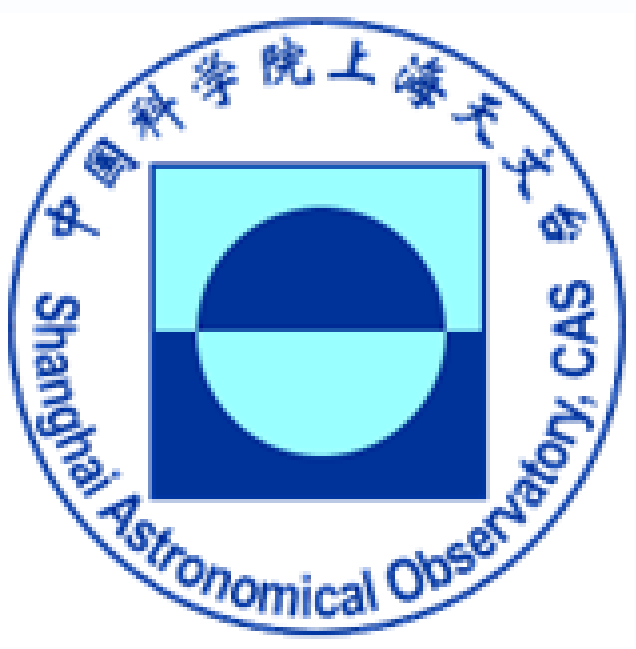


HBT: the Merger-Tree Based Subhalo-Finder

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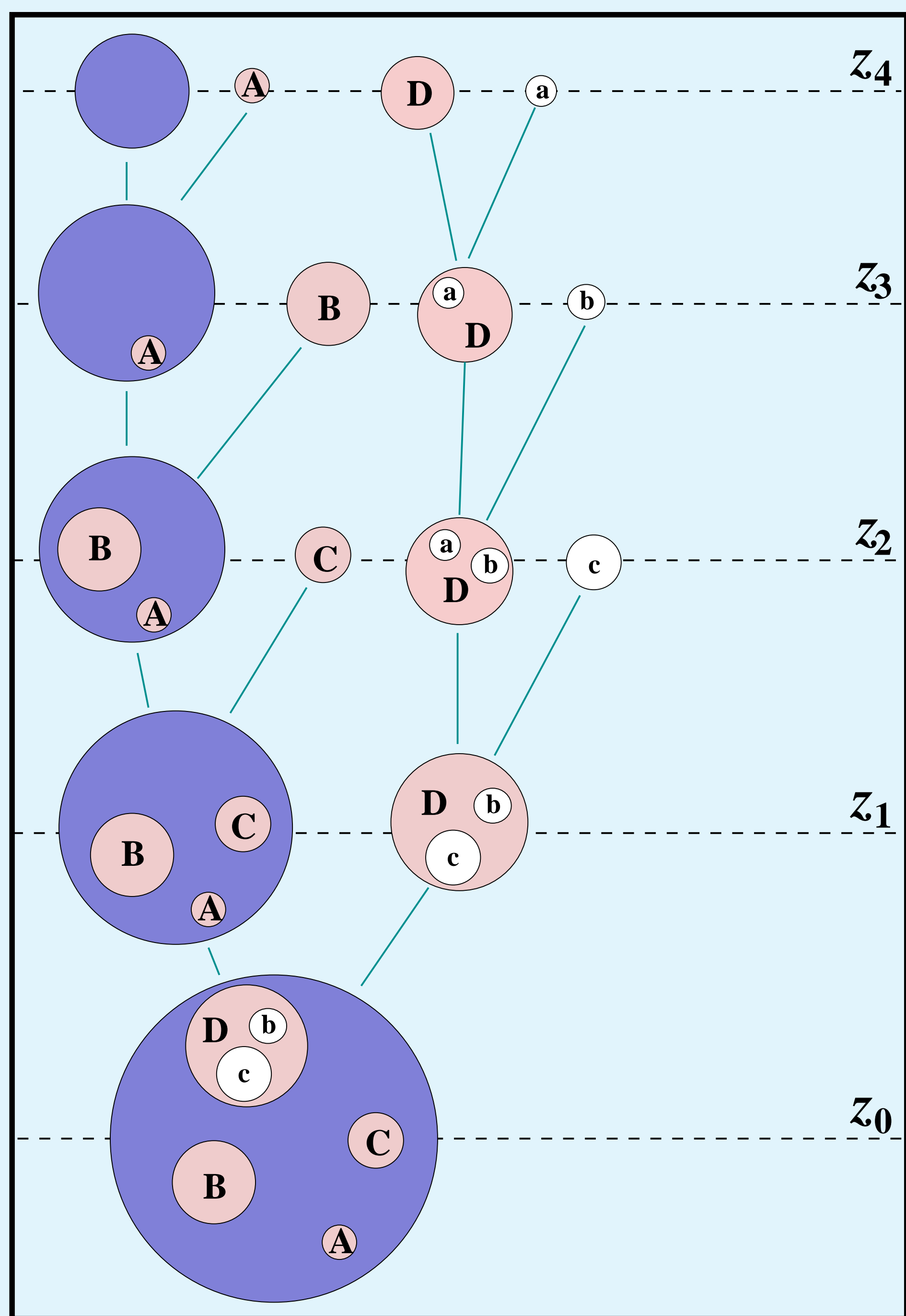
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Contribution

- A new and fast code based on the merger hierarchy of dark matter halos to find and trace dark matter subhalos in simulations.
- This Hierarchical Bound-Tracing (HBT) code is able to well resolve subhalos in high density environment and keep strict physical track of subhalos' merger history.

