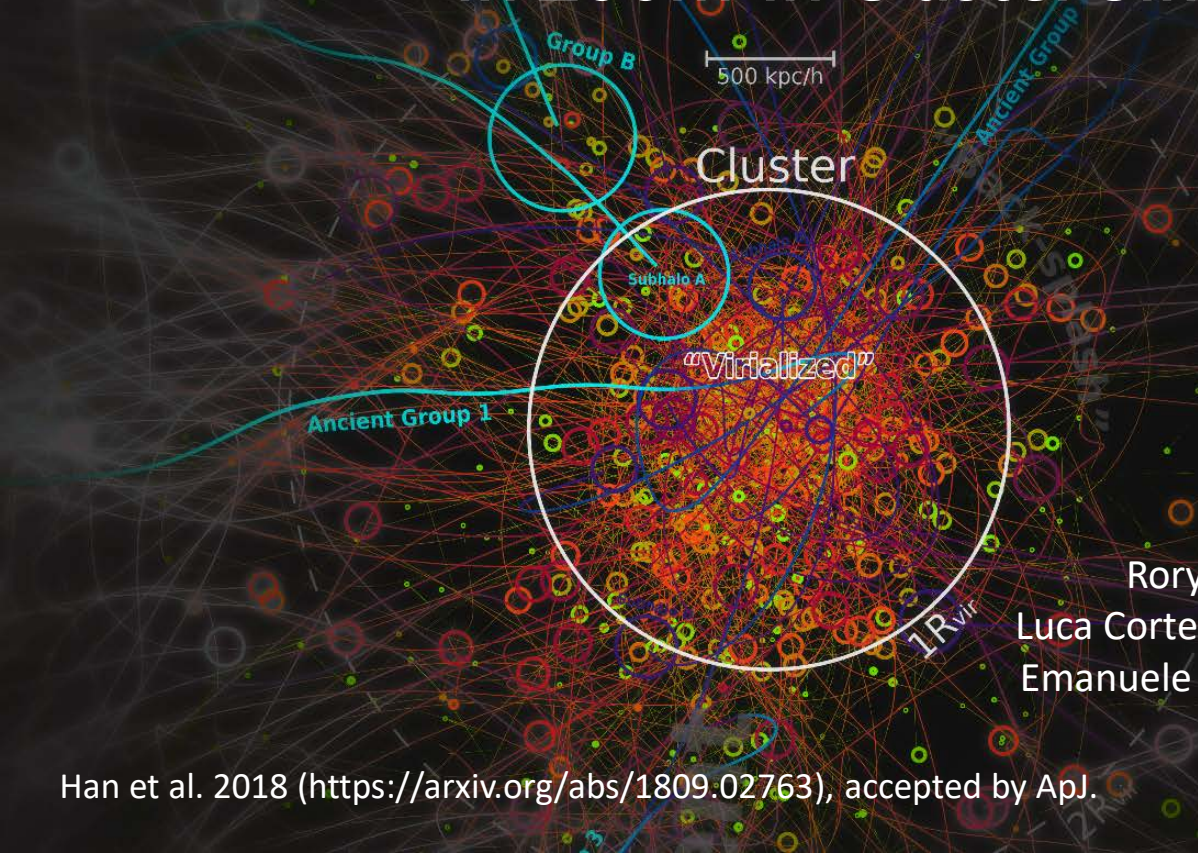
RUM 2018

Preprocessing and Mass Evolution of Dark halos

in Zoom-in Cluster Simulation



San Han

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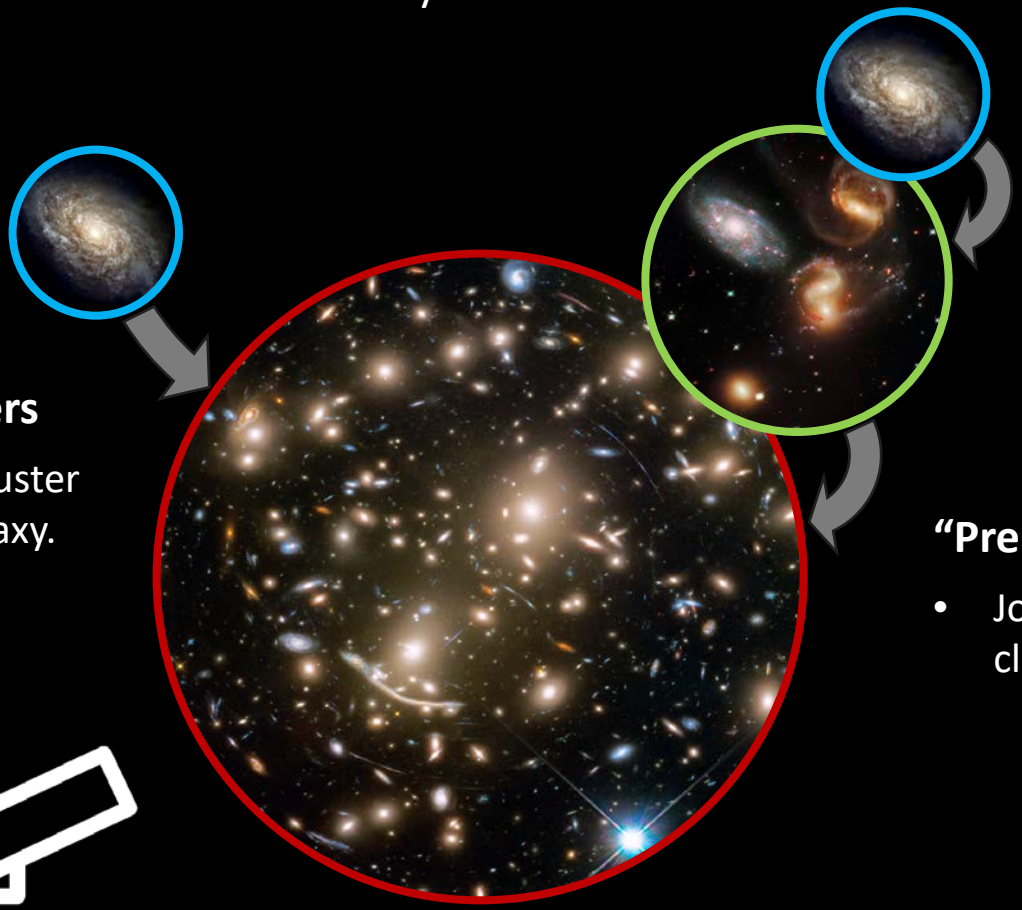
Luca Cortese (ICRAR), Barbara Catinella (ICRAR),
Emanuele Contini (Yonsei), Sukyoung Yi (Yonsei)

Han et al. 2018 (https://arxiv.org/abs/1809.02763), accepted by ApJ.

