THE IMPORTANCE OF LOW-MASS CLUSTERS FOR SATELLITE QUENCHING IN C-EAGLE SIMS

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QUENCHING OF GALAXIES

Quenching may start shortly after the first appearance (Oesch+16).

Environment start to play an important role at $z \sim 1.6$ (Nantais+ 2016,2017).

Mixed components in different regions of the clusters (Moran+ 2007)

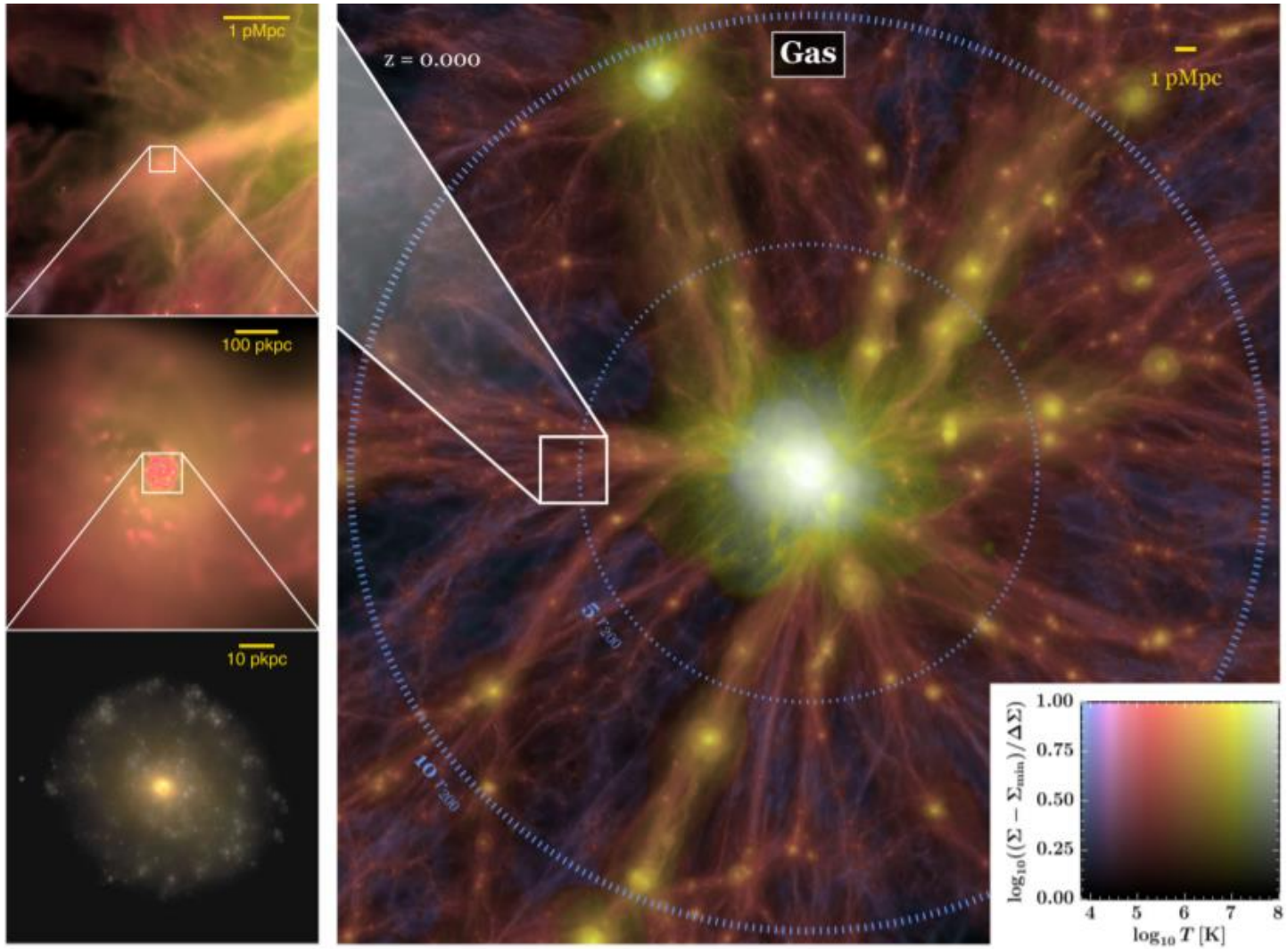
Even more complicated for dwarf galaxies!! (Benitez-Llambay+ 2014).

