



International
Centre for
Radio
Astronomy
Research

Be nice to satellites, they're going through a tough phase

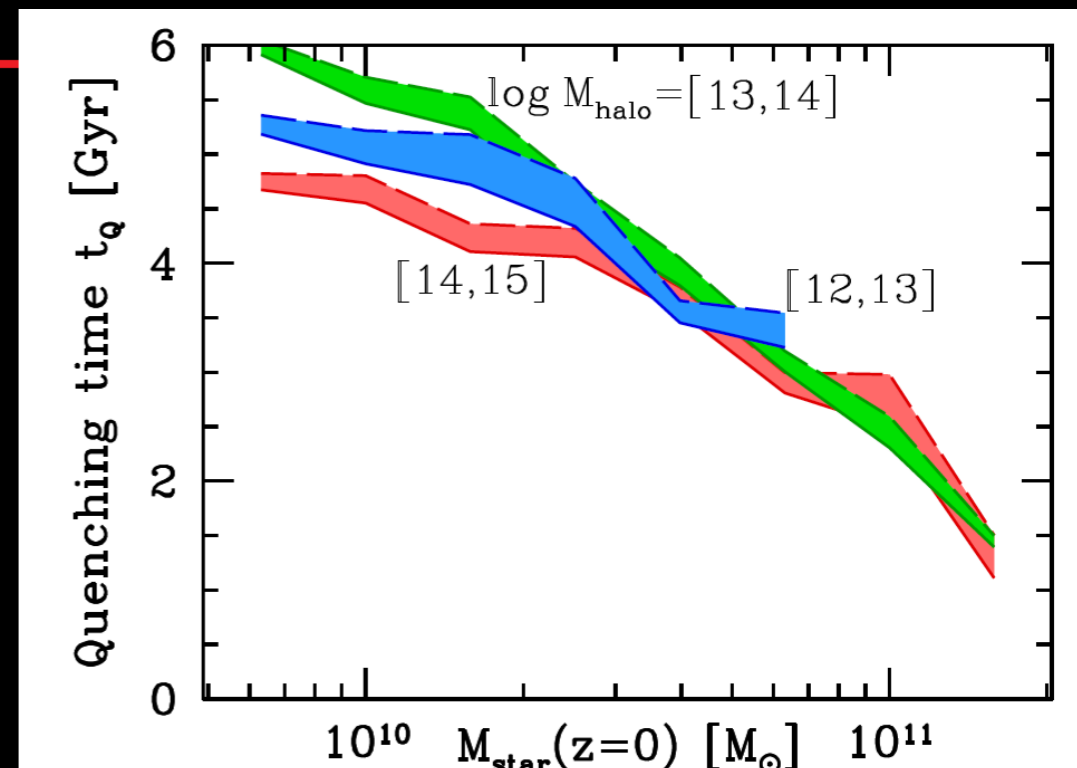
Rhys Poulton

Supervisors: Aaron Robotham and Chris Power

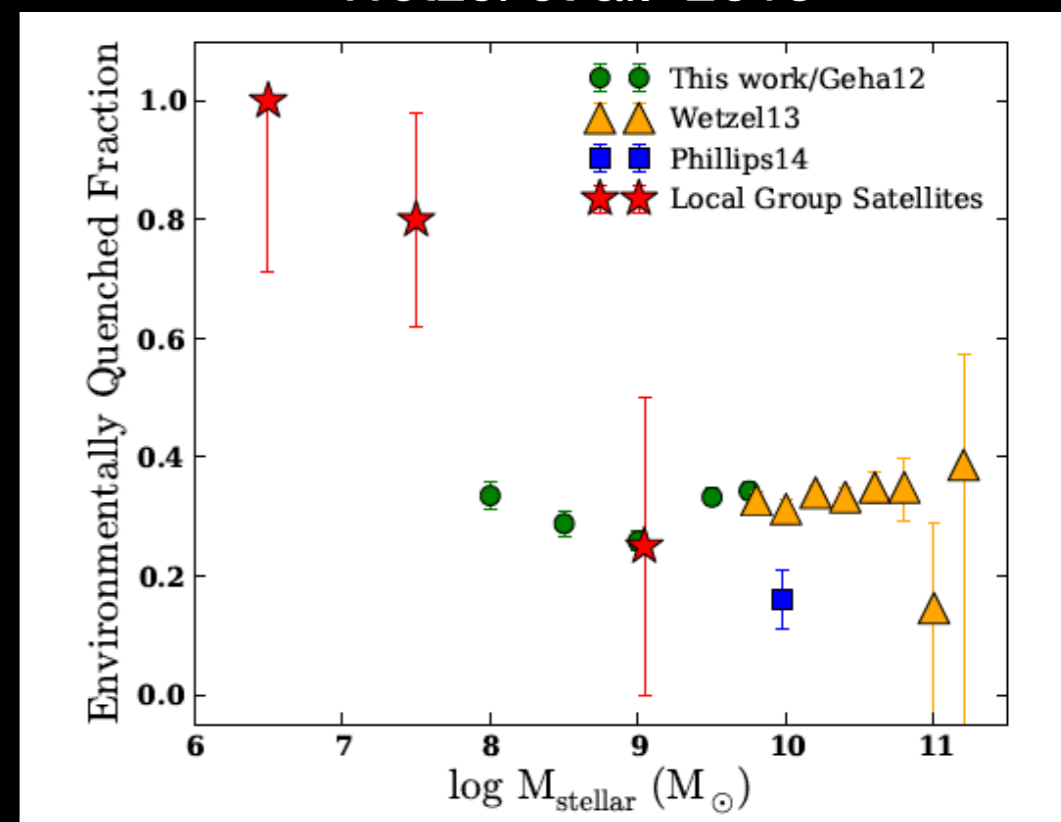
Co-Supervisor: Pascal Elahi



- **Quenching -> slowing of SFR**
- **Larger galaxies tend to just self quench**
- **Satellites galaxies self quenched less**
- **Satellites galaxies are quenched by their environment**
 - **Ram pressure stripping - IGM strips ISM**
 - **Smaller satellites are quenched over very long timescales**
- **When run in state-of-the-art hydrodynamical simulations they tend to be:**
 - **Too gas poor**
 - **Excessively quenched**