Concept of Preprocessing

=Environmental effects of smaller systems

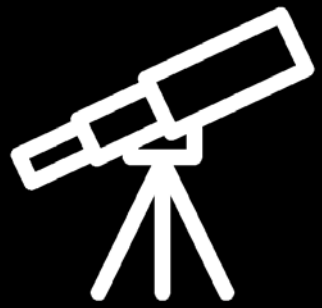


Normal Members

- Fell into the cluster as isolated galaxy.

“Preprocessed” Members

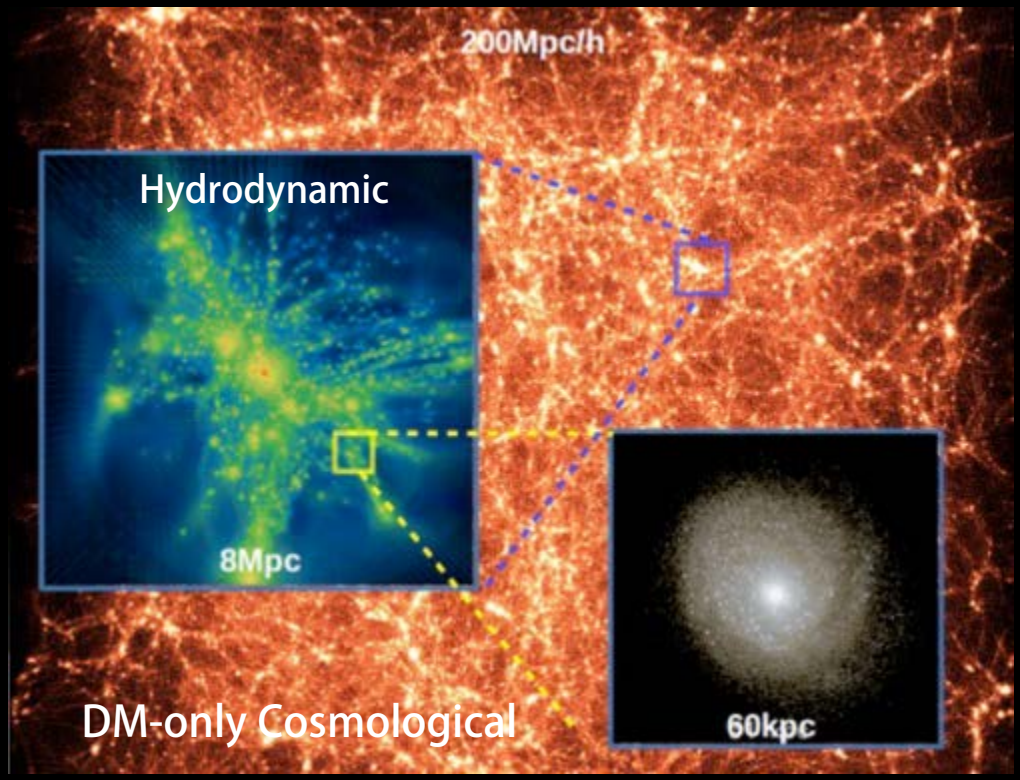
- Joined group before cluster infall.



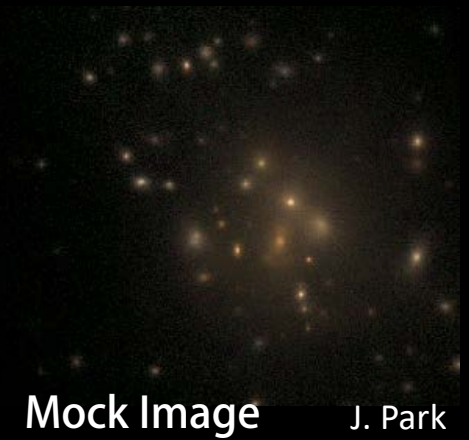
Yonsei Zoom-in Cluster Simulation

Choi & Yi 2017

- 16 regions zoomed into clusters with masses in a range $10^{13.7}$ - $10^{15} M_{sun}$.
- Minimum force resolution **0.76kpc**



