Mass Loss and Preprocessing of Group Galaxies

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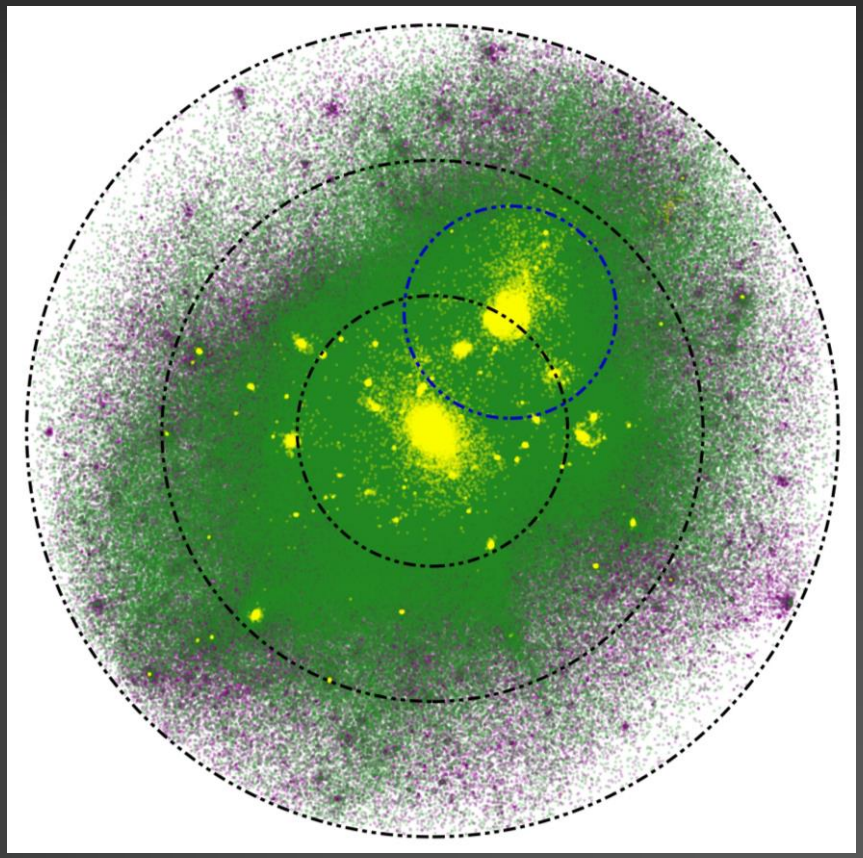
Simulation

- SPH hydrodynamical zoom-in simulation of galaxy group using Gasoline2 [Wadsley+ 2017]
  - Group properties at z=0:
    - M_{vir} = 1.87×10^{13} $M_\odot$
    - R_{vir} = 664.7 kpc
  - High-res region:
    - m_{DM} = 3.9×10^{6} $M_\odot$
    - m_{baryon} = 7.2×10^{5} $M_\odot$
- Member galaxies:
  - out to $3R_{vir}$ at z=0
  - $M_{star} > 10^{8}$ $M_\odot$ at some time
  - 31 galaxies in total



