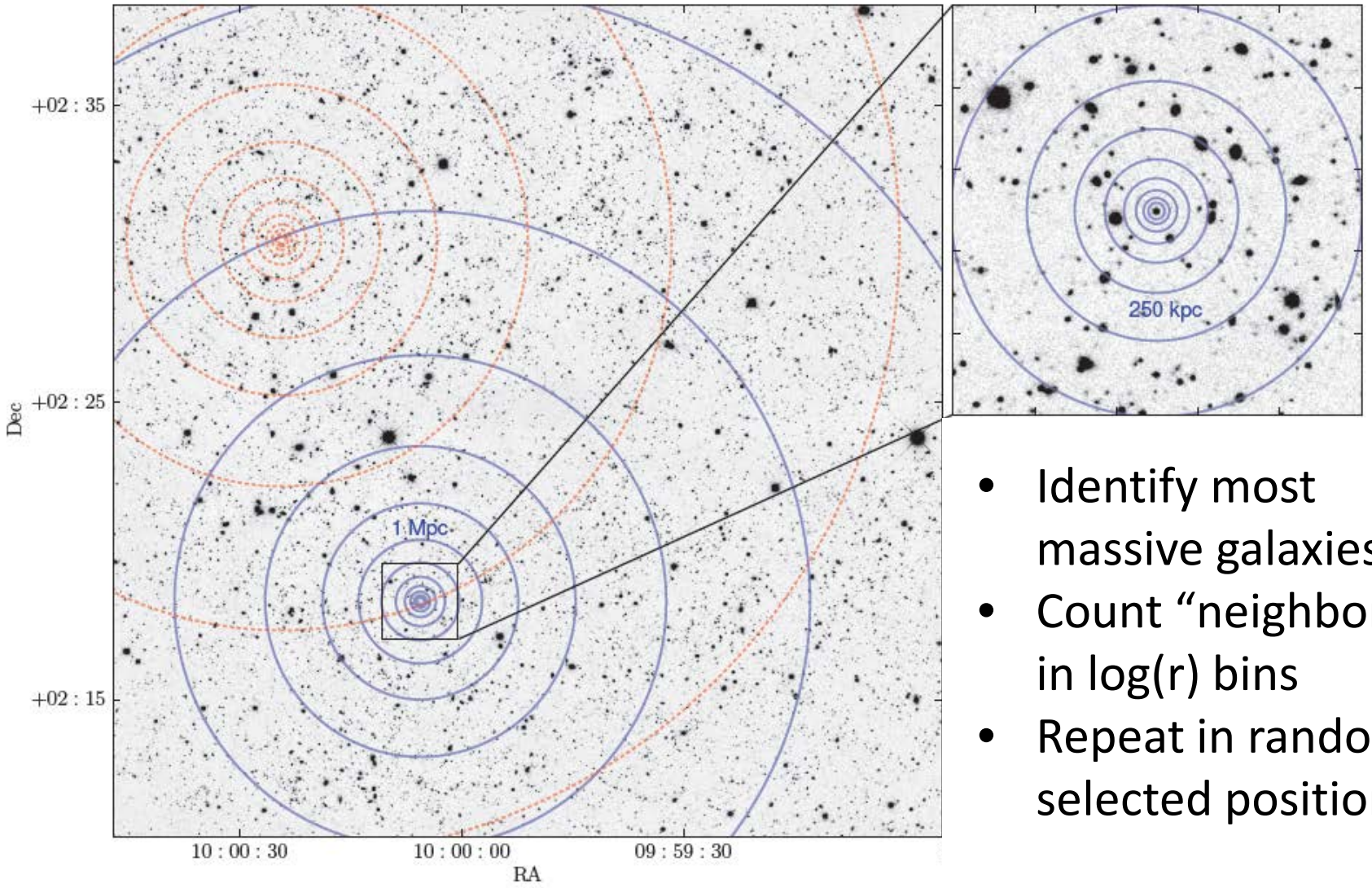
Cumulative number density

(instead of mass/luminosity matching)

- Find mass-redshift relation at a fixed cumulative number density
- Measure inferred mass evolution
- Select galaxies in mass bins that correspond to the evolution of mass

