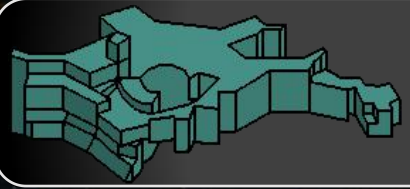
L-Galaxies Meeting Nov 2018

Stripping Environmental Effects in Formation and Evolution of Galaxies



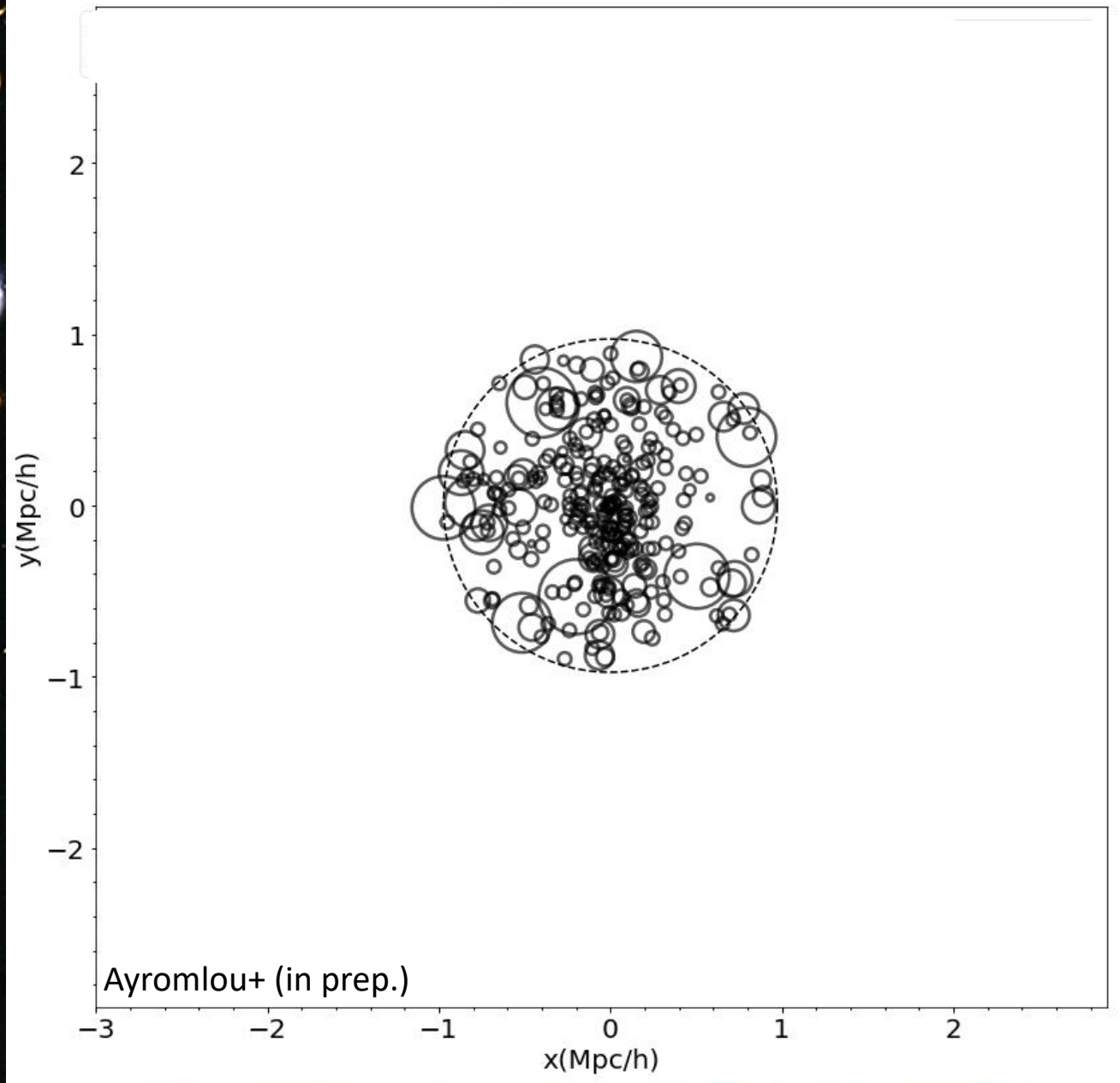
Max Planck Institute for Astrophysics

M. Reza Ayromlou (MPA)

Collaborators: Guinevere Kauffmann, Simon White, Dylan Nelson, Rob Yates

Which galaxies are the subject to gas stripping?

- Some common halo boundaries: R500, R200 (virial radius) and Splash back radius
- SAMs have stripping only for the satellites within R200



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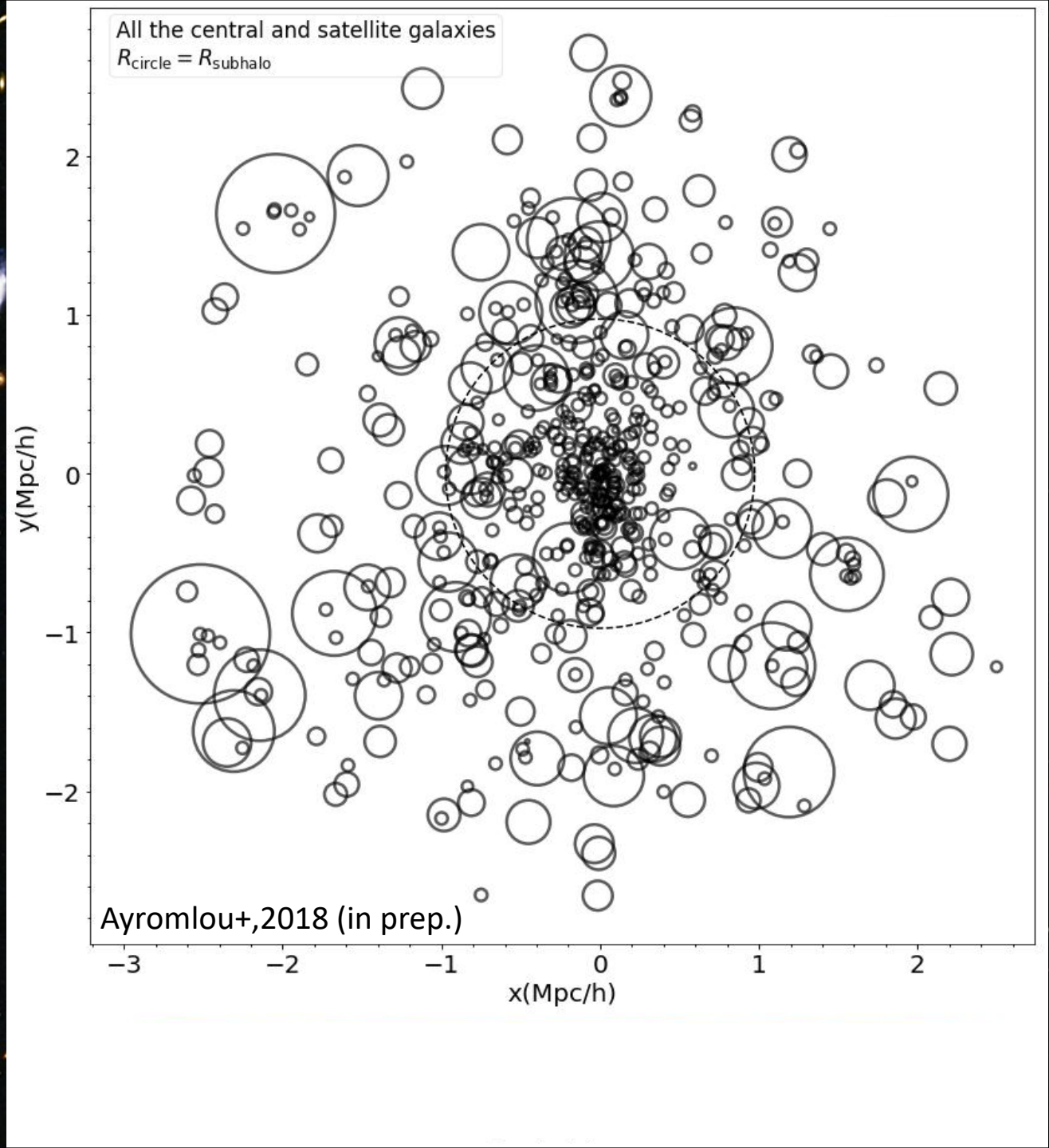
- Some common halo boundaries: R500, R200 (virial radius) and Splash back radius
- SAMs have stripping only for the satellites within R200
- BUT! More than 80% of the galaxies are centrals



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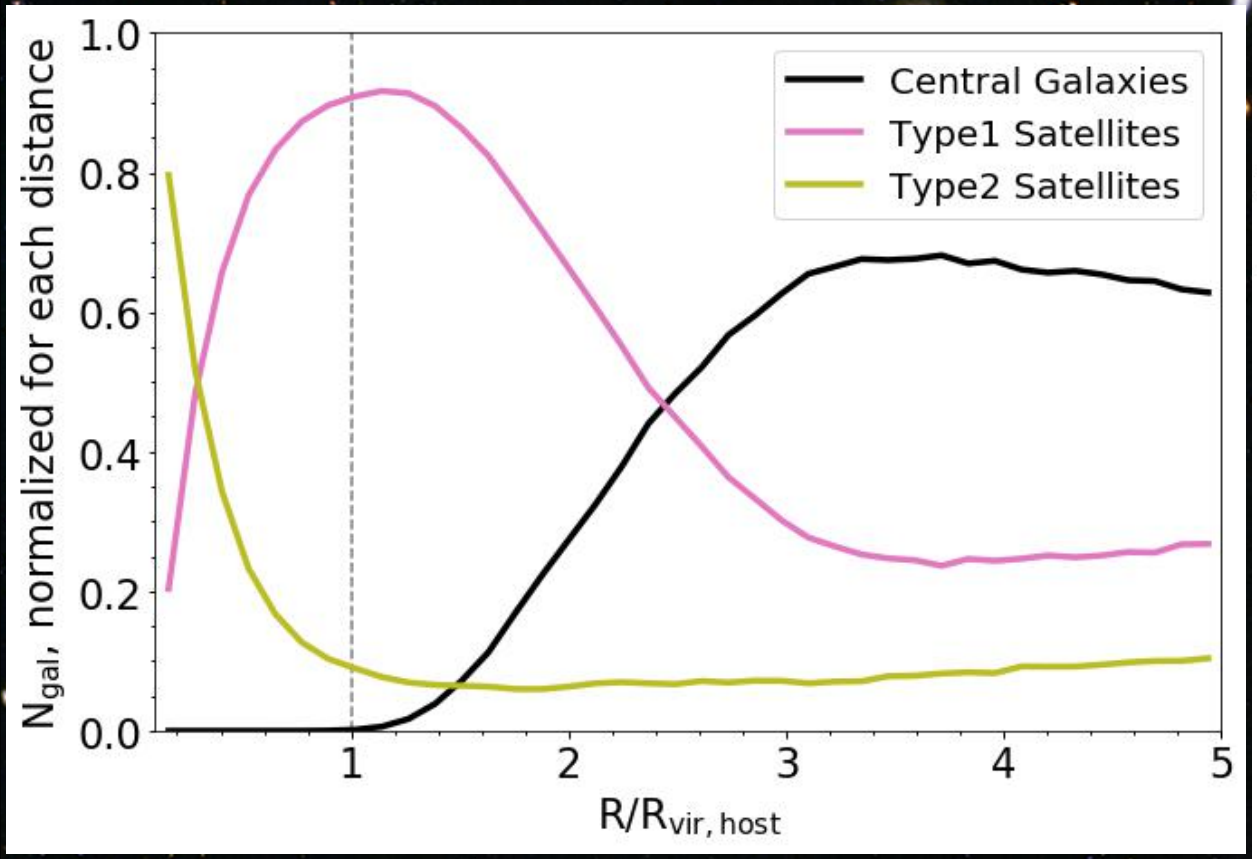

