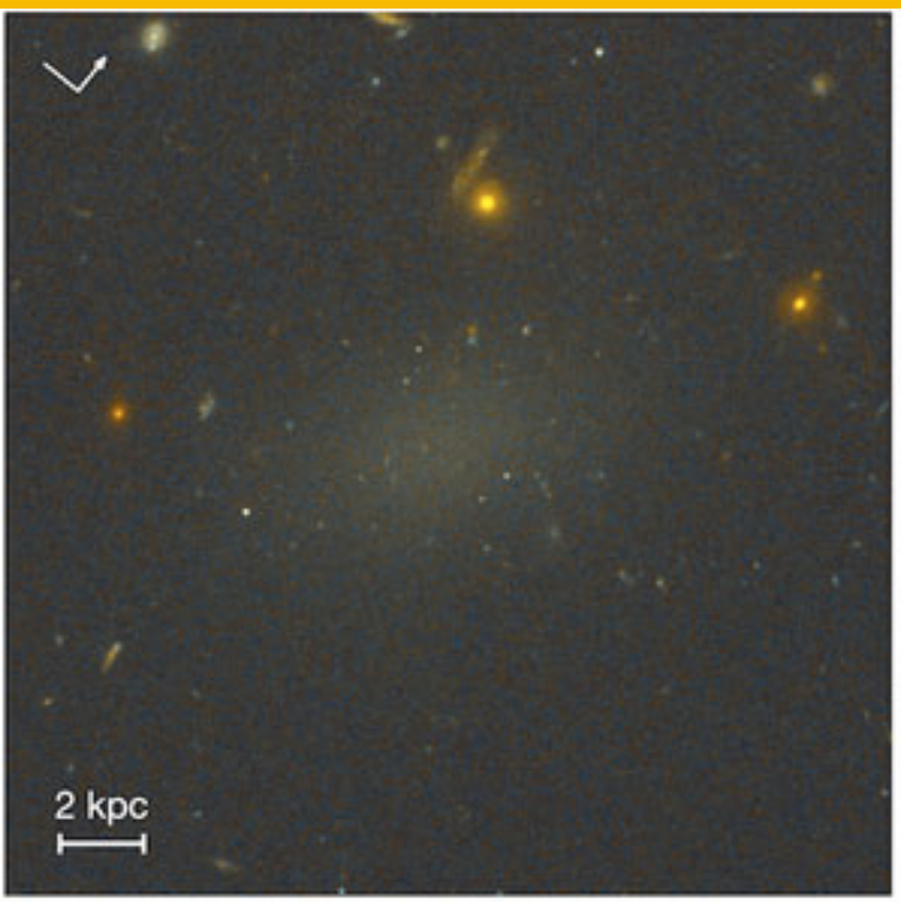
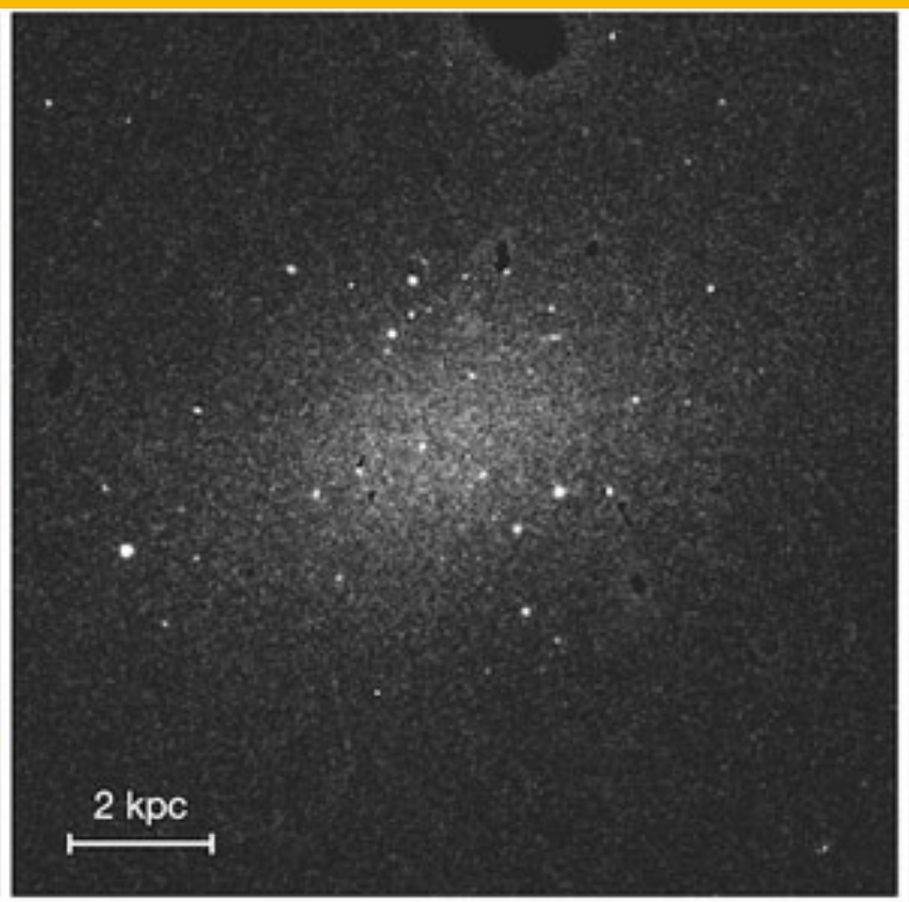
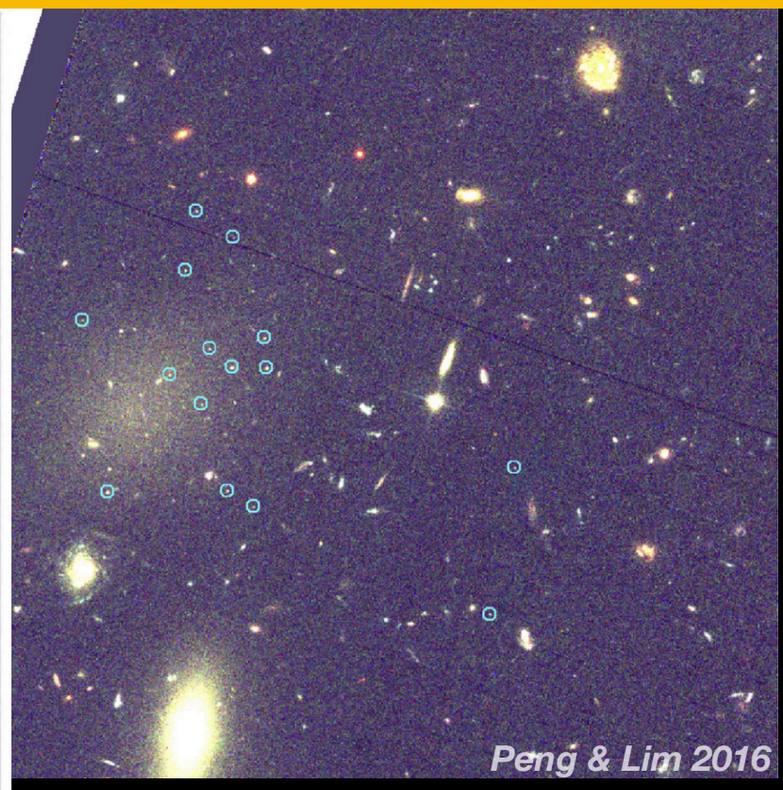