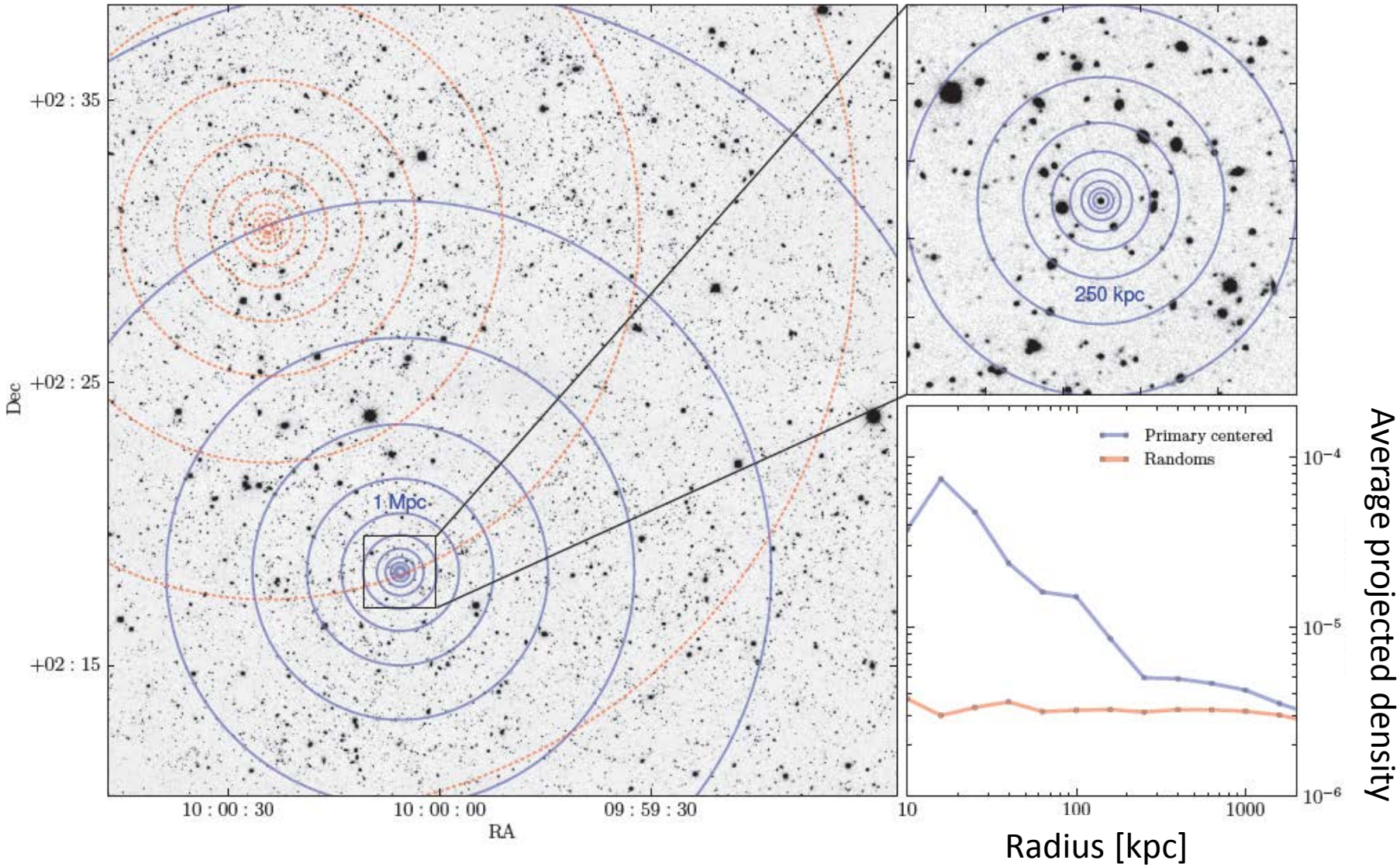


Statistical background subtraction



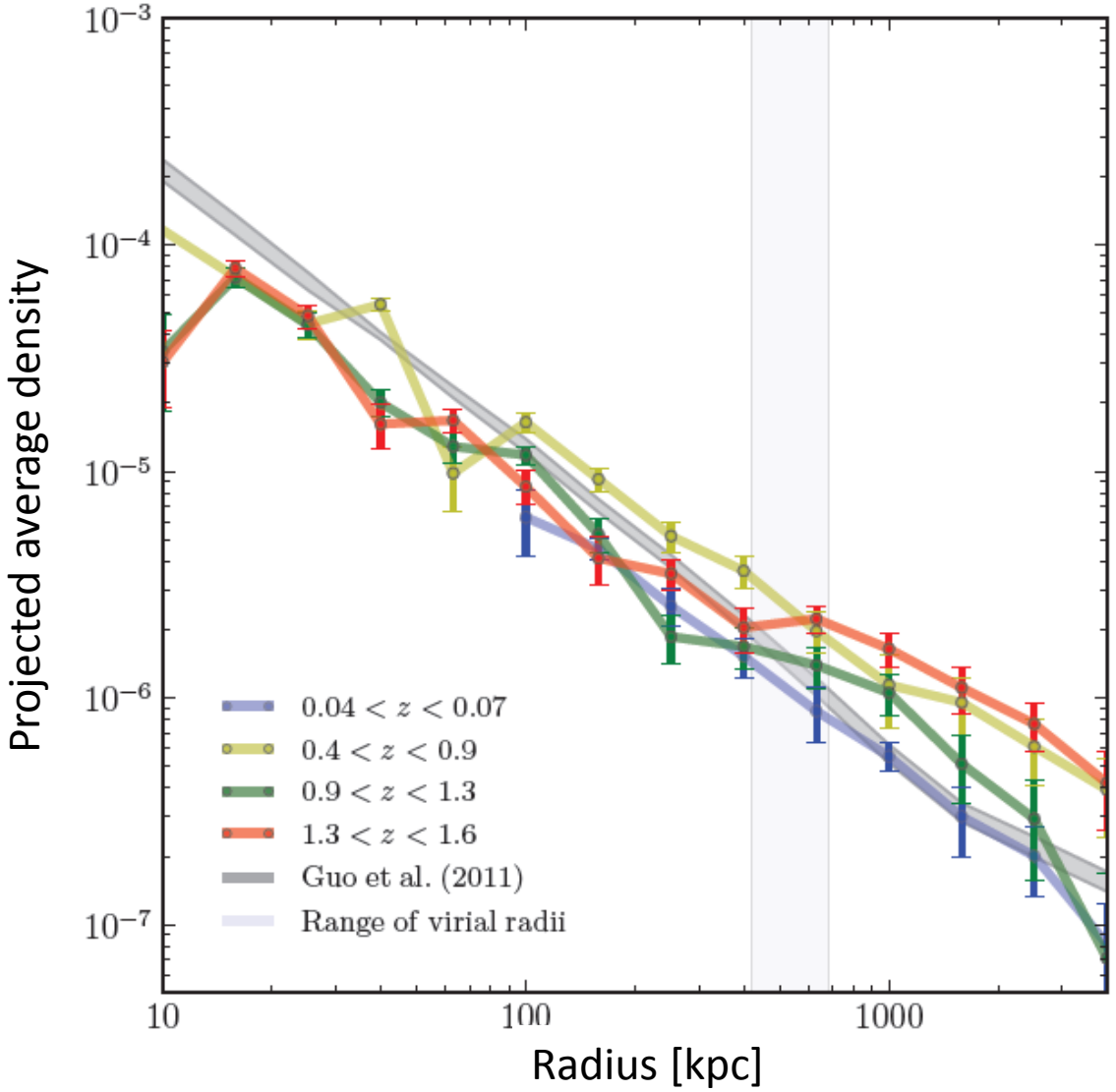
- Identify most massive galaxies
- Count “neighbors” in log(r) bins
- Repeat in randomly selected positions