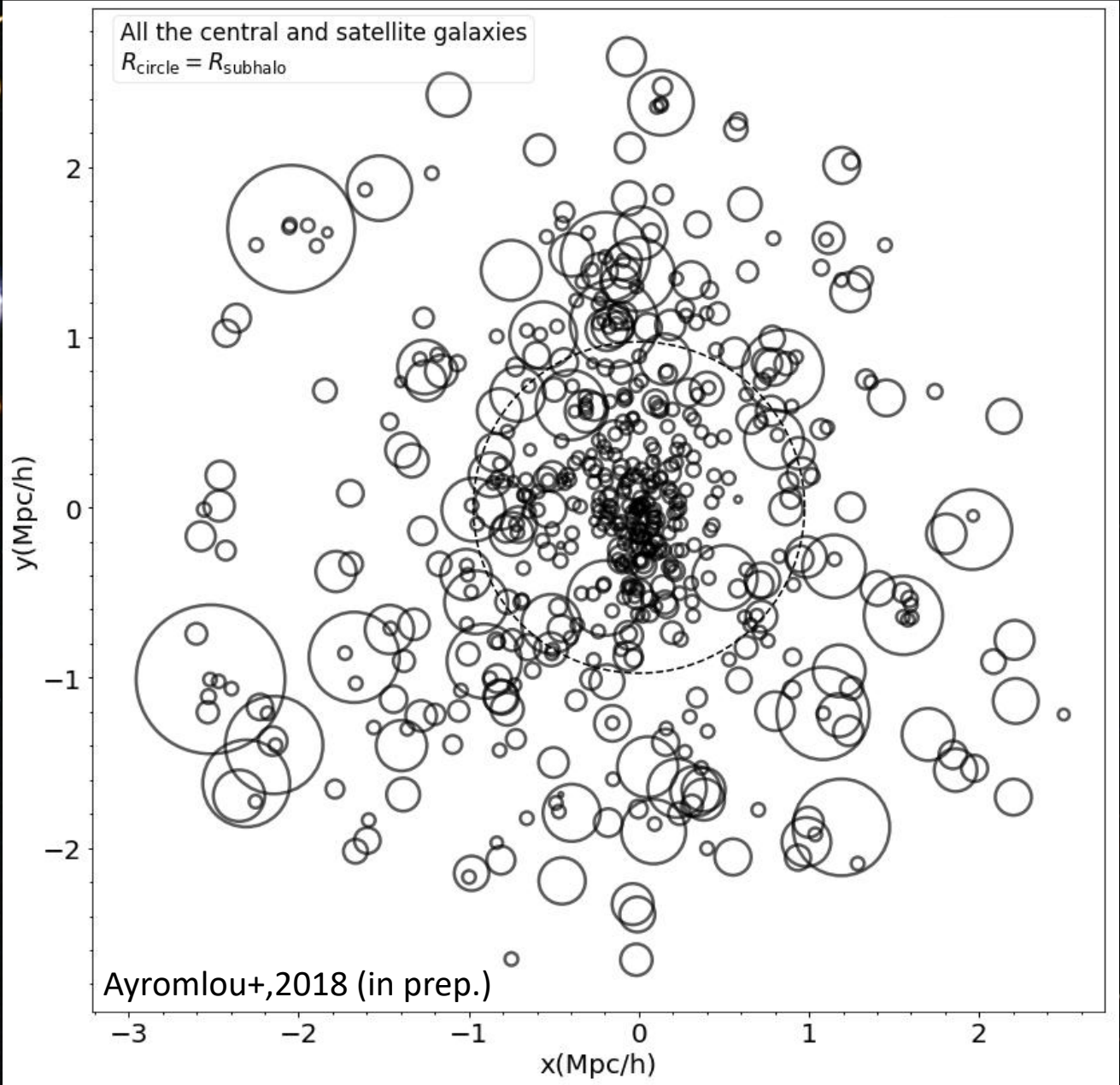

Gas Stripping Environmental Effects

$$F_{\rm g}(R_{\rm rp}) = \frac{GM_{\rm subhalo}(R_{\rm rp})M_{\rm hotgas}(R_{\rm rp})}{R_{\rm rp}^2},$$

$$P_{\rm rp} = \rho_{\rm LBE,hotgas} V_{\rm gal,LBE}^2,$$

Credit: clip2art.com

Jiang+, 2014

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Relative velocity		Virial velocity of the host halo
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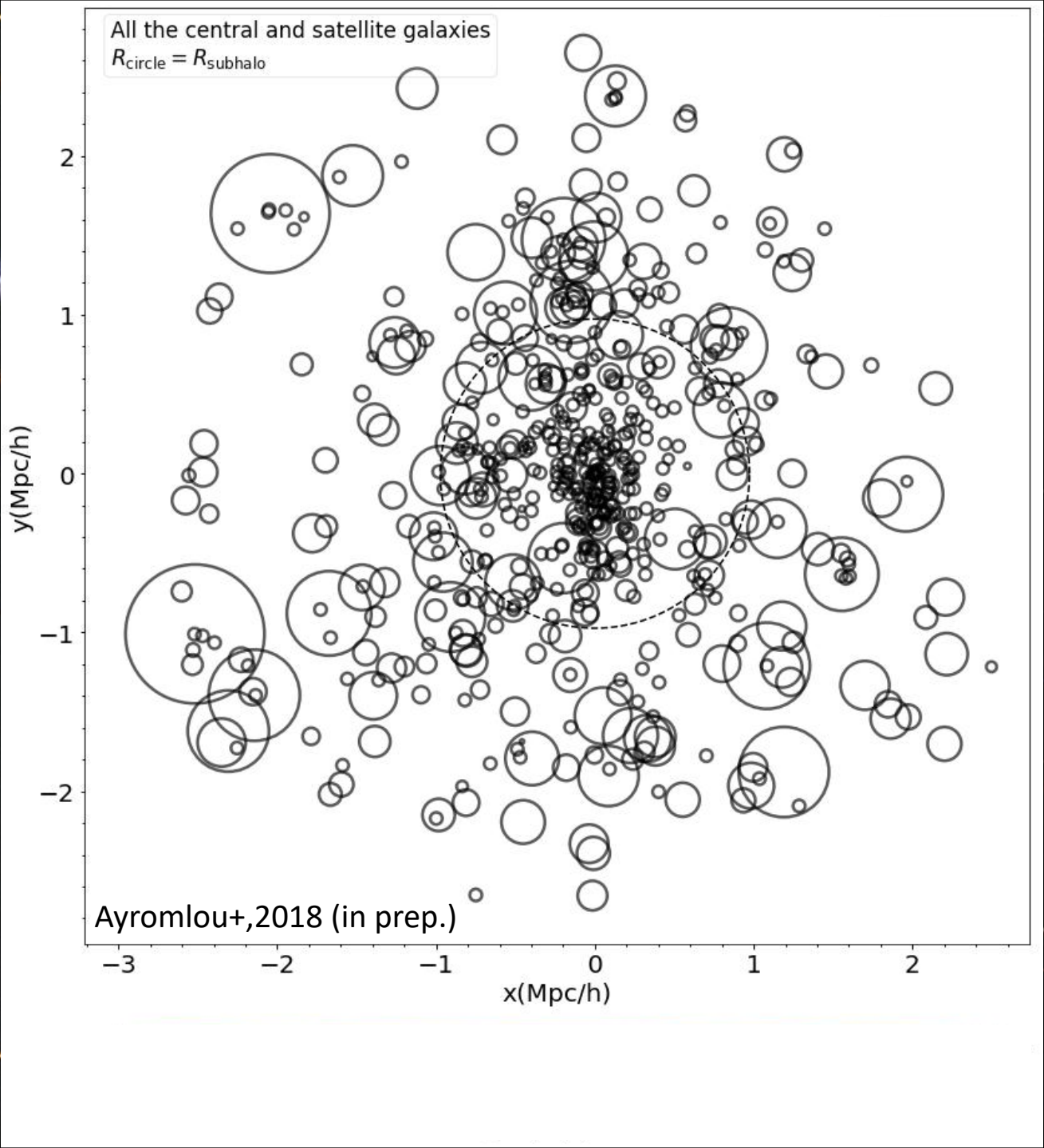

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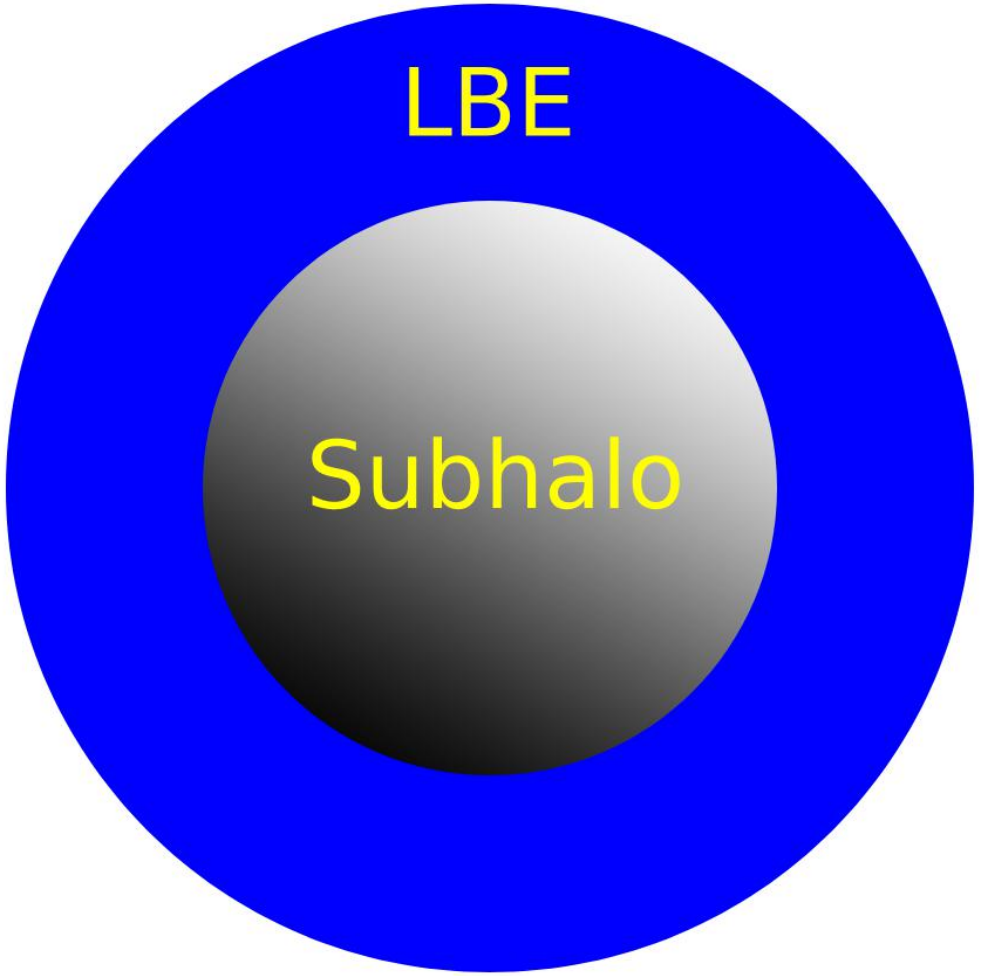