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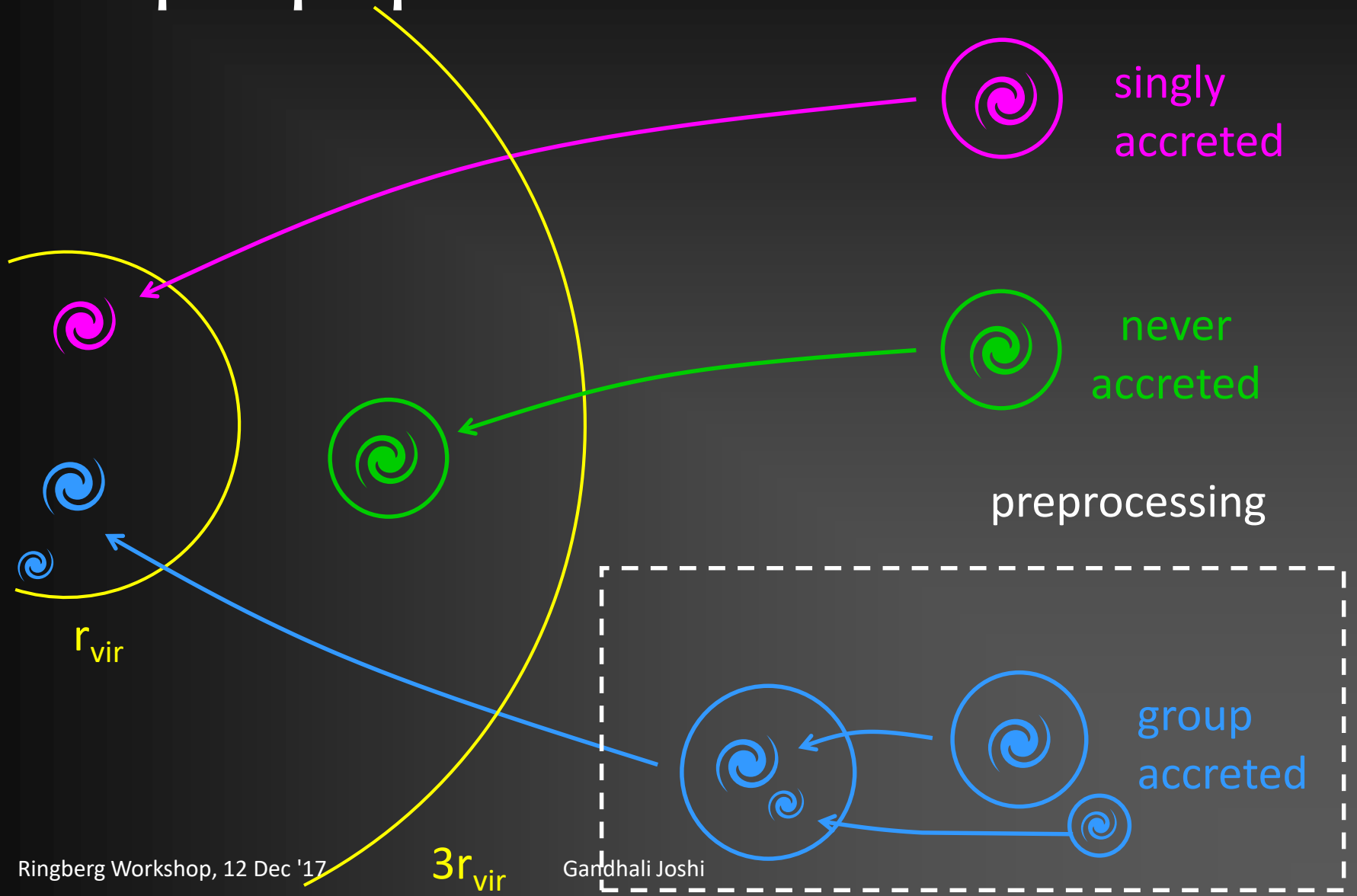
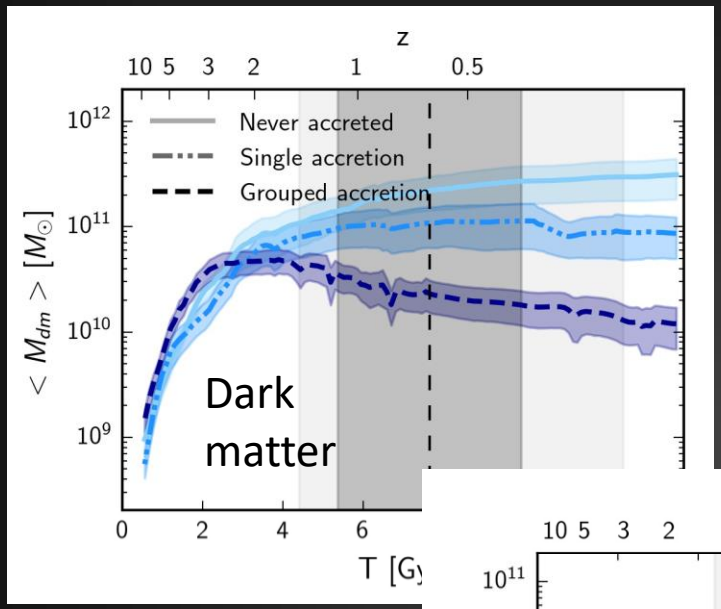
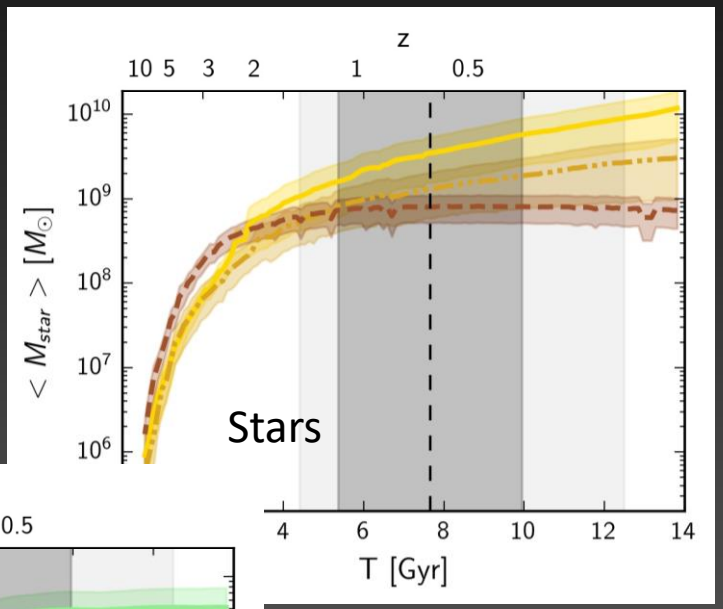
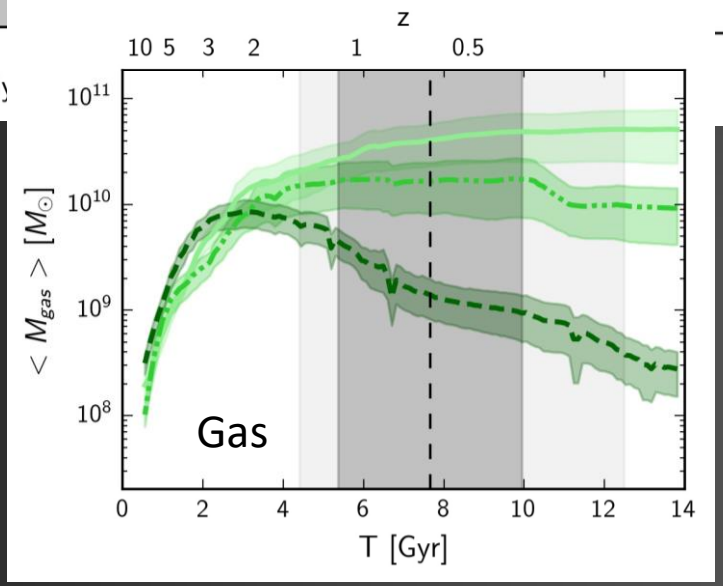
Sample populations