Wetzel et al. 2013



Wheeler et al 2014



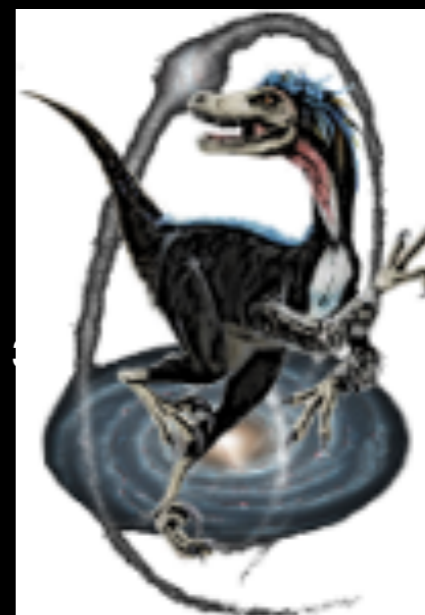
Whats the big idea?

- Use the parameters of the orbits of satellites to see if it can reveal if they are quenched
- Then feed this information into Semi-Analytic Models (SAMs)



What I am working with?

- **SURFS simulation suite [Elahi et al, in progress]**
 - Various simulation sizes from 40 to 900 Mpc
 - With particle numbers from 512^3 to 2048^3
- **VELOCraptor -STF [Elahi et al, 2011]**
 - 6DFOF halo finder
 - Able to disentangle major mergers
 - Treefrog

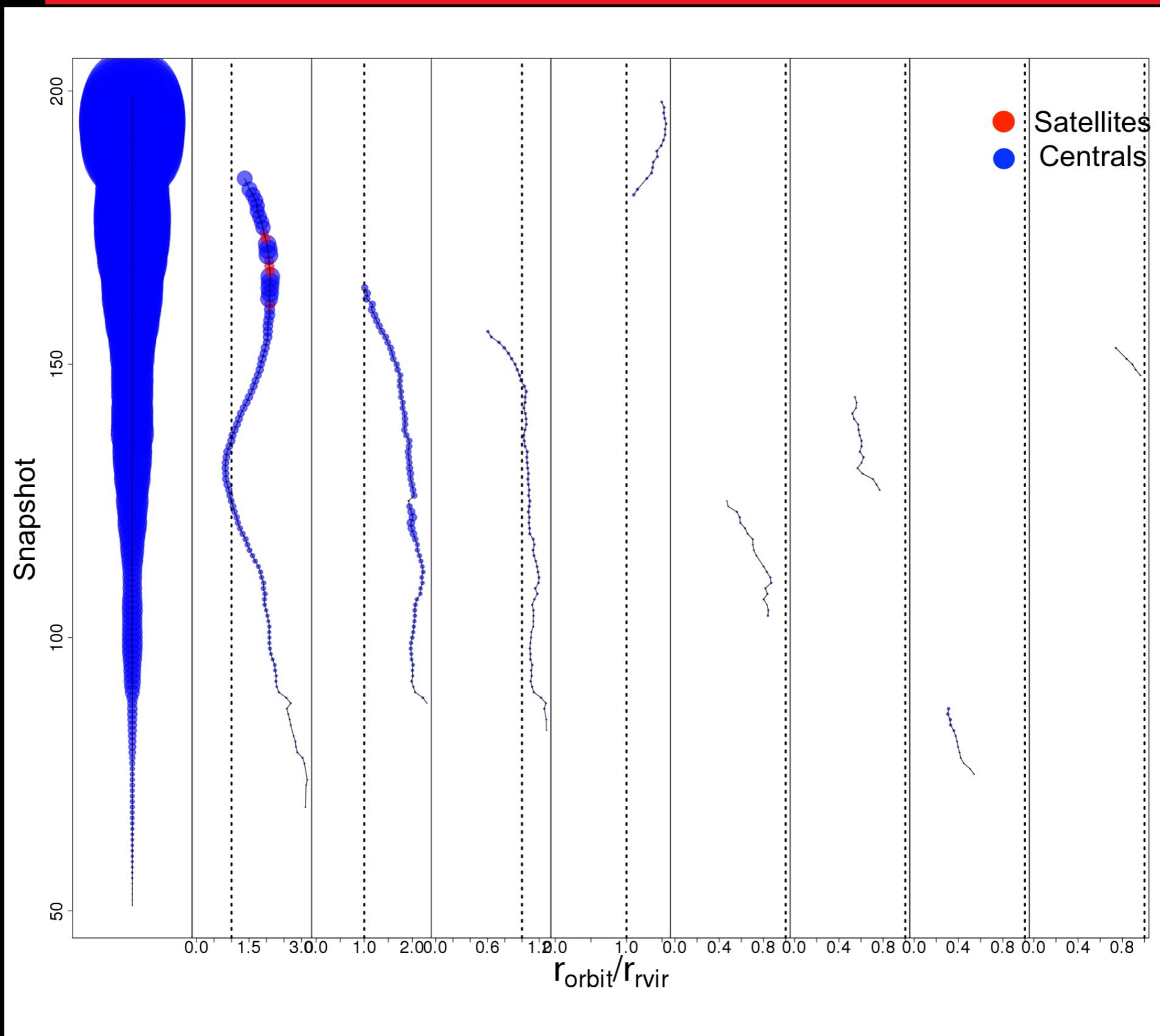




What have I done?

- **Optimise VELOCraptor/ Treefrog to produce better merger trees**

What have I done?





