Dwarfs Structural Properties: Environmental Effects

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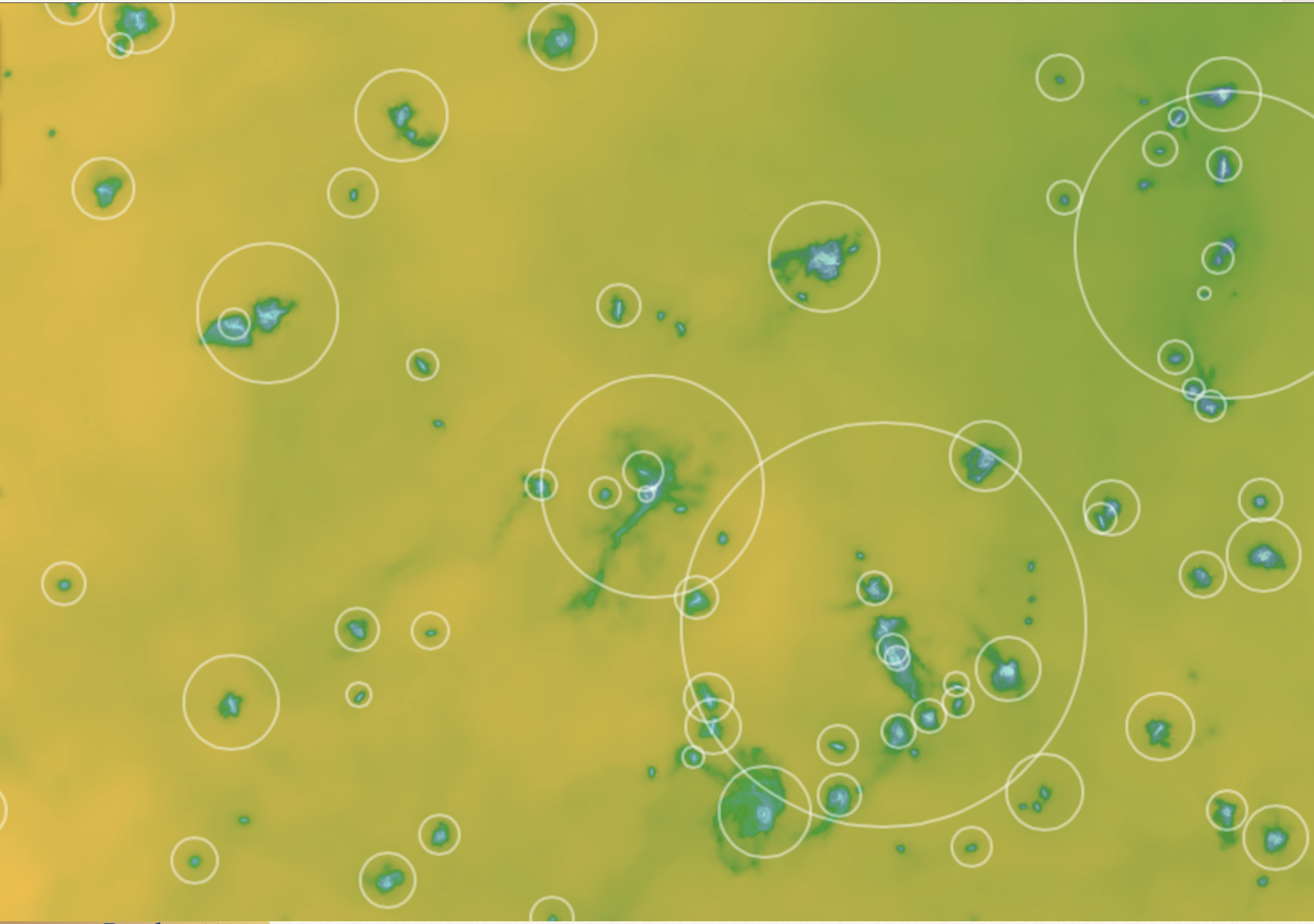
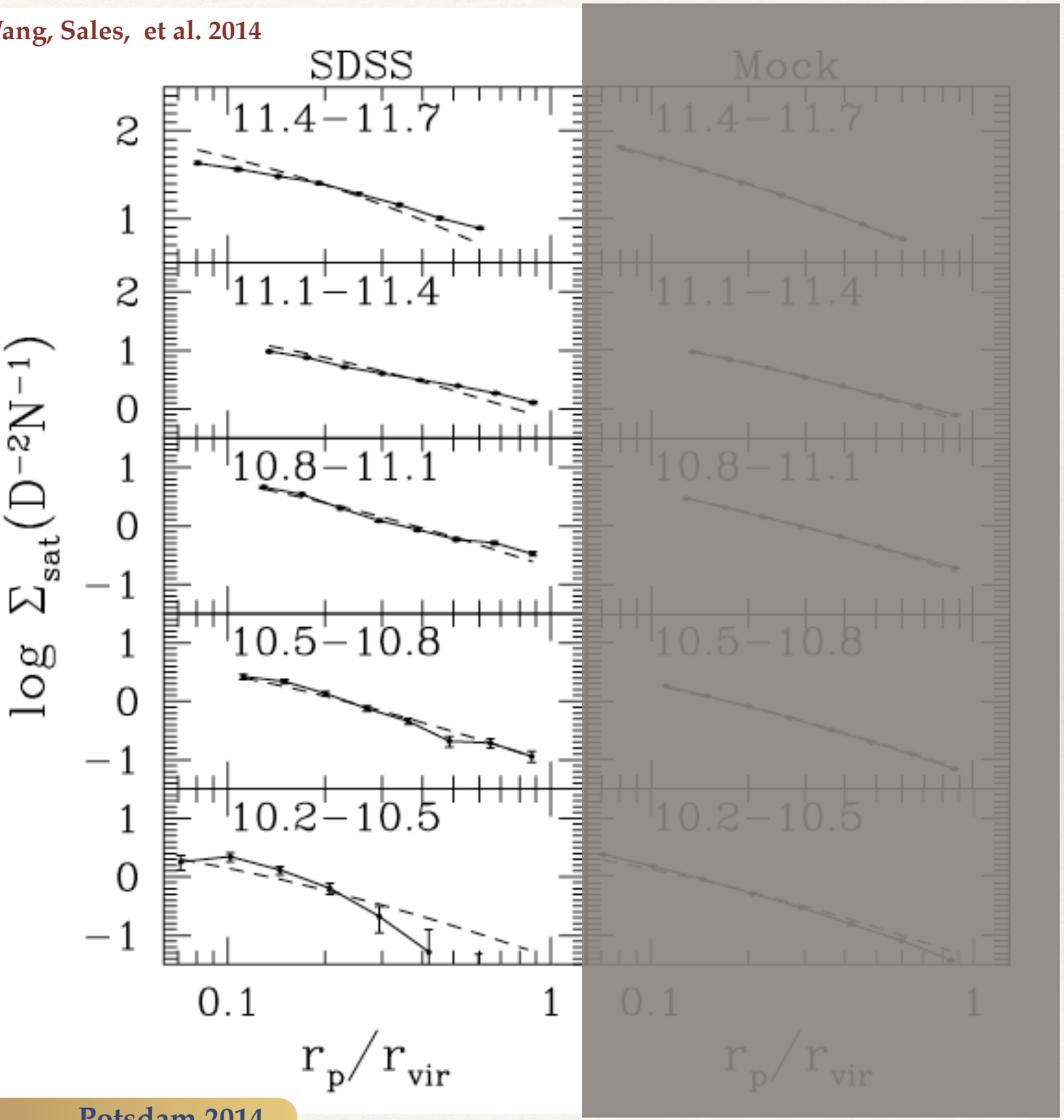