Statistical background subtraction



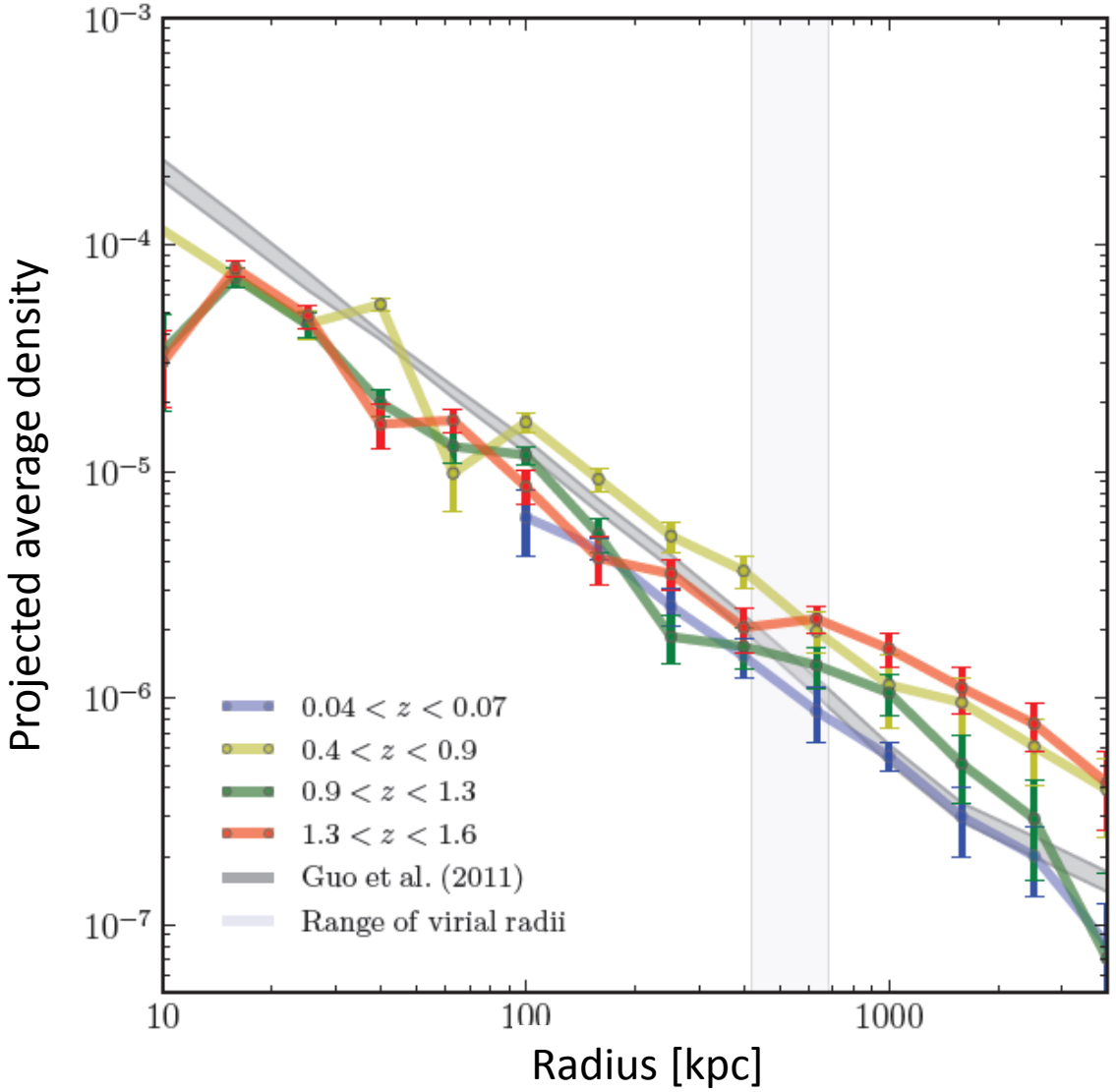
Projected number density functions

- The projected radial distribution of galaxies around massive primaries out to z=1.6