Component mass loss







Mass ↑

Time →

For singly- & group-accreted galaxies, significant mass loss in dark matter and gas, but not in stars

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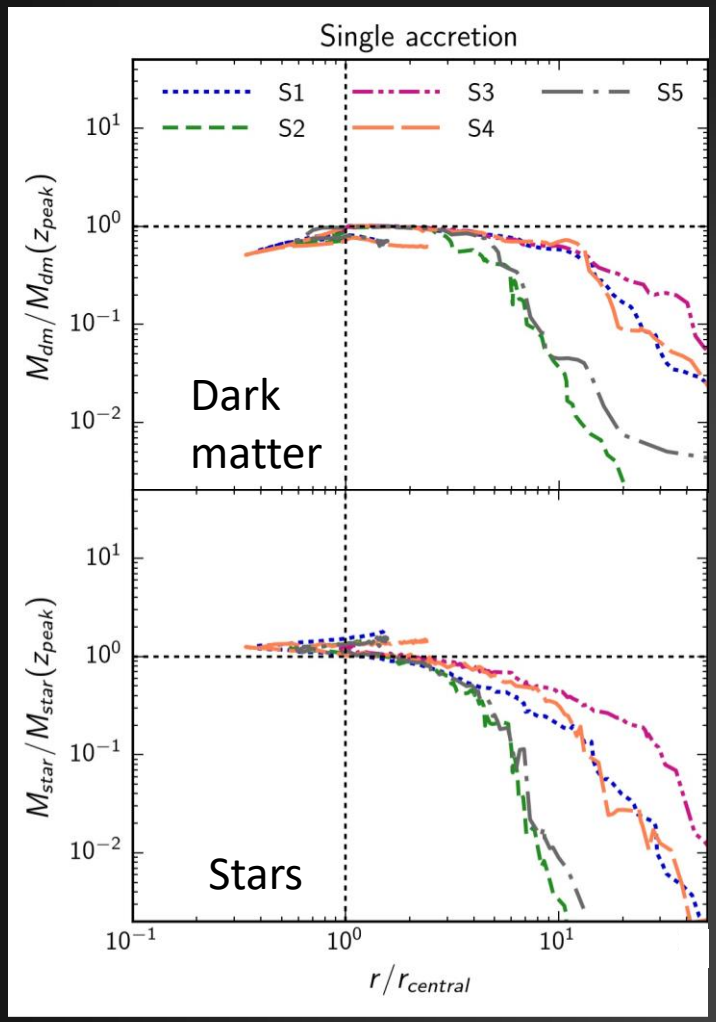
Radial trajectories: mass loss