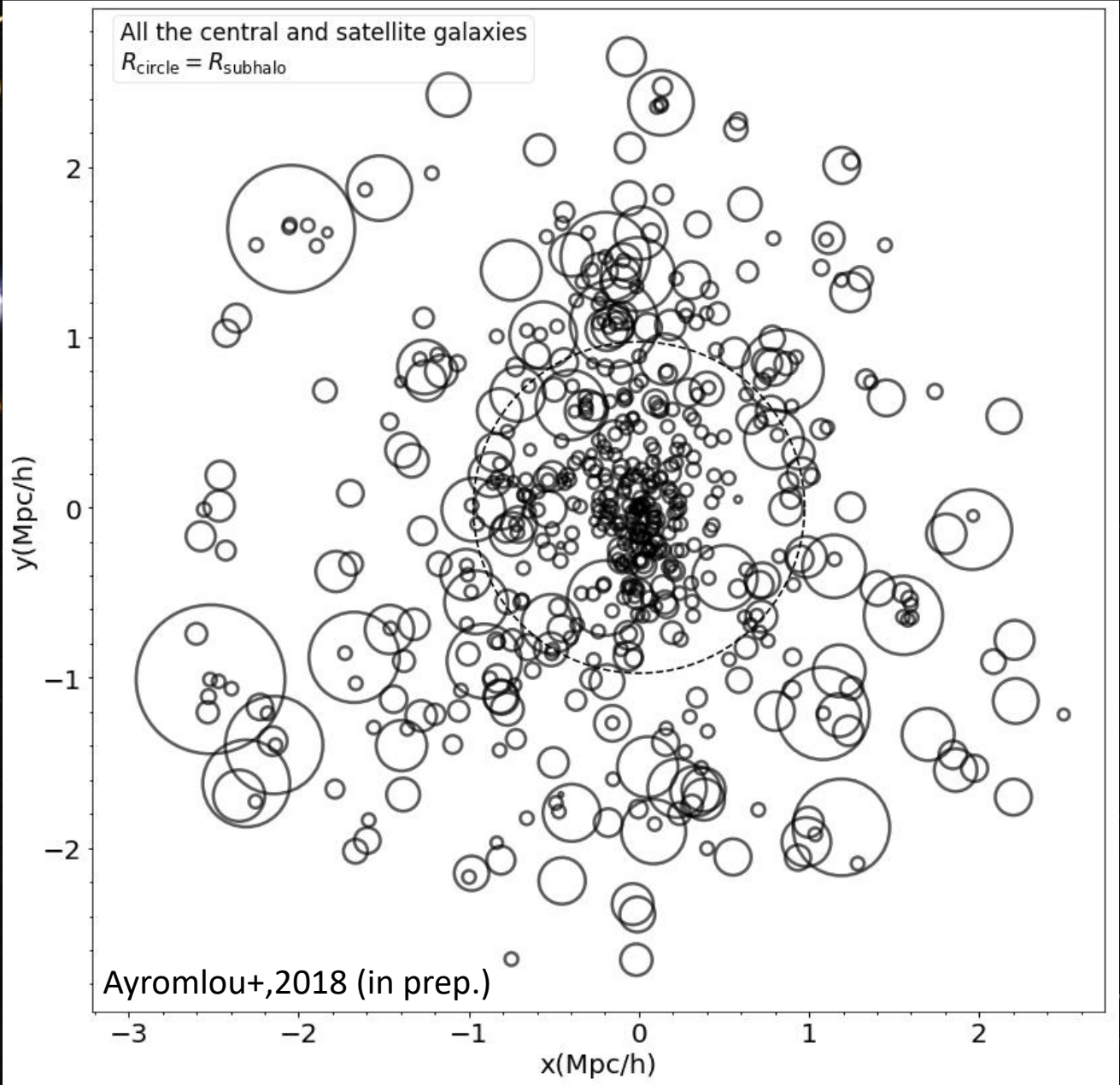

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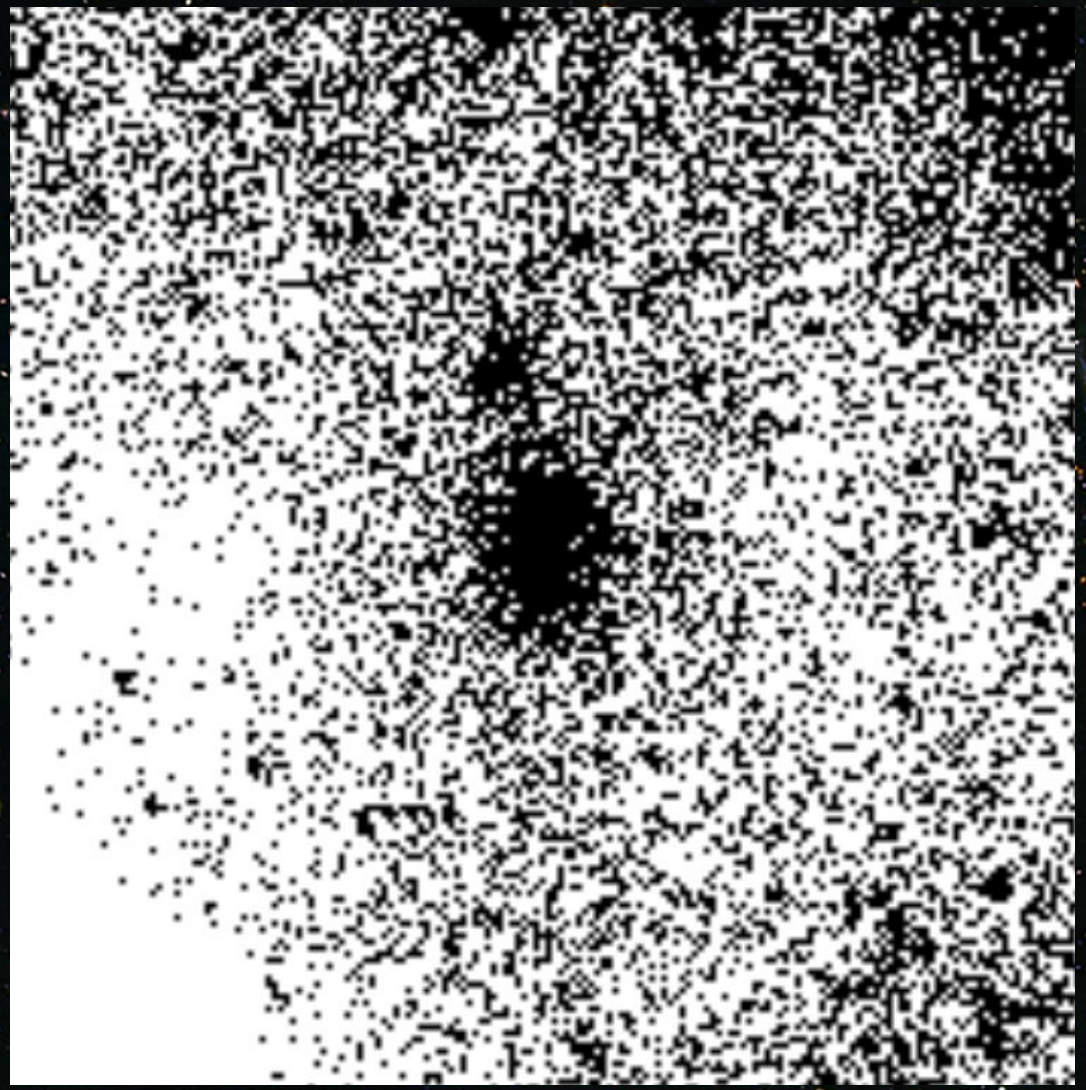

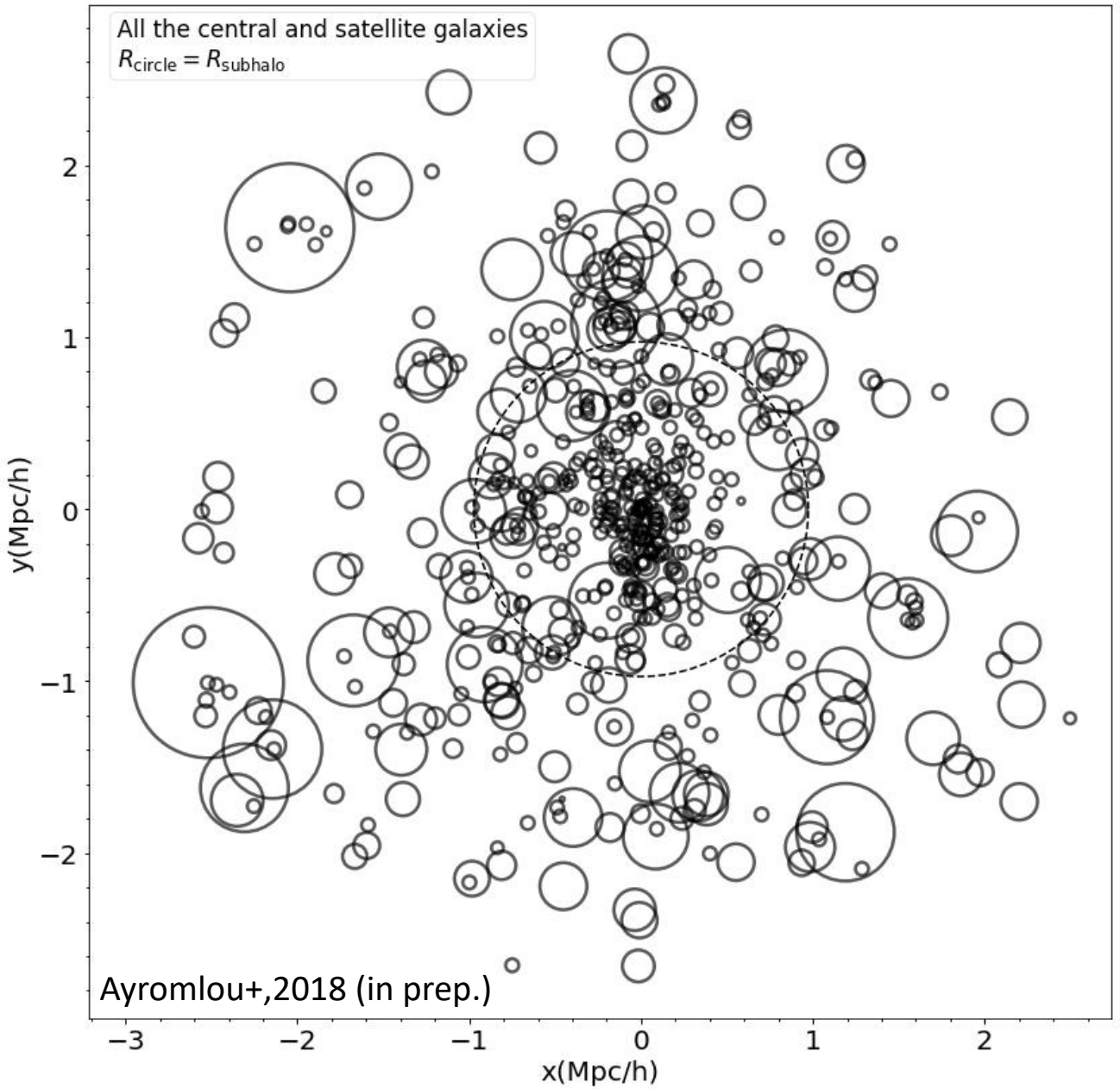

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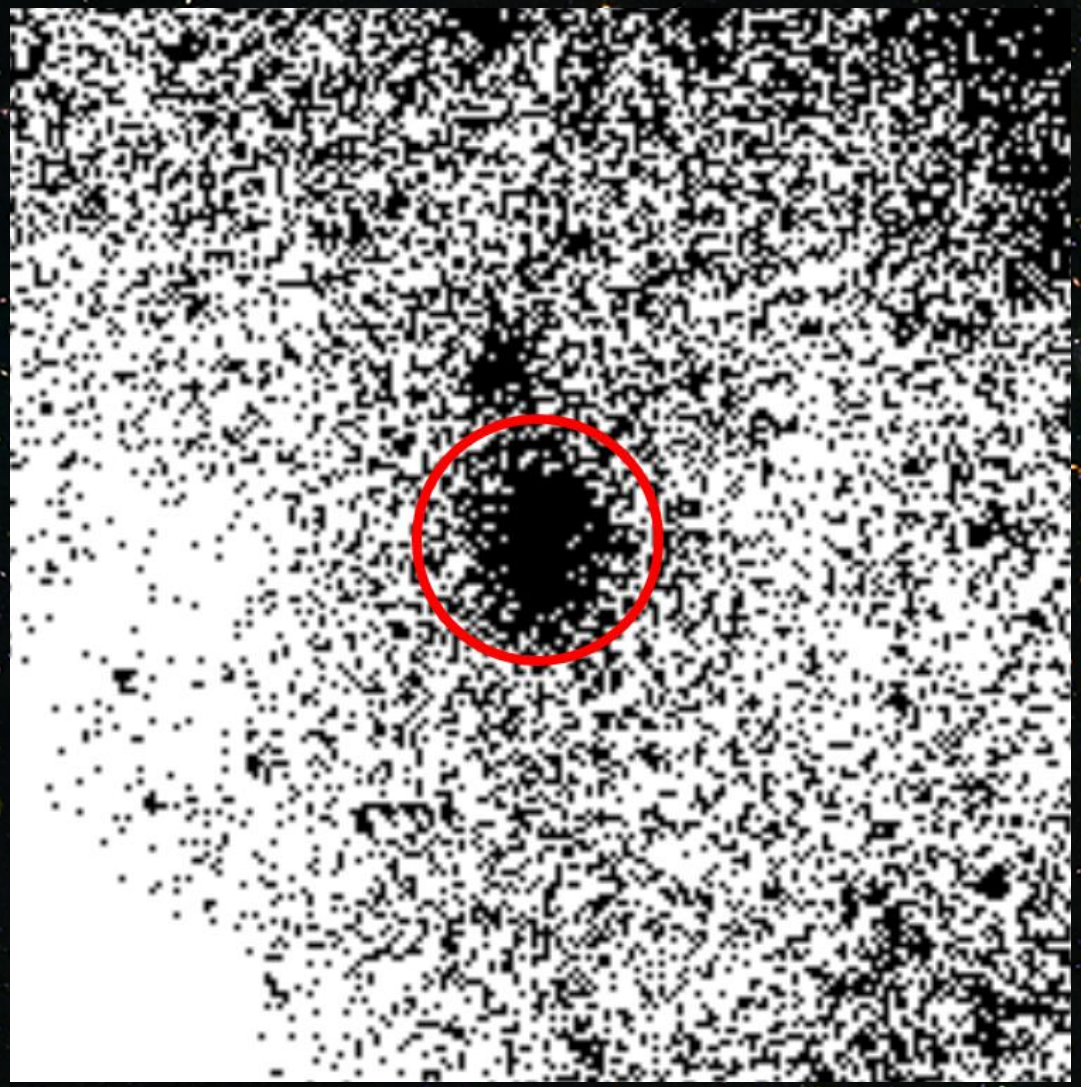