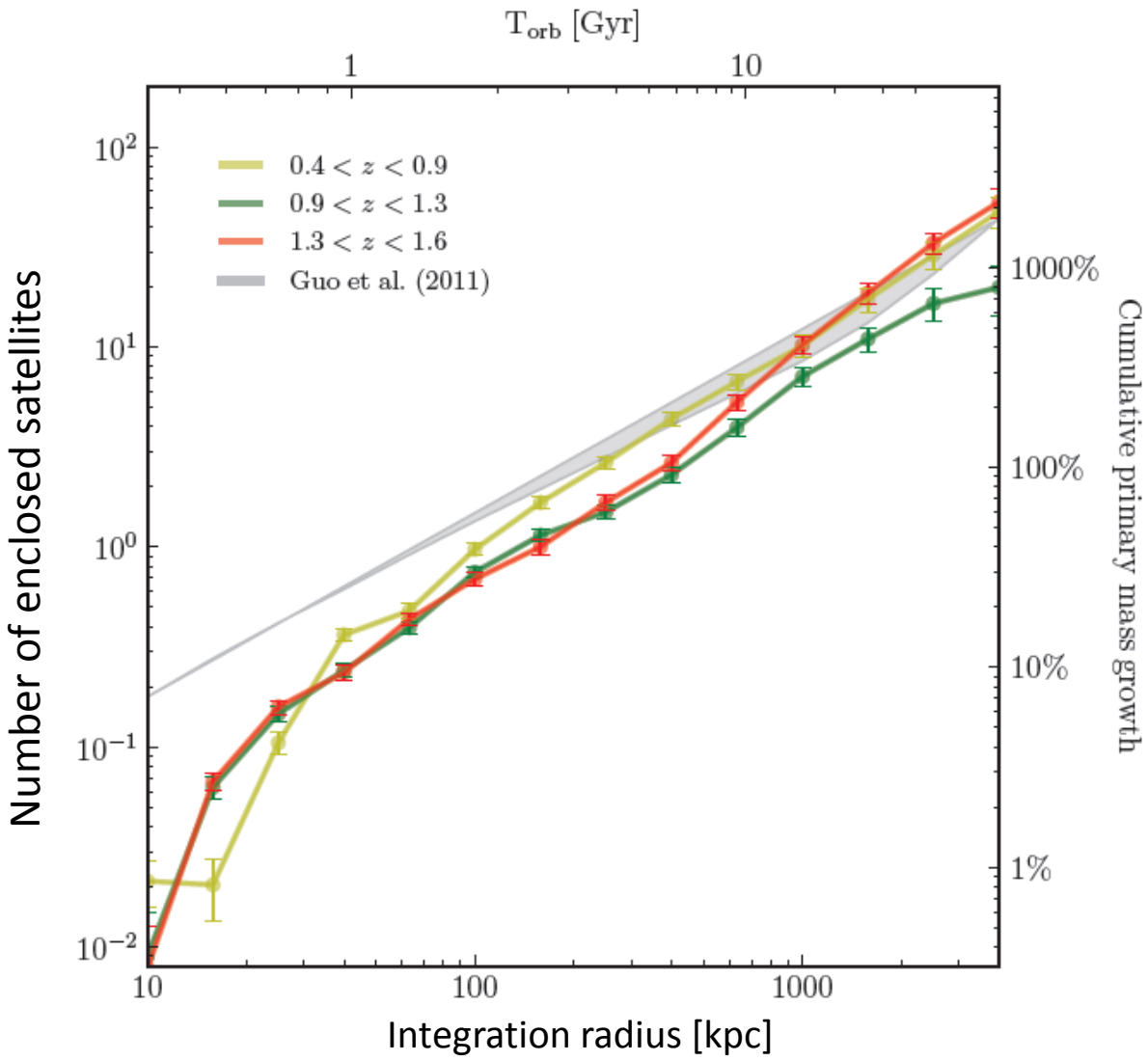
Projected number density functions

- The projected radial distribution of galaxies around massive primaries out to z=1.6
- Lack of evolution