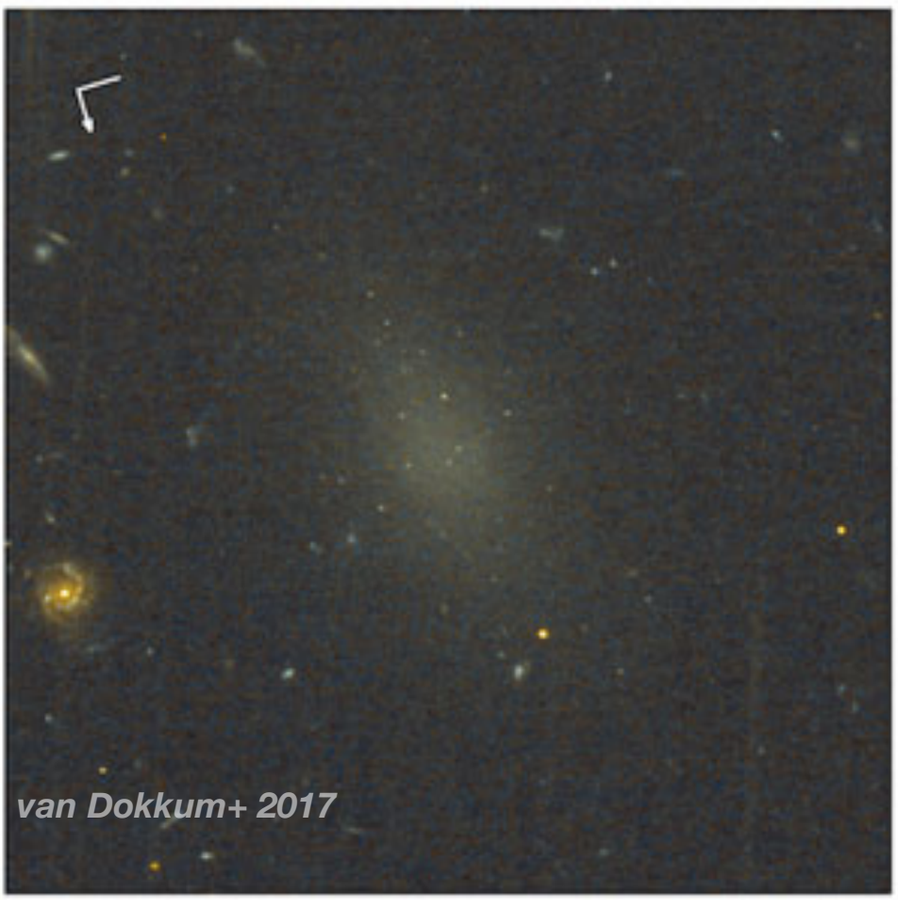
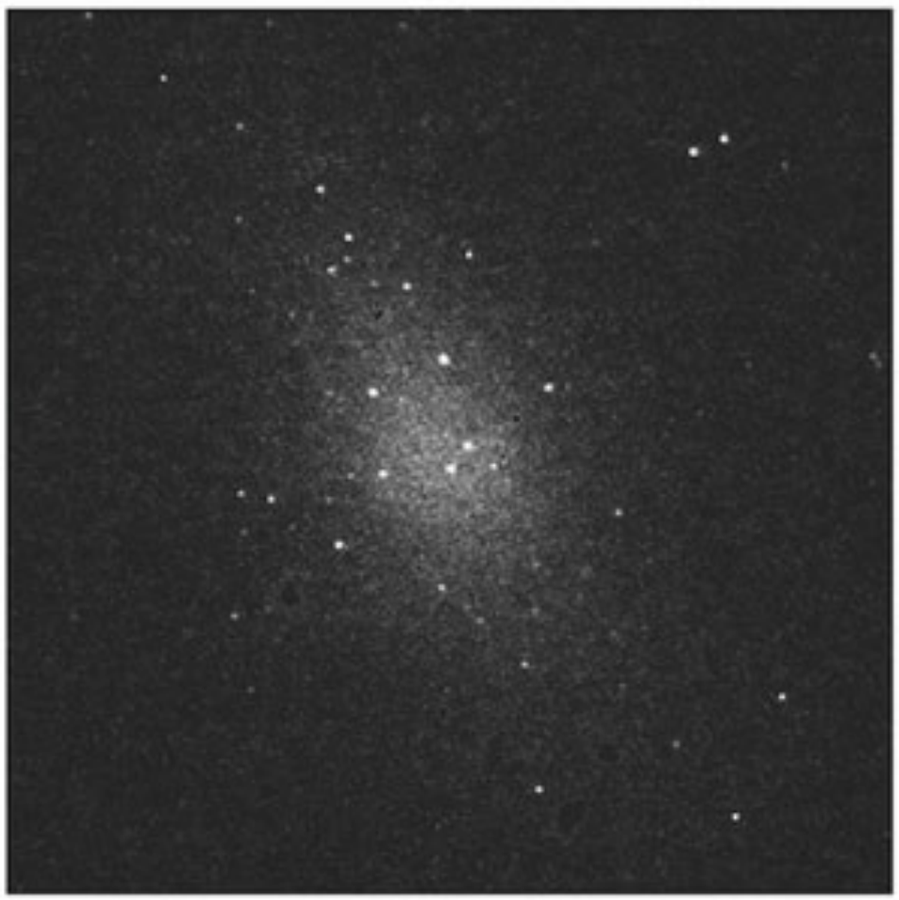
The formation of ultra-diffuse galaxies by tidal disruption