Recent studies suggest a needed threshold for quenching to happen(Roberts+ 2019)


DATA

C-EAGLE PROJECT

- ✓ 30 Clusters with masses between $10^{14} < M_{200}/Msun < 10^{15.4}$.
- ✓ Time resolution for particles of ~ 125 My, and for 3 Interval redshifts (0-1, 4-5, 7-8) resolution ~ 25My. For Group Catalogues time resolution of 500My.
- ✓ X-Ray and S-Z properties calculated.
- ✓ Gas particle resolution ~10^6Msun

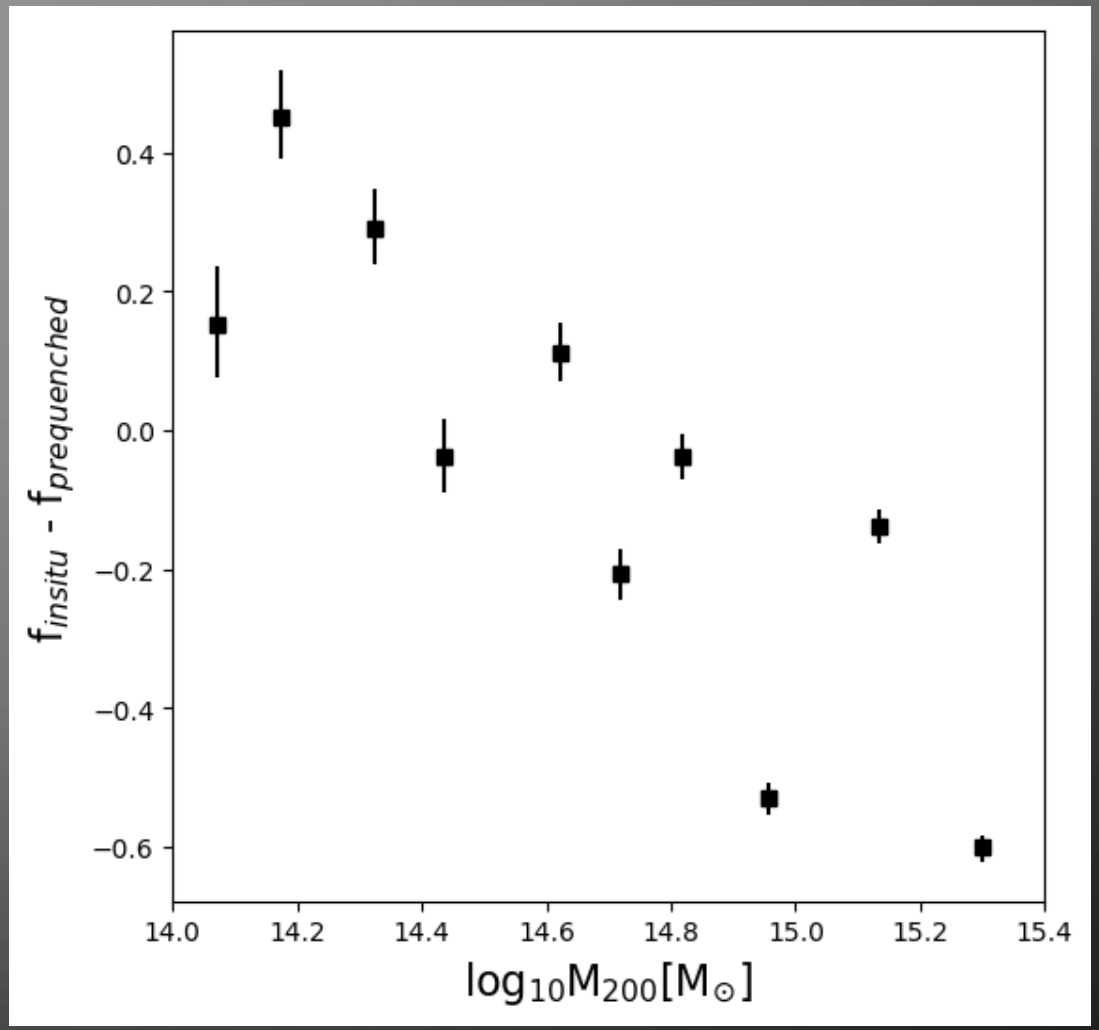


Barnes+2017; Bahé+2017

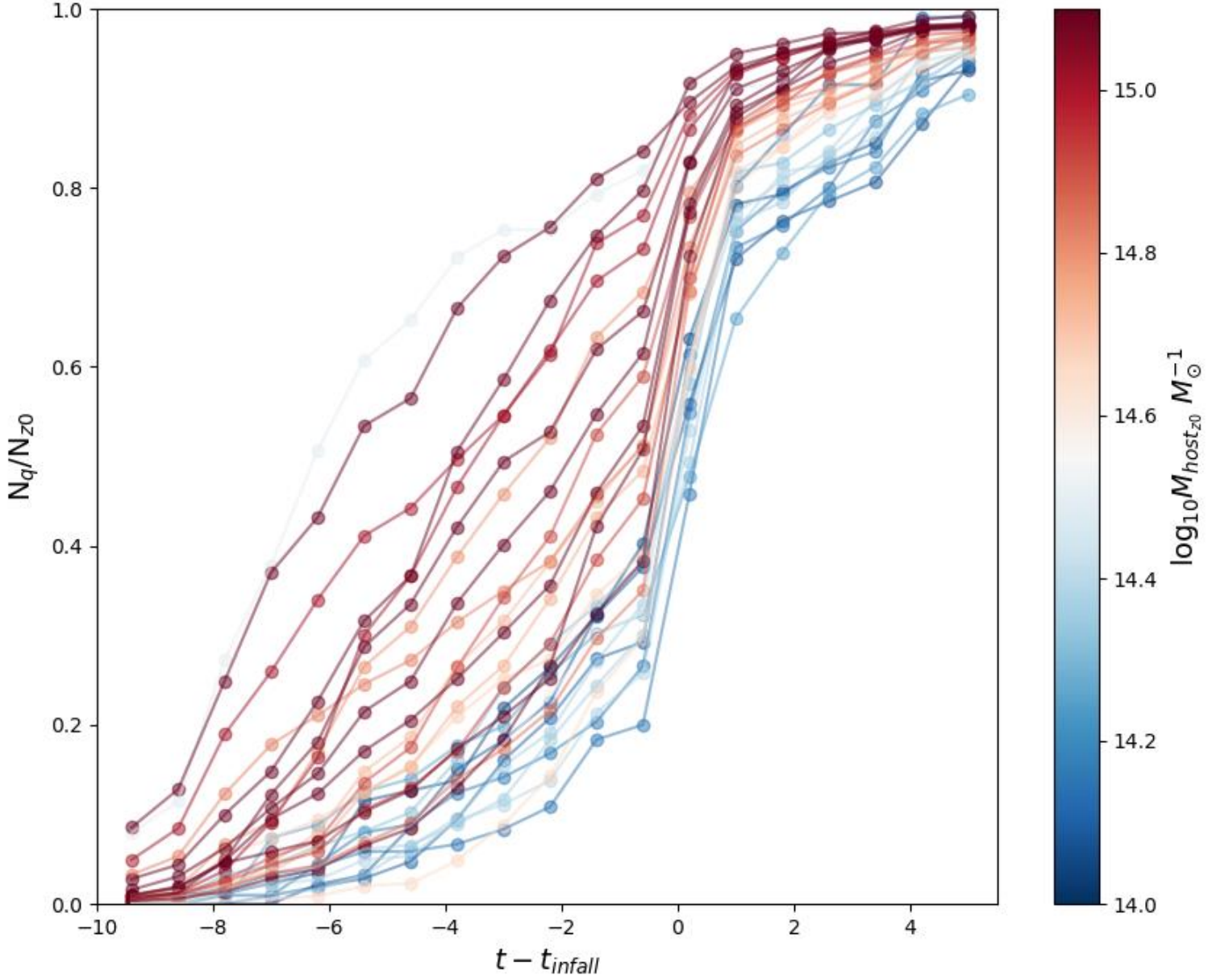
RESULTS

DOMINANT POPULATION

- High mass clusters quench less galaxies than low mass clusters.
- When M200~$10^{14.6}$Msun the predominant population change.
- Low mass clusters are the structures responsible for satellite quenching.