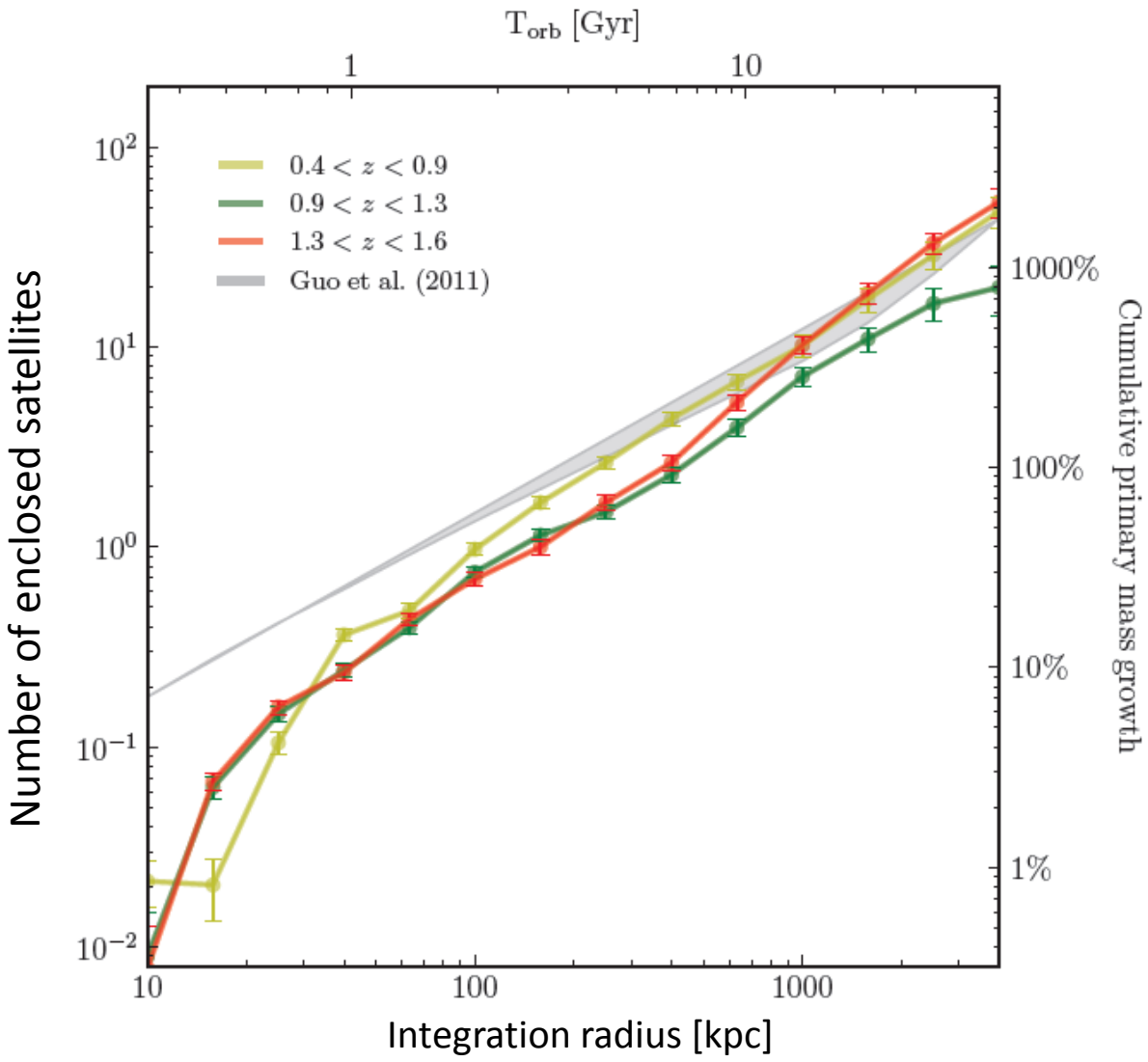
Typical massive galaxy environment

- Integrated number (mass) of "satellites" around massive galaxies
- Comparable to pair count measurements