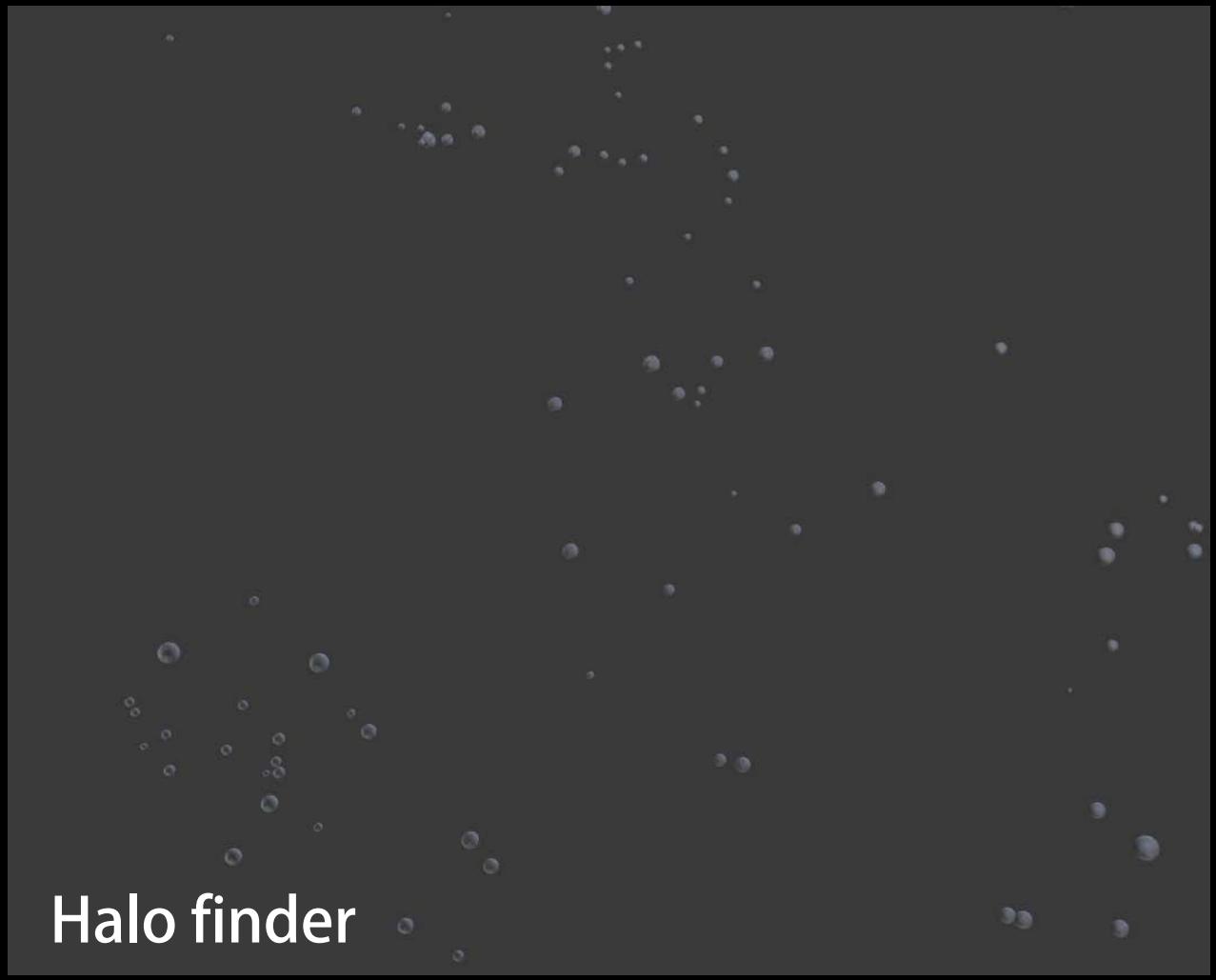
H. Choi



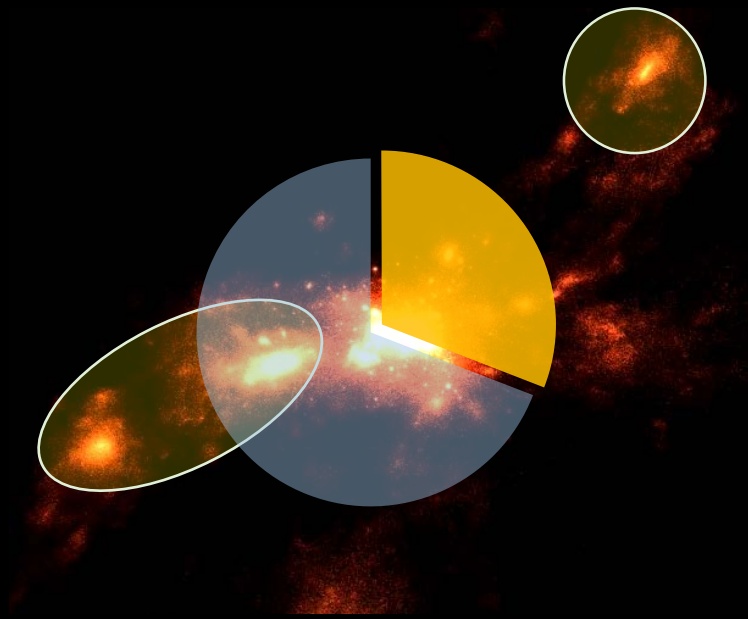
Mock Image J. Park

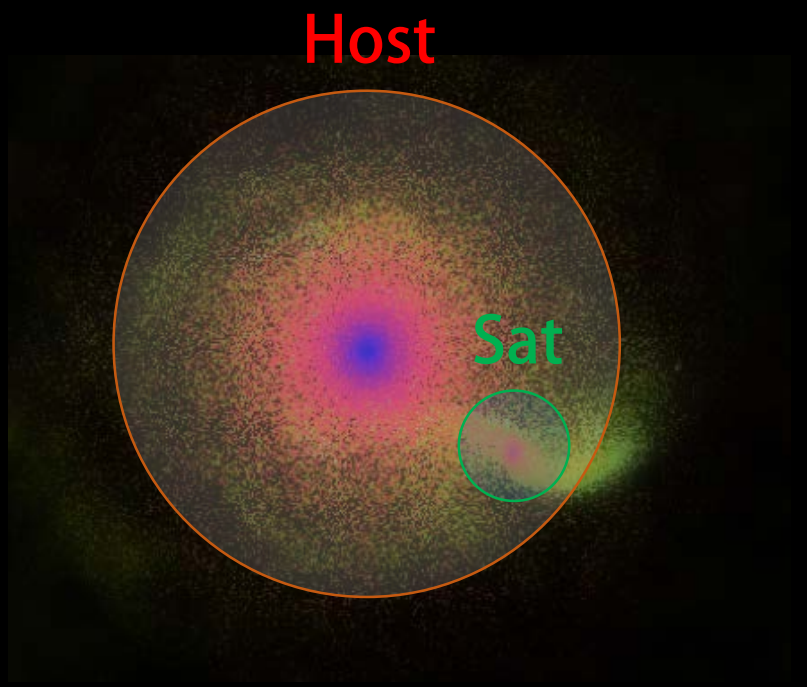
Yonsei Zoom-in Cluster Simulation

Choi & Yi 2017



What did we want to know?