- Singly accreted galaxies reach peak total mass at ~2-3R_{vir}
- But stellar mass shows moderate growth after peak total mass

Mass/mass at z_{peak} ⟵

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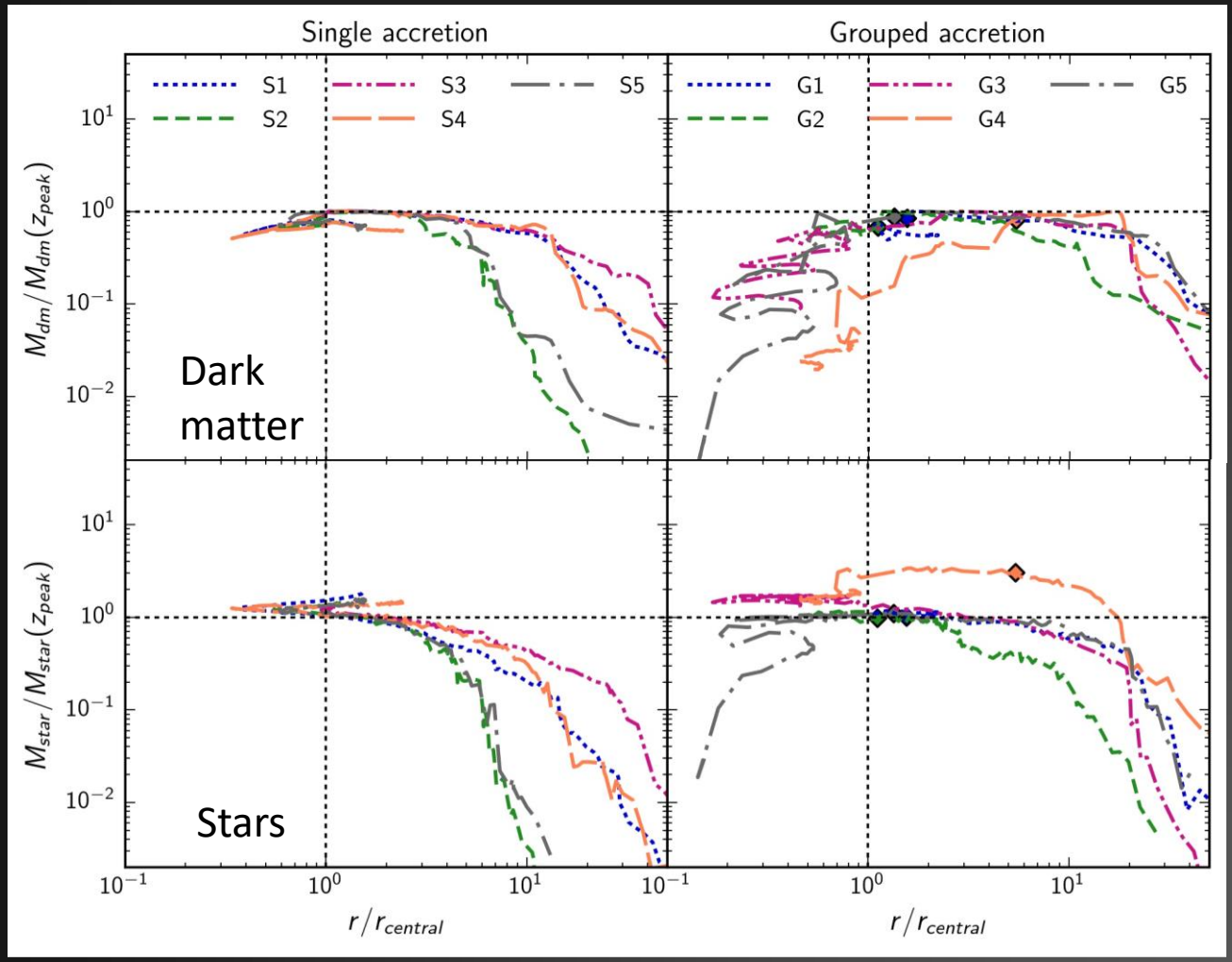
Distance from group ⟶ ⟵ (Time)