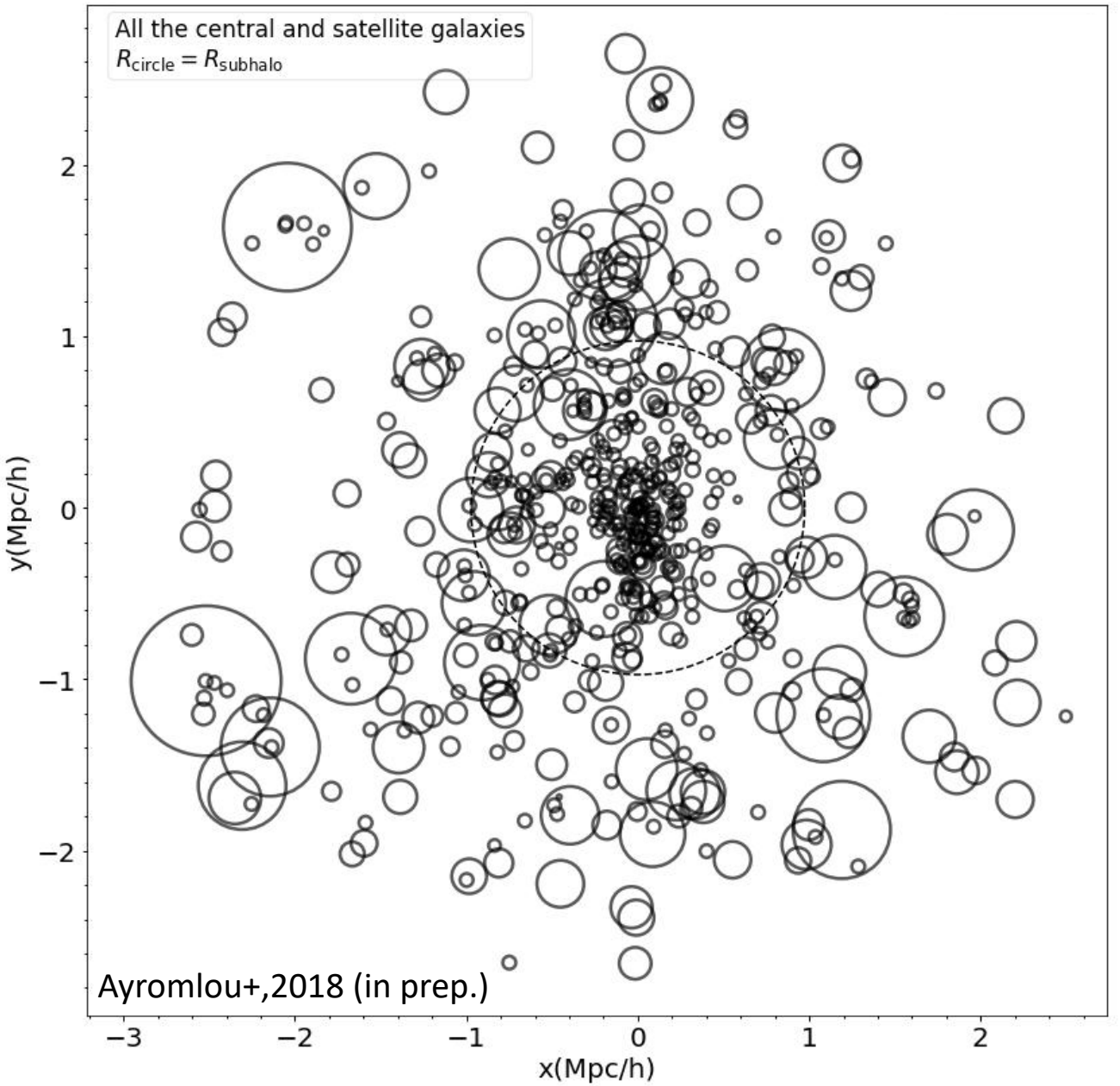

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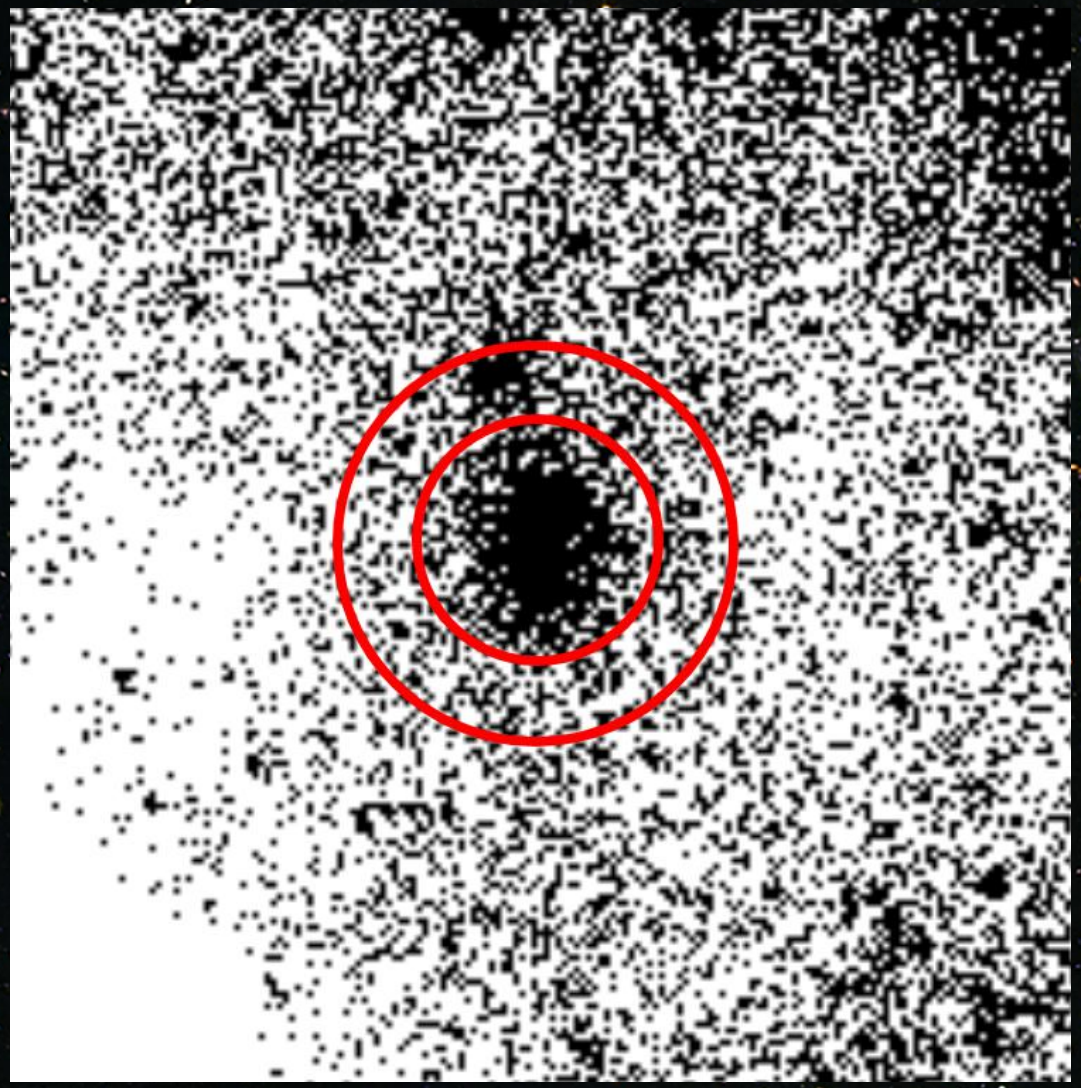

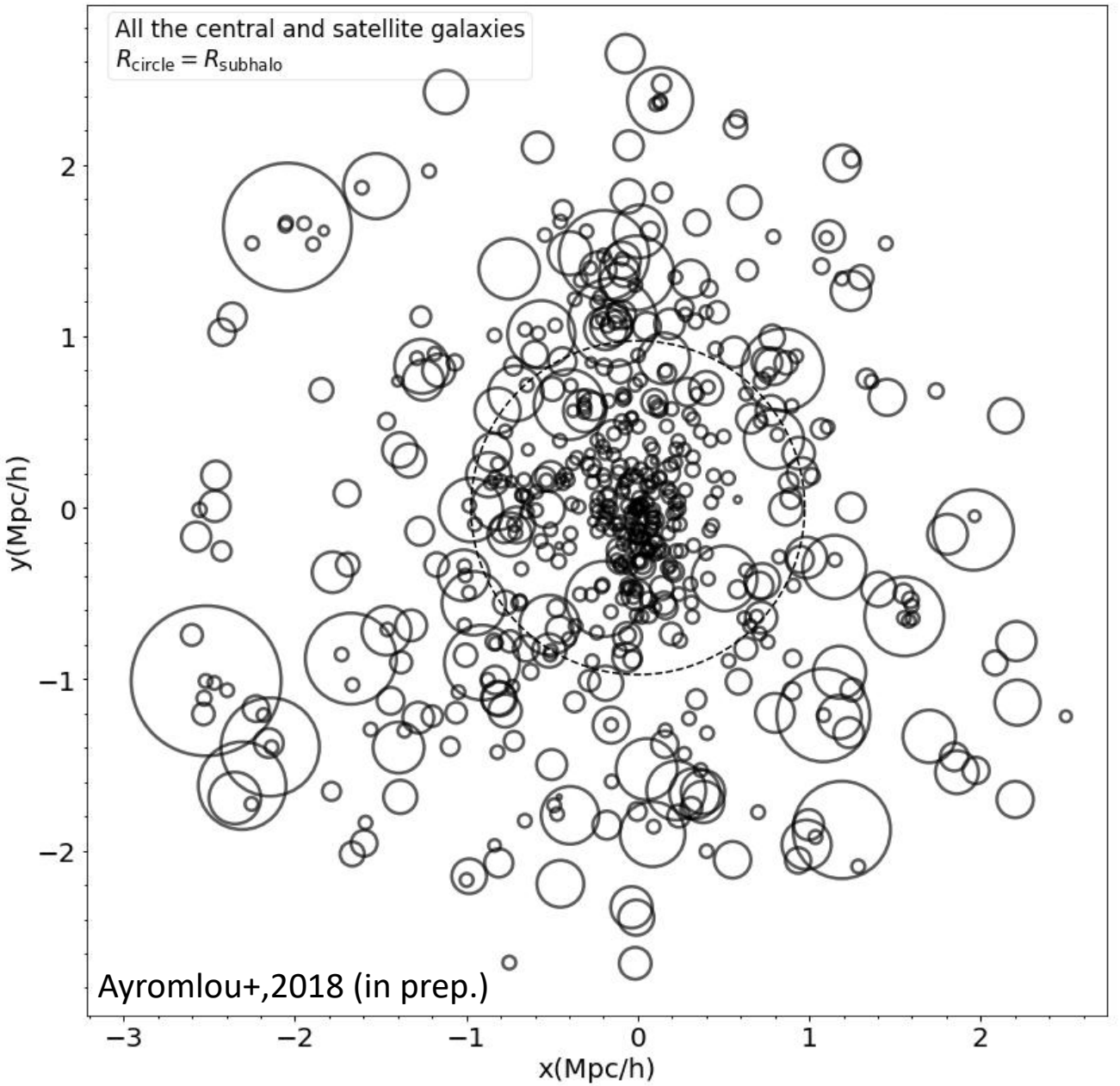

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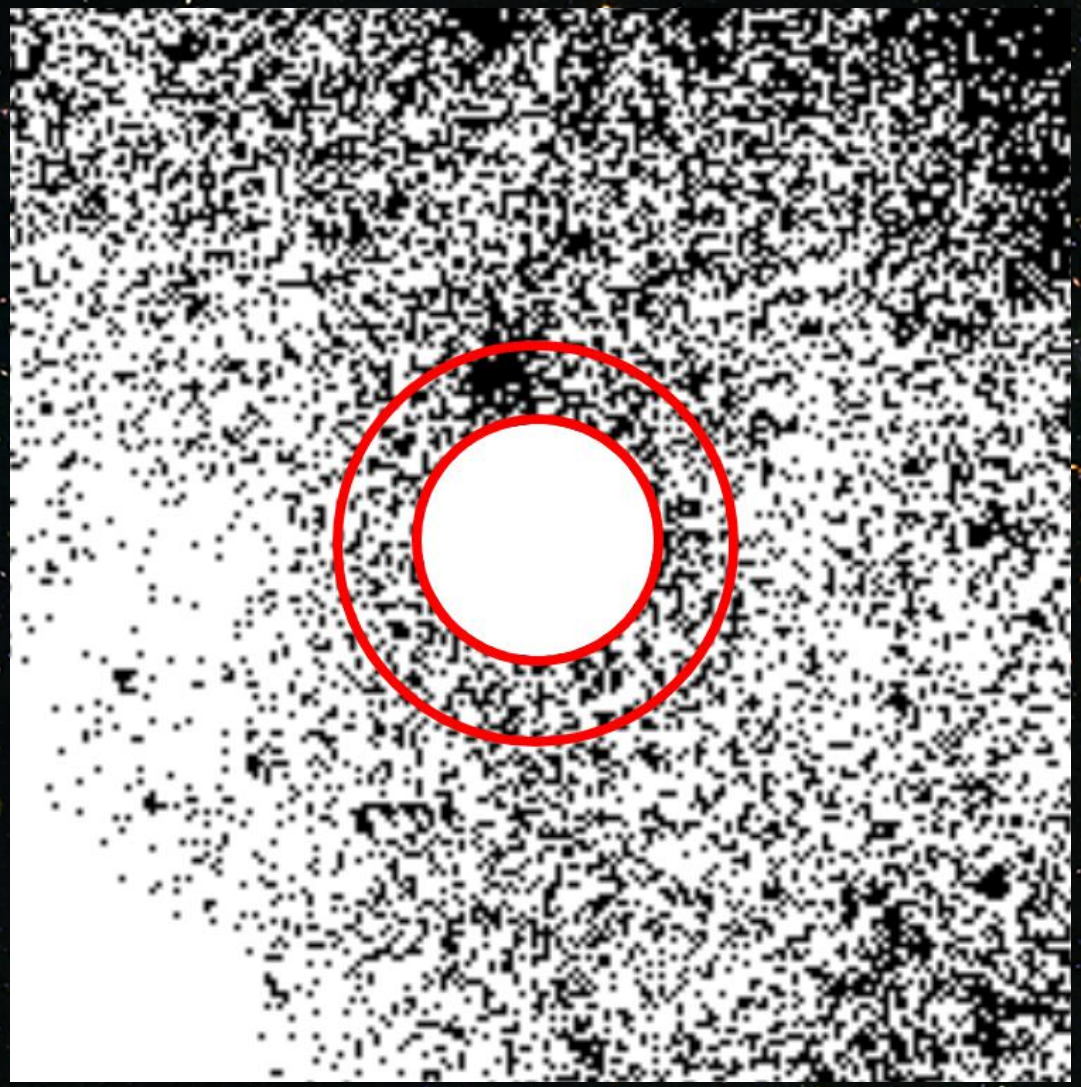
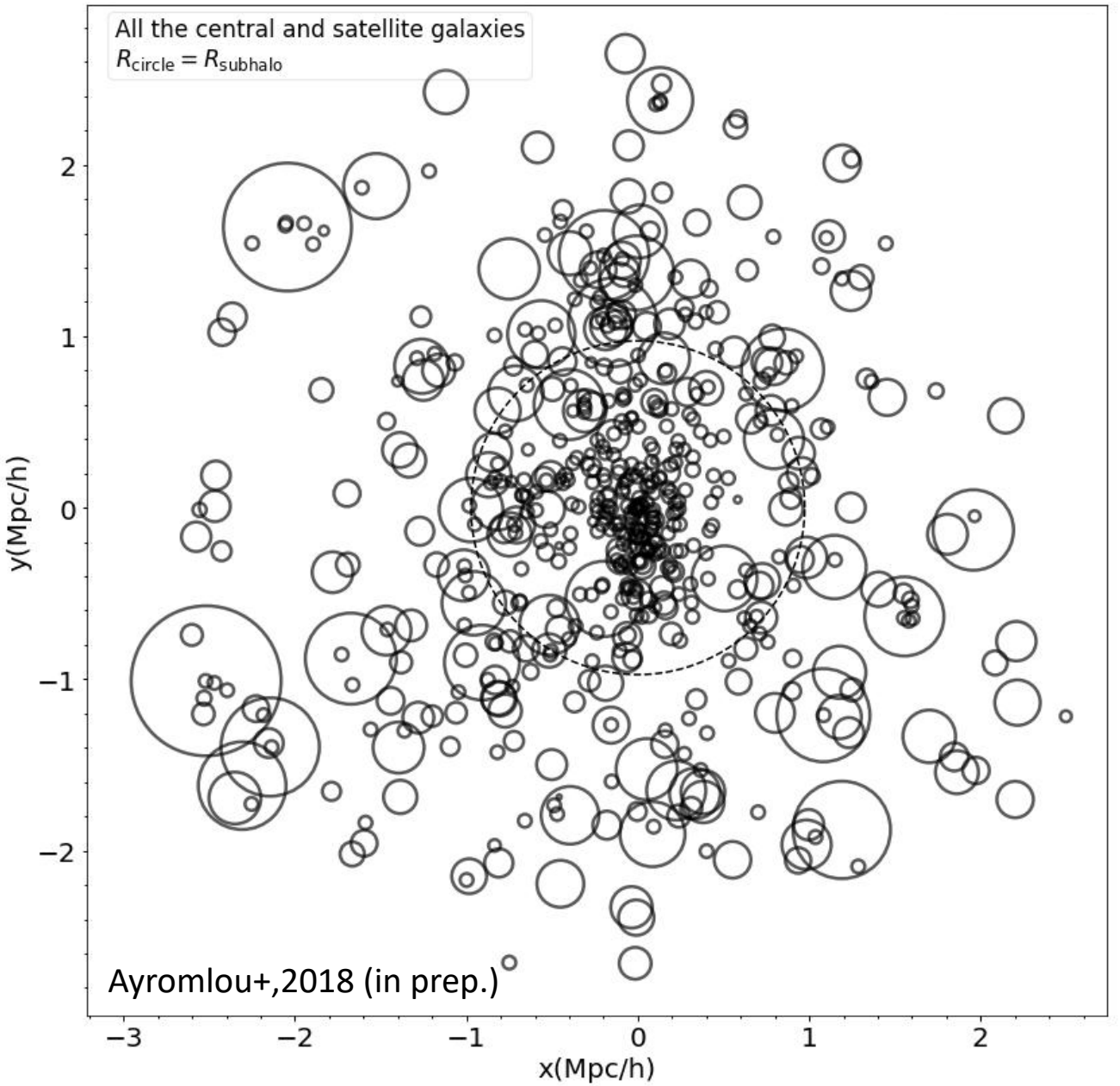
Finding the real Local Background Environment