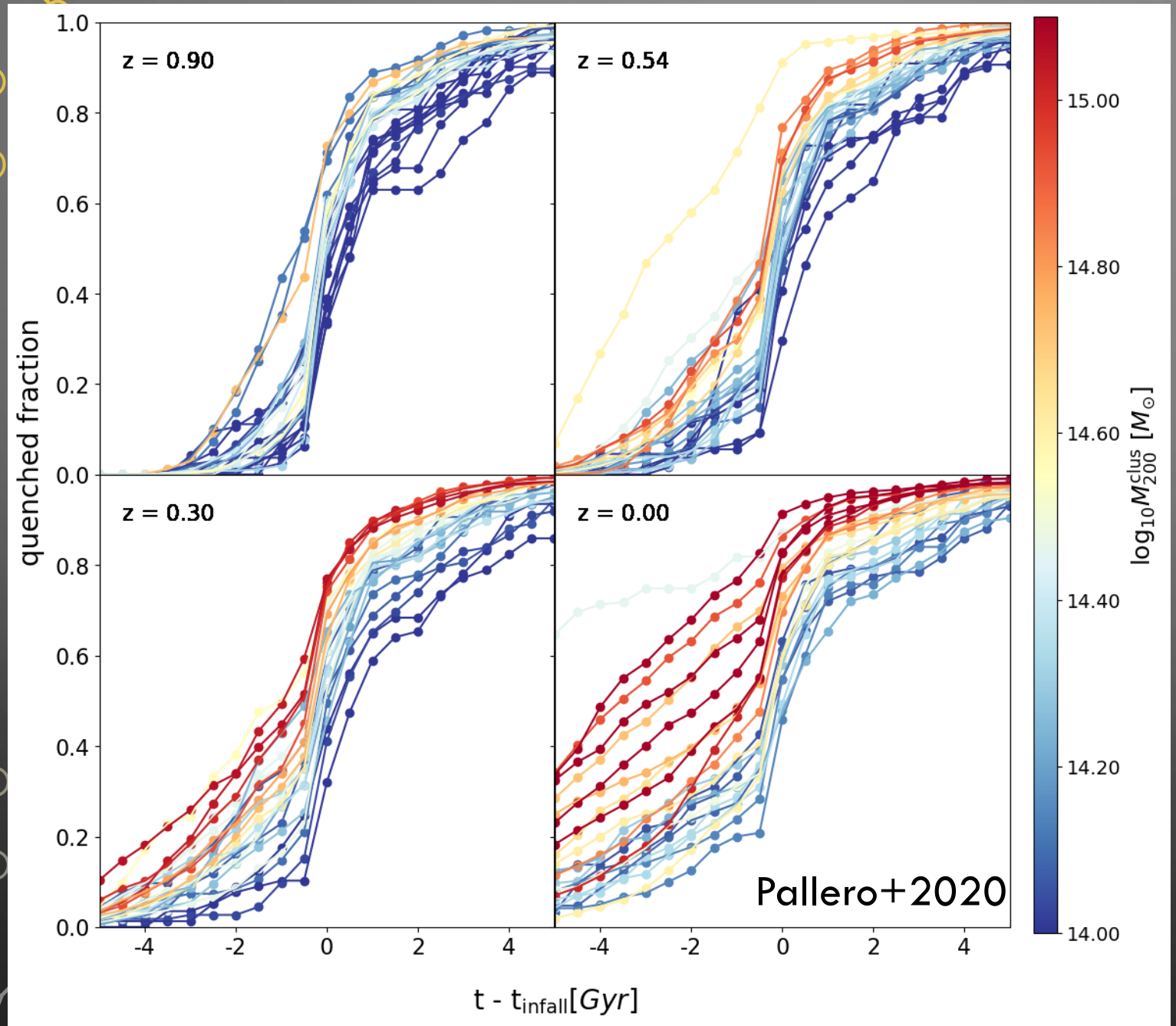


TIME EVOLUTION OF THE QUENCHED FRACTION



- Strong change in the slope at R200.
- LMC are the most efficient structures to quench the star formation.
- Between 20% and 80% of galaxies arrives to clusters quenched.
- After 4Gy all galaxies reach their quenching state, regardless the halo mass.