Laura V. Sales

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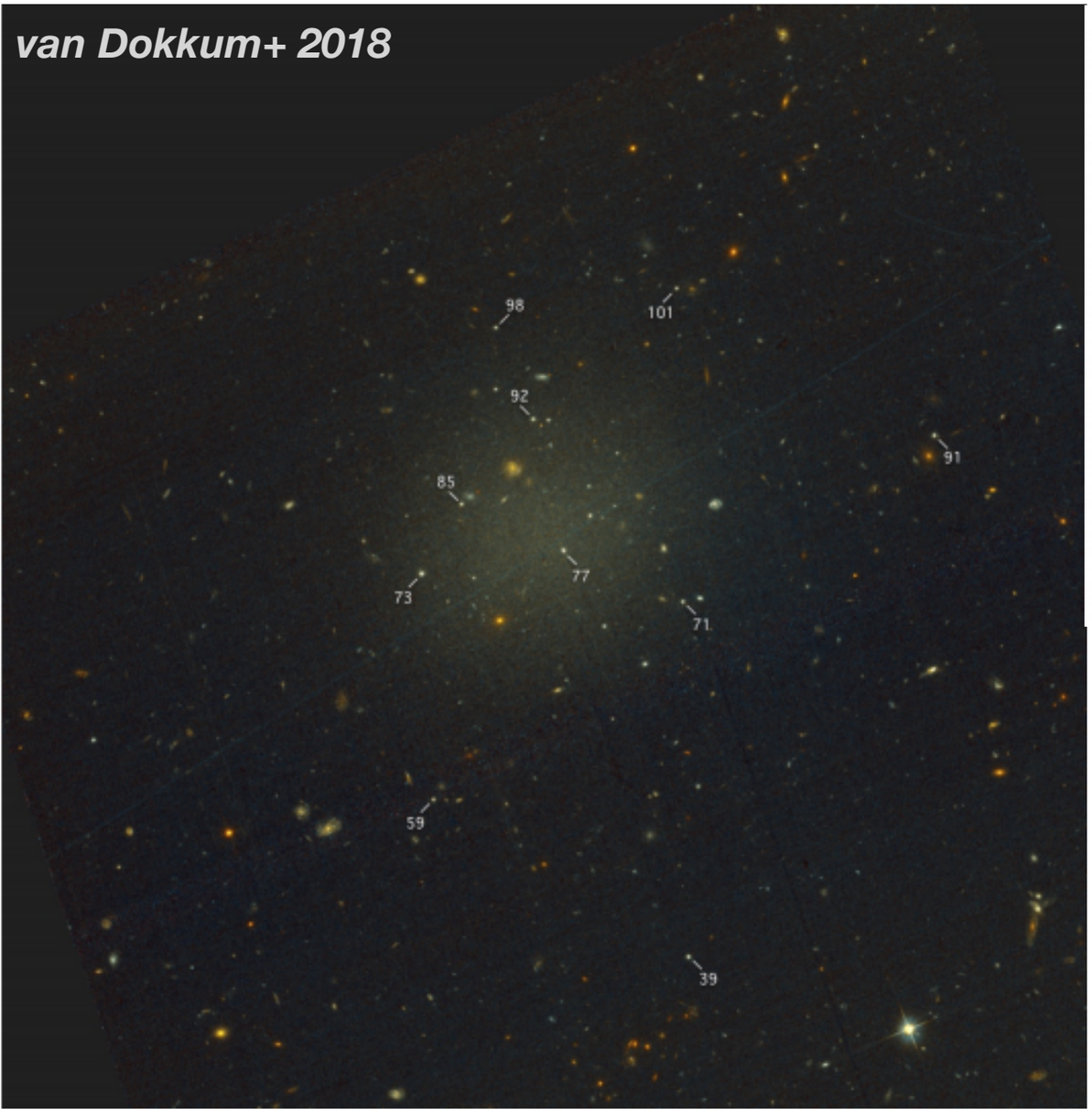
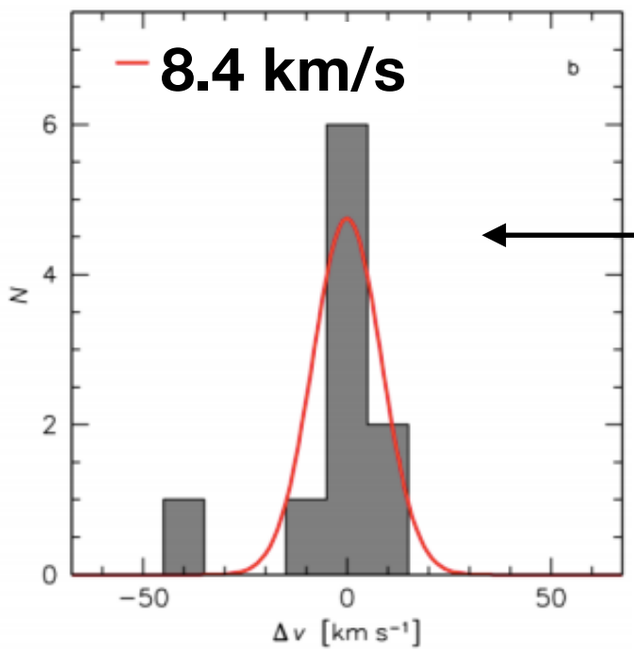
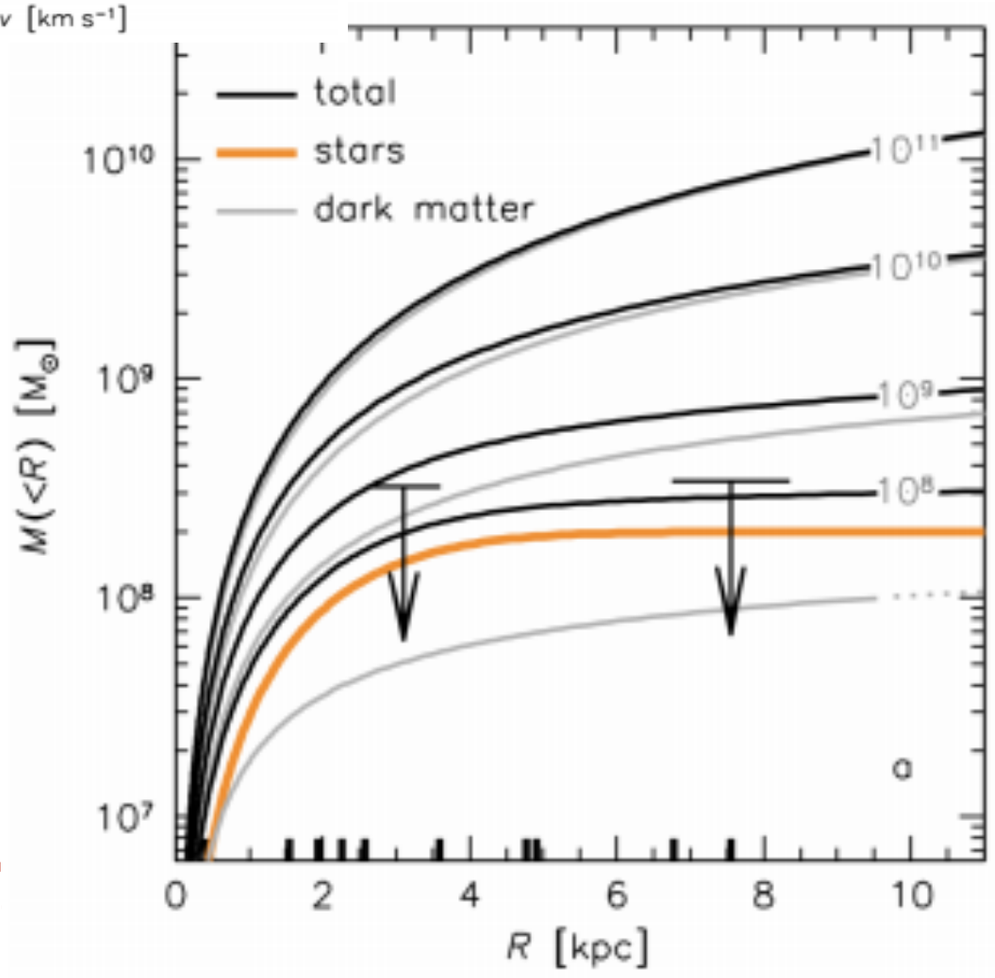
UC Riverside