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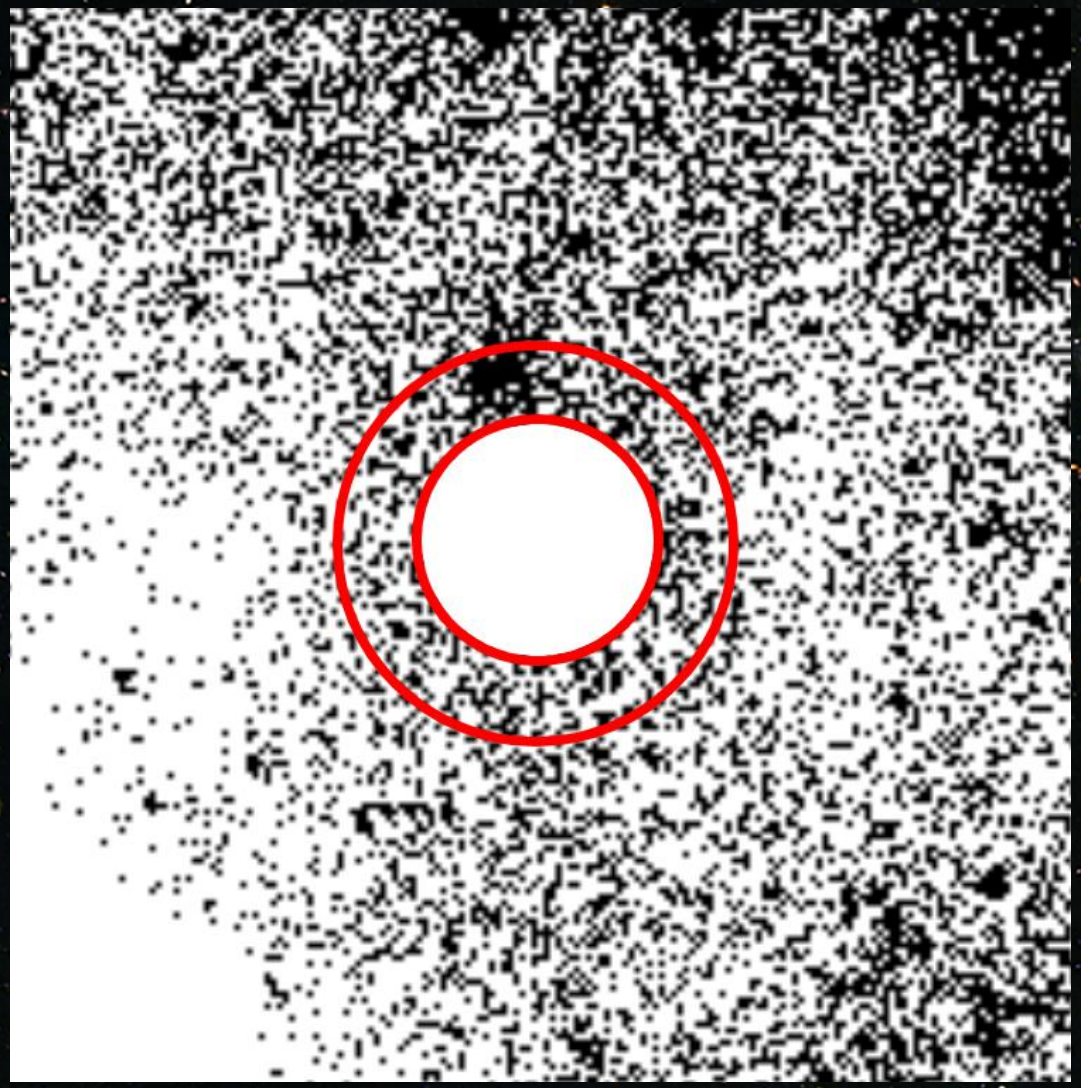

$$P(v) = f(2\pi\sigma_{\mathrm{subhalo}})^{-3/2} \exp\left(-\frac{|\vec{v} - \vec{v}_{\mathrm{subhalo}}|^2}{2\sigma^2_{\mathrm{subhalo}}}\right)$$

$$+ (1 - f)(2\pi\sigma_{\mathrm{LBE}})^{-3/2} \exp\left(-\frac{|\vec{v} - \vec{v}_{\mathrm{LBE}}|^2}{2\sigma^2_{\mathrm{LBE}}}\right).$$

Ayromlou+

$$L = \prod_{i=1}^{N} P(v_i)$$

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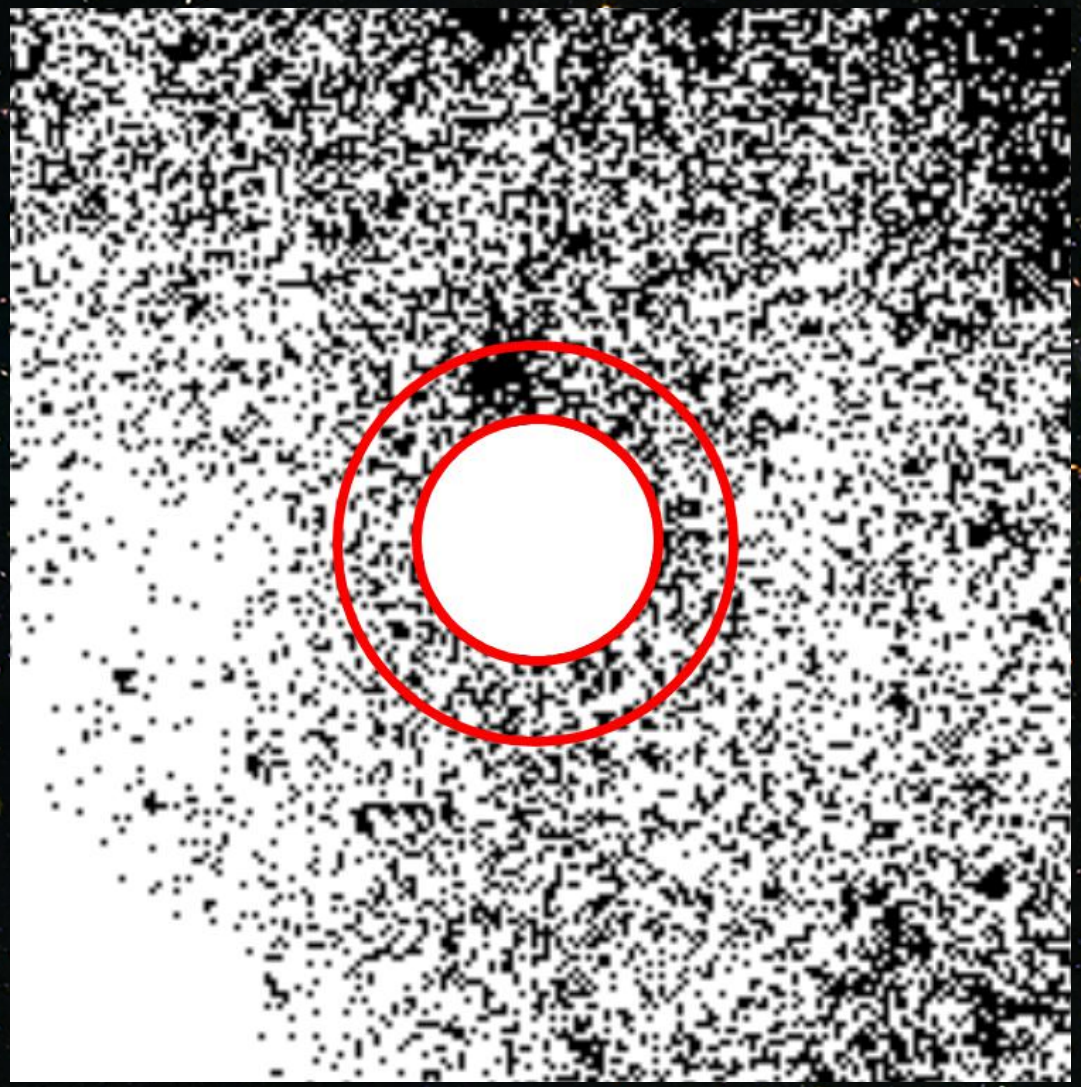

