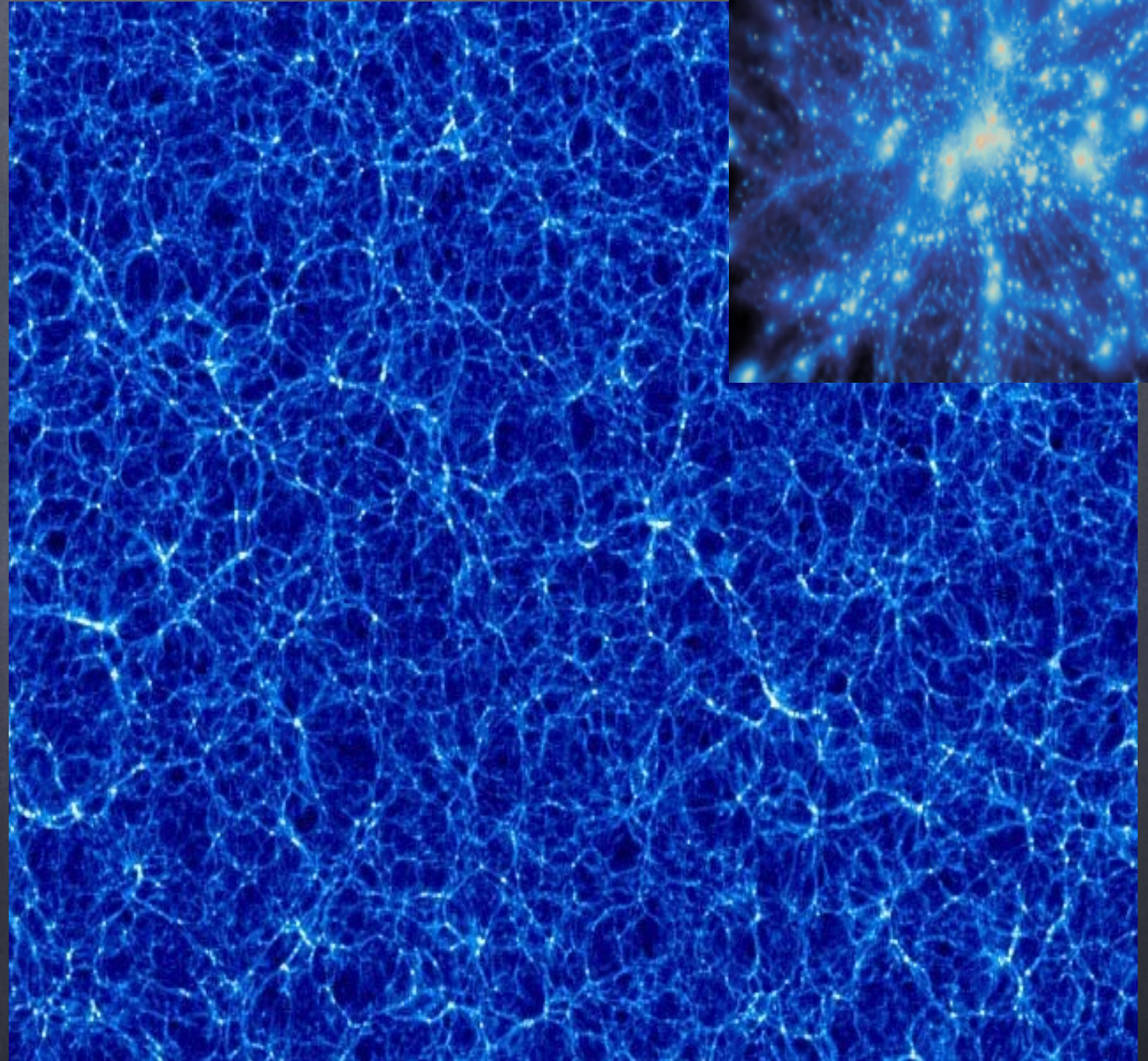2017.07.12

Substructure Abundance in Clusters may depend on Large-scale Environment

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Structures in the Universe

- Cosmic Web dominated by **filaments**

- Clusters grow by accreting **subhalos** through filaments

(credit : Multidark simulation www.cosmosim.org)