Statistics

- What fraction of halos in the cluster have been “preprocessed?”

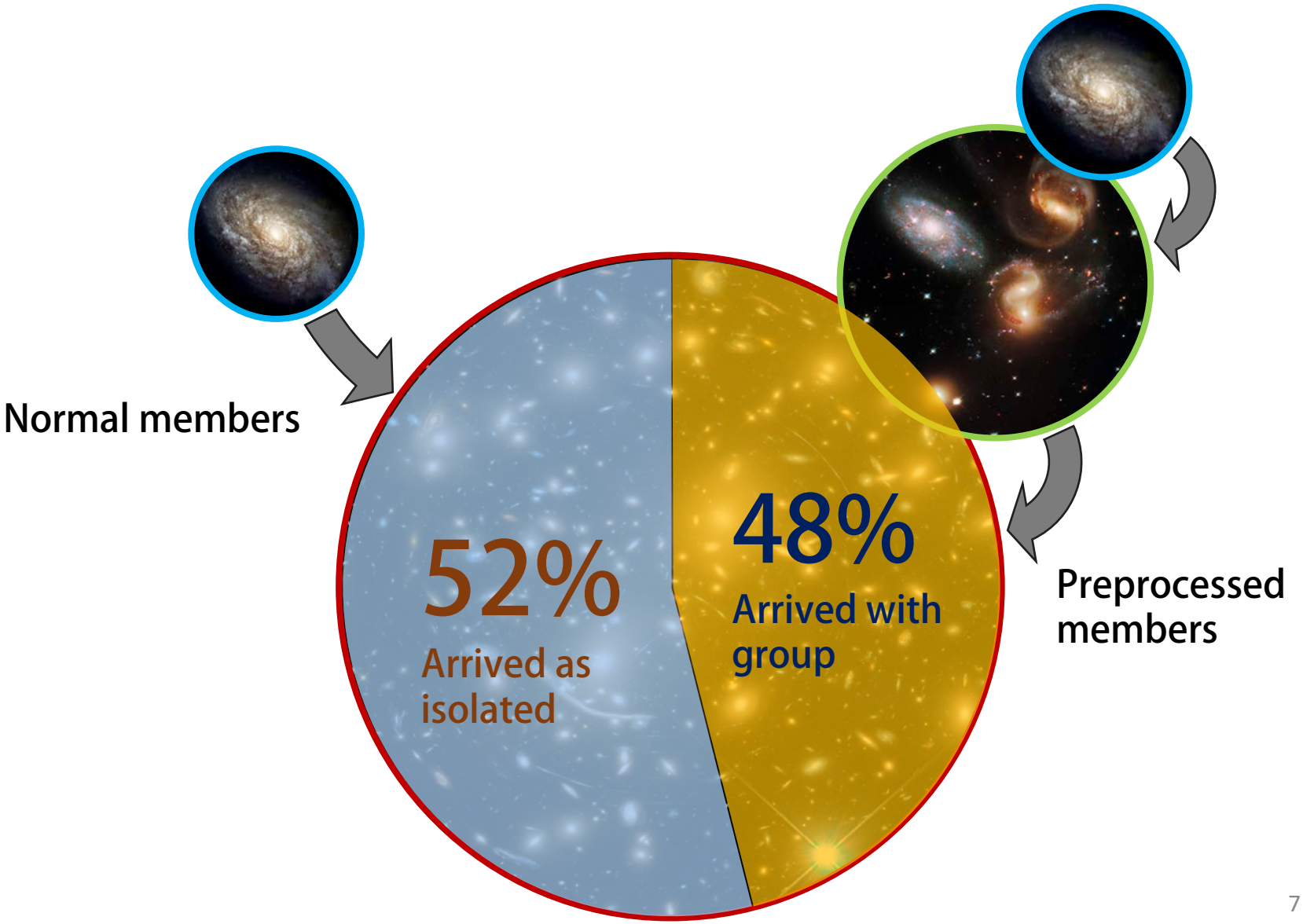
Significance

- How important is the preprocessing?
- When is the effect maximized?