Radial trajectories: mass loss



Group-accreted galaxies reach peak total mass in external groups – as far out as $10R_{vir}$

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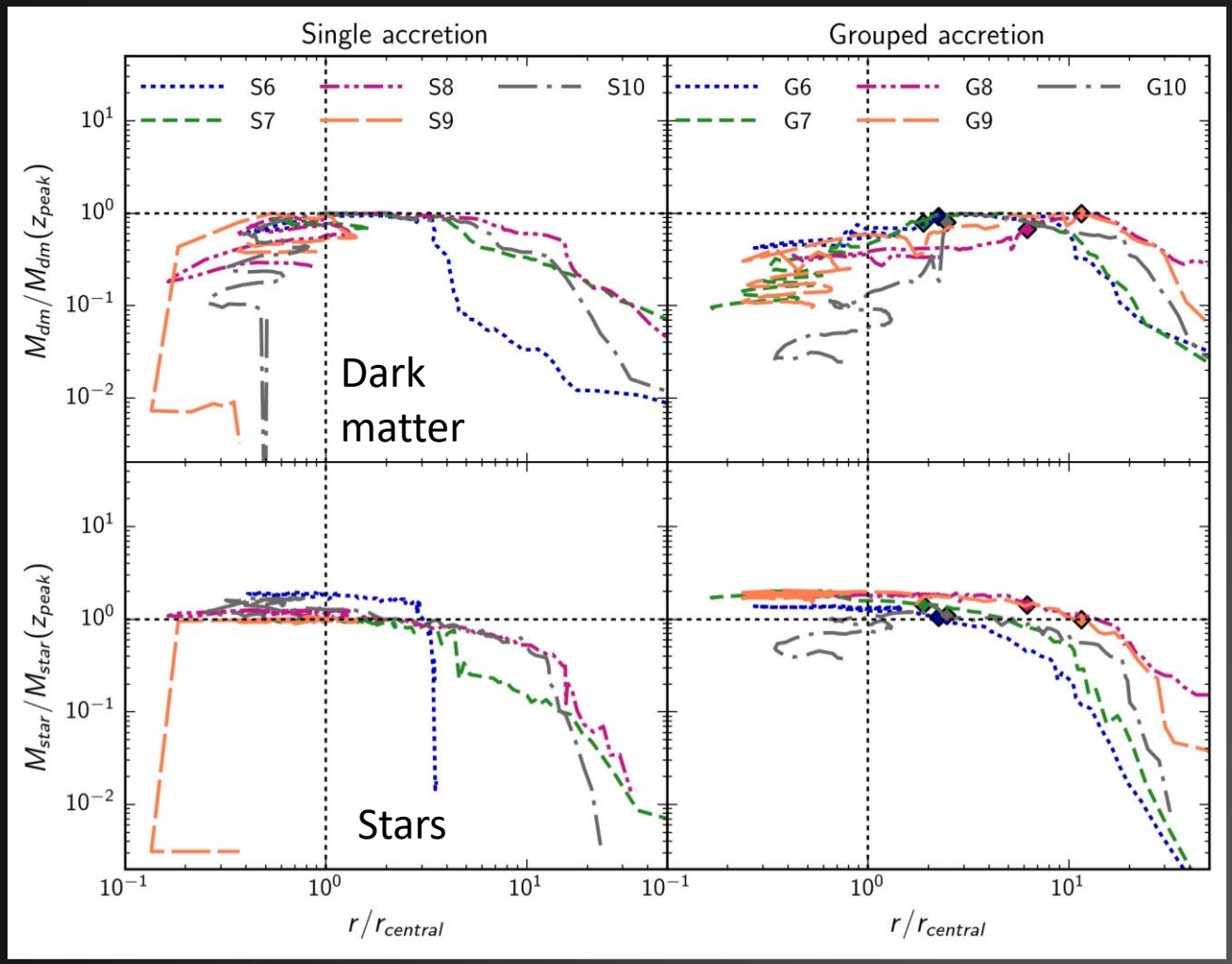
Mass/mass at z_{peak} ⟵

Distance from group ⟶

⟵ (Time)