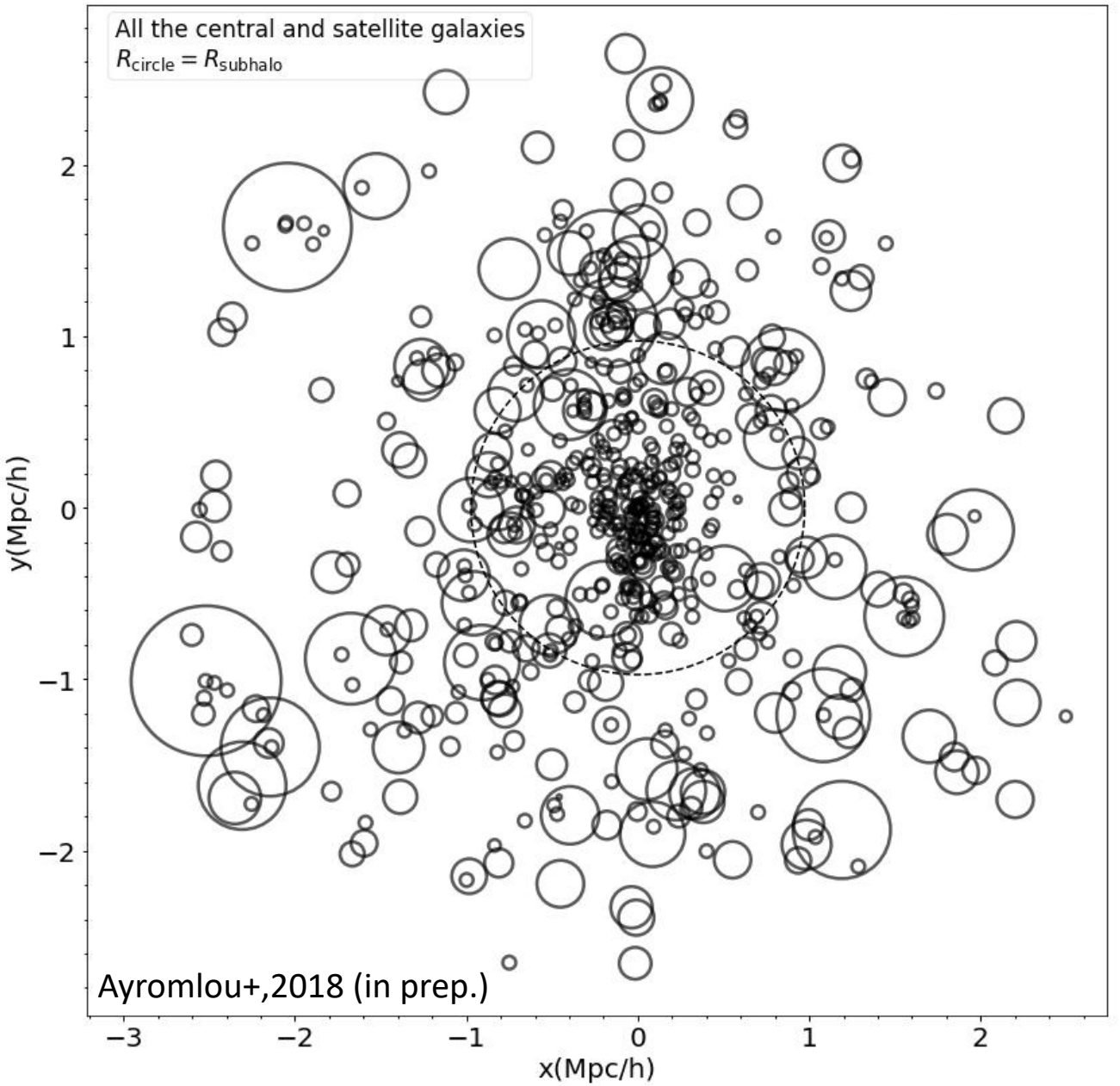

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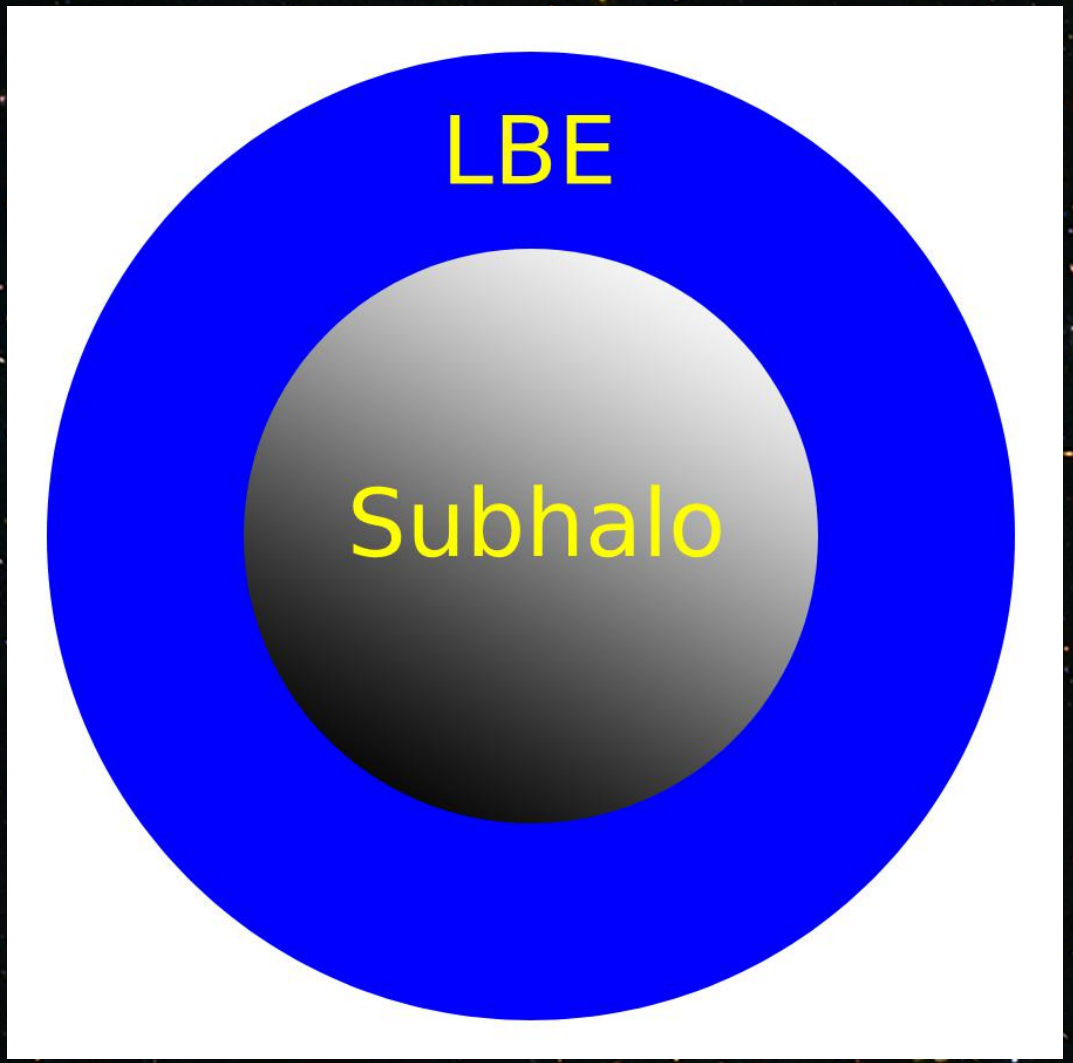

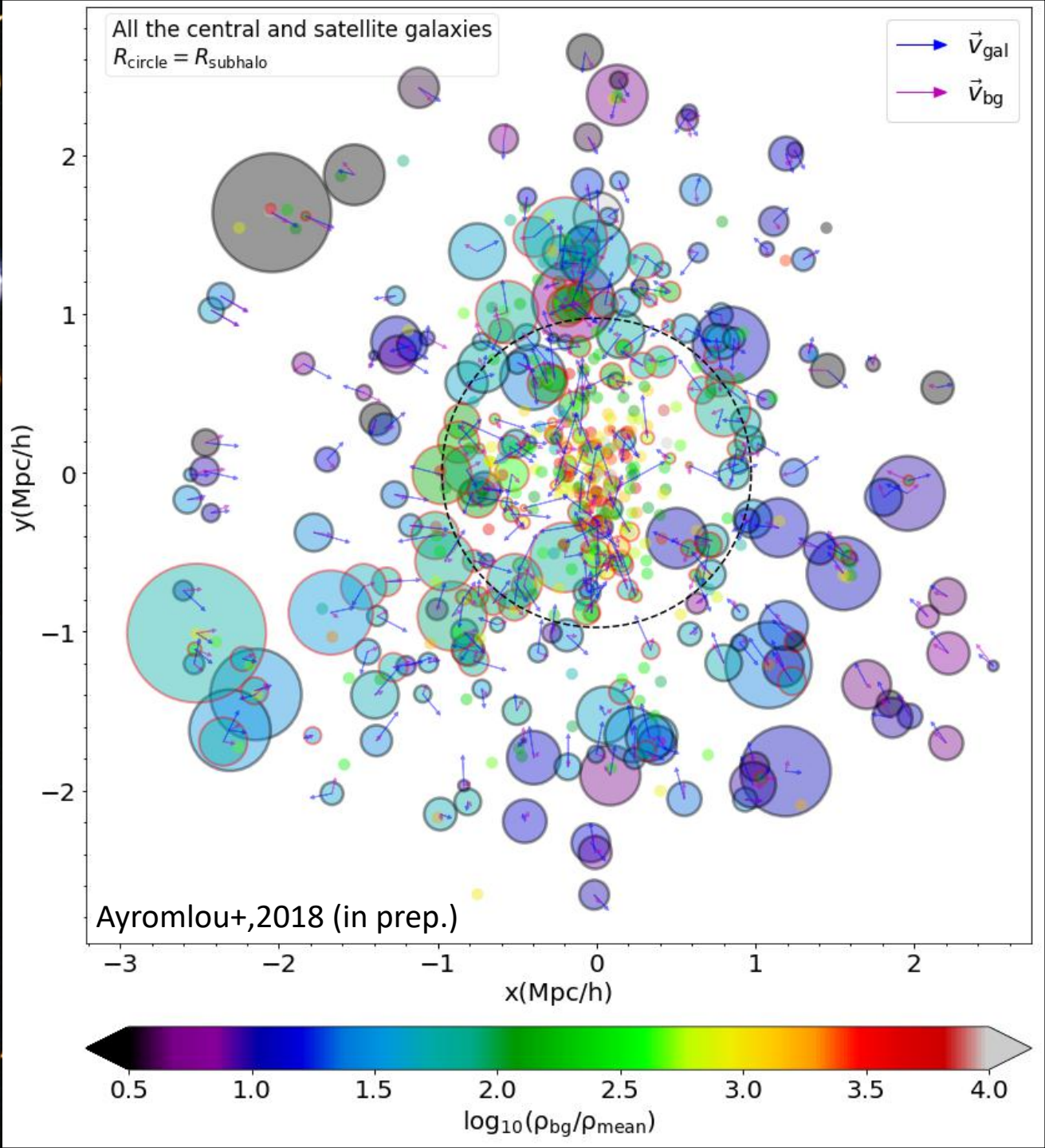

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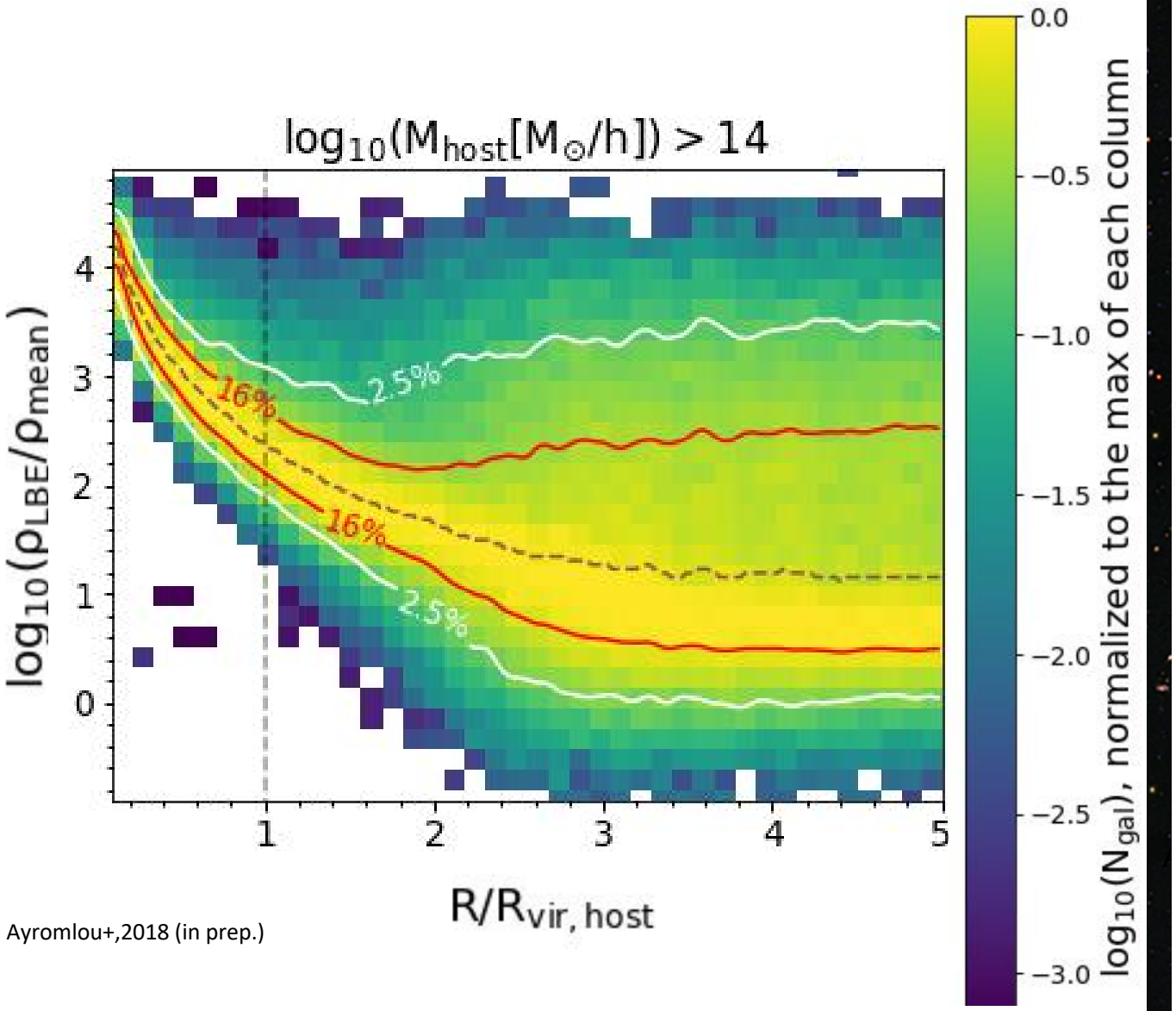
The Density of LBE