LOOKING CLUSTERS AT DIFFERENT REDSHIFTS

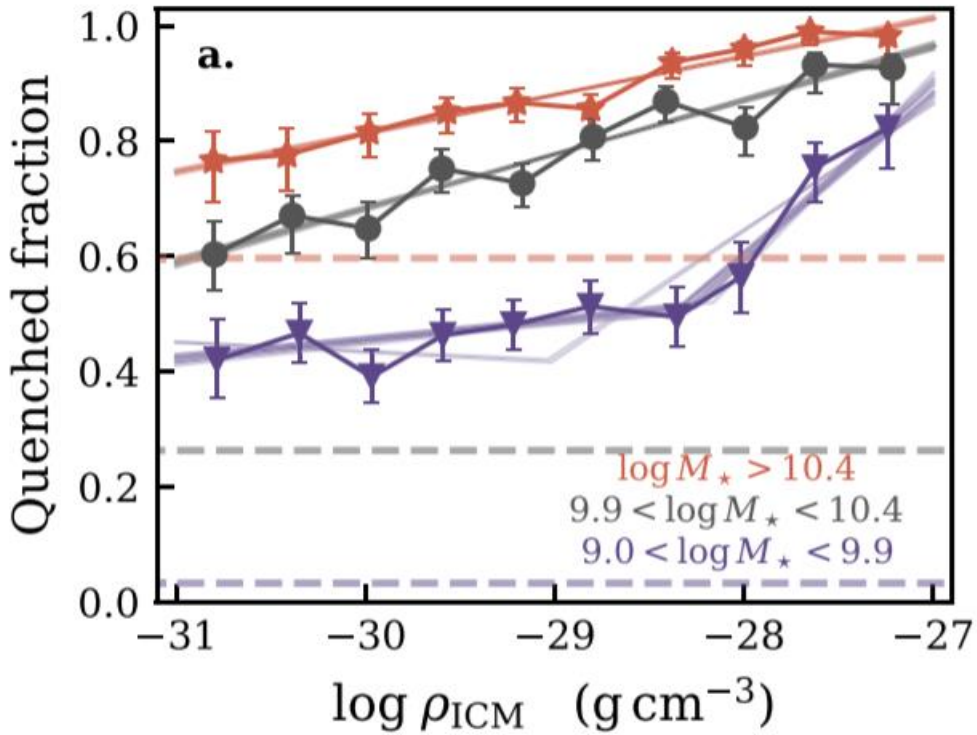


- Fraction of pre-quenching decreases as we look at higher redshifts.
- Clusters with same mass present different quenched fractions at different redshifts.
- Consequence of the different assembly history suffered by clusters at different redshifts.

A CARACTERISTIC THRESHOLD IN DENSITY?