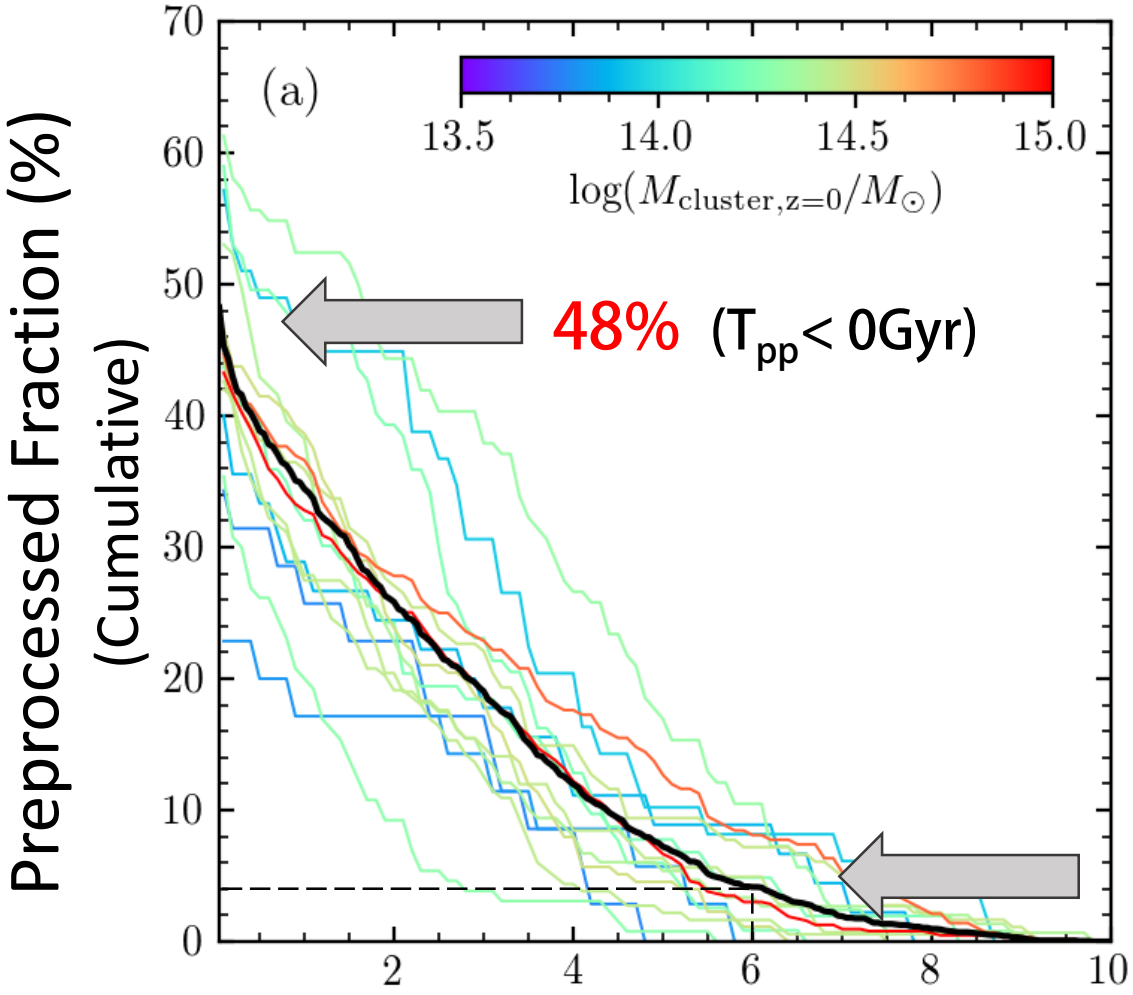
Galaxies vs DM halos

Results

Fraction of preprocessed halos in clusters



Fraction of preprocessed halos in clusters

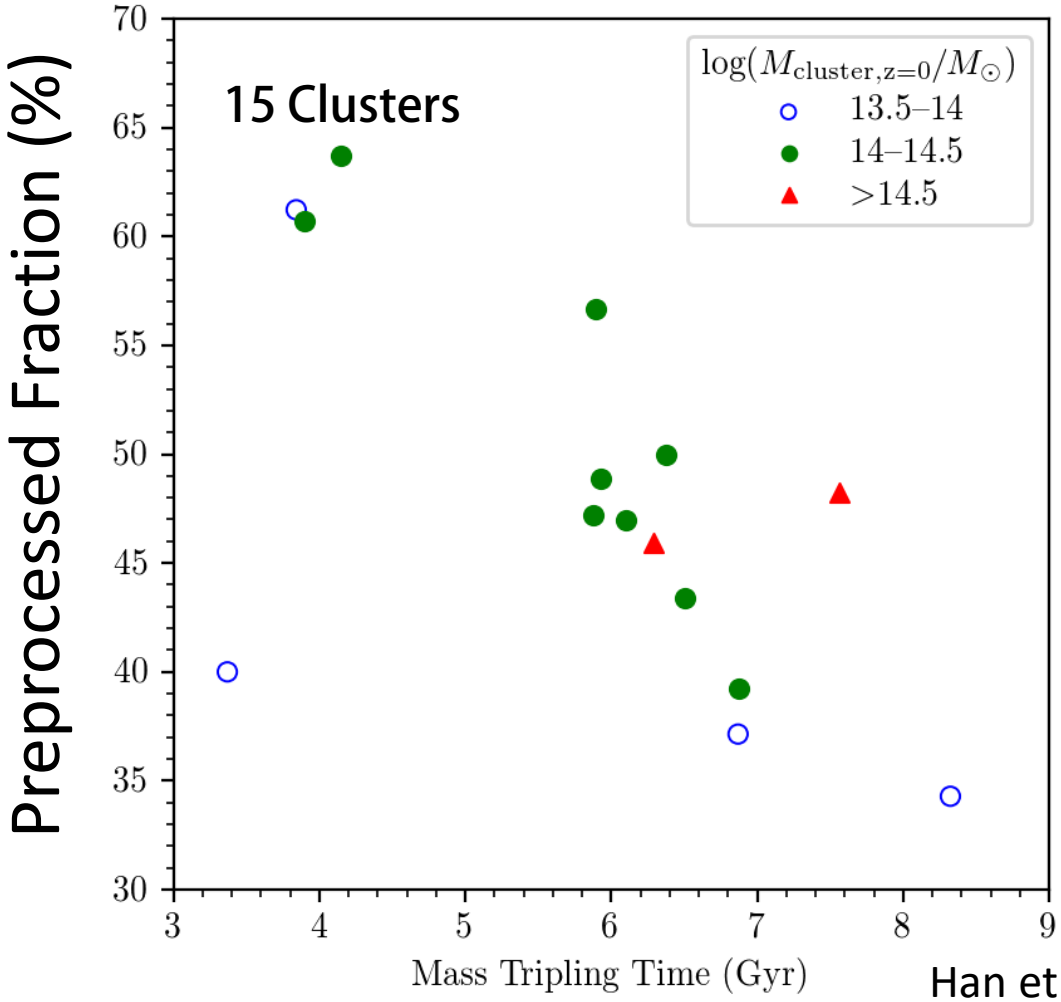


(Black: average)

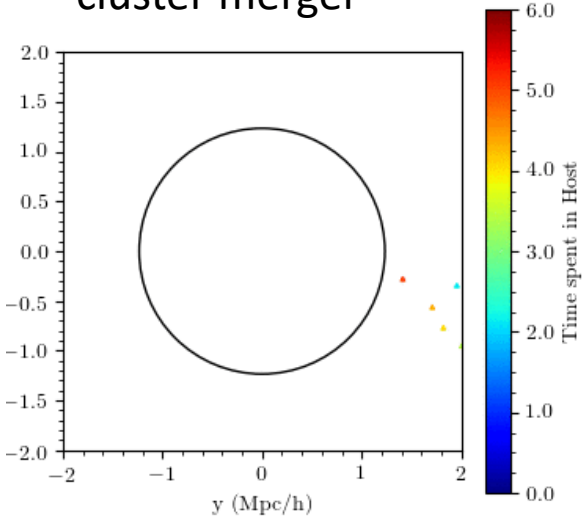
(colored: different clusters)