Subhalos in Halos

Statistical and structural properties of **subhalos** are probes of

1) mass accretion history

2) dynamics of host halo

3) underlying cosmology

Subhalo Abundance & Radial distribution

vs

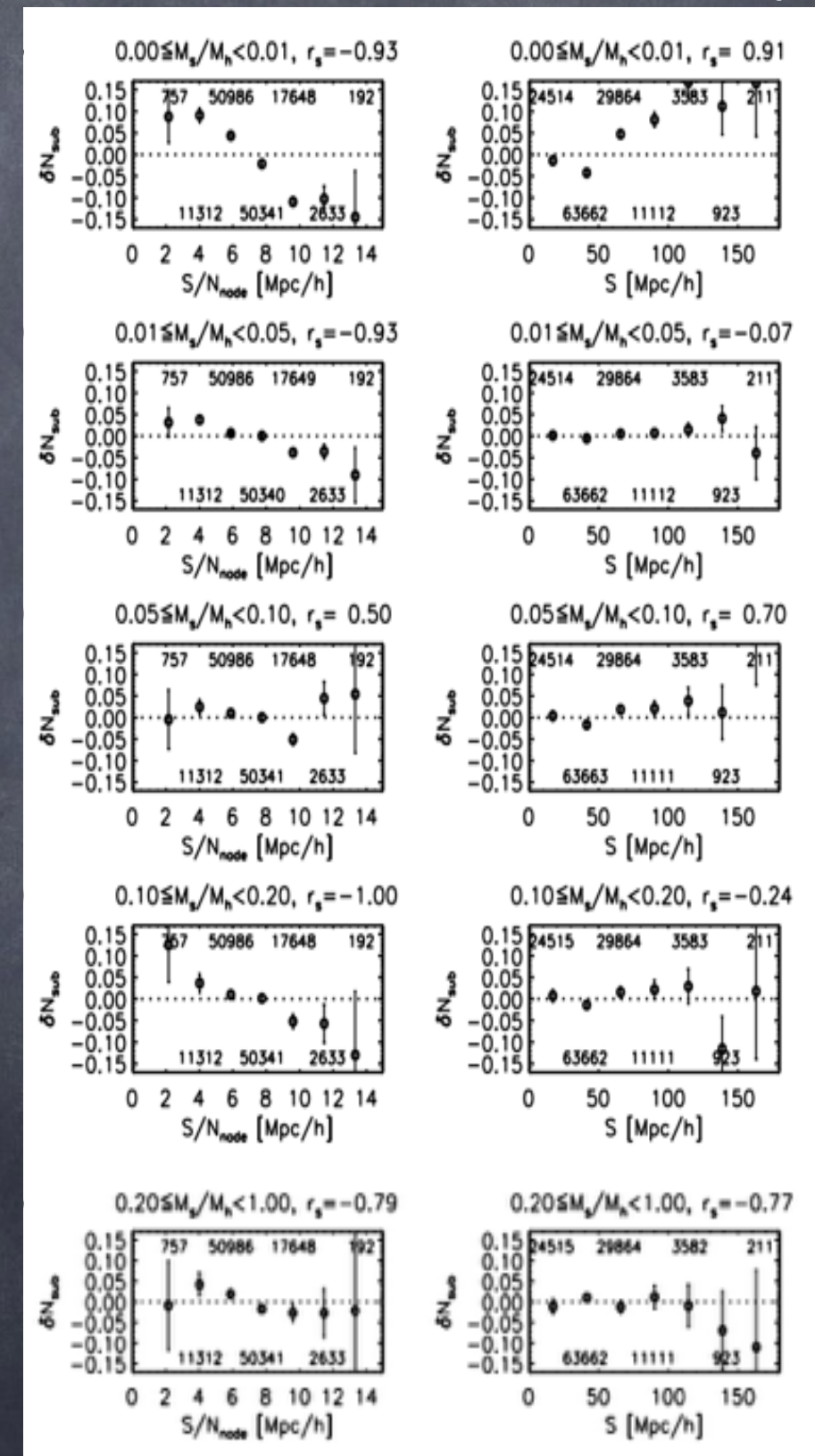**Filament** Size & Straightness

Substructure Excess & Deficit

(Preliminary)