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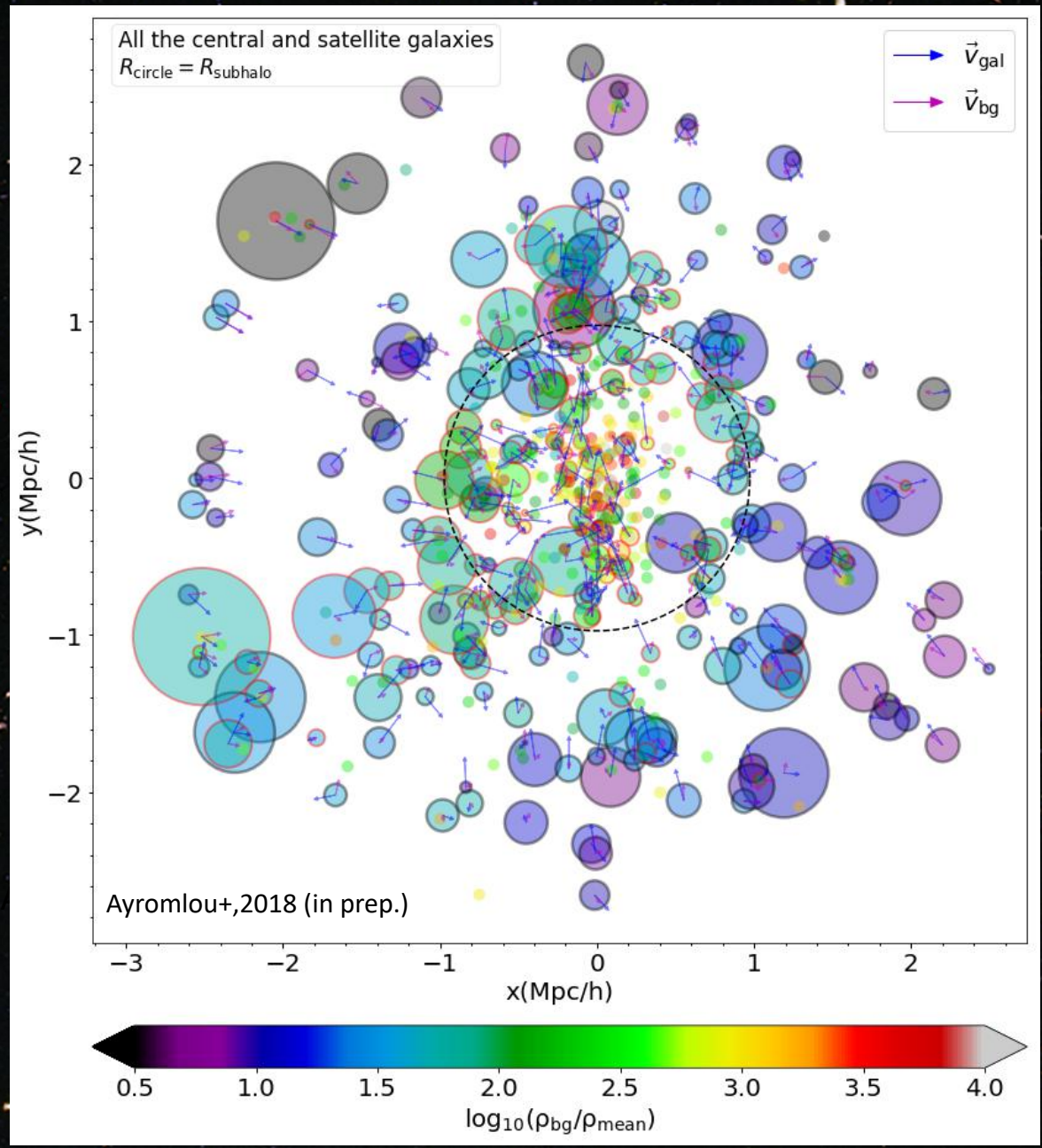
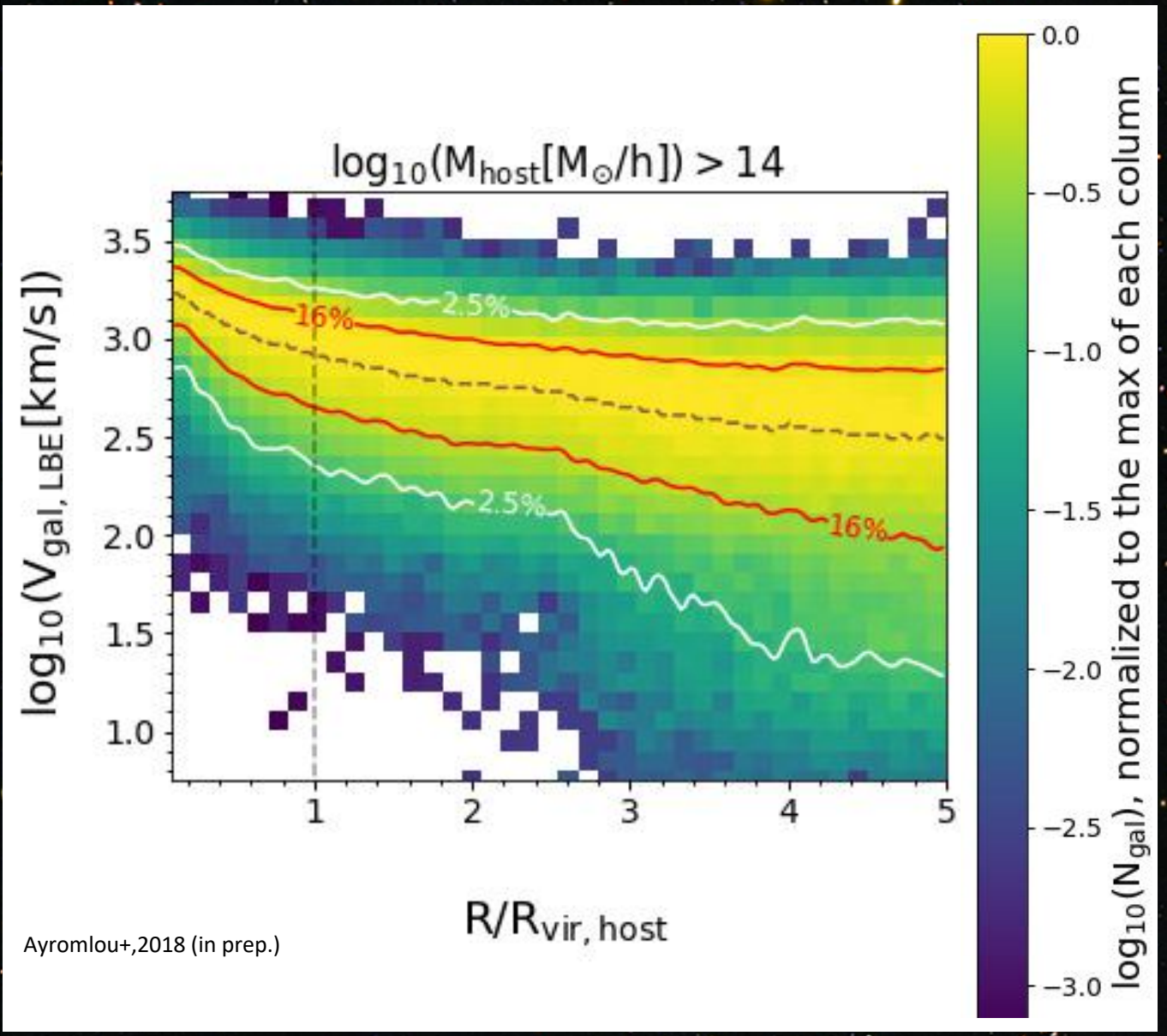
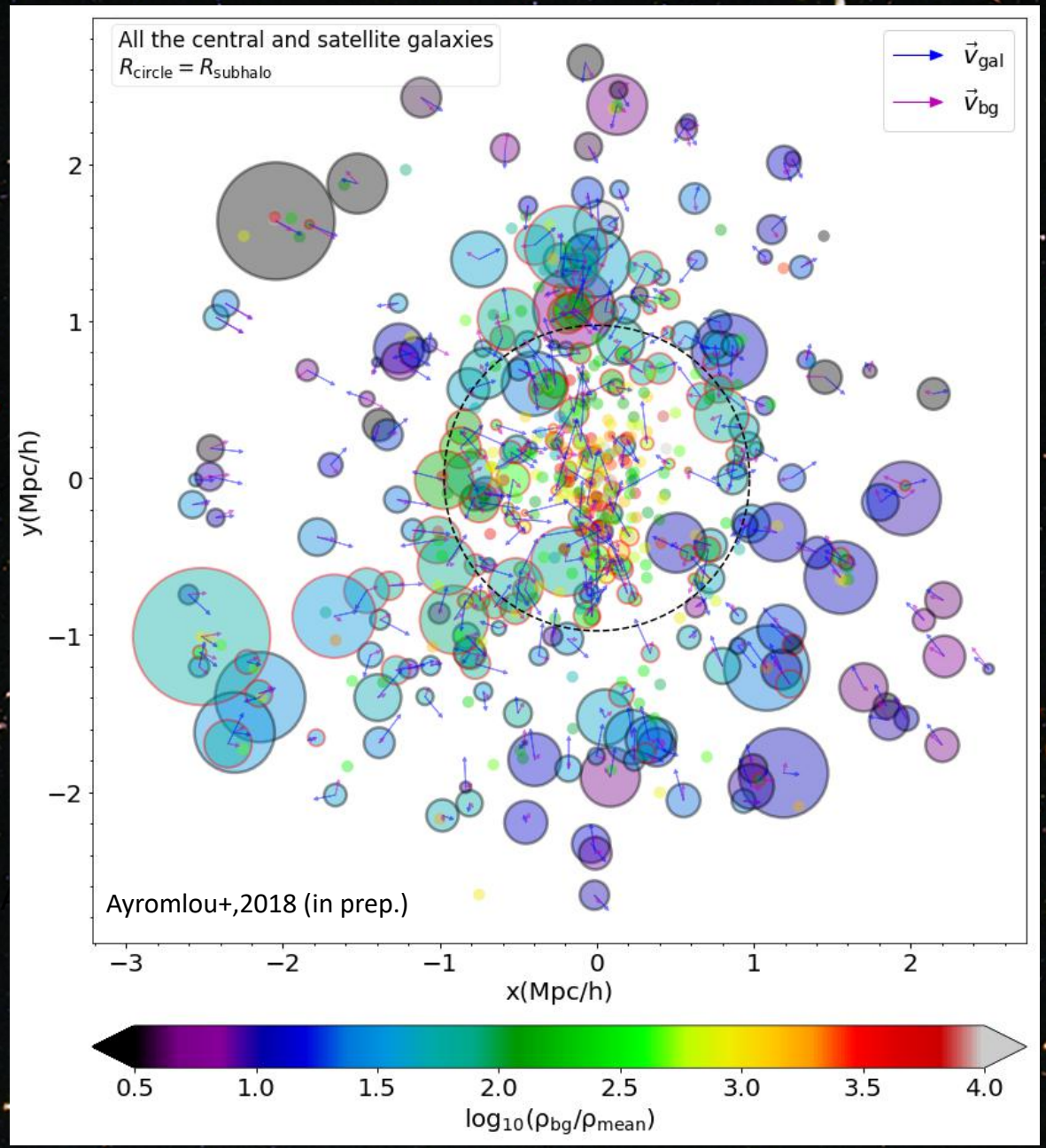
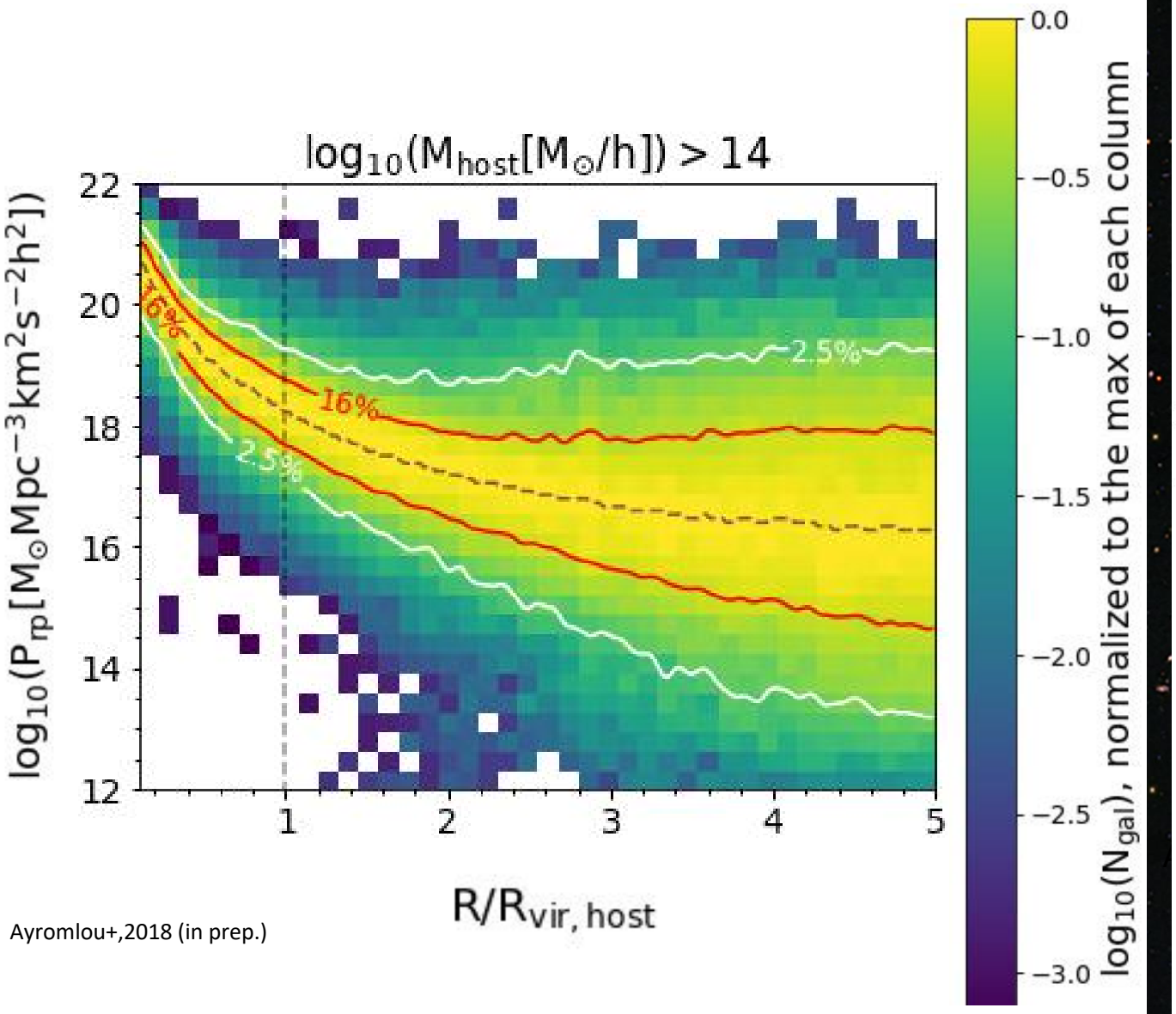