Han et al. 2018

Recent growth history of the cluster



Example of group-cluster merger



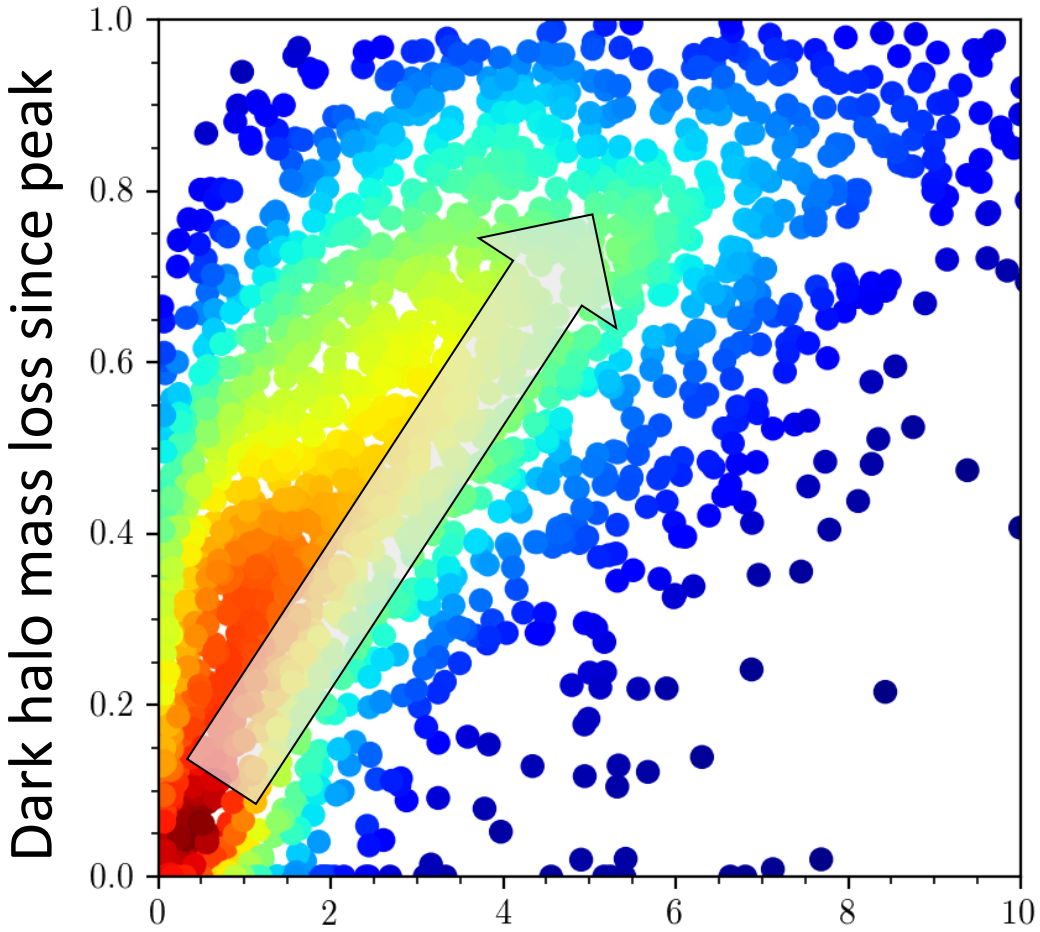
Rapid growth
= Recent group merger

Han et al. 2018

Rapid — *Recent* Growth Speed — Slow

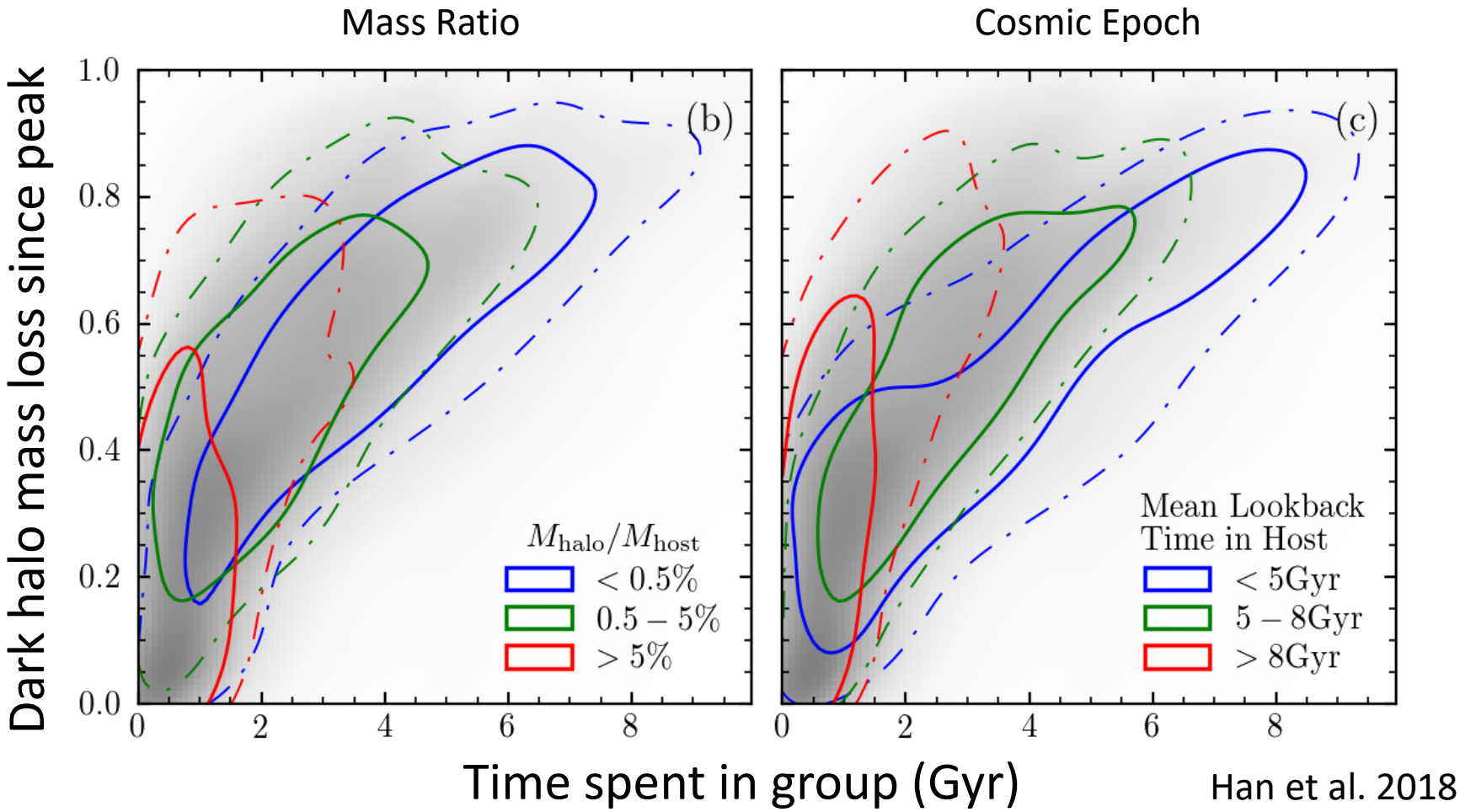
Tidal mass loss of satellites in preprocessing