Satellite Galaxies in SDSS

1. Select isolated primaries from spectroscopic survey
2. Look for all objects in photometric SDSS within estimated r_{vir}
3. Remove the average background counts
4. Left over signal characterizes the satellite population (excess count, profile, color distribution, etc)

Satellite Radial Distribution around Isolated Primaries

Wang, Sales, et al. 2014

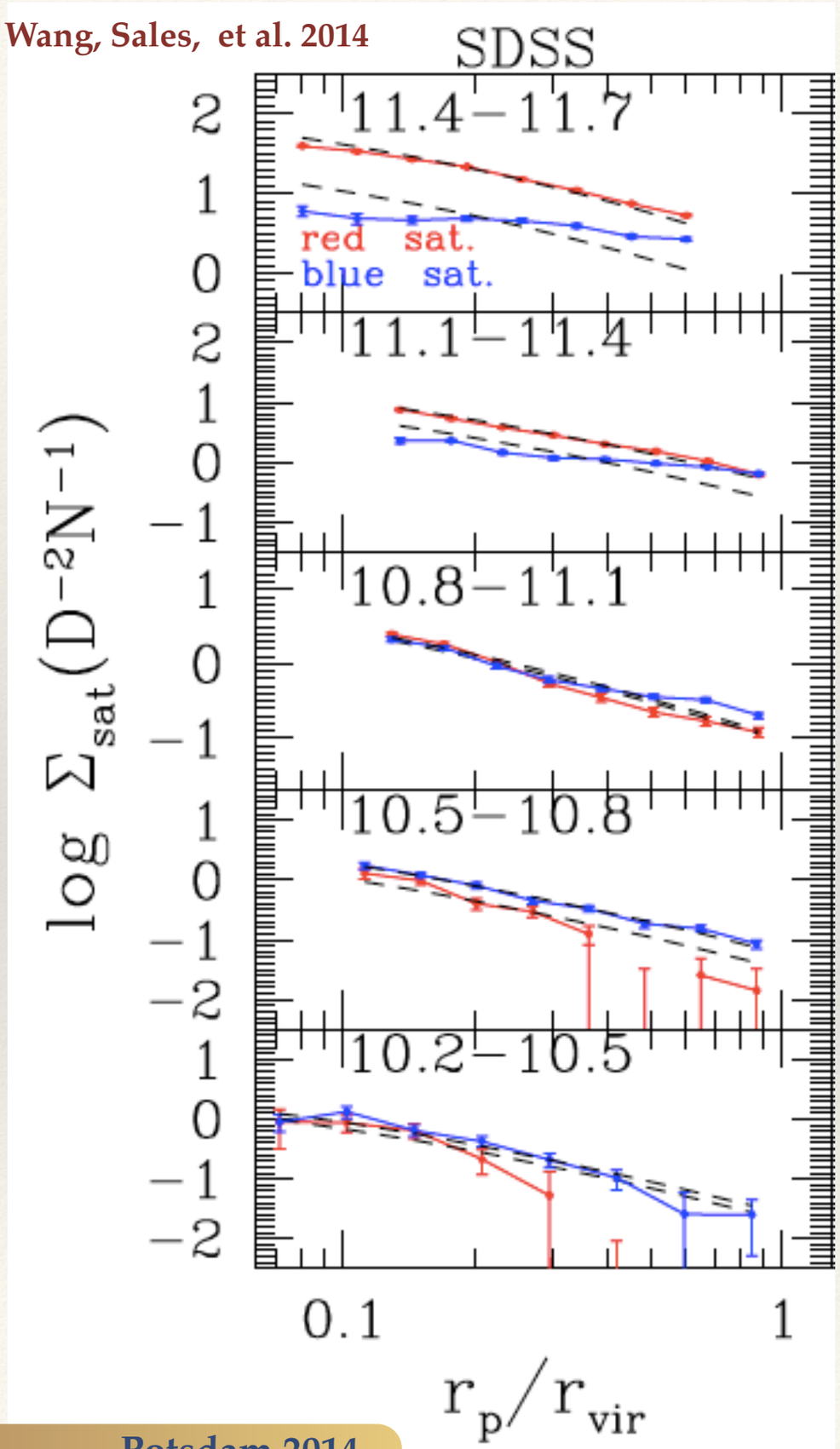


Primary Mass

Satellites roughly follow the underlying DM distribution

Satellite Radial Distribution according to color

Wang, Sales, et al. 2014



Dominant red

Flat profile for blue sats.