VELOCraptor updates

- **Minimum halo size to do another search for more halos**
 - minimum particle per cell
 - number of cells
- **Adaptive linking length (implemented by Rodrigo Canas, PhD student @ ICRAR/UWA)**
 - Velocity
 - Position

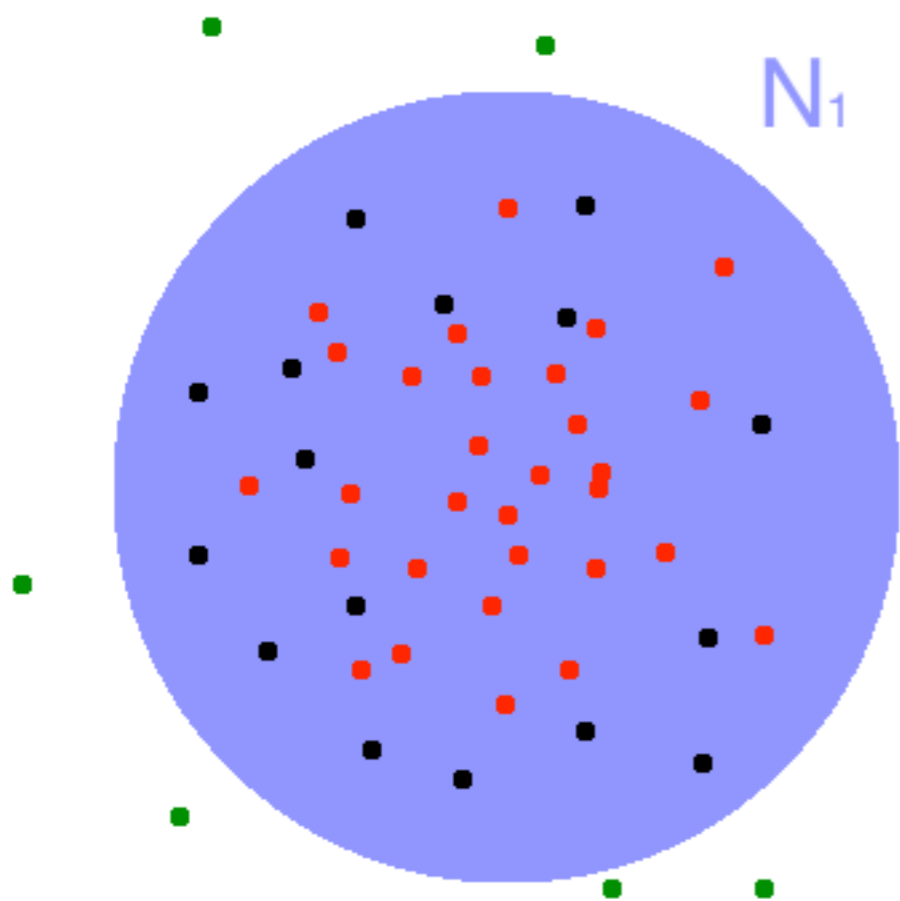


Treefrog Updates

- **Changed the merit function's temporal weighting**

Treefrog Updates