Color: density of points



Han et al. 2018

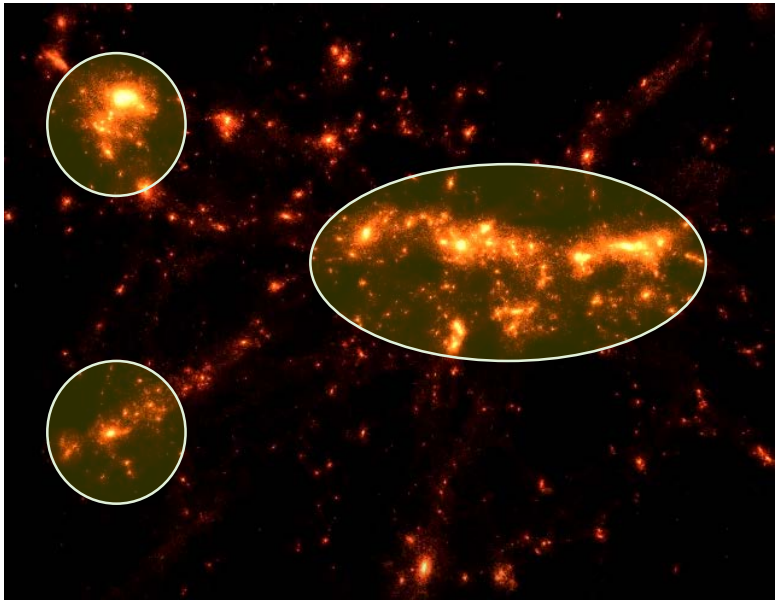
Variation of tidal mass loss rate



Han et al. 2018

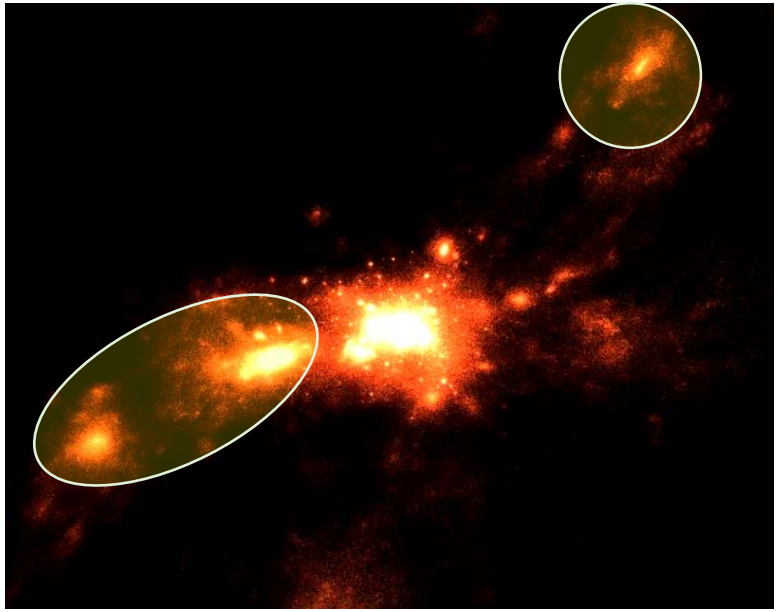
Earlier groups were more destructive!