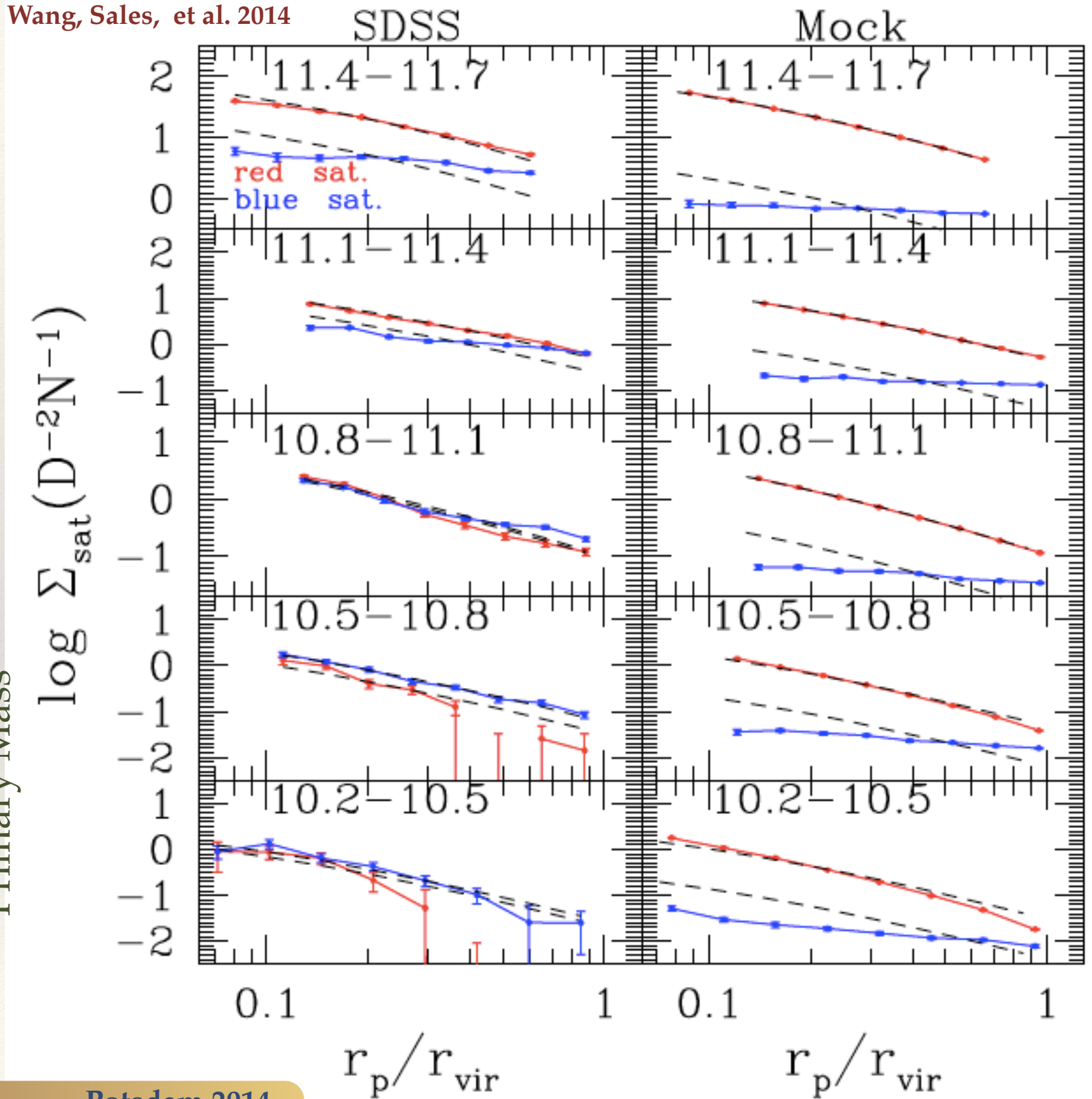
Primary Mass

Dominant blue

Comparable slopes for red & blue

Satellite Radial Distribution according to color

Wang, Sales, et al. 2014

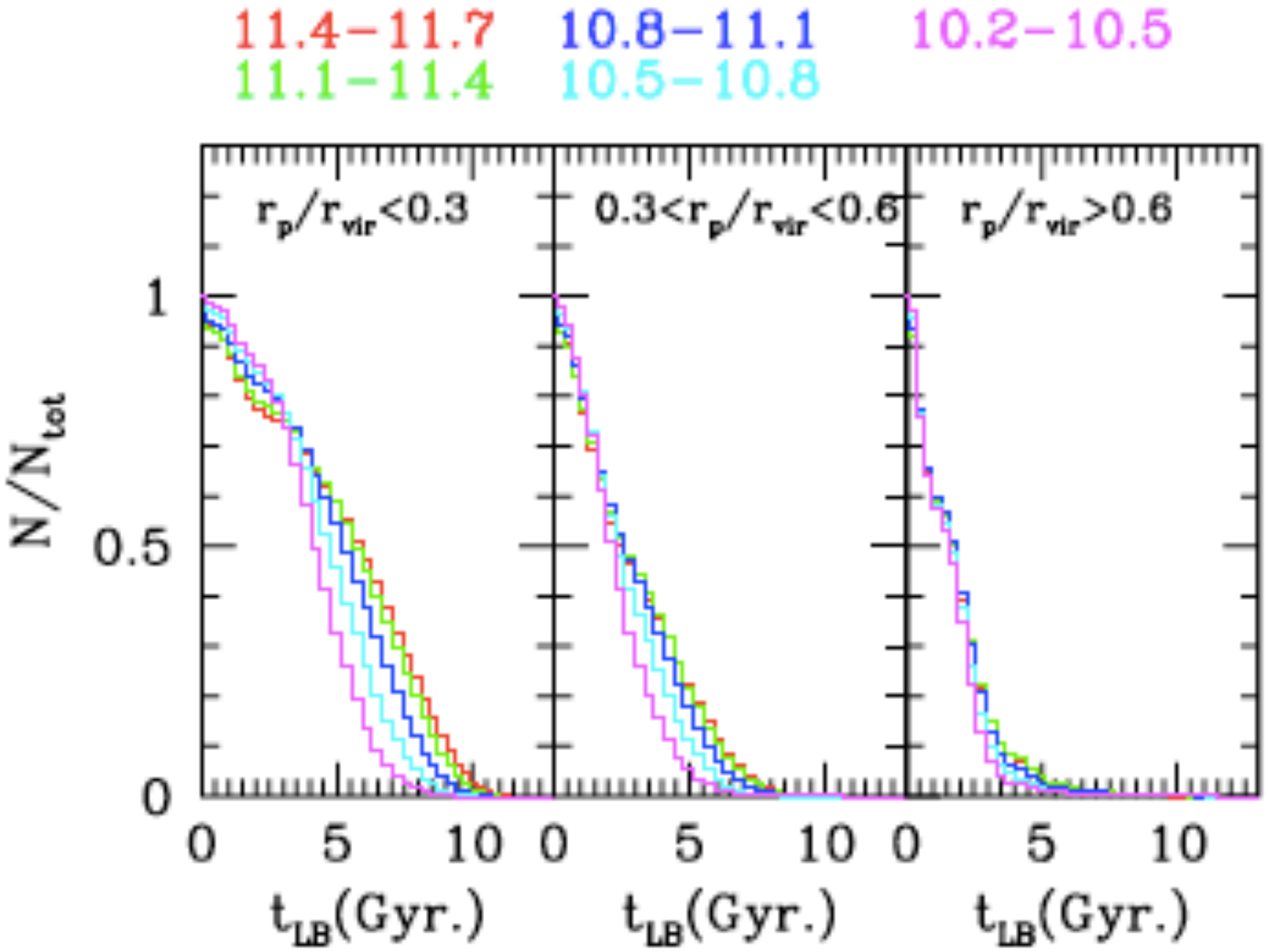


Primary Mass

SAMs overproduce red satellites
&
blue population has a shallow profile

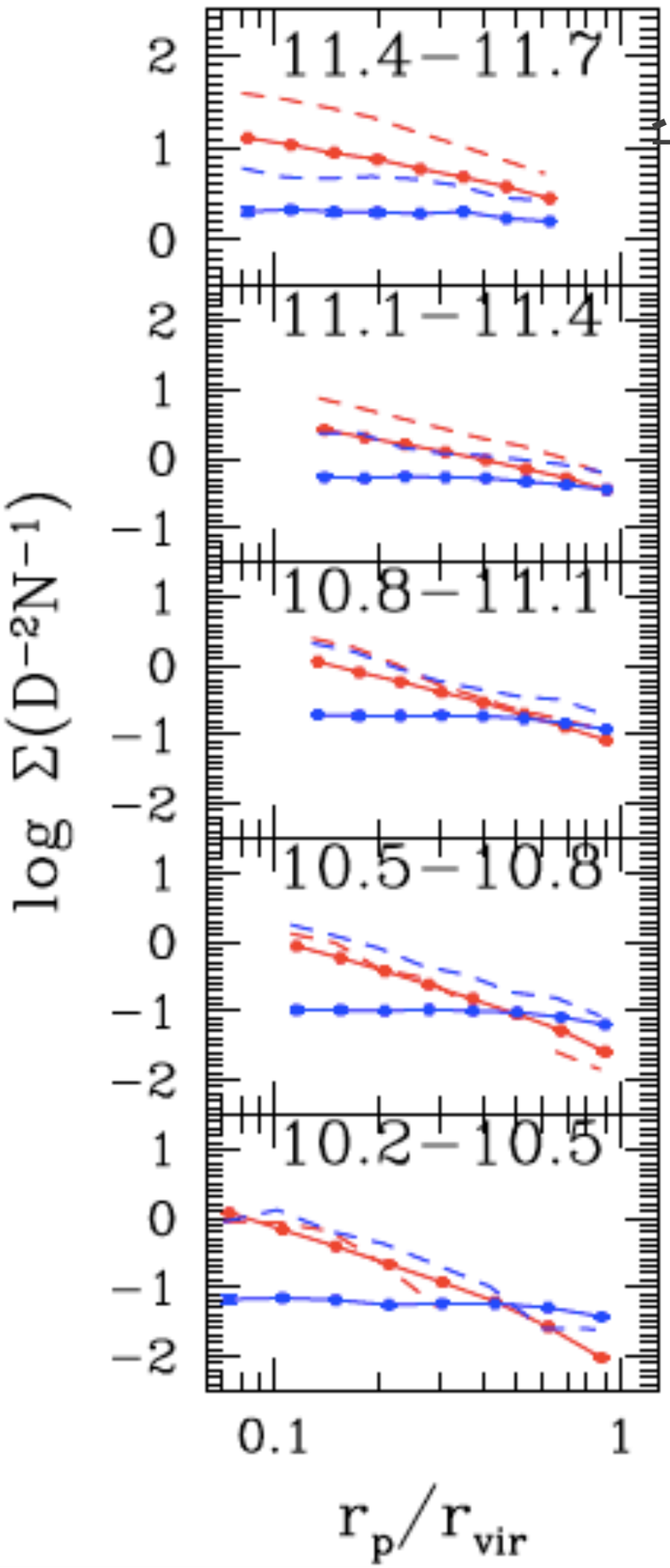
(see also: Weinmann 2006,2010; Kang 2008; Kimm 2009; Guo et al. 2013)