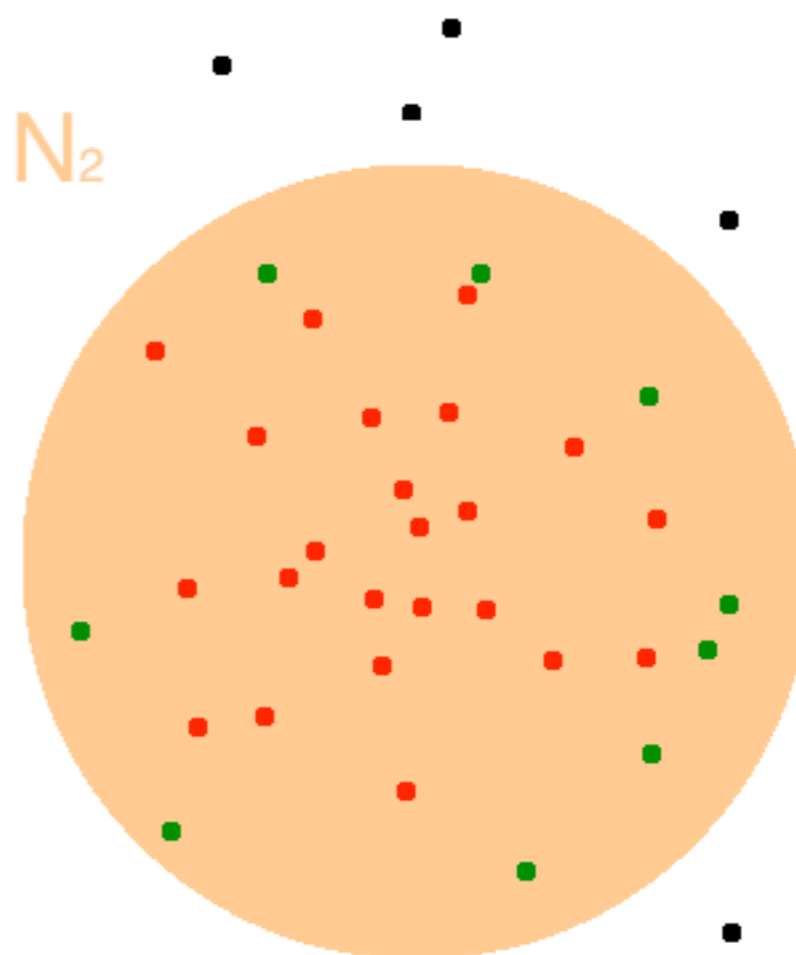
Snap



N_{sh}

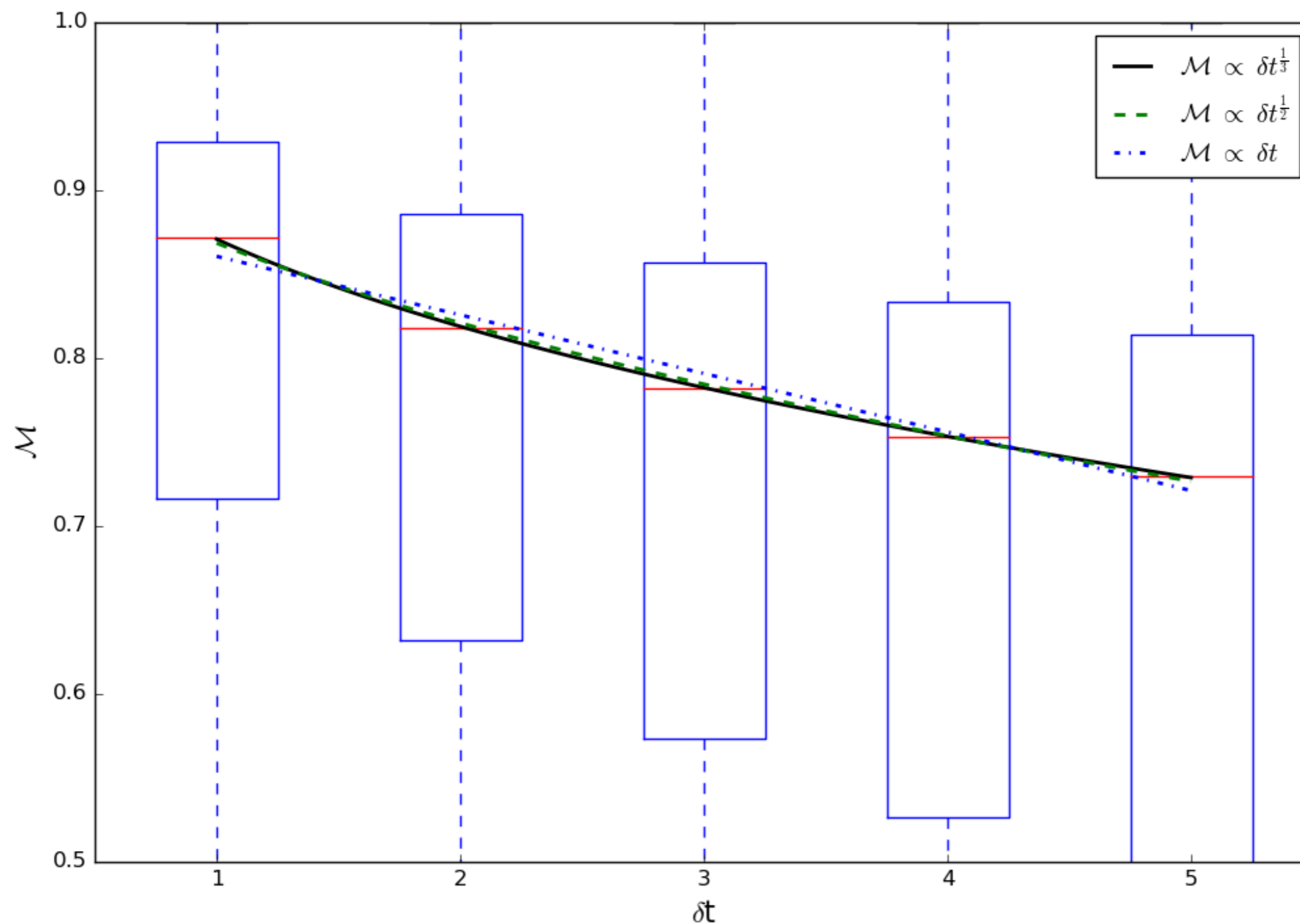
Snap + 1

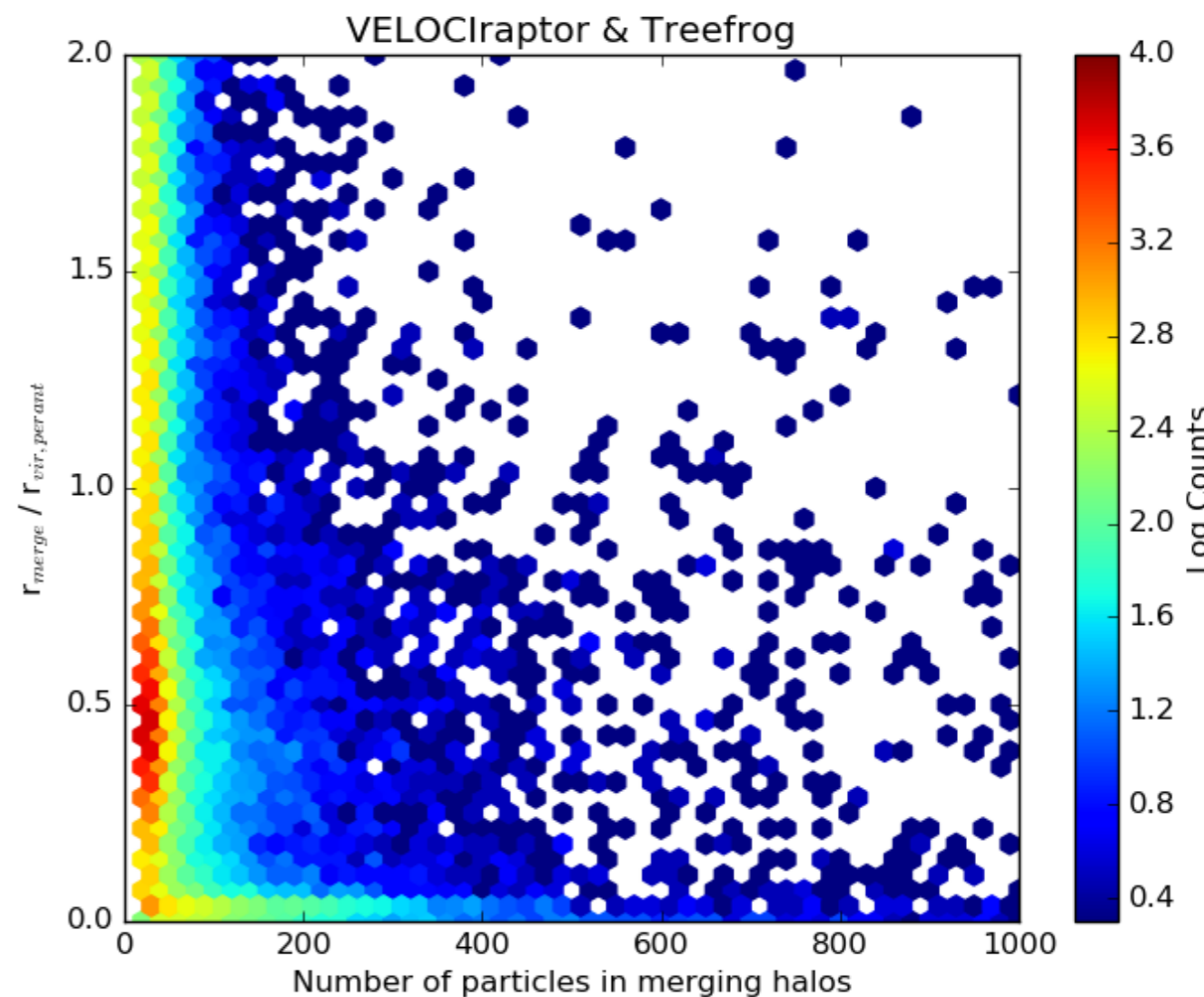
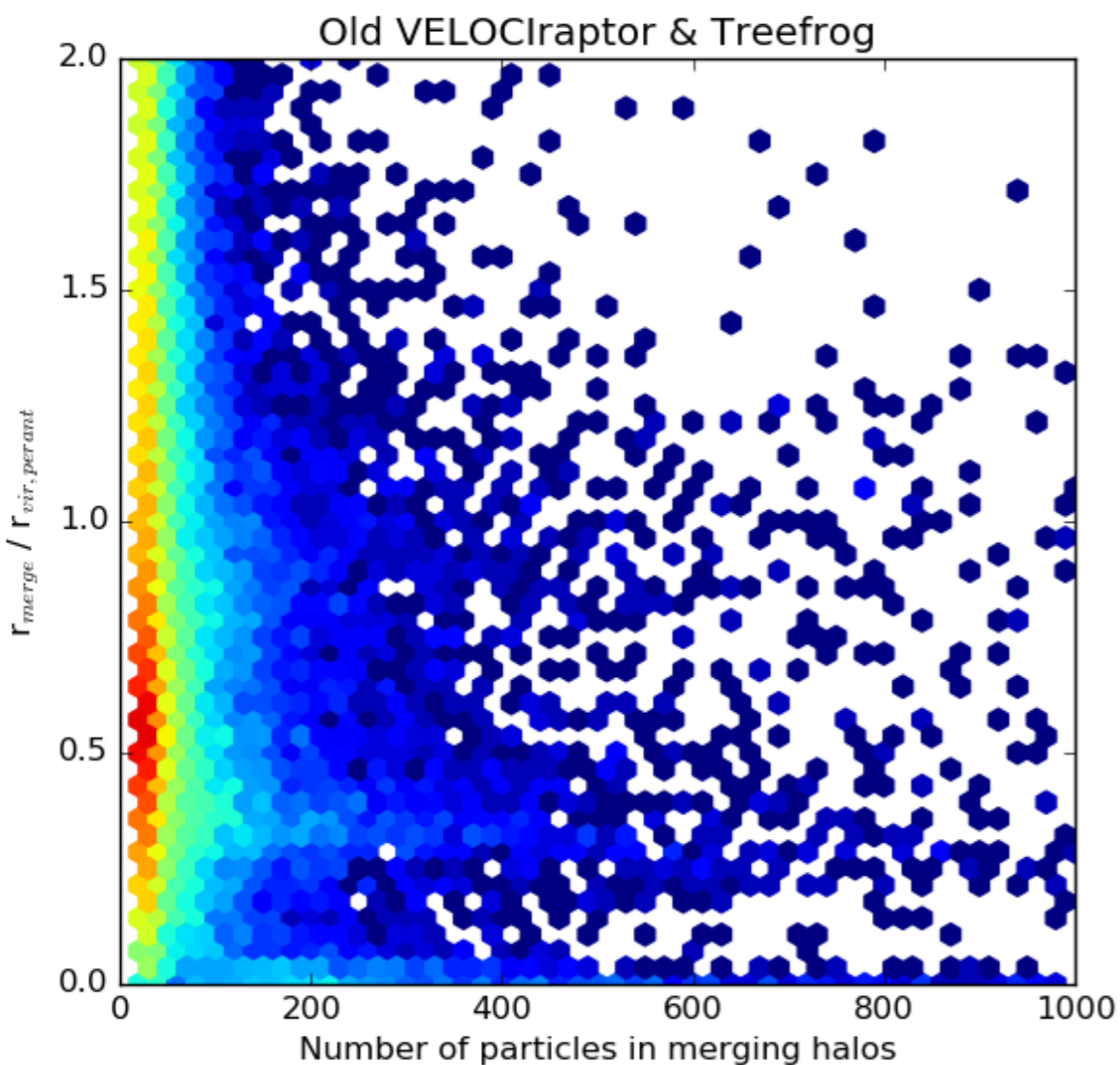
N_2