Algorithm



(Image Credit: Giocoli et al. 2010)

We combine the merger tree construction and subhalo identification into a single process, by tracing the particles of all the halos that ever existed to find their self-bound descendants at a later time.

Additional features include:

- Robust unbinding algorithm with adaptive source subhalo management
- Full record of the merger hierarchy of subhalos
- Possible growth of satellite subhalos through accretion from subordinate subhalos
- Possible satellite-satellite mergers
- Possible re-accretion of stripped mass

Local accretion of background mass is simply ignored in the current version.

Availability

HBT is open source.

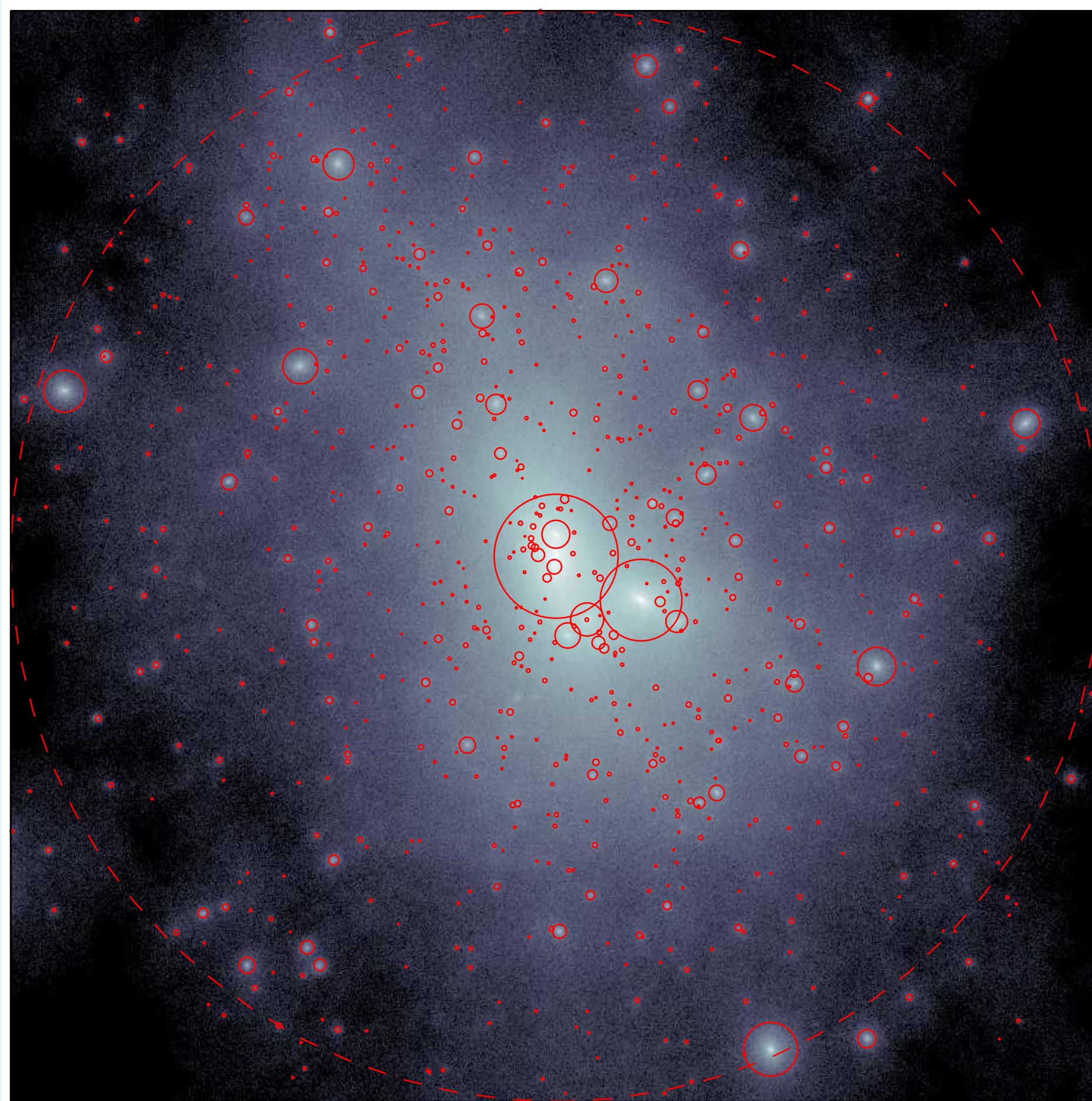
Reference

arxiv:1103.2099

Introduction

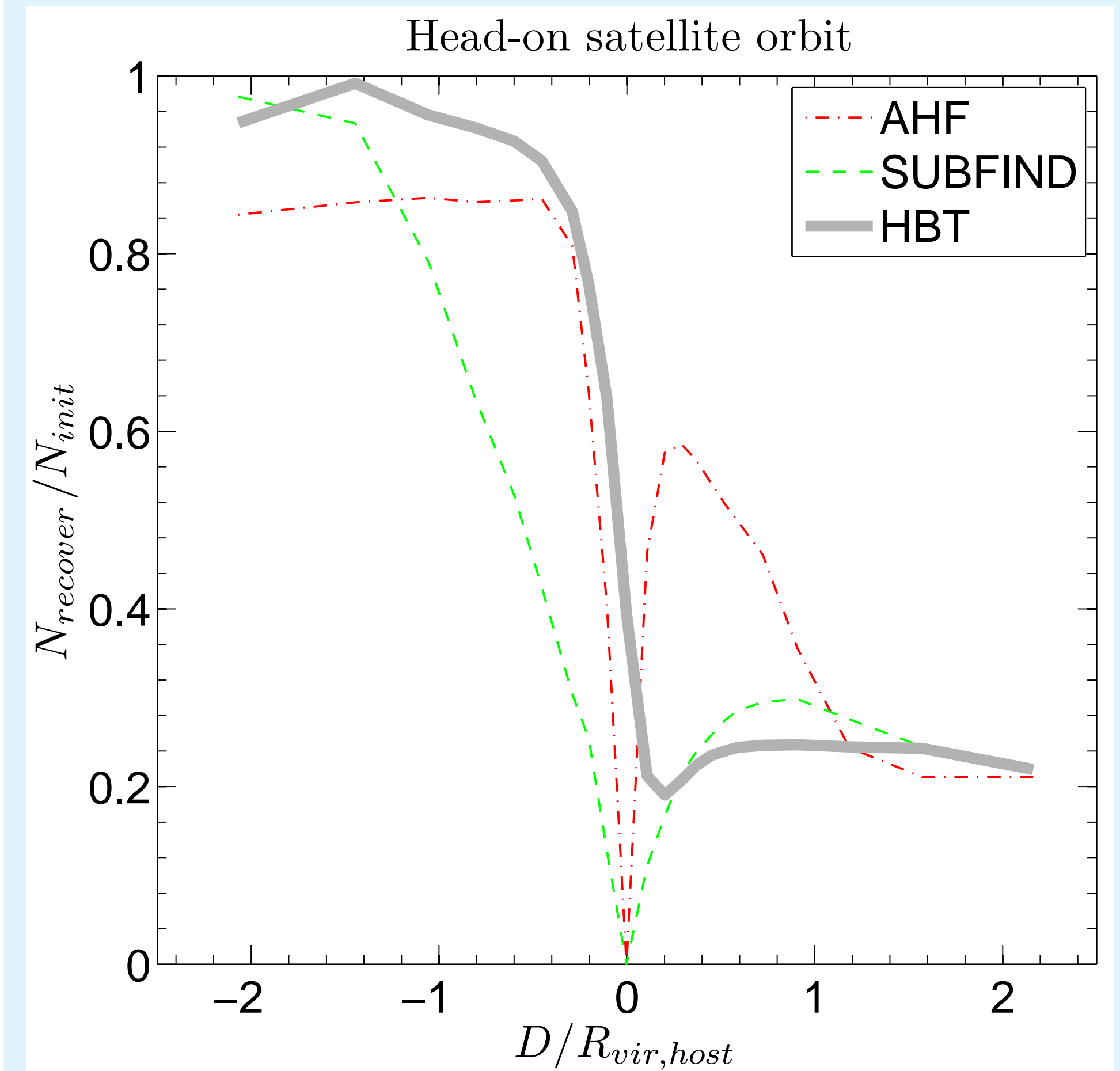
Subhalo-level dark matter merger trees provide the backbone for current state-of-art galaxy formation models. Many algorithms exist to identify subhalos from simulations, most of which suffer from subhalo resolution problem. The difficulty in identifying subhalos propagates to missing or false links in the resulting merger trees. Possible solutions lie in utilizing phase space information or through subhalo tracing.

Halos: Home of Galaxies



The projected density image of a cluster-sized dark matter halo. Red circles mark subhalos identified by HBT.

Subhalo Resolution Problem



Most existing subhalo finders try to identify subhalos statically, facing the difficulty of separating subhalos' particles from the high density background. With HBT we are able to avoid this problem by looking into the merger history.

Subhalos as Revealed by HBT

- More Extended and More Massive
- More Robust and More Complete
- Strictly Physical