Satellite Infall Times



Wang, Sales, et al. 2014

Satellites in the inner regions fall in ~5 Gyr ago.
They seem to remain blue in low mass primaries



Dashed = SDSS

Solid = SAM - Ram Pressure below 10^{14} M_{sun}

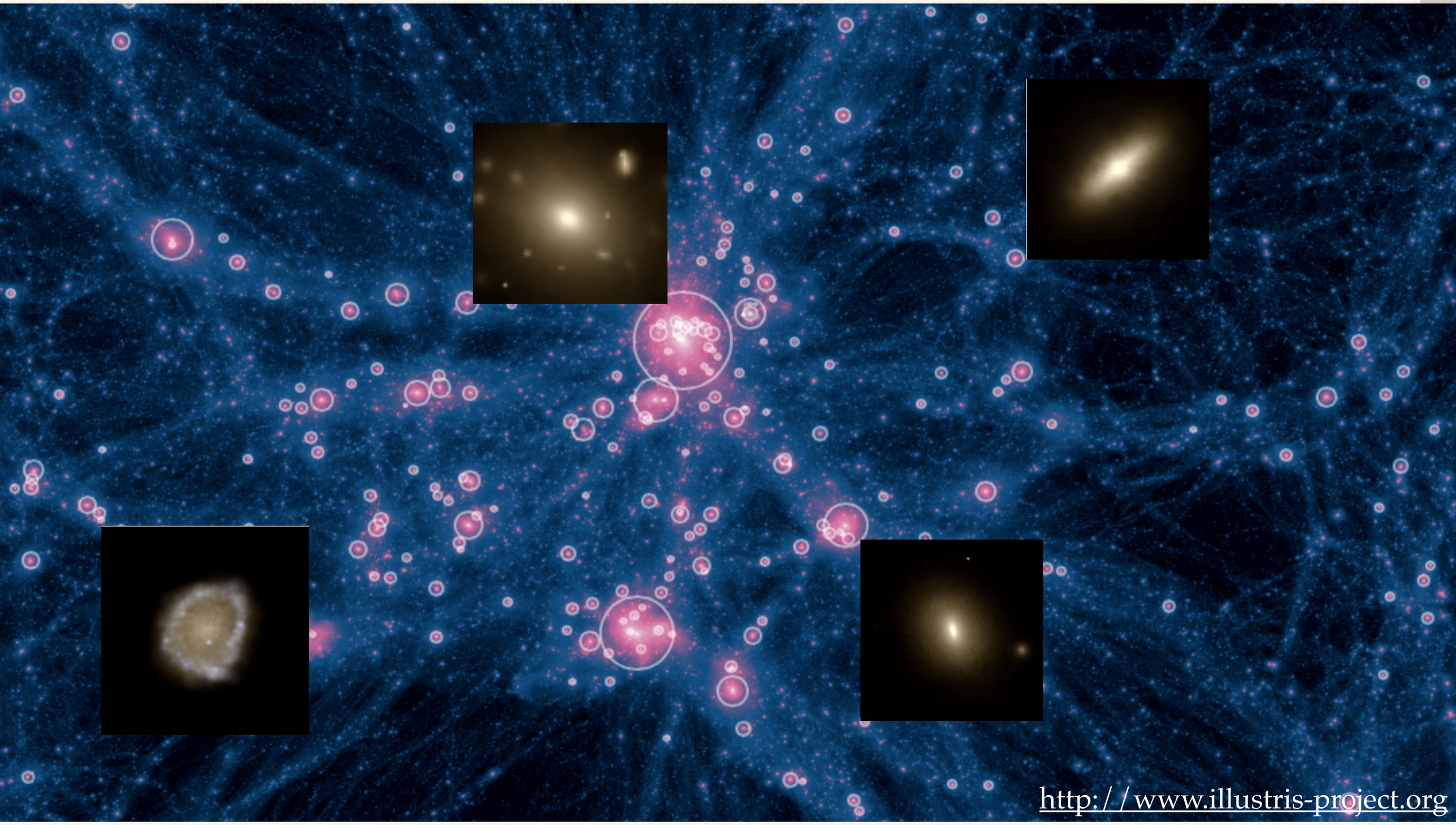
Artificially removing all environmental effects below $M_{host}=10^{14}$ M_{sun} does not solve the problem