NGC1052–DF2: an UDG without dark matter



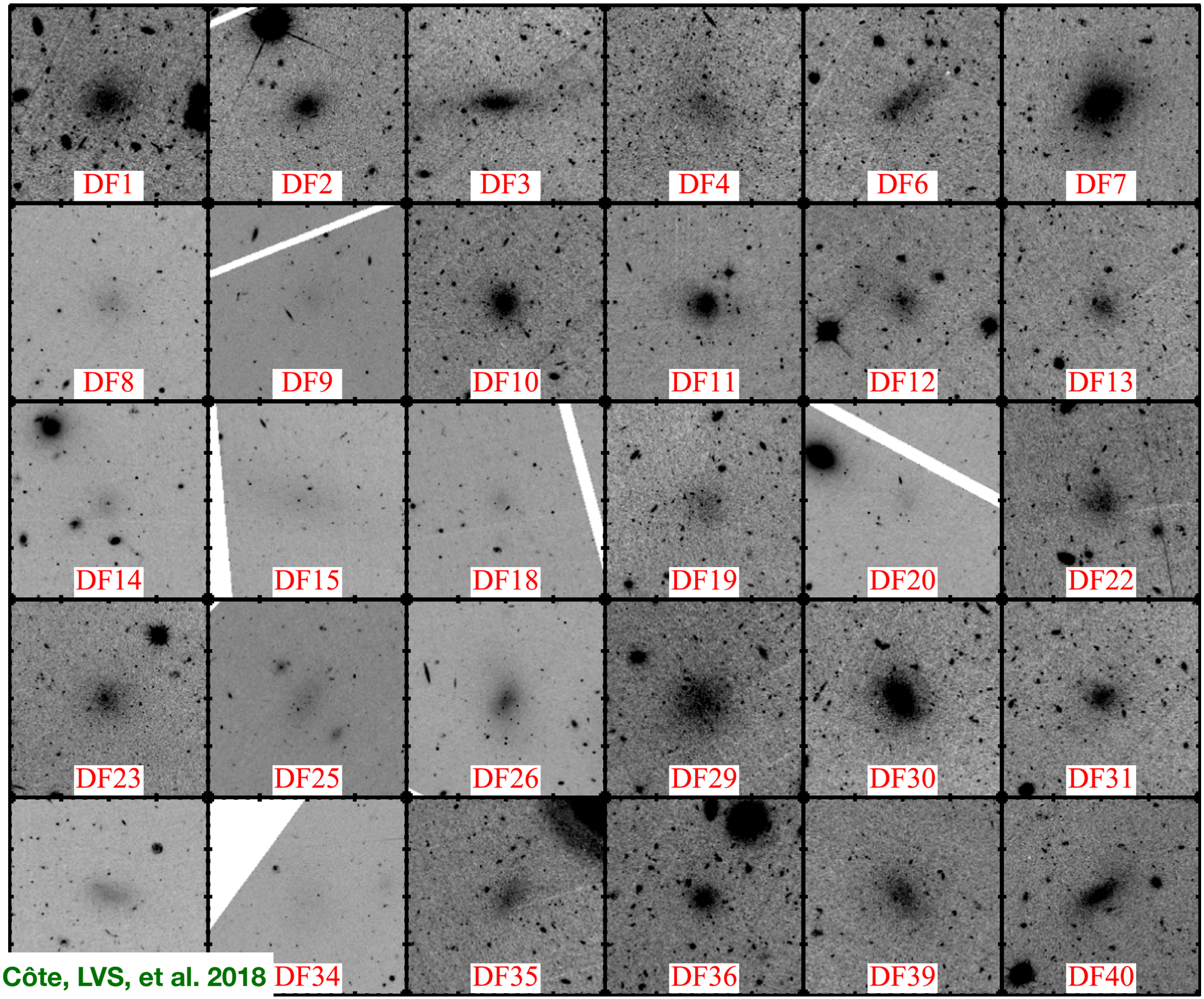


Velocity dispersion of associated GCs



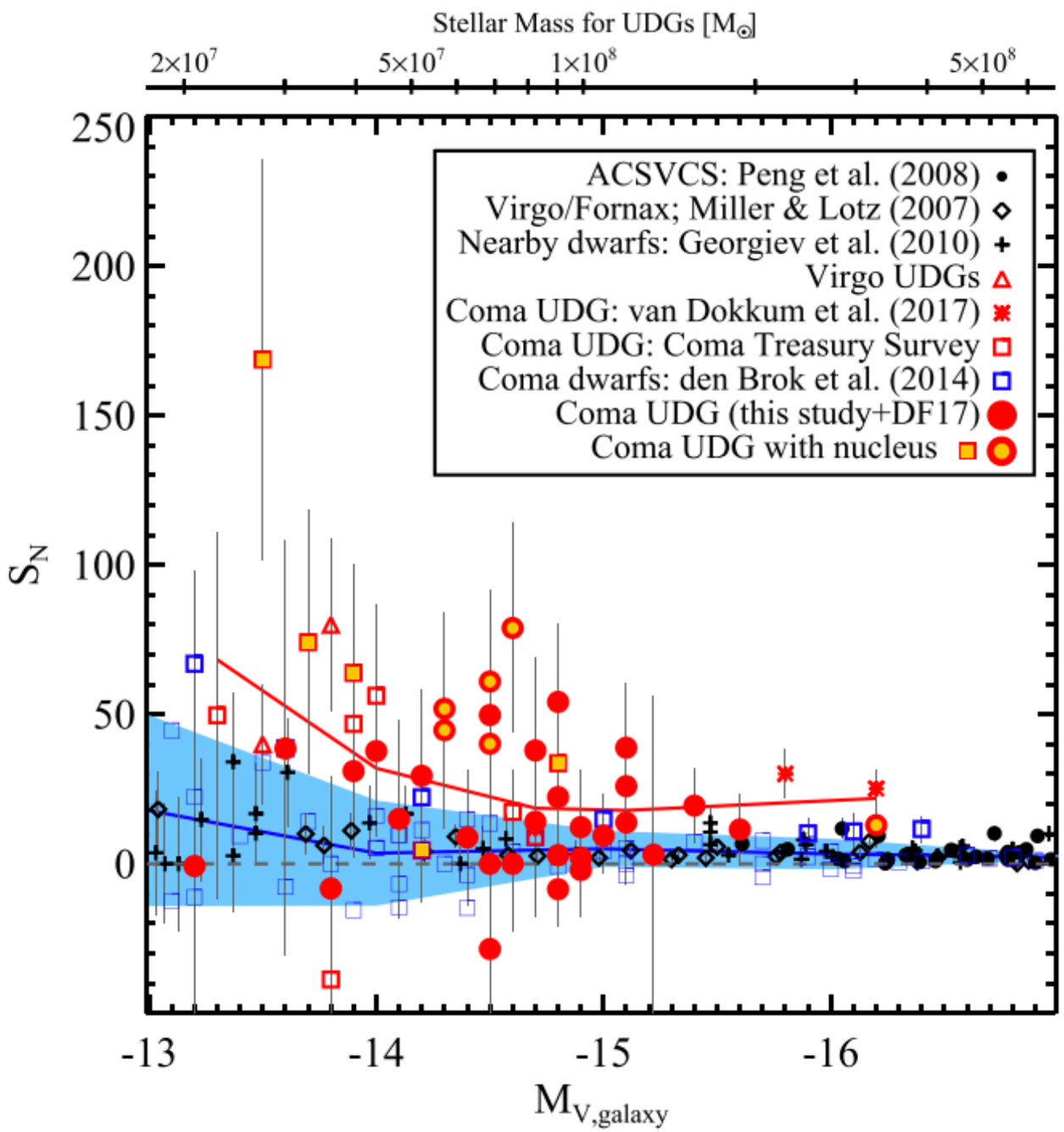
Dynamical modeling of GCs in NGC1052–DF2 indicates that it is consistent with having no dark matter

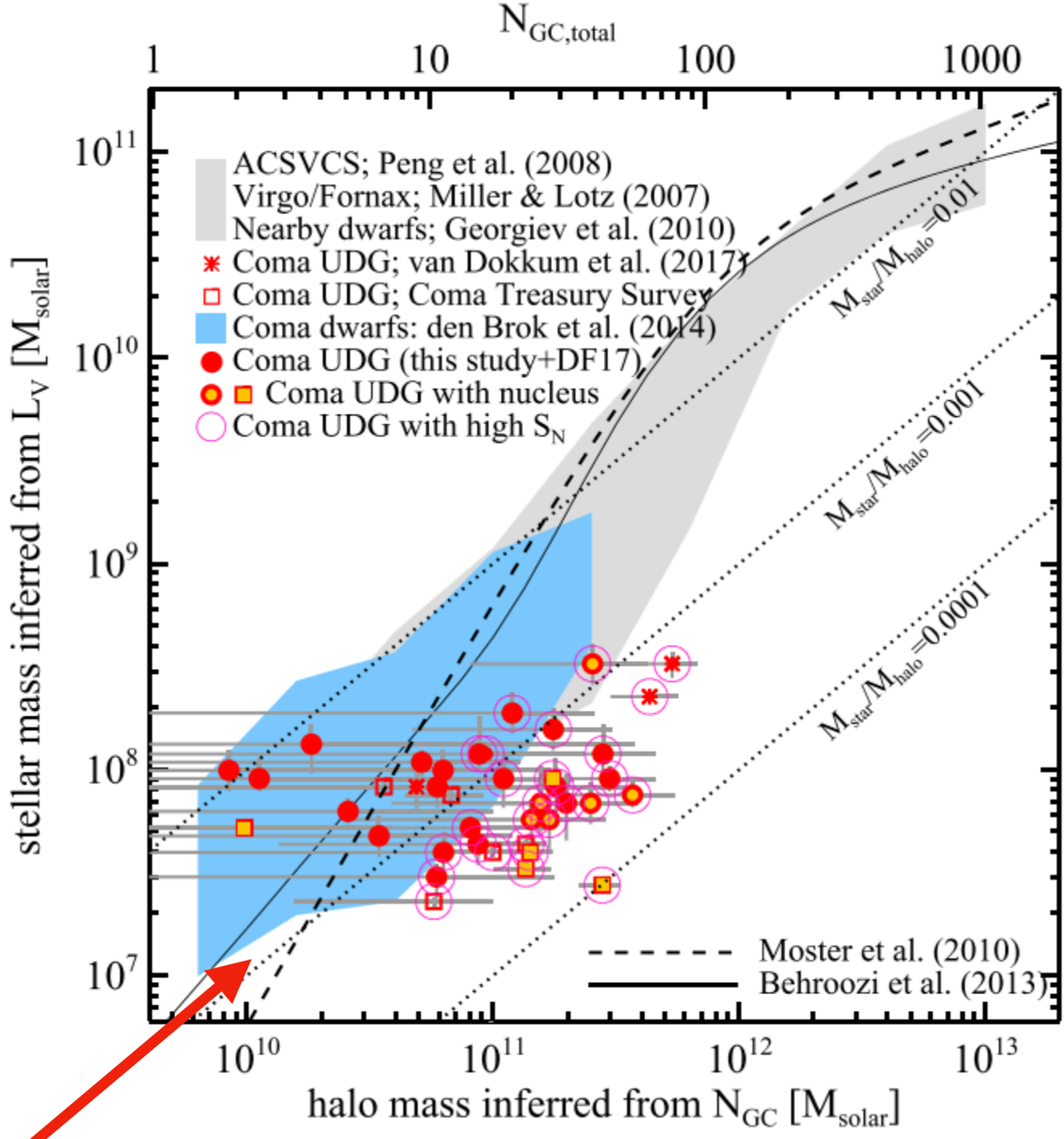
48 Ultra-diffuse galaxies in Coma and their globular clusters