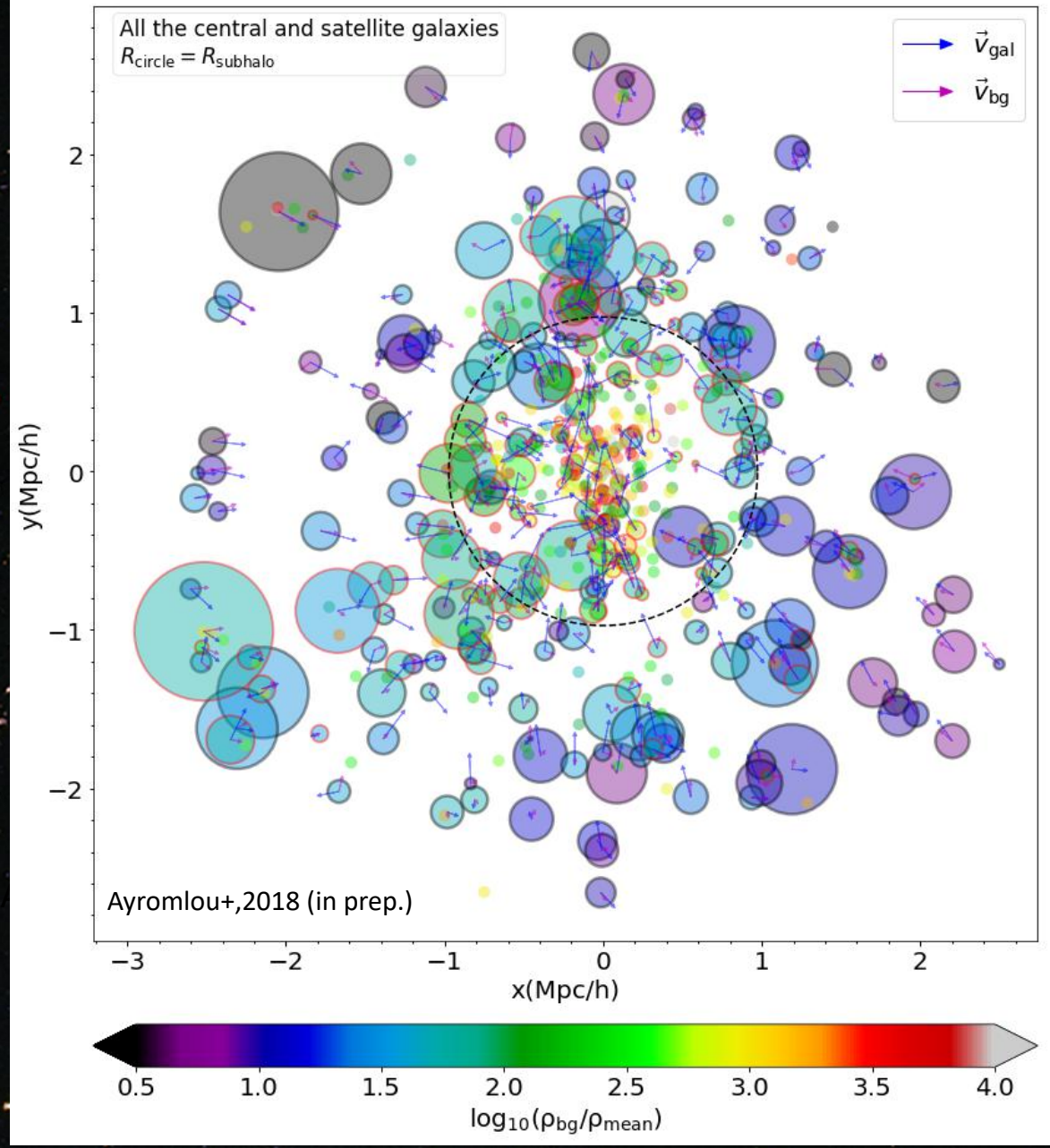
Galaxy's velocity relative to LBE





Ram-Pressure on the Hot Gas





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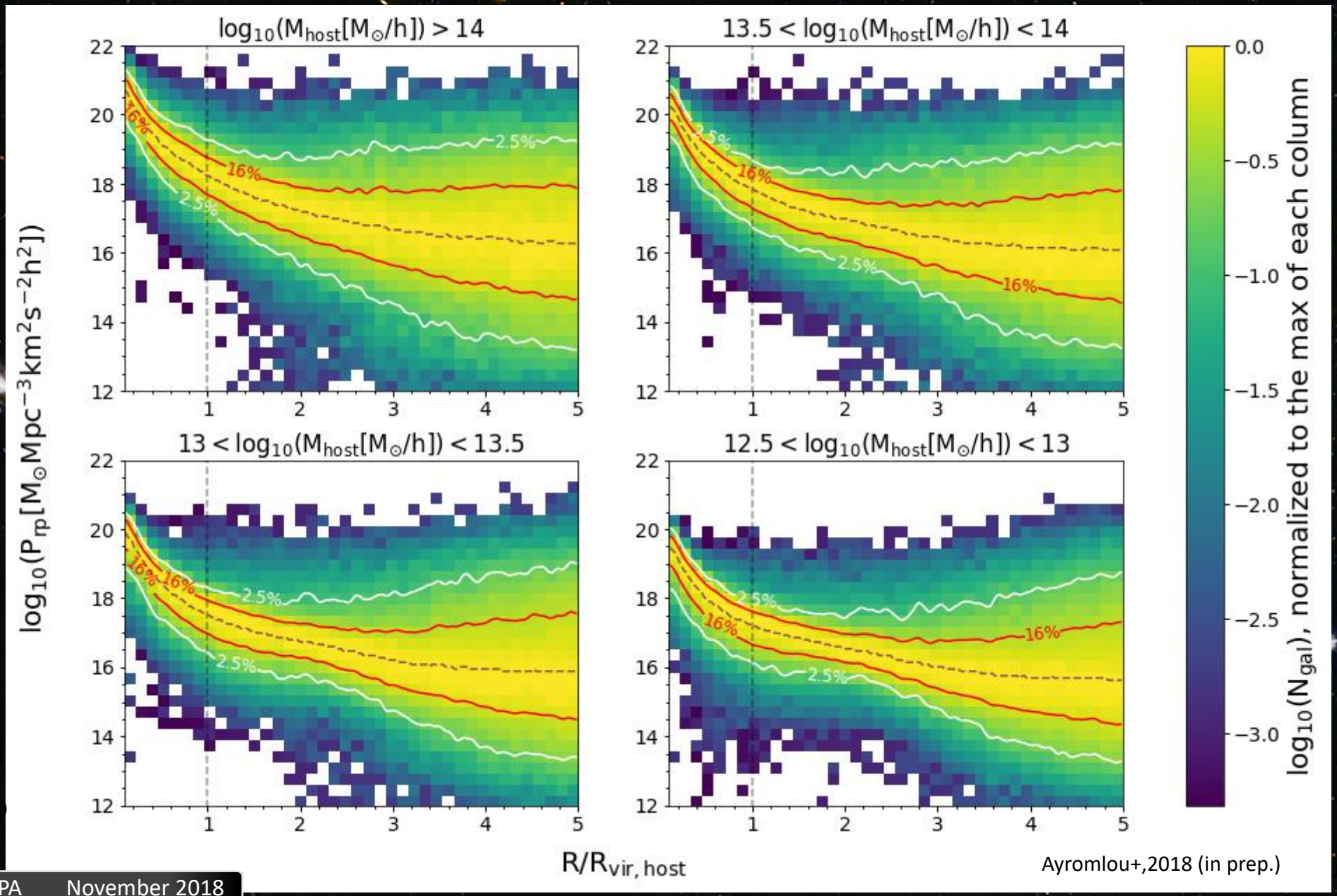

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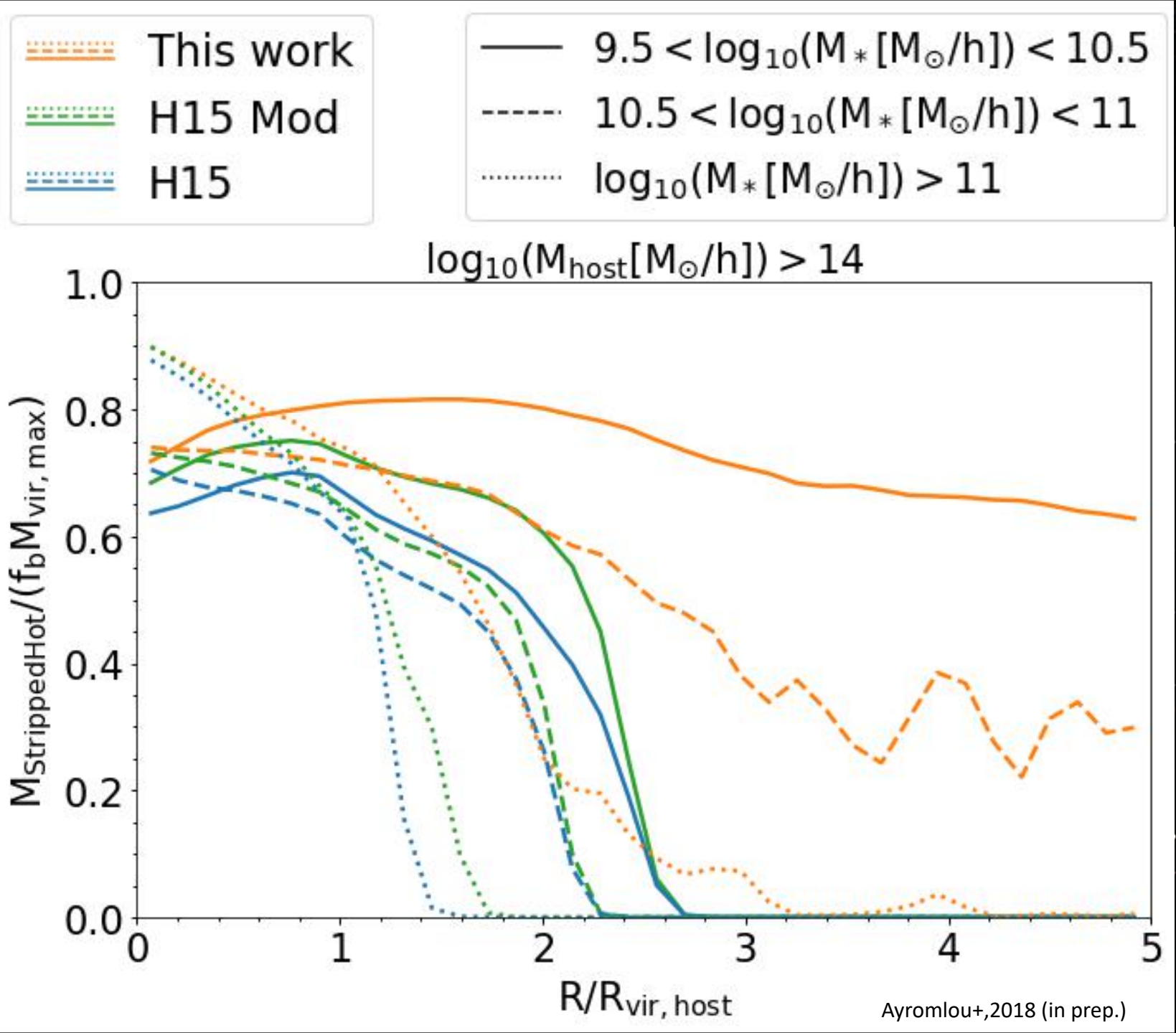
Relative velocity	Galaxy's velocity relative to its LBE	Virial velocity of the host halo
Gravity estimation	1) Halfmass radius and total mass within half mass radius for satellites 2) Virial radius and mass for centrals	Virial radius and mass at infall for satellites
Region of interest	Everywhere in the simulation, for all the satellite and central galaxies	Satellite galaxies within massive clusters

How Efficient is the RPS beyond R200: A New Run of L-Galaxies

Total Stripped Mass through the history of main progenitor branch



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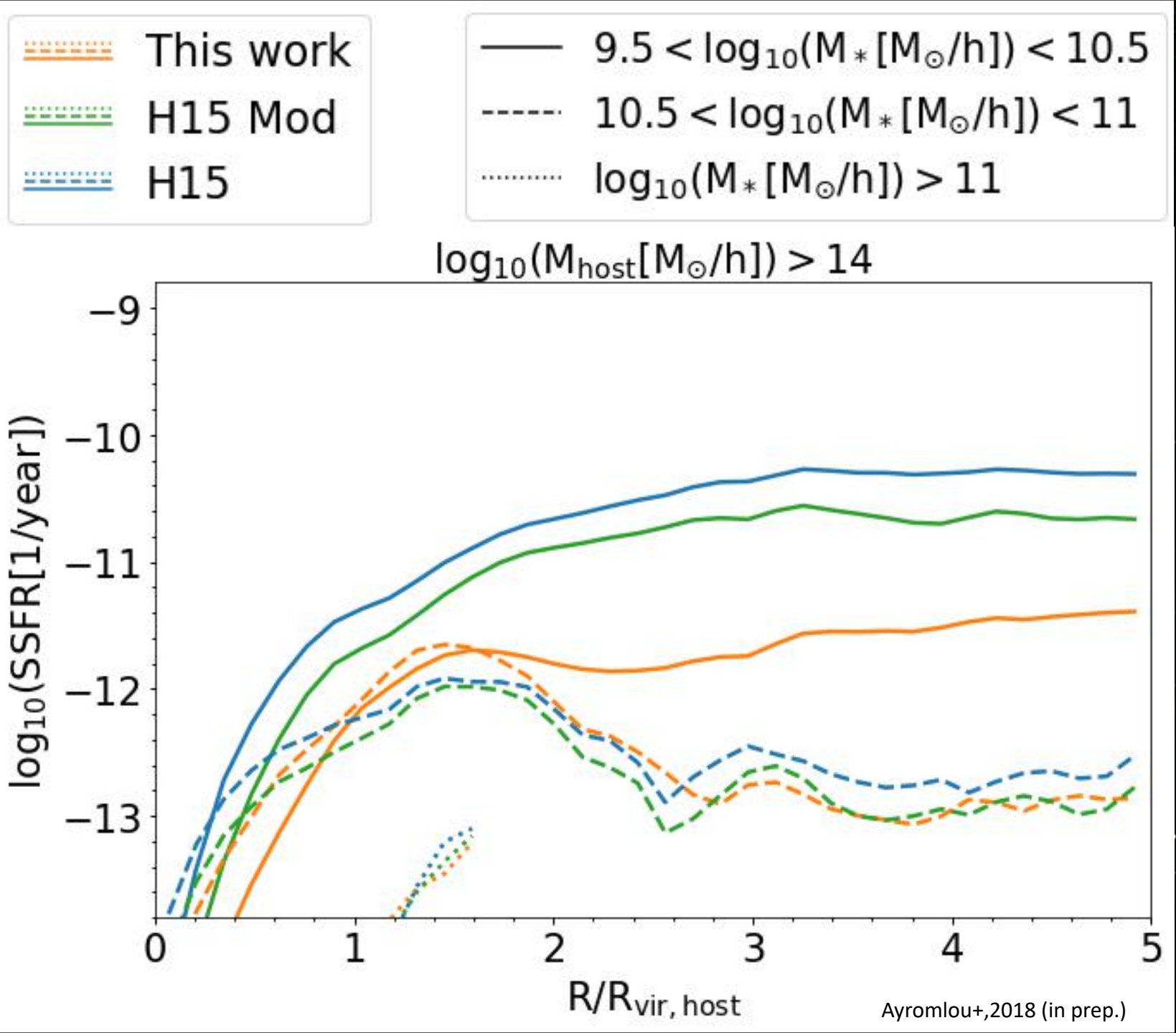
How Efficient is the RPS beyond R200: A New Run of L-Galaxies

Specific Star Formation Rate

for all the galaxies within

5Rvir of central host halos.



Ayromlou+,2018 (in prep.)

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More to do in the future

- Cold gas stripping using LBE metod
- Gas density profile needs to be modified
- Recalibration of L-Galaxies
- The problem of galactic conformity
- Baryon fraction: the infall recipe

Ayromlou+,2018 (in prep.)

Summary

- LBE estimation, an advanced method to capture RPS
- First time to use particles data in Semi-Analytical Models
- LBE is completely continues at the virial radius or any other halo boundary
- There is no boundary for halo to cutting-off the environmental effects
- Extending RPS to all the galaxies, significantly changes the physical quantities of galaxies like SSFR and Hot gas mass.