(Increased fraction of blue satellites but radial profile remains too shallow)

Possible explanations:

- Spatial distribution of star formation?
- More complex re-accretion of gas?
- Infall properties?
- More?…

Satellite Galaxies in the Illustris Simulation

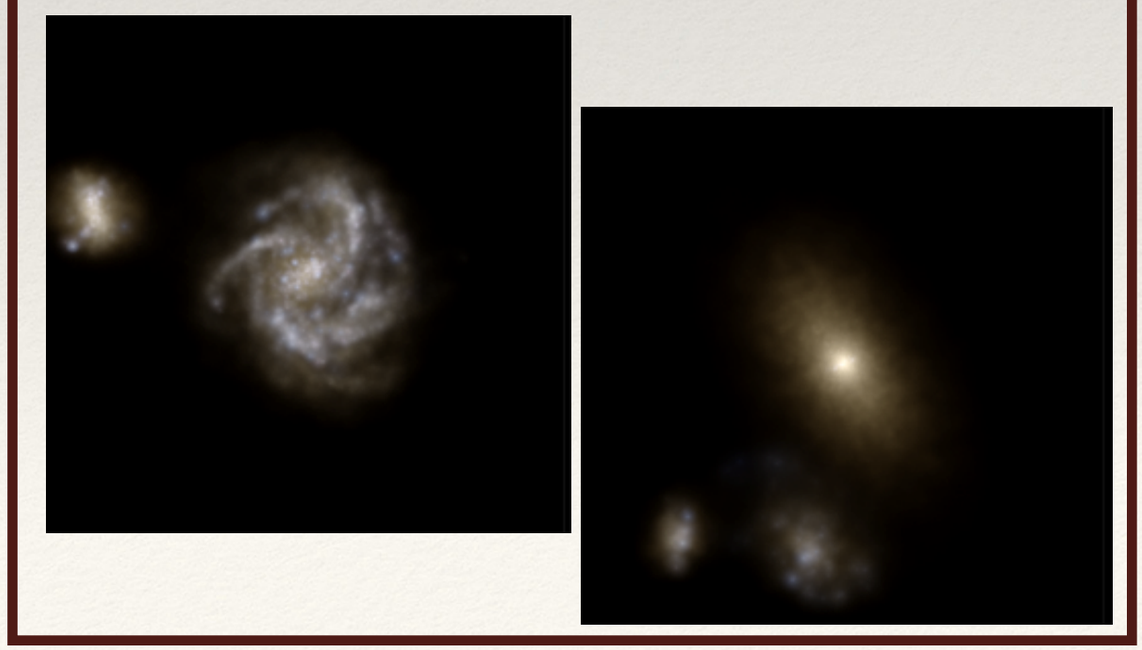


http://www.illustris-project.org

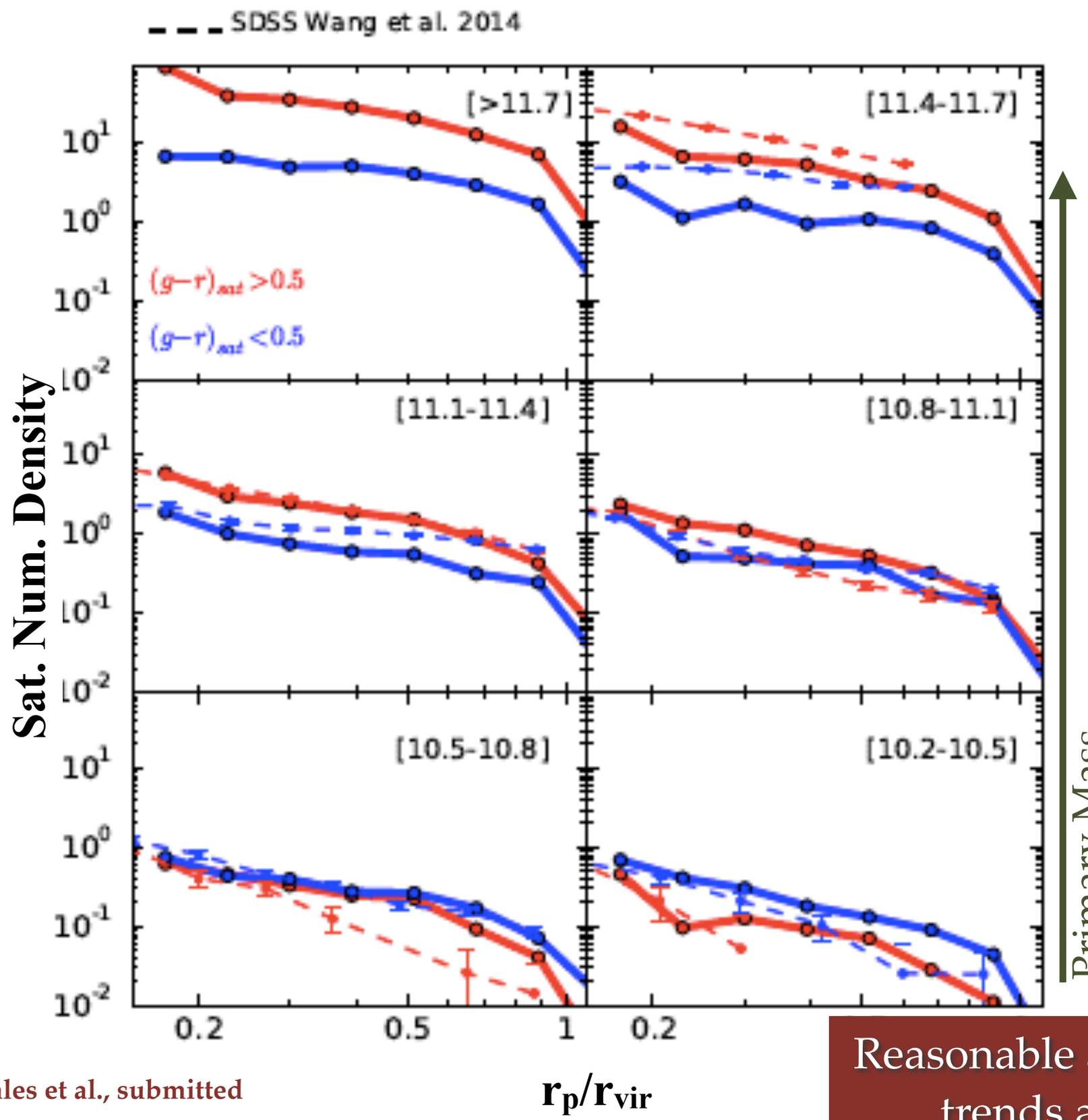
(Vogelsberger+ 2014a,b; Genel+ 2014)