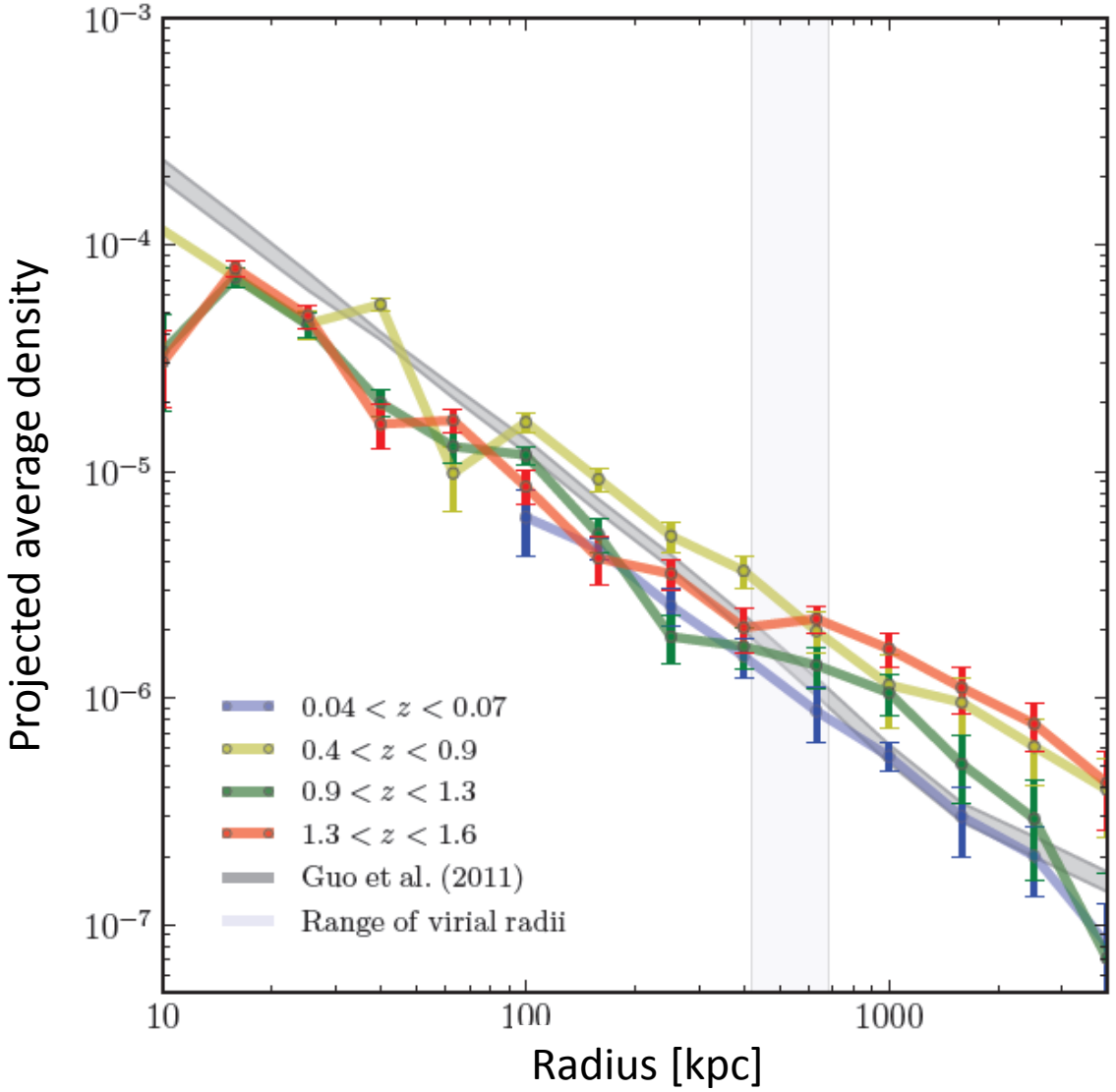
Typical massive galaxy environment

- Massive galaxies at 0<z<1.6 reside in groups
- 2 to 3 satellites within virial radius
- Equal total stellar mass in satellites as in central



Lack of evolution with redshift

- All profiles are consistent with one another
- Similar result from Guo et al 2011 (SAM)