Groups in different epoch



Early Groups

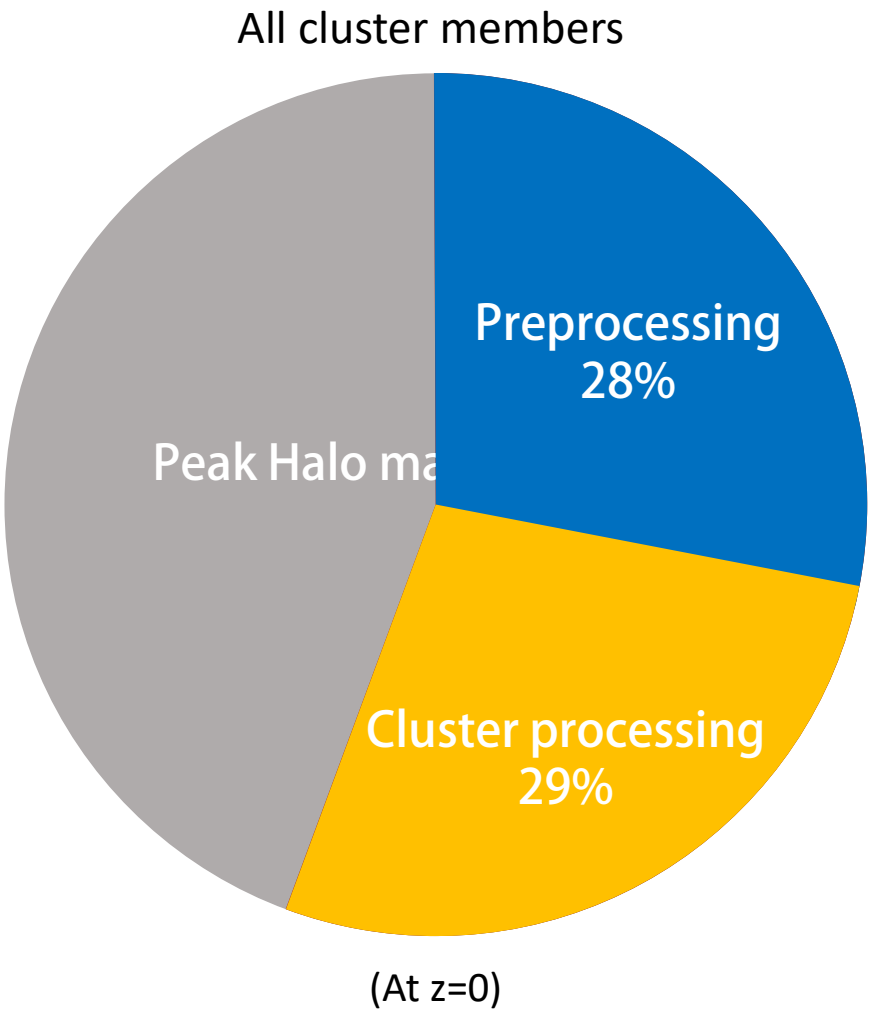
Violent mergers/accretions



Late Groups

Ordered accretion/growth

Mean mass loss of cluster members



Summary

- Fraction of halos came from groups in the cluster ~48%
- Higher preprocessed fraction = Recent rapid mass growth
- Rate of tidal stripping varies with:

  host-satellite mass ratio

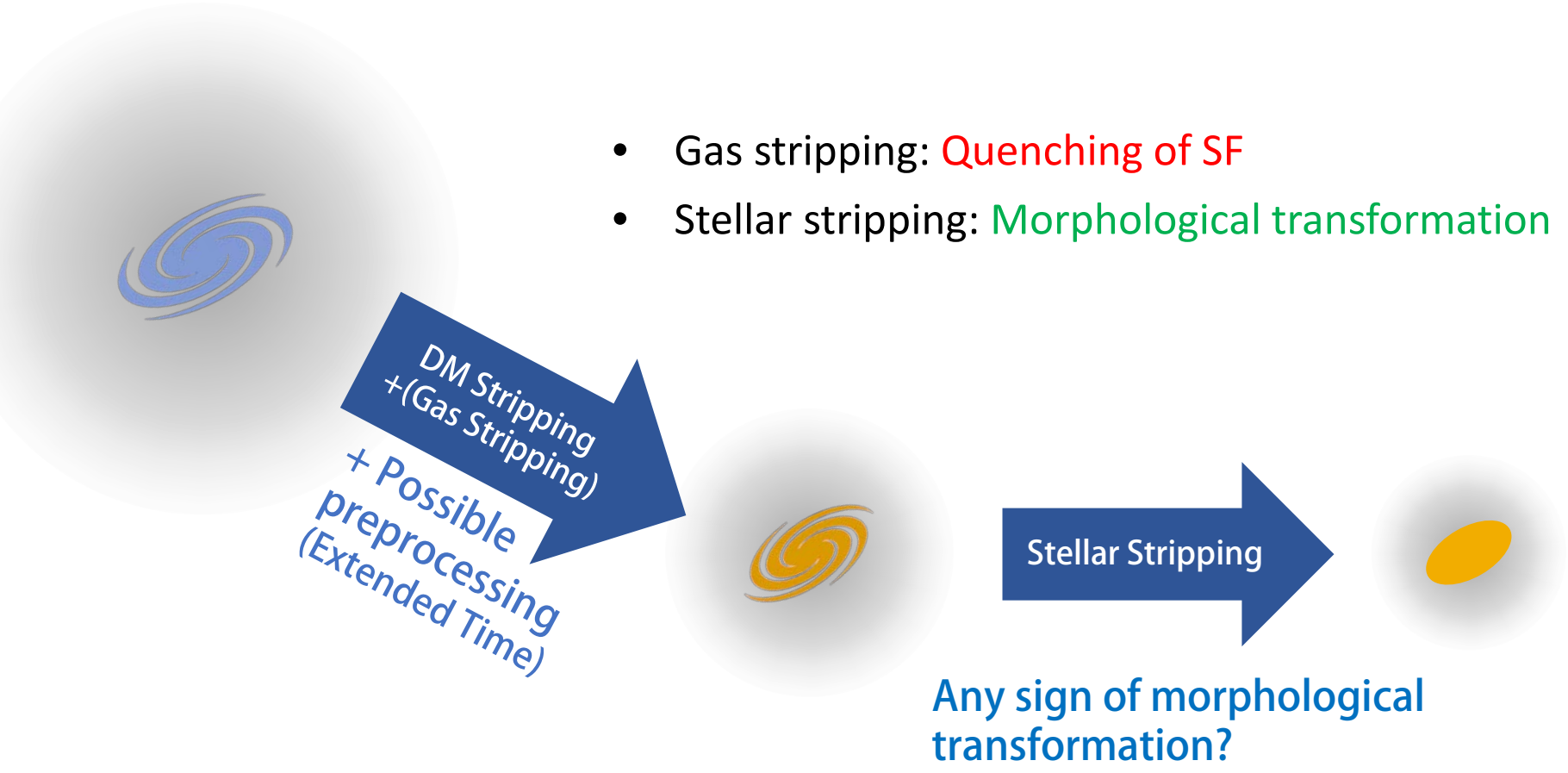
  cosmic epoch.

- **Tidal stripping in group is important as clusters!**

Future Aspects

Transformation of galaxies

- Gas stripping: Quenching of SF
- Stellar stripping: Morphological transformation



https://arxiv.org/abs/1809.02763

Merci!