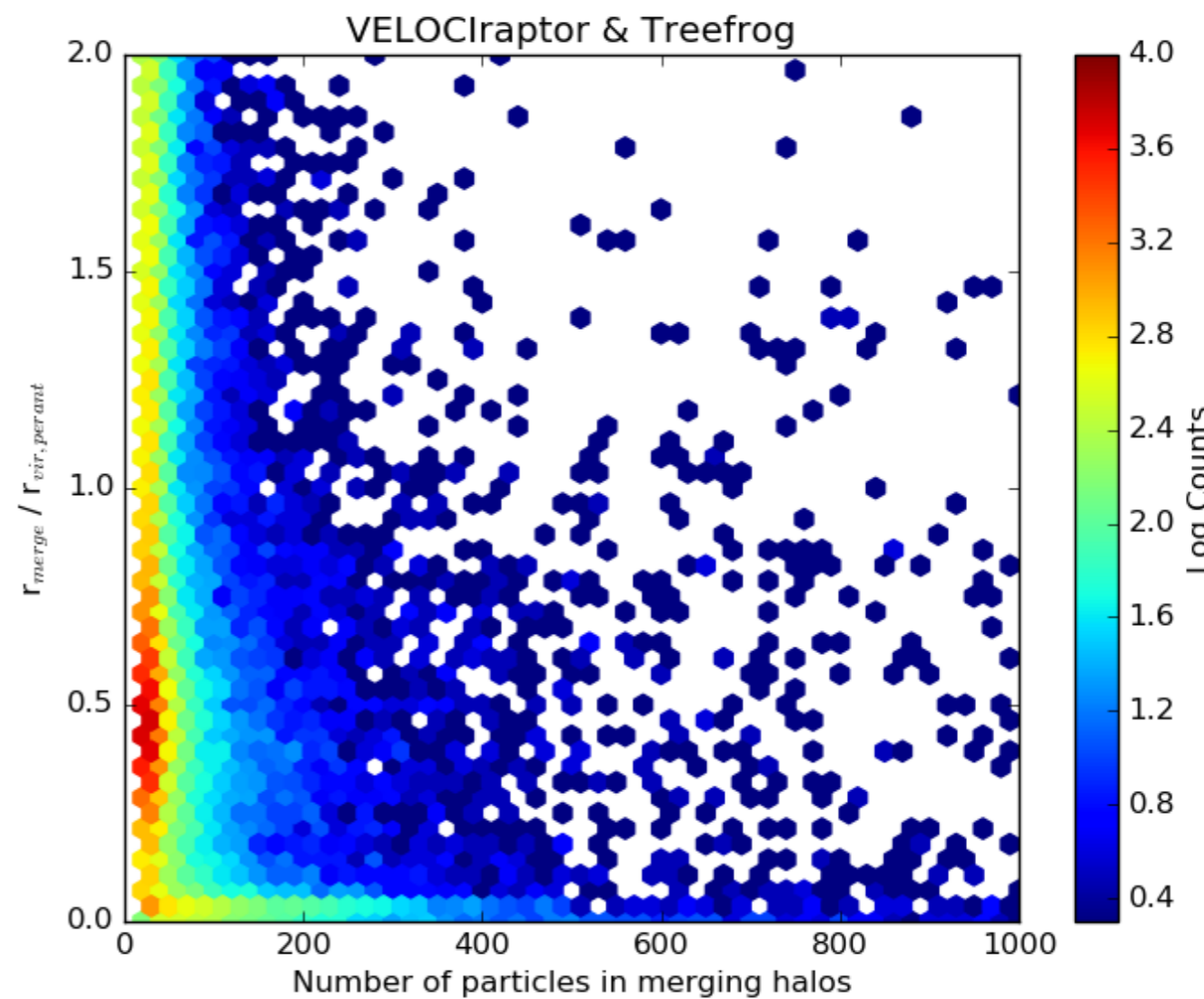
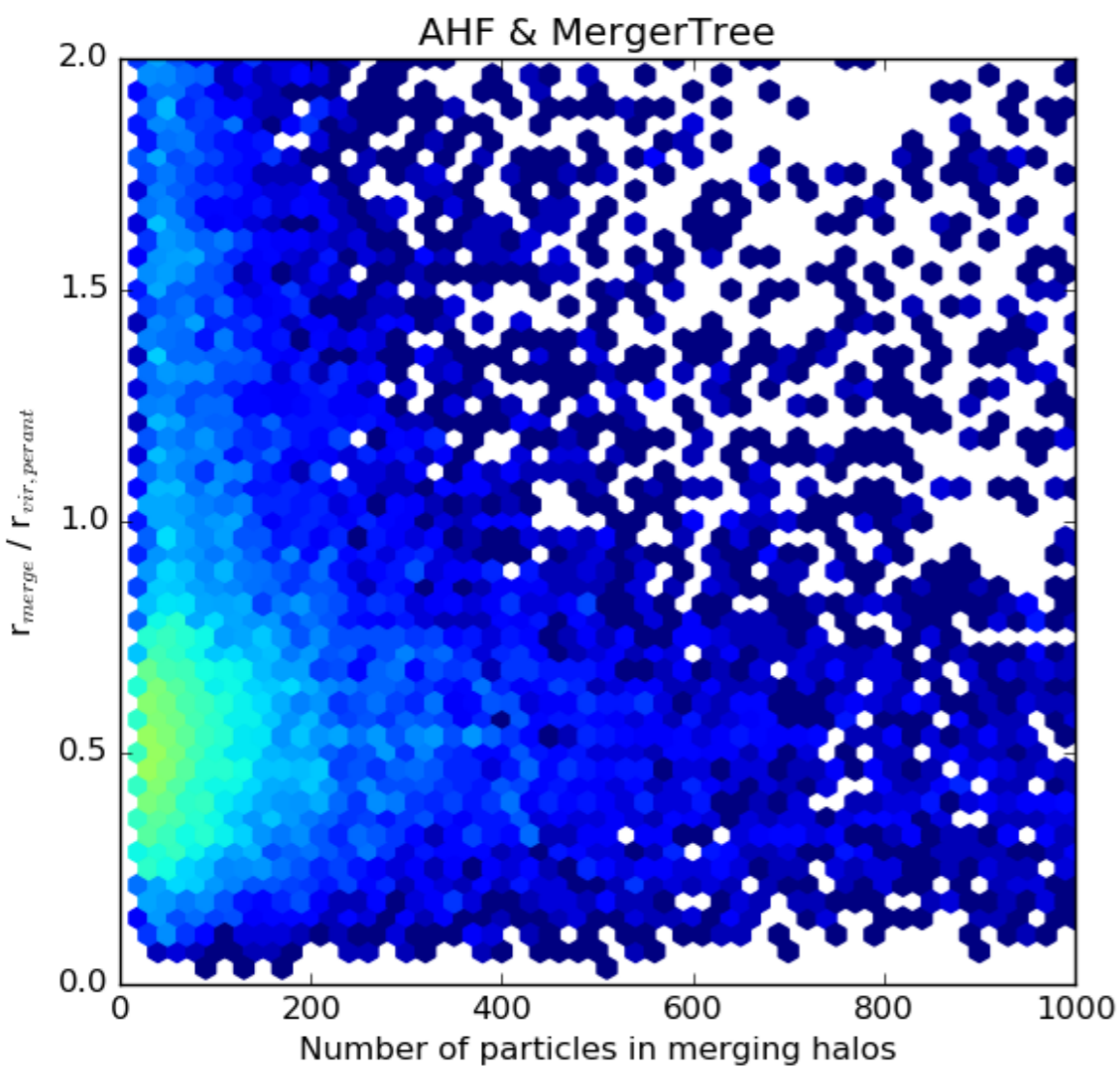