Lim, Peng, Côte, LVS, et al. 2018

GCs in Ultra-diffuse galaxies in the Coma cluster

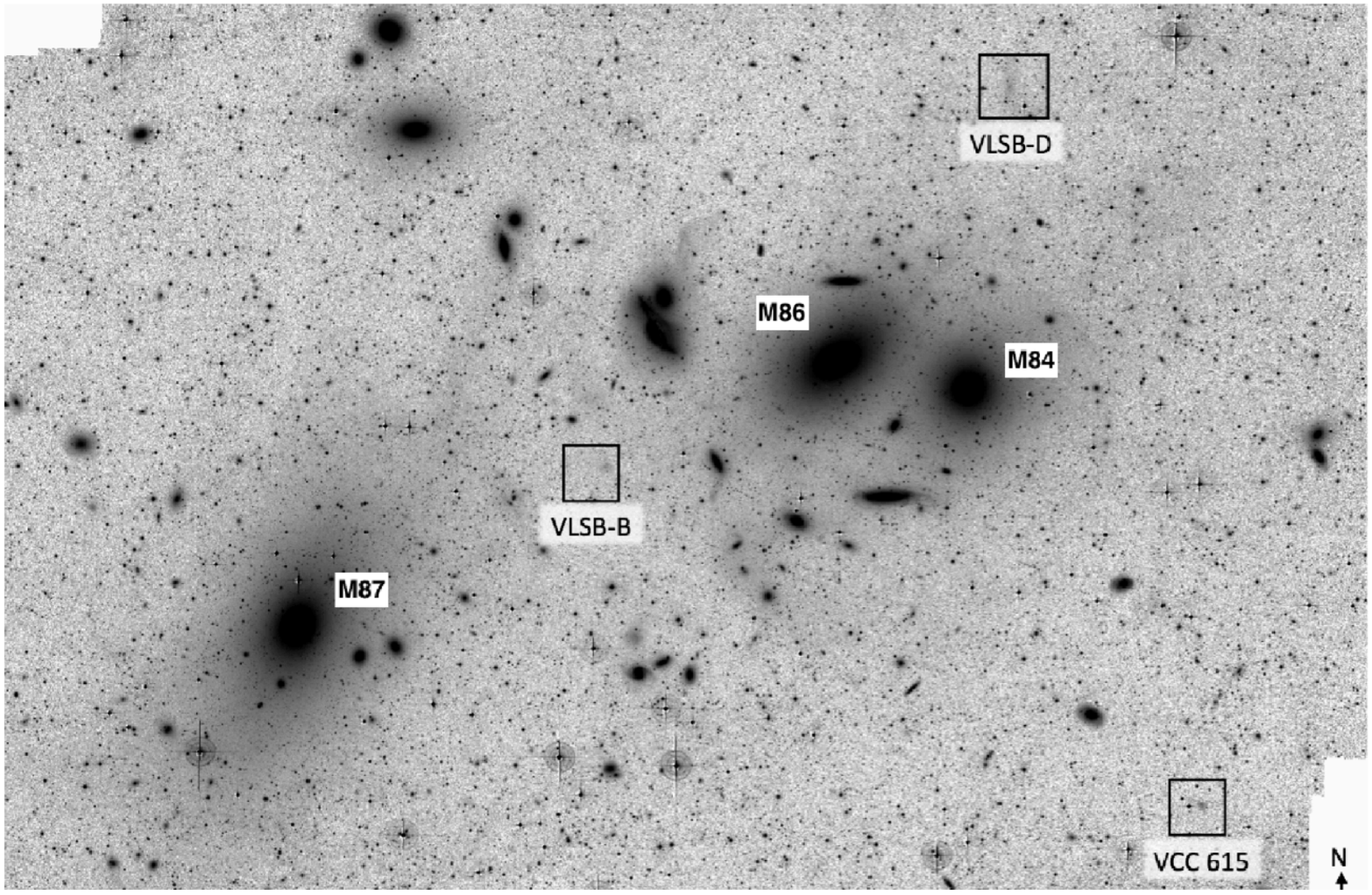


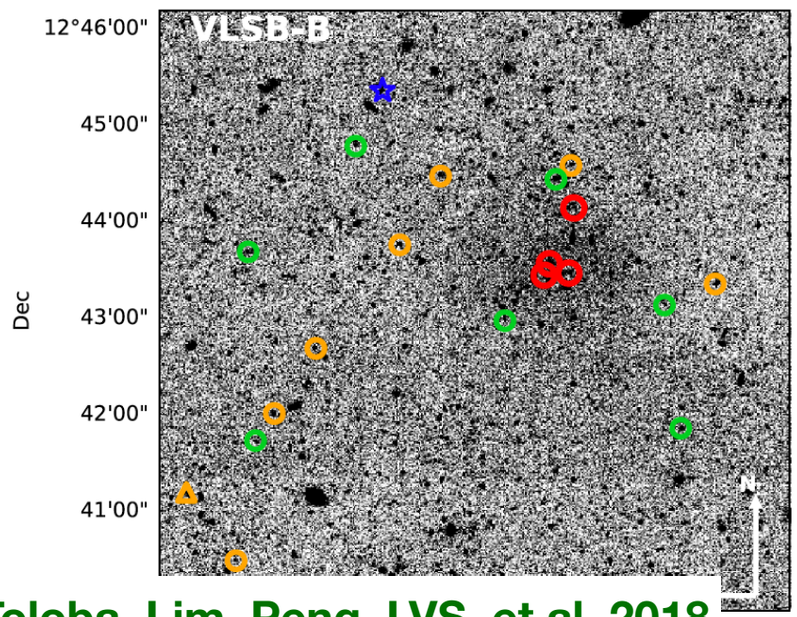


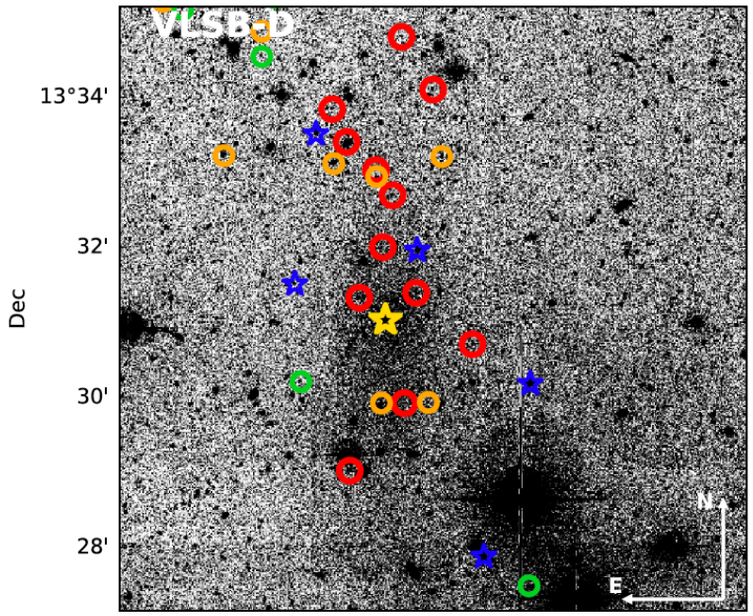
Lim, Peng, Côte, LVS, et al. 2018

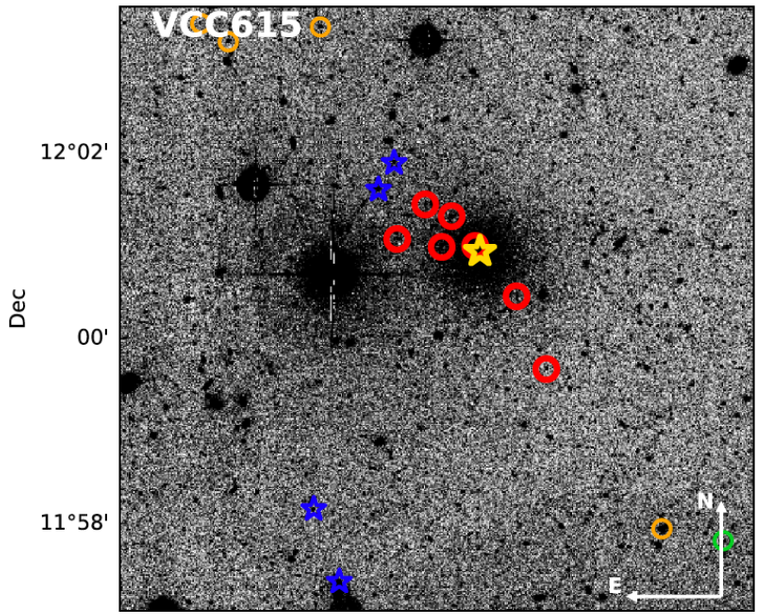
Different origins for UDGs