Satellites around massive primaries in Illustris

Satellites around MW-like primaries in Illustris



Satellite Radial Distribution according to color



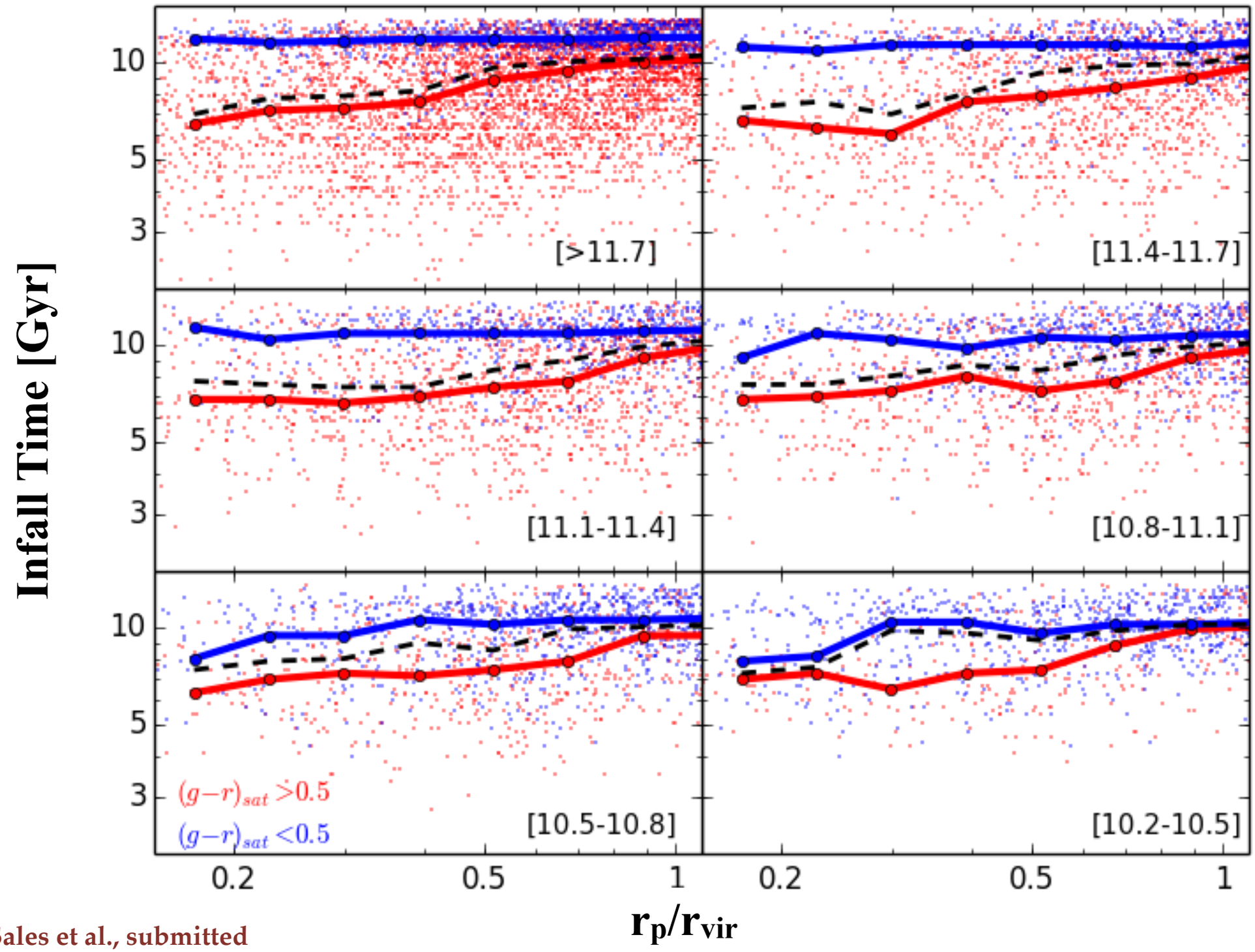
Sub-dominant & shallow blue distribution

Dominant & steep blue distribution

Sales et al., submitted

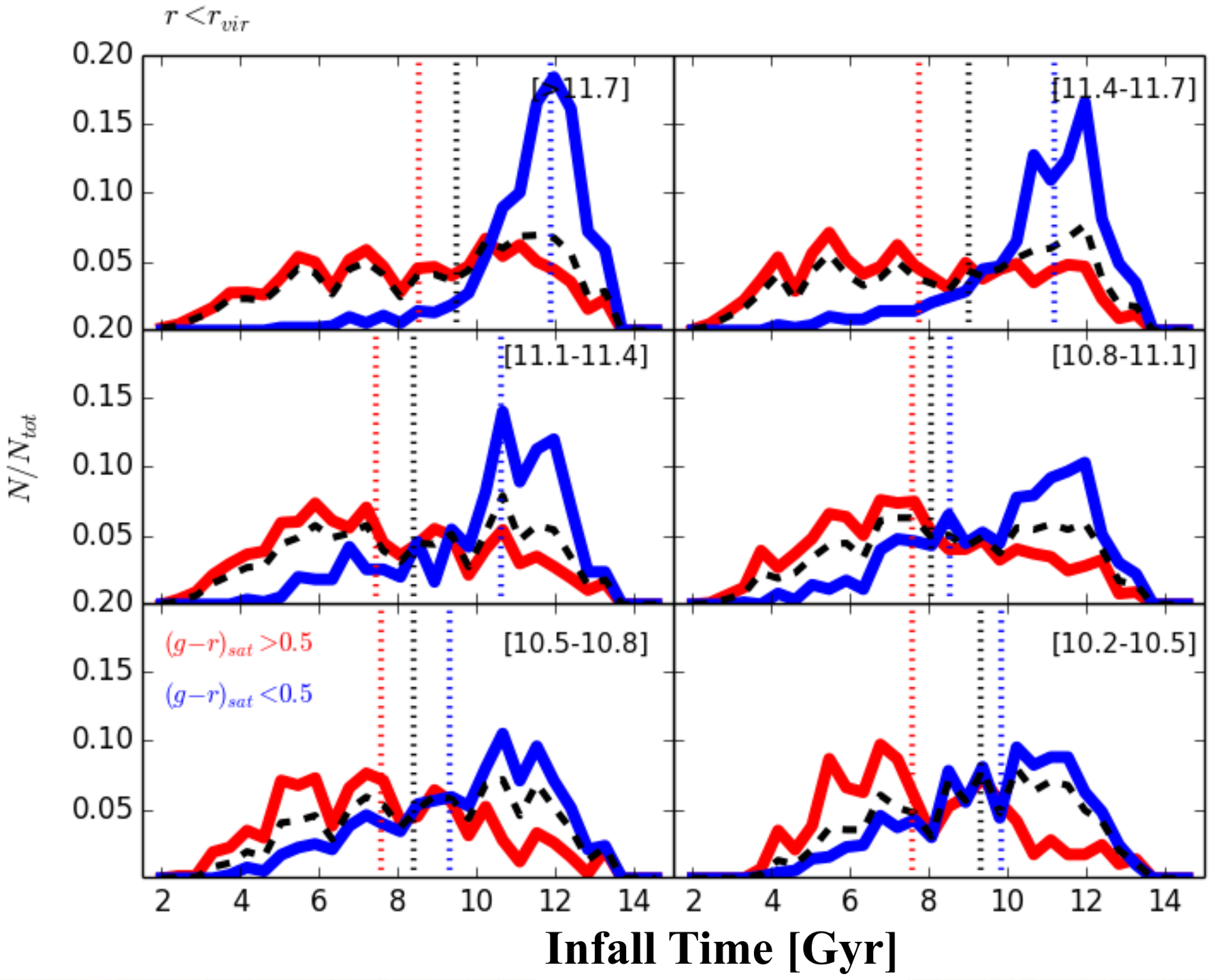
Reasonable agreement between observed trends and the hydro simulation