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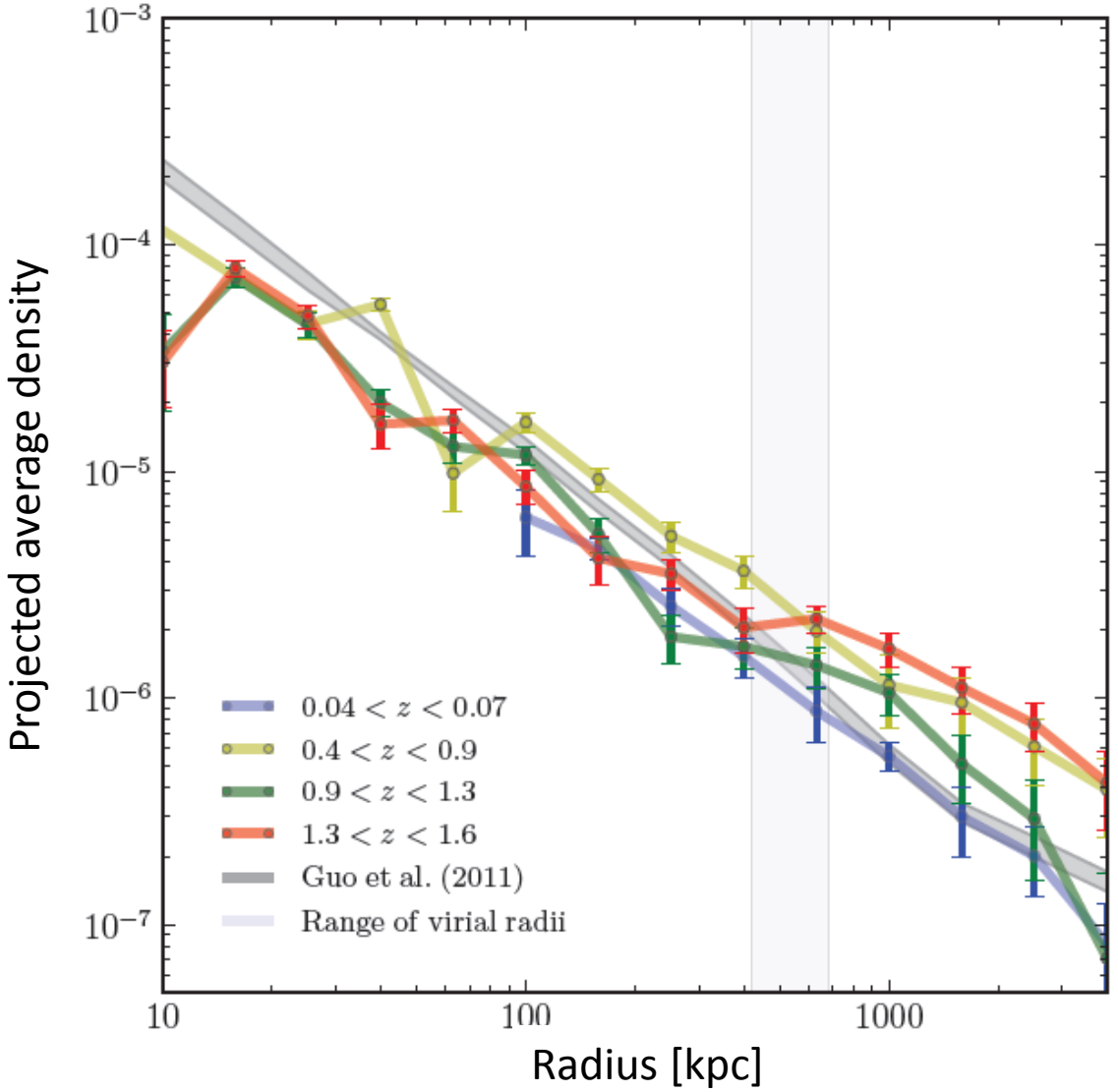
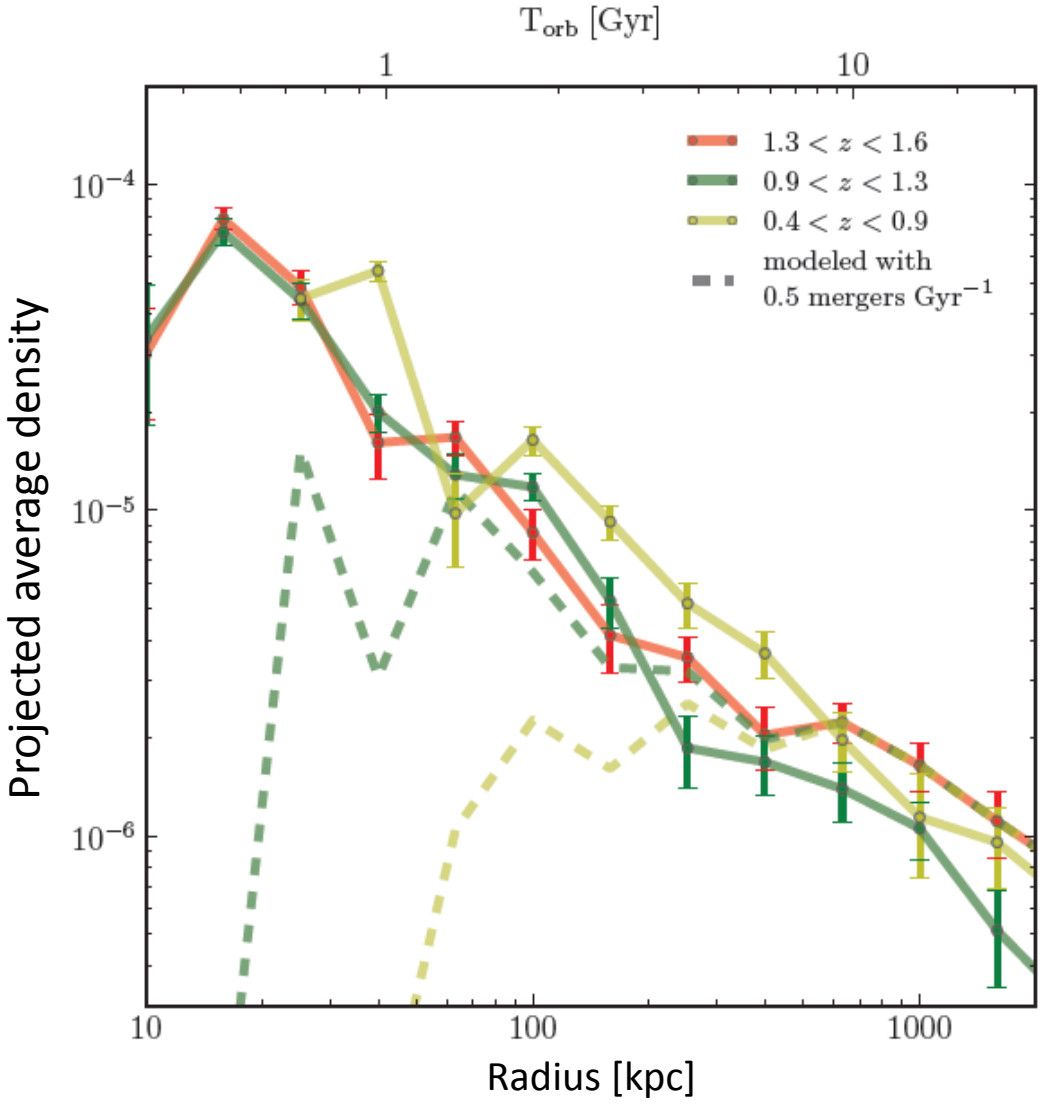
→No mergers?