Kinematics of GCs in Virgo UDGs also hint at a variety of origins for UDGs



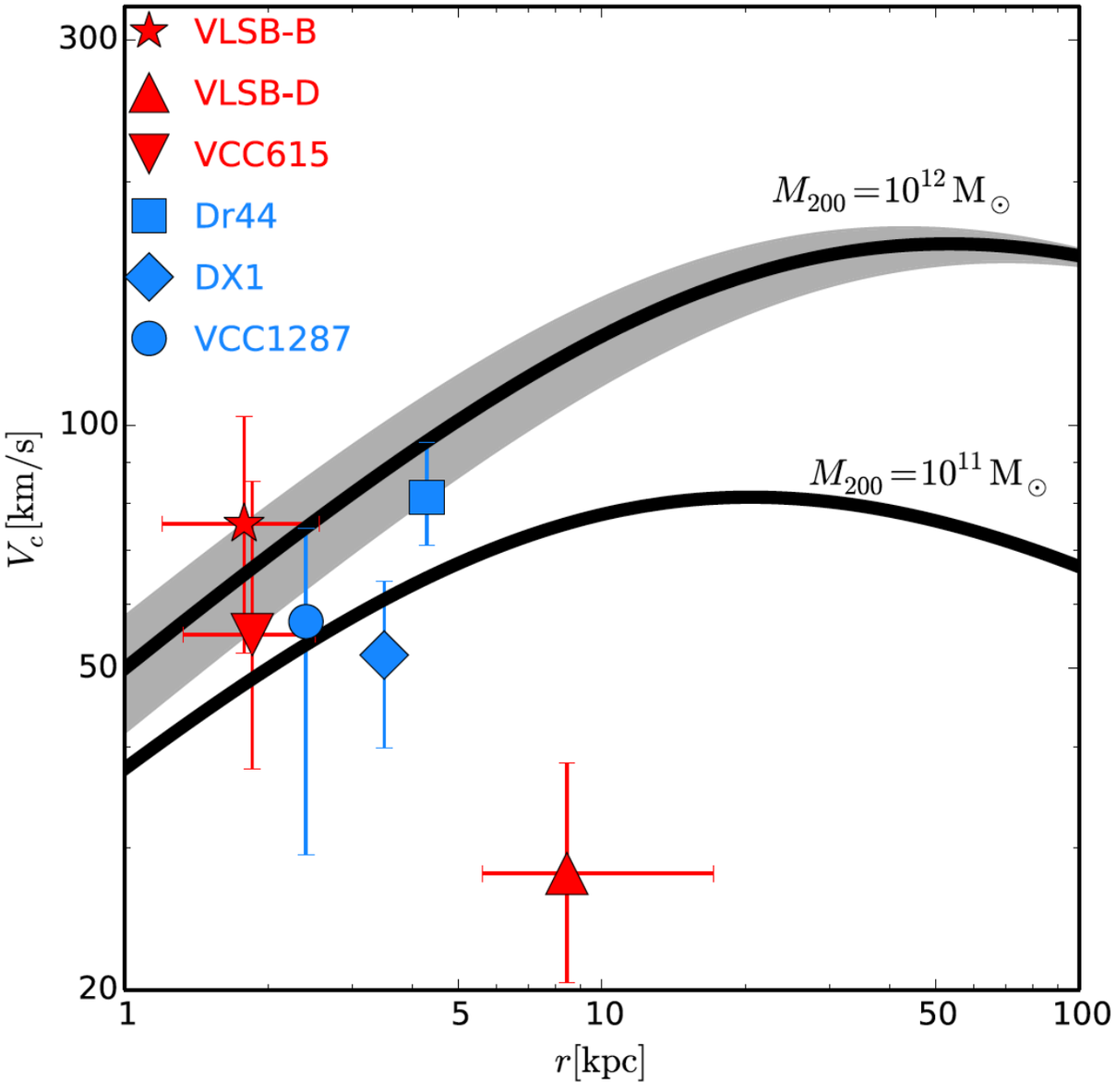


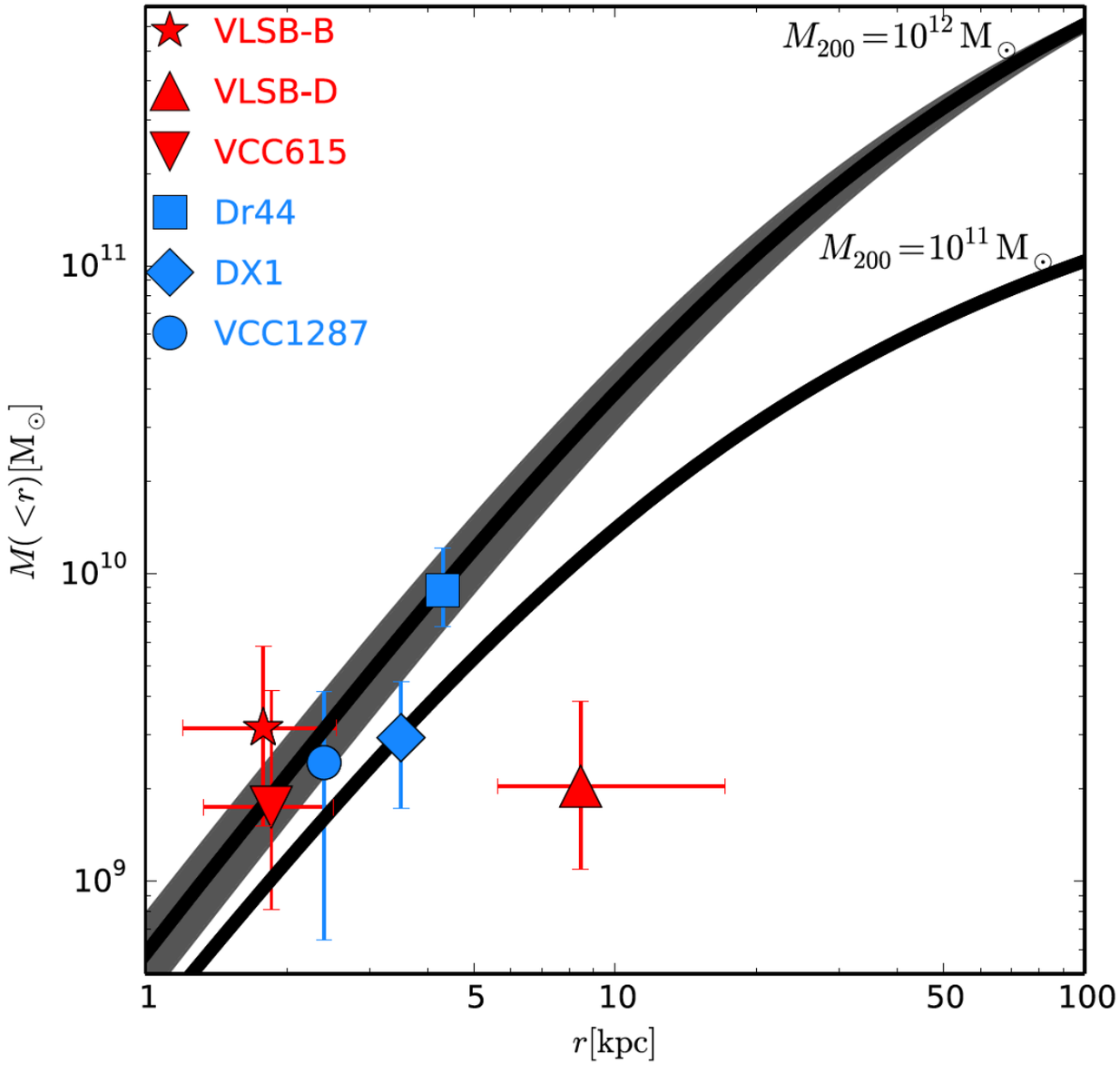




Toloba, Lim, Peng, LVS, et al. 2018

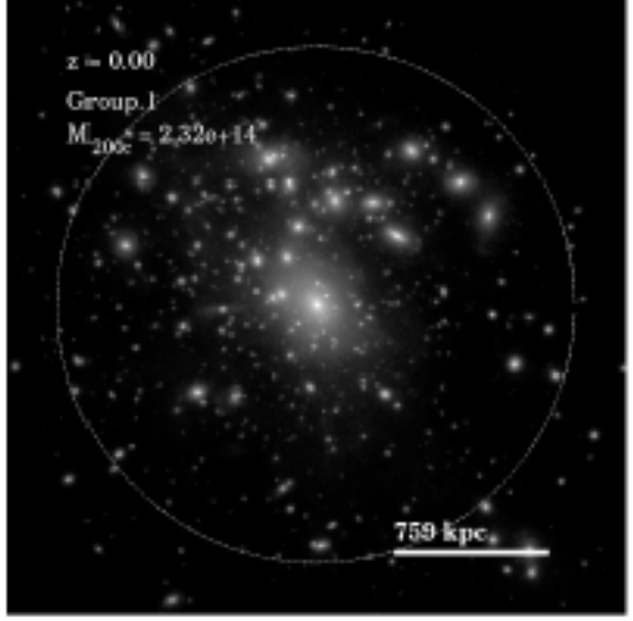
Constraining the dark matter halo mass of UDGs