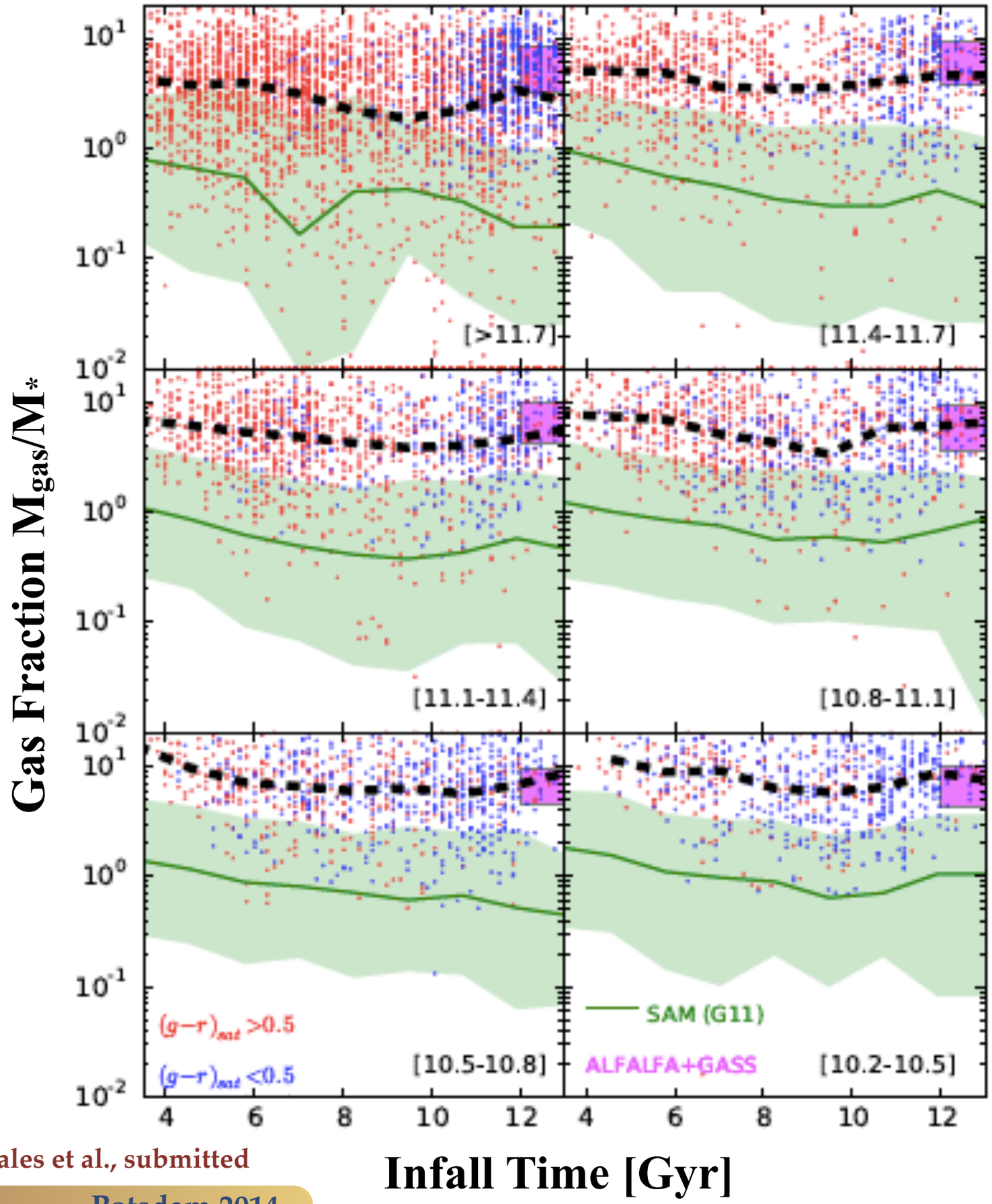
Satellite Infall Times & Colors in Illustris