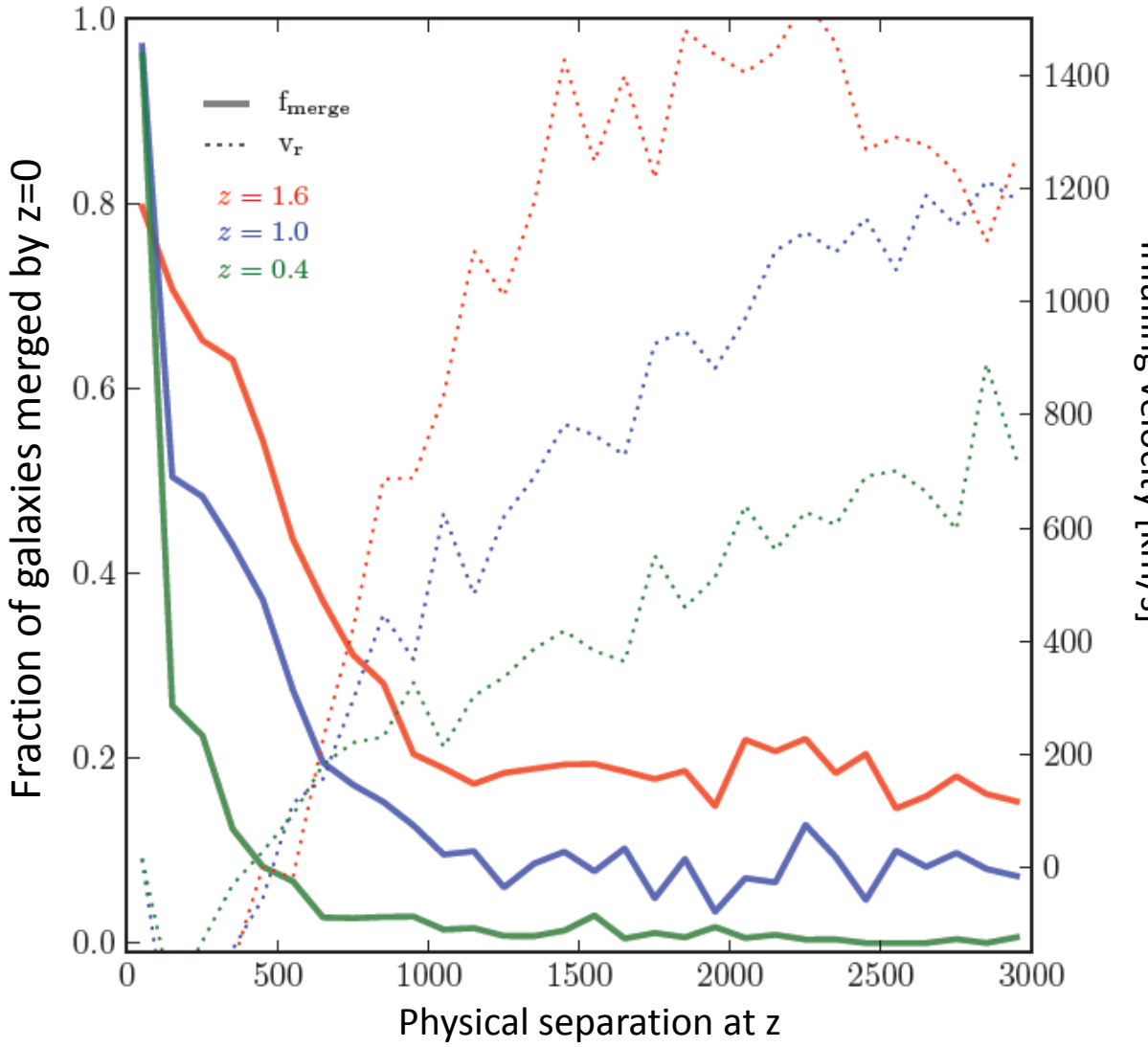
The effect of mergers

- Model mergers at a reasonable rate (0.5 Gyr^{-1})
- Derive new profiles and compare with observed ones
- Mergers can alter the profiles dramatically



Evolution in semi analytic models

- SAMs predictions:
  - Most satellites at 1 < r/Mpc < 3 on extreme orbits
  - Galaxies inside the virial radius gradually merge and are on shallower orbits



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The projected radial distribution of galaxies around massive galaxies

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Remarkable balance between in-halo merging and accretion into the halo

Supported by semi analytic modelling