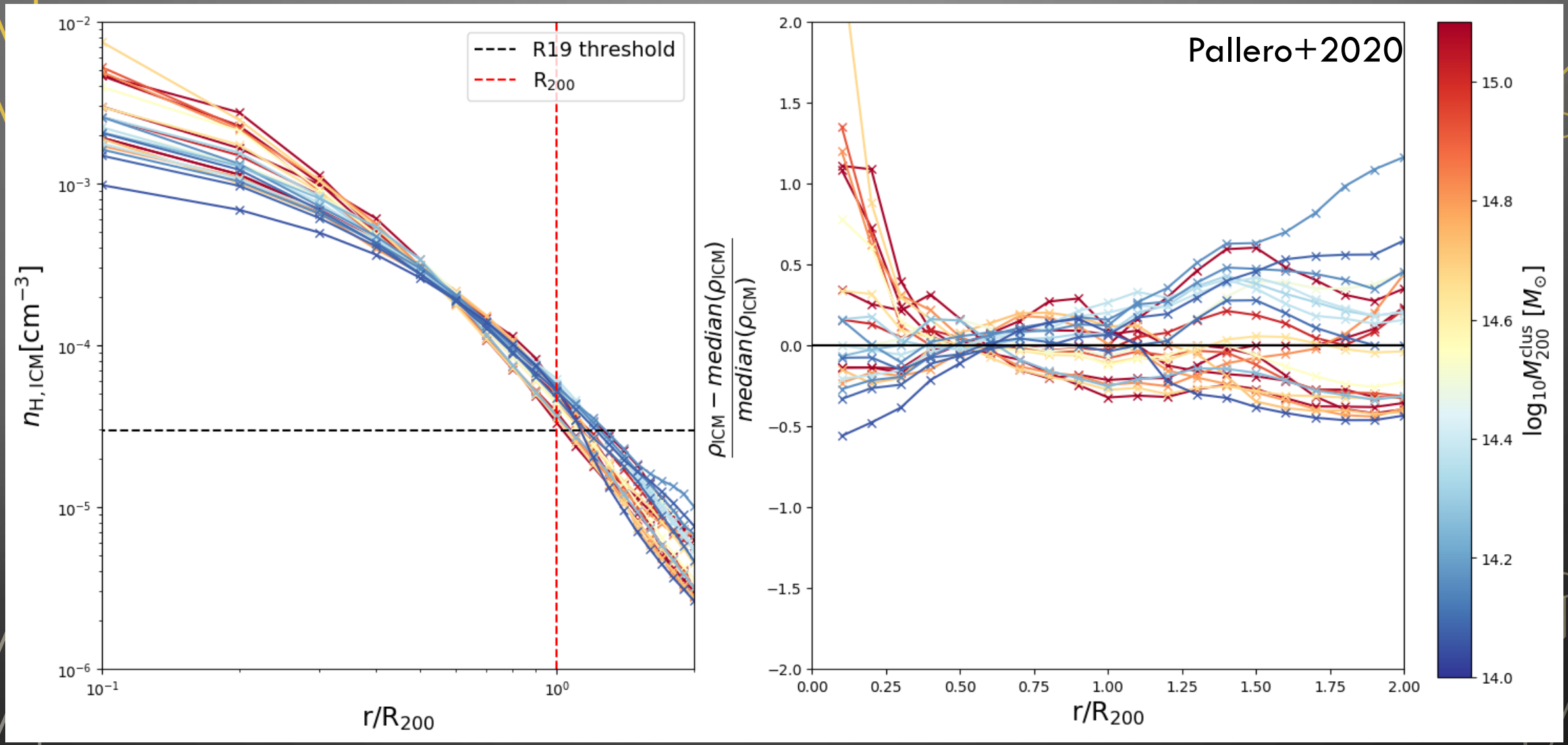
ROBERTS + 2019

- They found that the quenched fraction of satellite galaxies grows with ρ_{ICM}.
- Also found a change in the slope for low mass galaxies when $\rho_{ICM} > 10^{-28.3}$gr cm^{-3}
- What do we found…



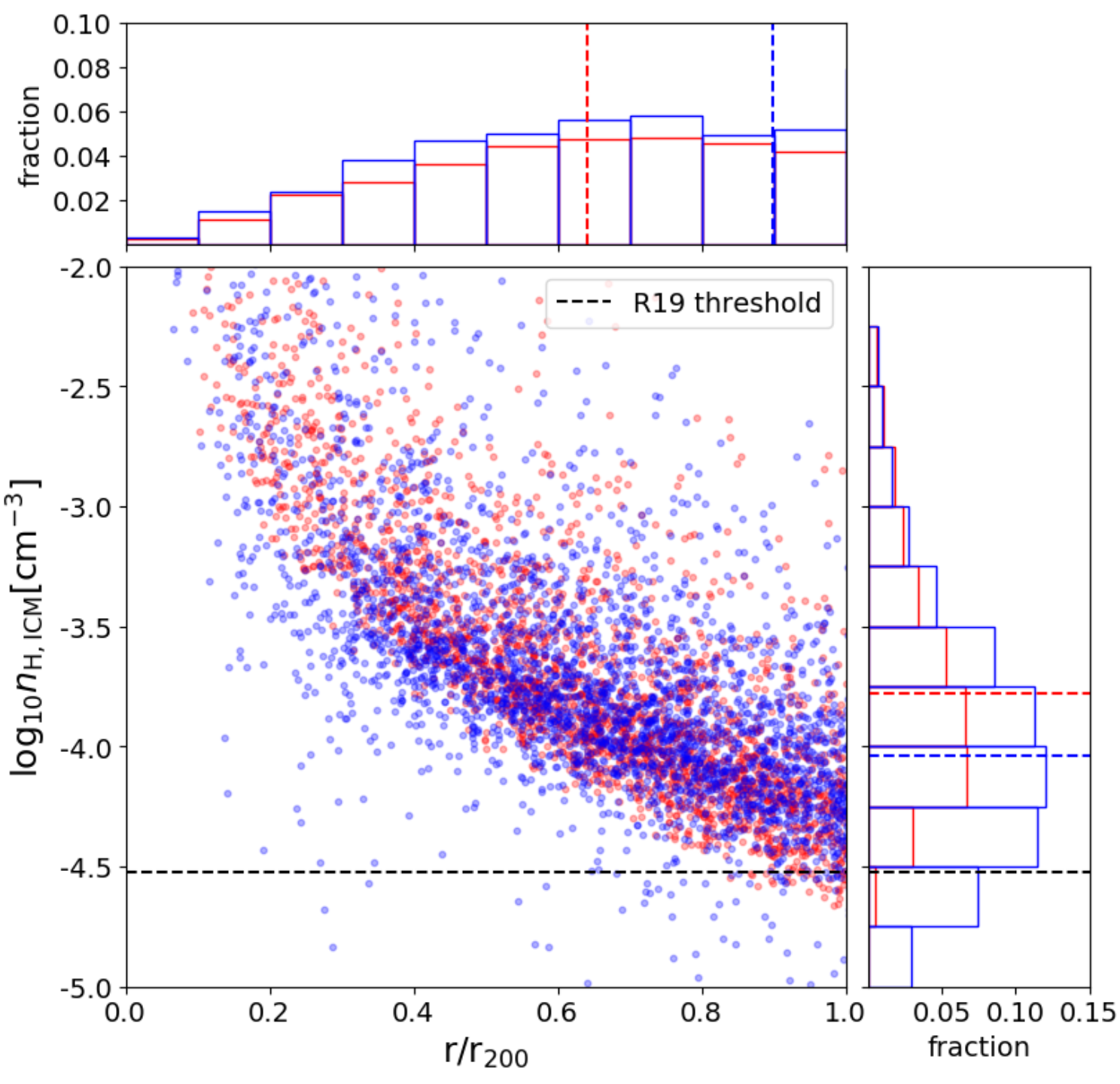
ROBERTS + 2019

GAS DENSITY PROFILES



- Threshold proposed in R19 reached at r≥r200.
- Low mass clusters shows an extended envelope.