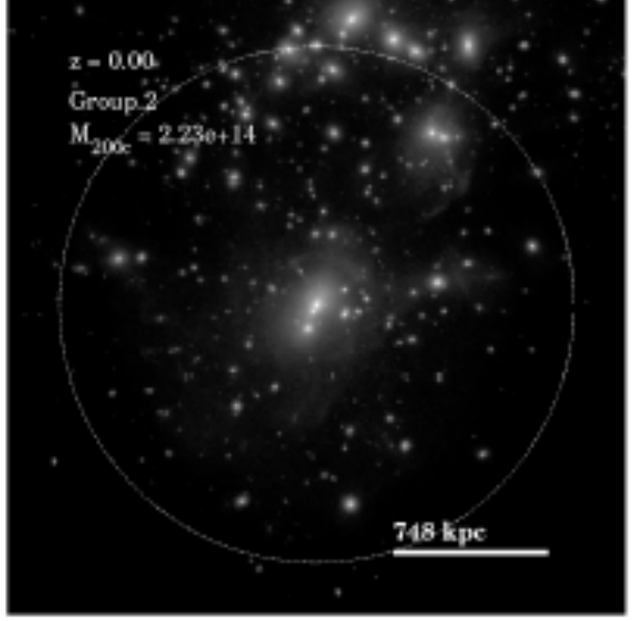


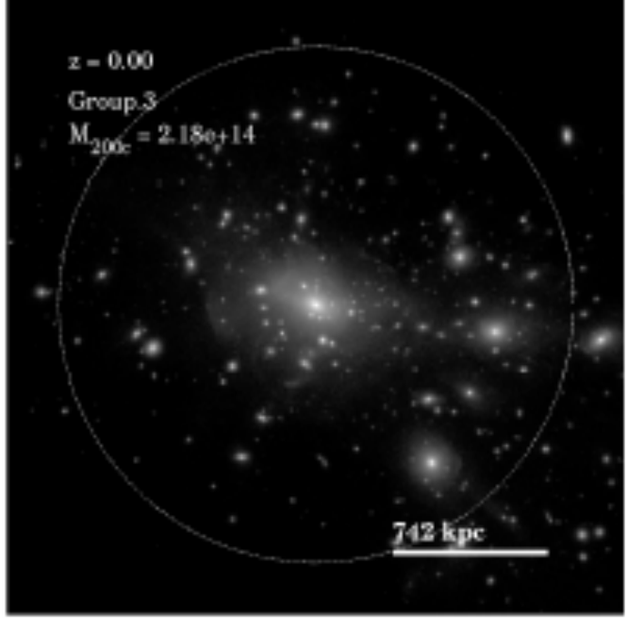


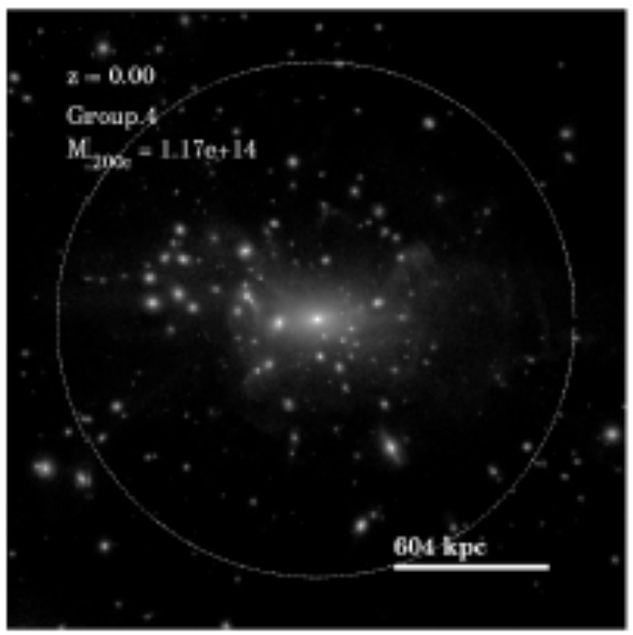
Toloba, Lim, Peng, LVS, et al. 2018

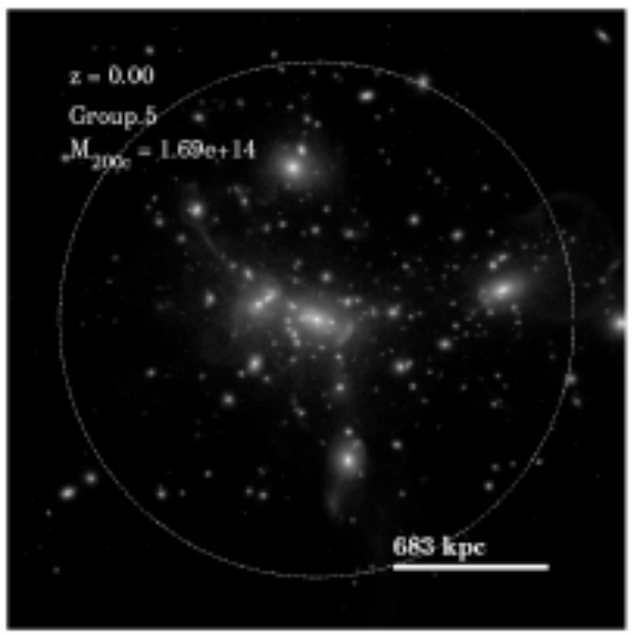
Galaxy clusters in Illustris TNG