$$\delta N_{sub} = \frac{N_{sub} - \bar{N}_{sub}}{\bar{N}_{sub}}$$

Substructure abundance shows

1. correlation with **filament straightness**.
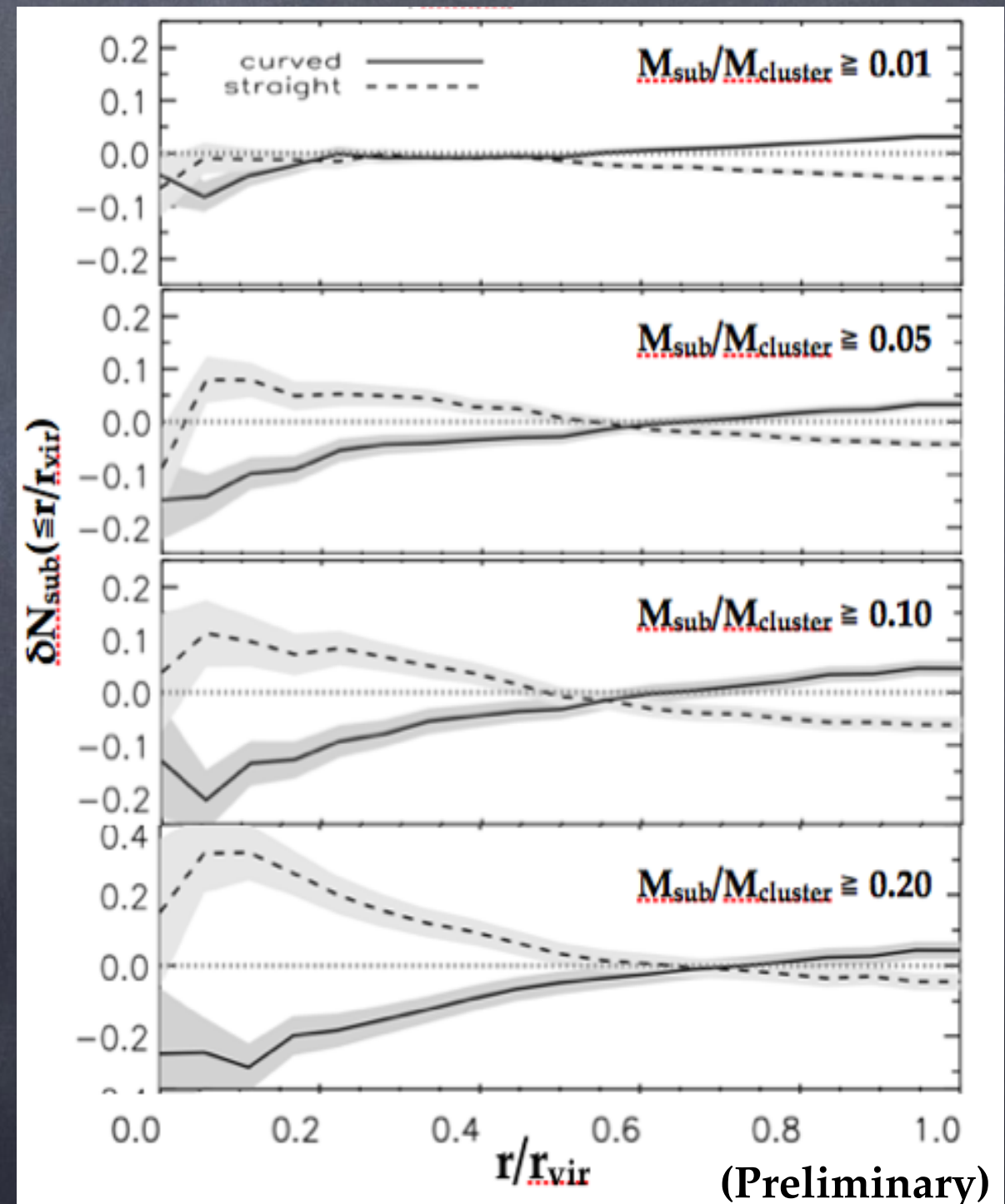
2. little correlation with **filament size**.

Straighter ➡   **Larger** ➡

Substructure Radial Distribution

$$\delta N_{sub} = \frac{N_{sub} - \bar{N}_{sub}}{\bar{N}_{sub}}$$

More substructures near cluster centers in **straight filaments**.

Abundance of massive subhalos shows larger amplitude.

(Preliminary)

Discussion & Future plan

In **straight filaments**, **subhalos** enter early and fall deep into clusters.

-> substructure excess near center
-> longer tidal stripping
-> deficit in total substructures

Effect of large-scale density?
~O(10Mpc/h)