- Density experienced by galaxies at their quenching time as a function of the cluster-centric distance.
- Galaxies get quenched when ρ_{ICM} denser than the proposed threshold
- Density measured following Vega-Martinez+2021.



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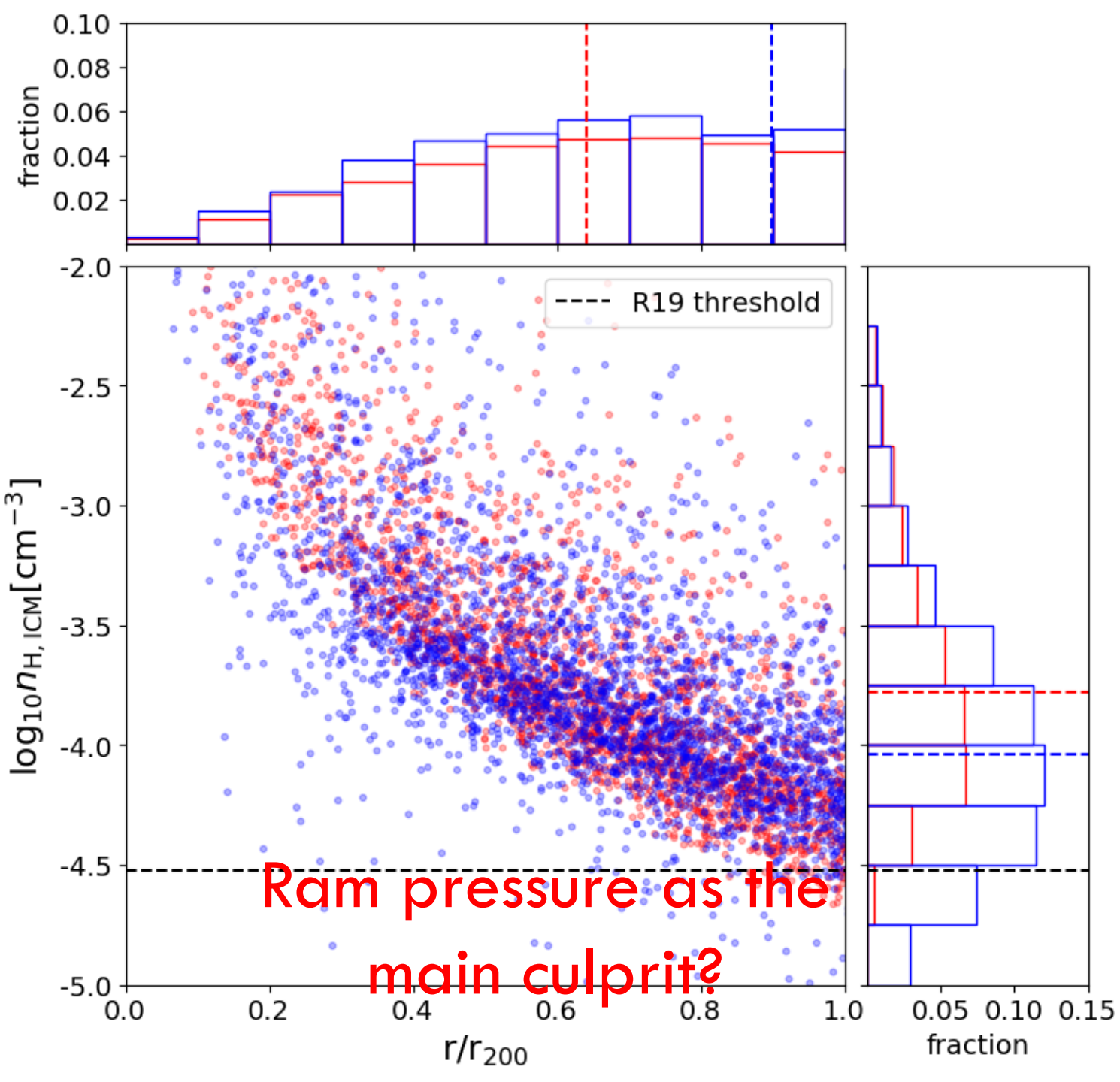
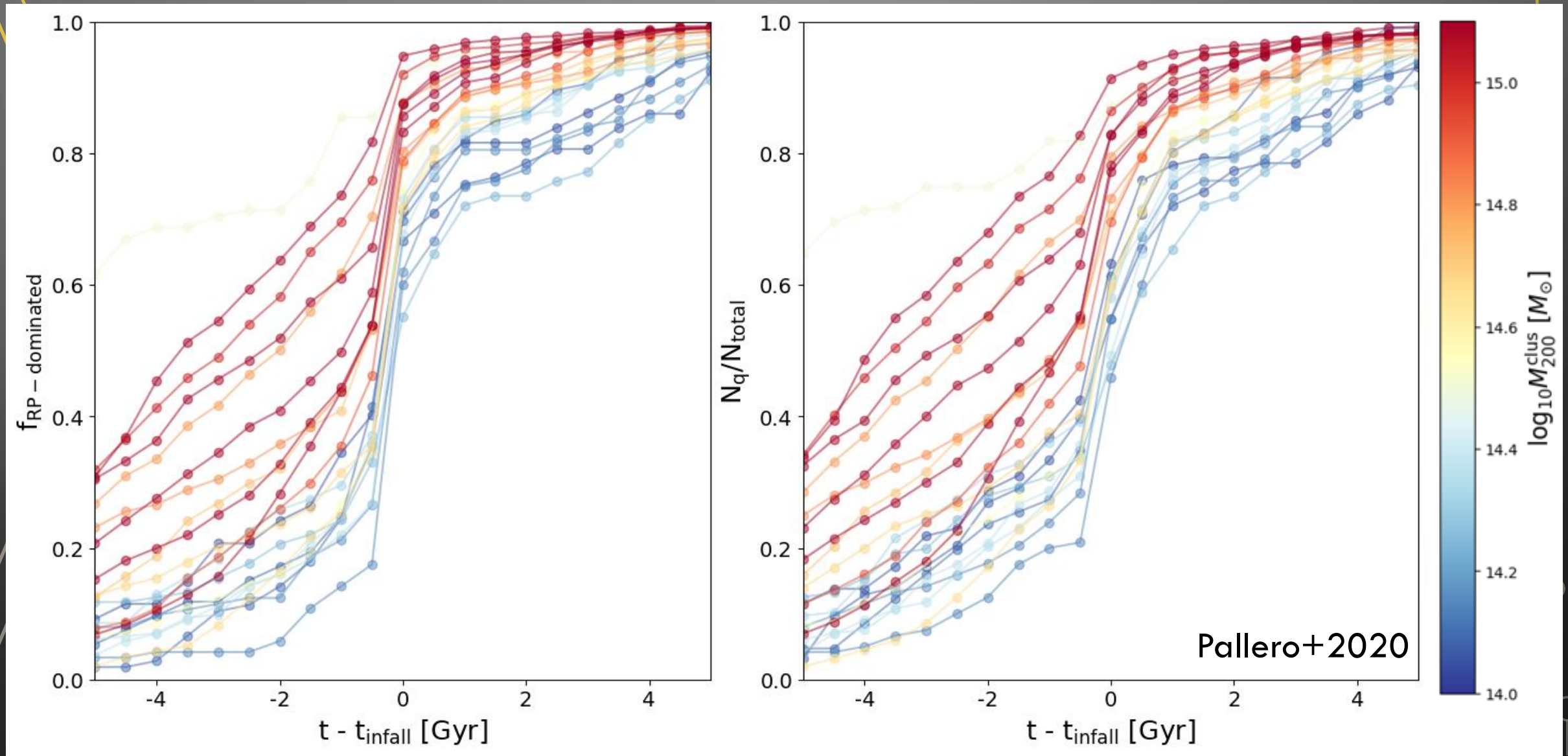


RAM PRESSURE, MAIN CULPRIT OF SATELLITE QUENCHING !



SUMMARY AND CONCLUSIONS

- Low mass clusters are the precursors of quenching ($13.8 < \log_{10} M200/Msun < 14.2$).
- Quenching in-situ dominates the LMC regime, while pre-quenching dominates the HMC regime at $z = 0$.
- When looking at higher redshift, in-situ quenching become dominant regardless the halo mass.
- A lower threshold of $\rho_{ICM} > 10^{-28.3}$gr cm^{-3} ($3\times10^{-5} n_H[cm^{-3}]$) is needed for quenching to happen.
- Ram Pressure as the main culprit for satellite quenching in galaxy clusters!


THANKS!