$$\mathcal{M} = \frac{N_1 N_2}{N_{sh}^2} \boxed{/\Delta T}$$

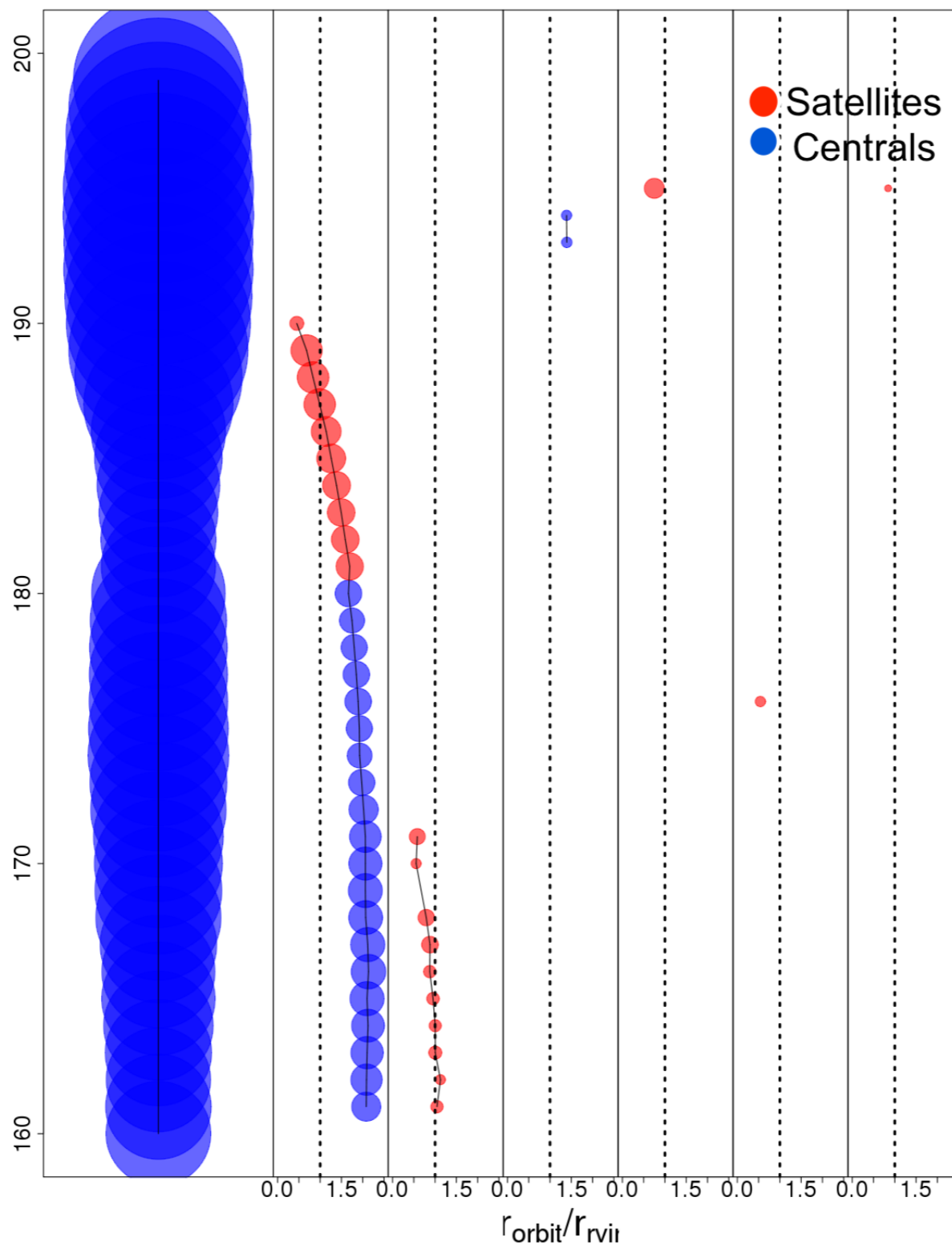
Treefrog Updates



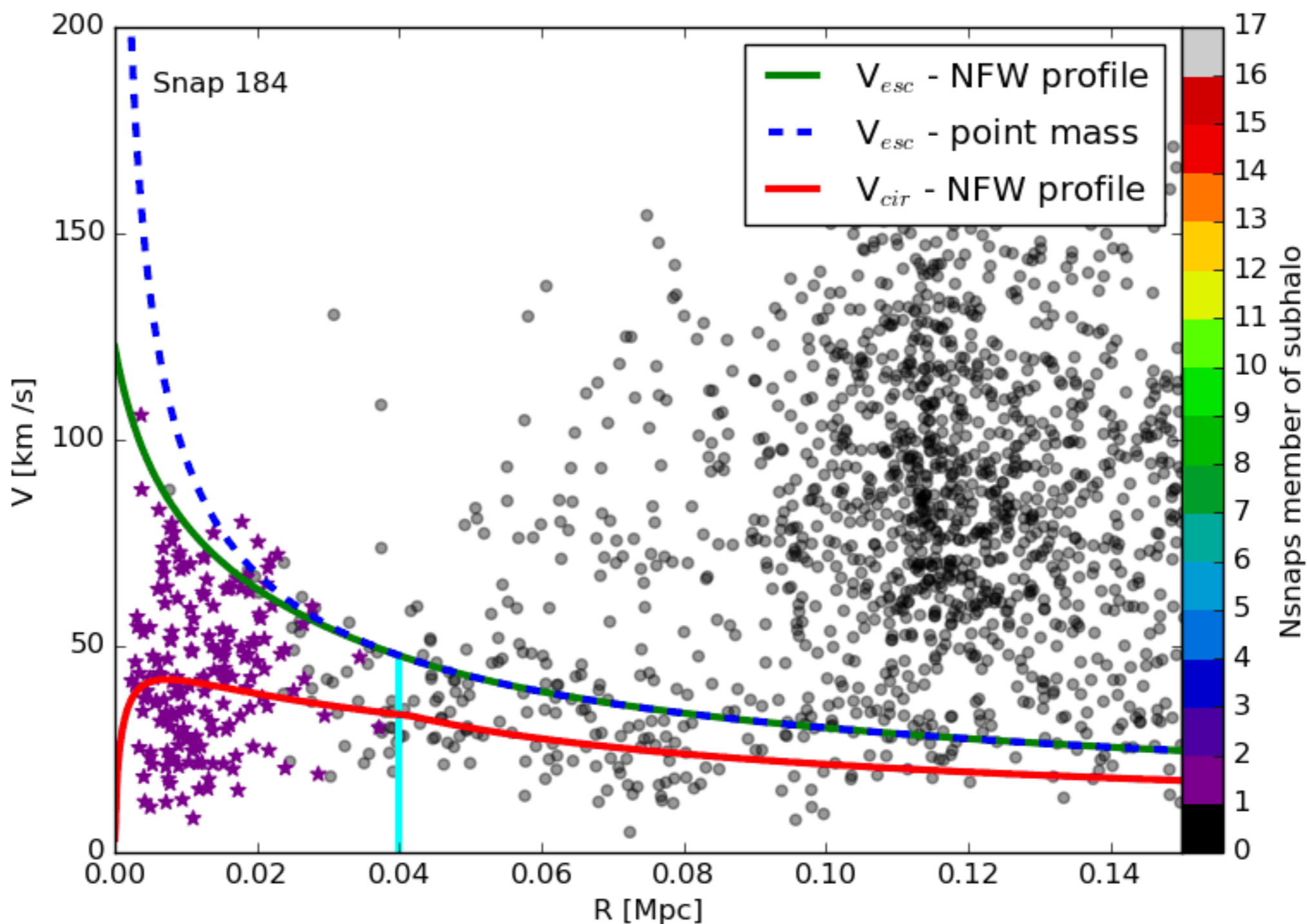




Results cont.

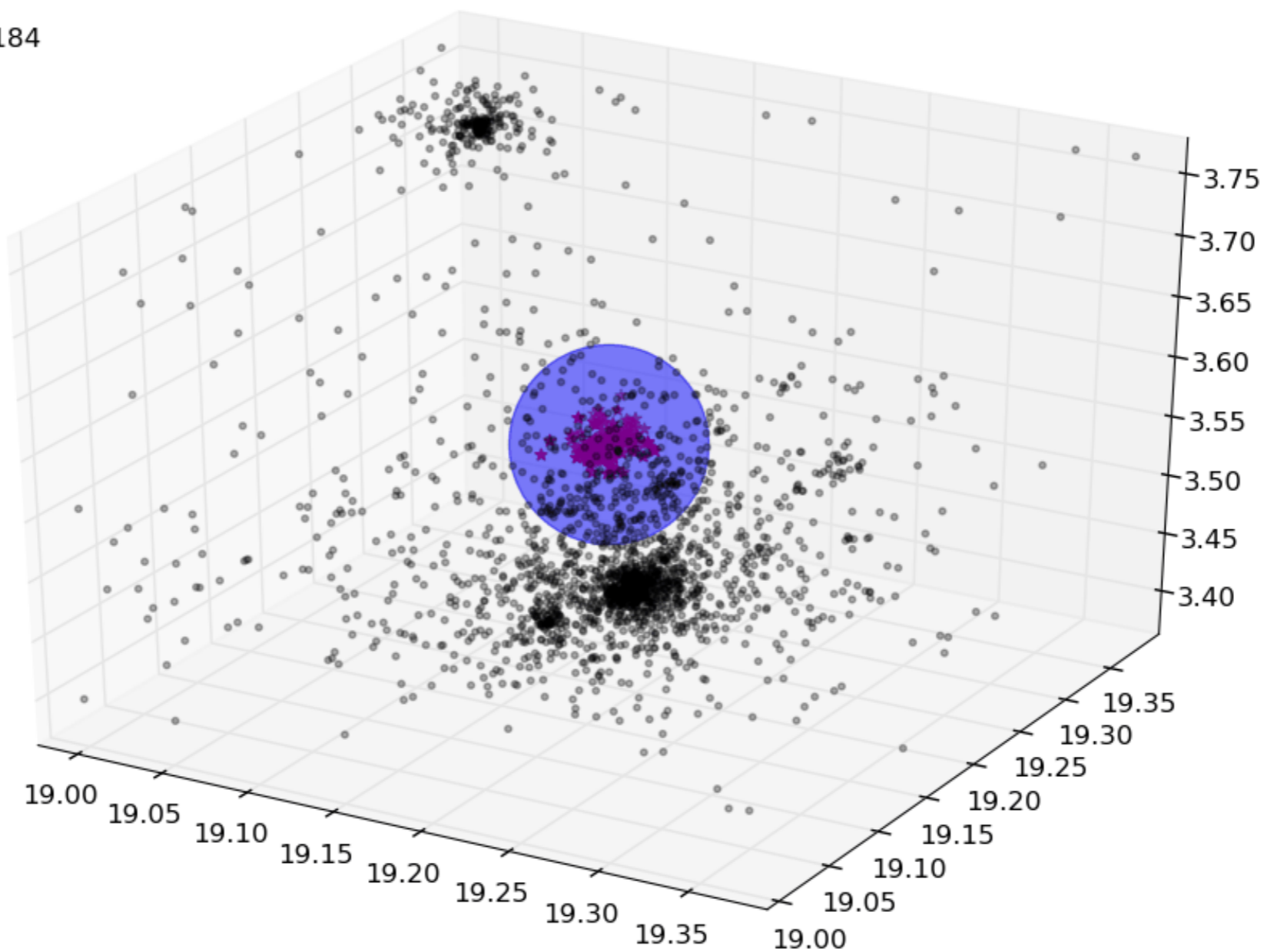


Halo Ghosting



Halo Ghosting

Snap 184





What's next?

- Test & Implement halo ghosting as part of VELOCraptor & Treefrog code set
- Create an orbit catalogue of all the orbiting satellites
- Look at parameters of orbits
- See if the properties of the orbits can reveal if a galaxy is quenched or not



Longer term project

- **Alter Semi-Analytic Models (SAMs)**
- **Implement what was found from orbit analysis**



Summary

- **Successfully optimised VELOCraptor and Treefrog to track halos well inside the virial radius**
- **Started to look at the halo ghosting**

Next steps

- **Test and implement halo ghosting**
- **Create an orbit catalogue**
- **Input what we learn into SAMs**