Radial trajectories: mass loss



Group-accreted galaxies reach peak total mass in external groups – as far out as $10R_{vir}$

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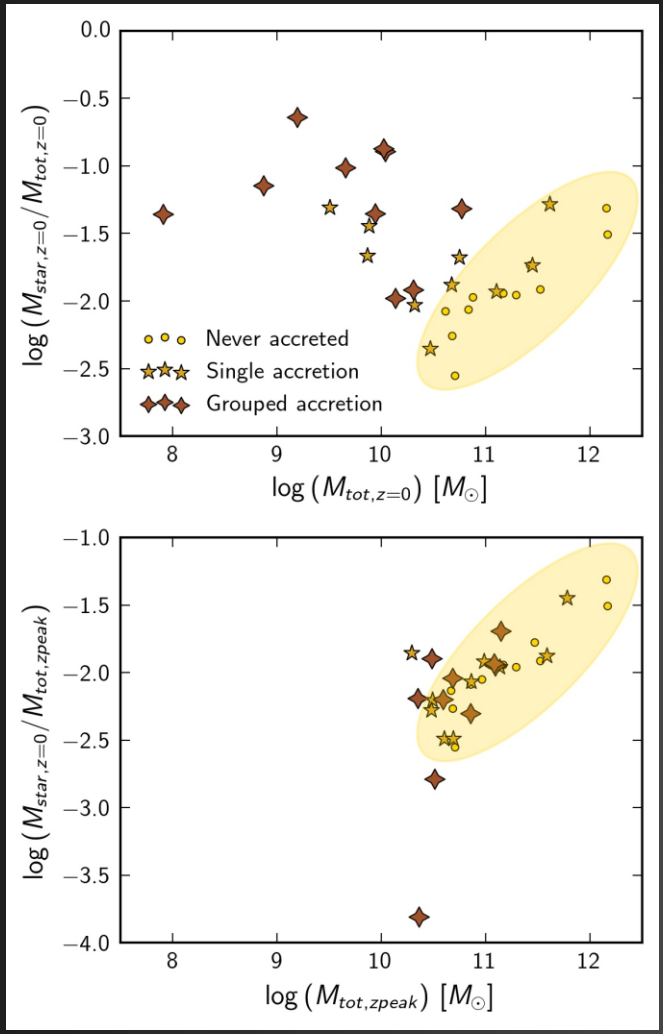
Mass/mass at z_{peak} ⟵

Distance from group ⟶

⟵ (Time)

Implications for galaxy properties



- Unaccreted and grouped galaxies occupy distinct regions in SMHM relations
- At *peak total mass*, all three populations show roughly the same SMHM correlation with total mass

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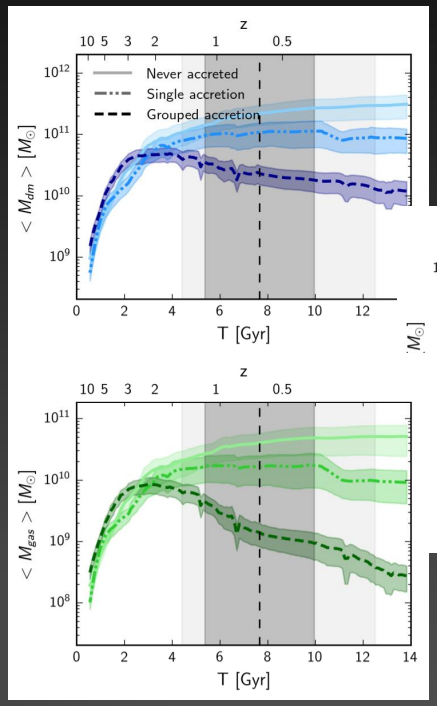
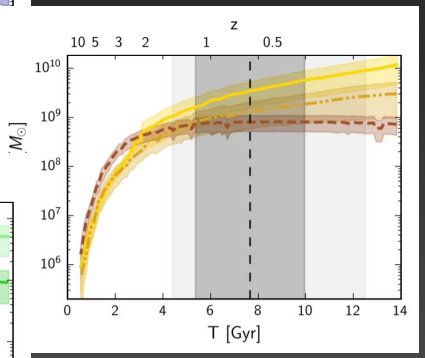
Summary

- Galaxies undergo significant mass loss in group and cluster environments
- Tidal stripping mostly affects dark matter and gas, but not stellar content of galaxies
- Mass loss and preprocessing has significant consequences for scatter in SMHM relations and gas fractions





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