Sales et al., submitted

Satellite Infall Times & Colors in Illustris

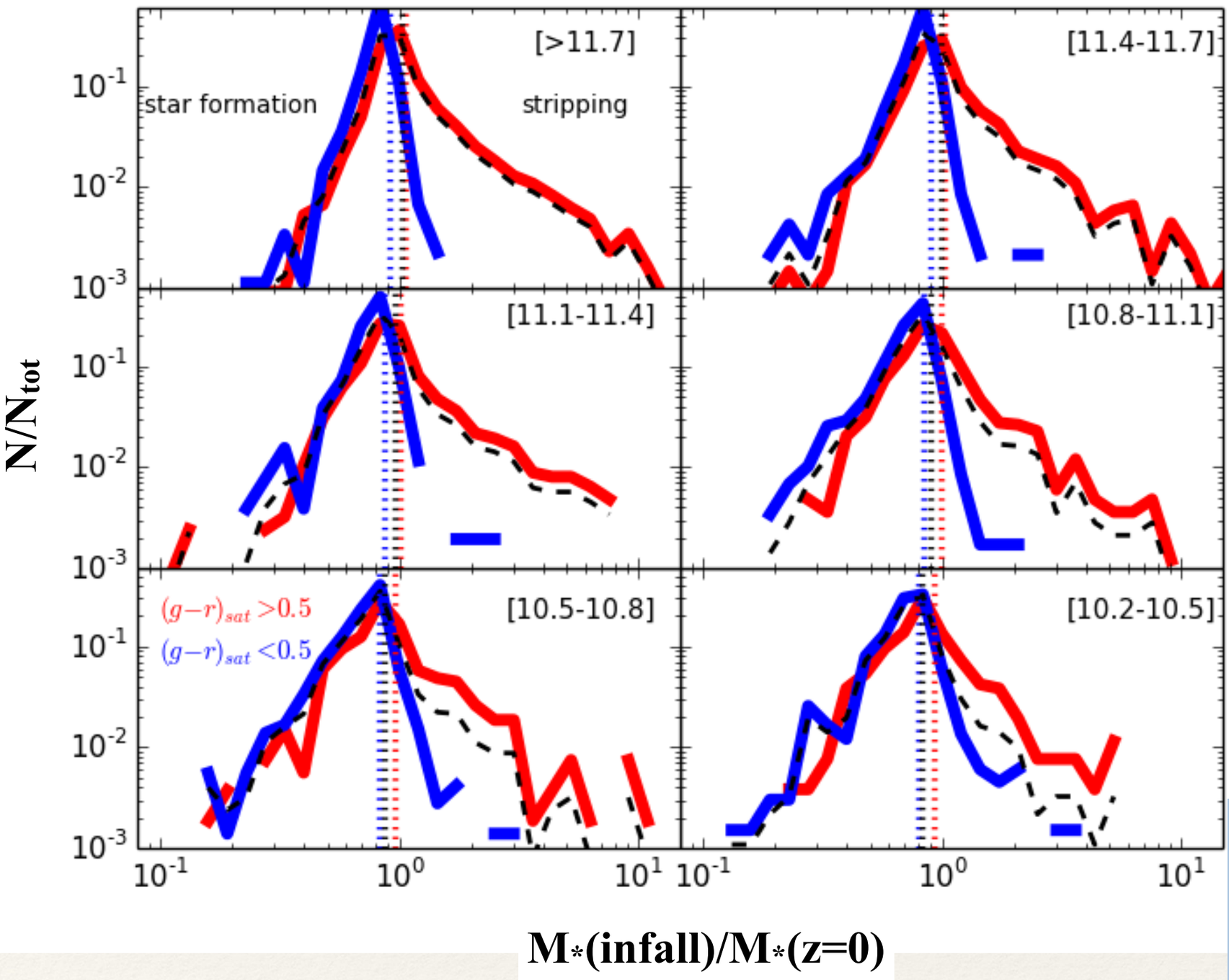




Sales et al., submitted

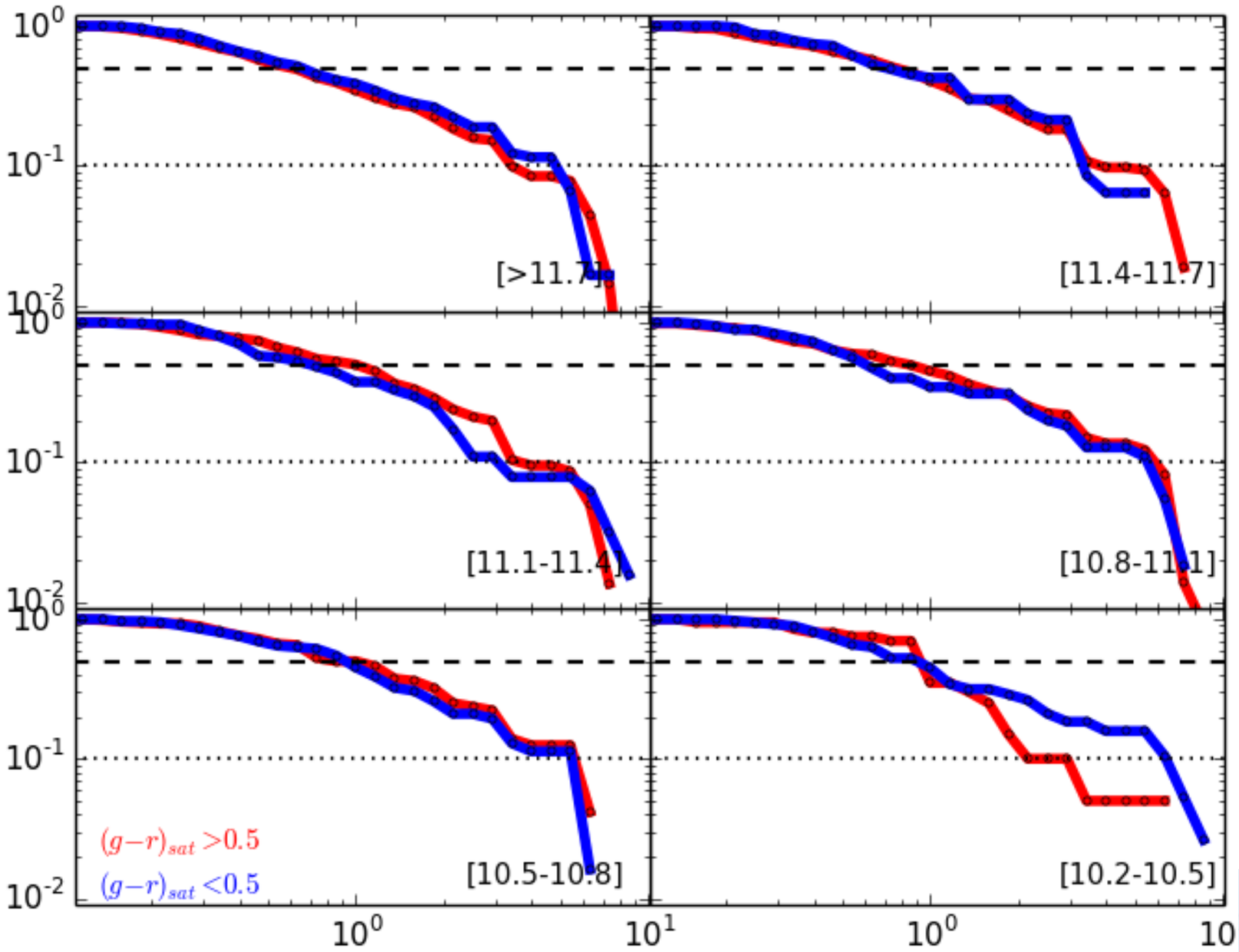
- Gas fractions of infalling dwarfs are significantly larger in Illustris than in previous SAMs
- Gas fractions vary weekly with redshift

Satellite Stellar Mass Evolution



- On average, satellites have approx. same M* at infall than at z=0
- 1%-10% of satellites more than double their mass while they are satellites

A word about pre-processing…



Infall time onto z=0 host

Last time it was a central of its FoF group

- ~50% satellites spent more than 1Gyr in a different group before joining the final host
- Pre-processing doesn't have a strong impact on the final satellite color

Summary

- In observations, **satellite distributions vary with primary mass**. Massive primaries have a dominant population of red satellites and blue objects distribute in a shallower profile. Instead, for MW-like objects, blue satellites are dominant and have a comparable slope to the red population

- Environmental effects weak-to-negligible for host masses $M_{vir}<10^{13}\ M_{sun}$

- Reasonably good agreement in the color & distribution of satellites in the Illustris hydro-simulation

- **Large gas fractions** at infall seem key

- Strong suggestion of a **characteristic mass**: dwarfs with $M^* < 10^8\ M_{sun}$ are all quenched in the Local Group but star forming in the field (see Wheeler et al. 2014, Geha et al. 2013)