Tracing the ICL to Large Radii: MACS J1149 as a Test Case for BUFFALO Clusters

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Frontiers in ICL Studies

ICL as a probe of cluster splashback radius



Detected as a break in density profile.

Multiple recent studies see splashback signature for stacked of cluster

Simulations indicate that ICL should provide an unbiased tracer to detect splashback radius.

ICL as a tracer of the mass distribution



Observations indicate that ICL closely traces the total matter distribution on scales of 140 kpc.

Simulations find that ICL is a good tracer on larger scales as well.

Pre-BUFFALO Project: Bridged Coverage Gap



Deep multiwavelength HST imaging in multiple bands

hubblesite.org

Previous HFF ICL studies by Montes & Trujillo (2014, 2018, 2019), Morishita et al. (2017), Jimenez-Teja+(2018) Limited to central ~400 kpc due to field of view.



BCG+ICL Profile

- Background subtraction using data at >2.4 Mpc
- Comparable radial extent to existing stacked analyses
- Several inflection points visible





- Transition from BCG to ICL at ~70 kpc
- Second point of inflection at ~1.4 Mpc, consistent with caustic in density distribution



Comparison with C-EAGLE Simulations

- Depth and shape of feature consistent with splashback signature in C-EAGLE simulations
- r_{sp}/r200 is smaller than C-EAGLE
 - Multiple possible contributing factors

ICL to Mpc possible with HST.

First likely detection of splashback radius for individual cluster via ICL.







Approved Cycle 29 GO Program

Steinhardt+(2020)

- 20 orbits (4 orbits per cluster ; F105W and F160W imaging) •

 - 2D correspondence of ICL and dark matter to larger radii
 Astrophysics from radial color and baryon fraction measurements
- Anyone interested in participating is welcome! •