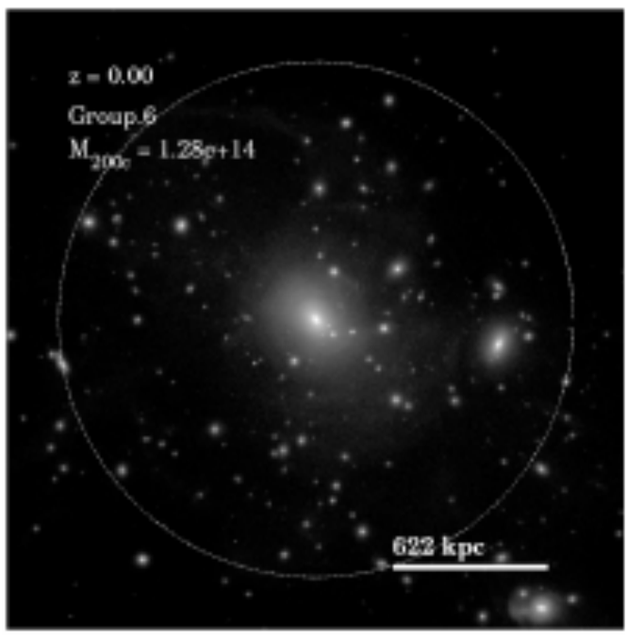


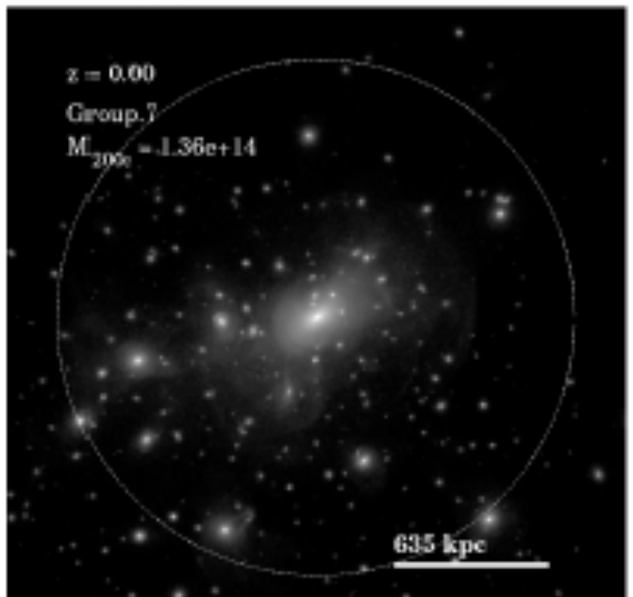


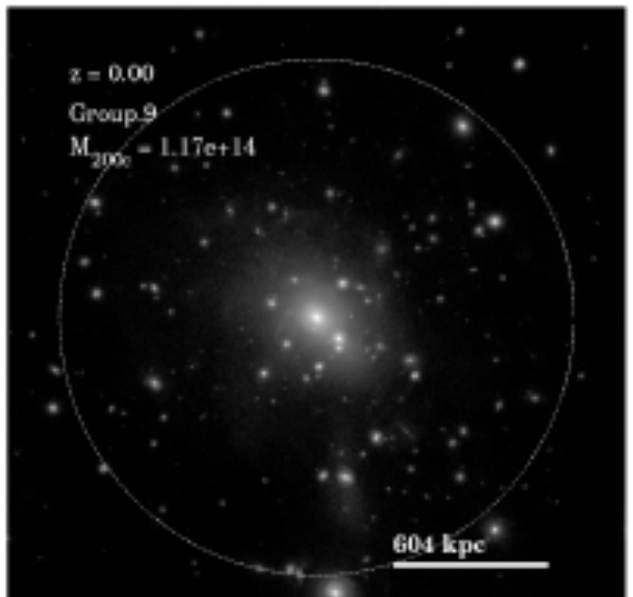


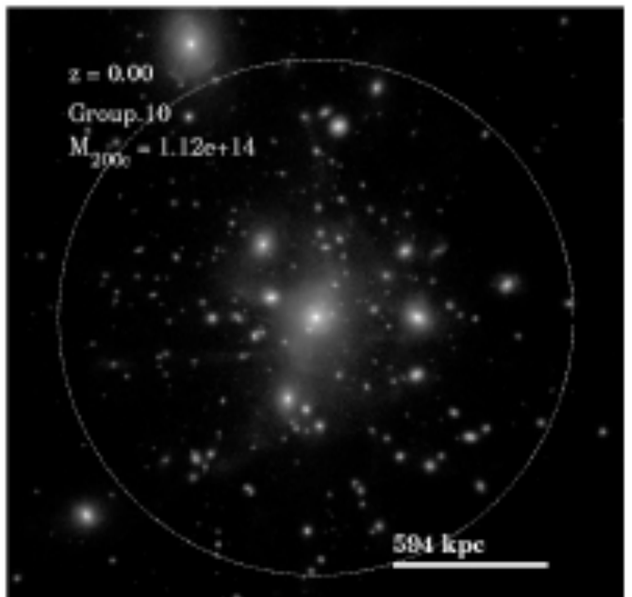






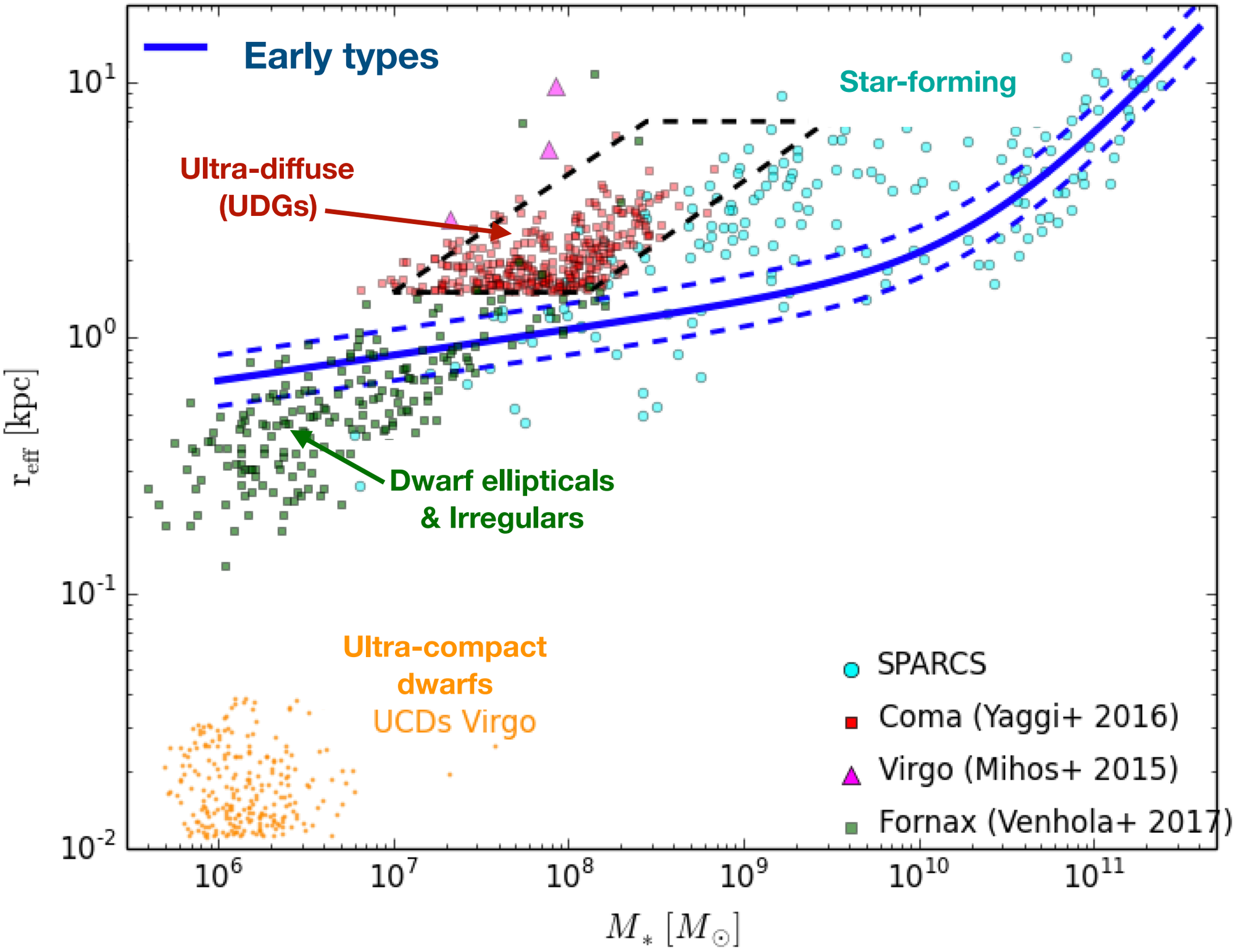






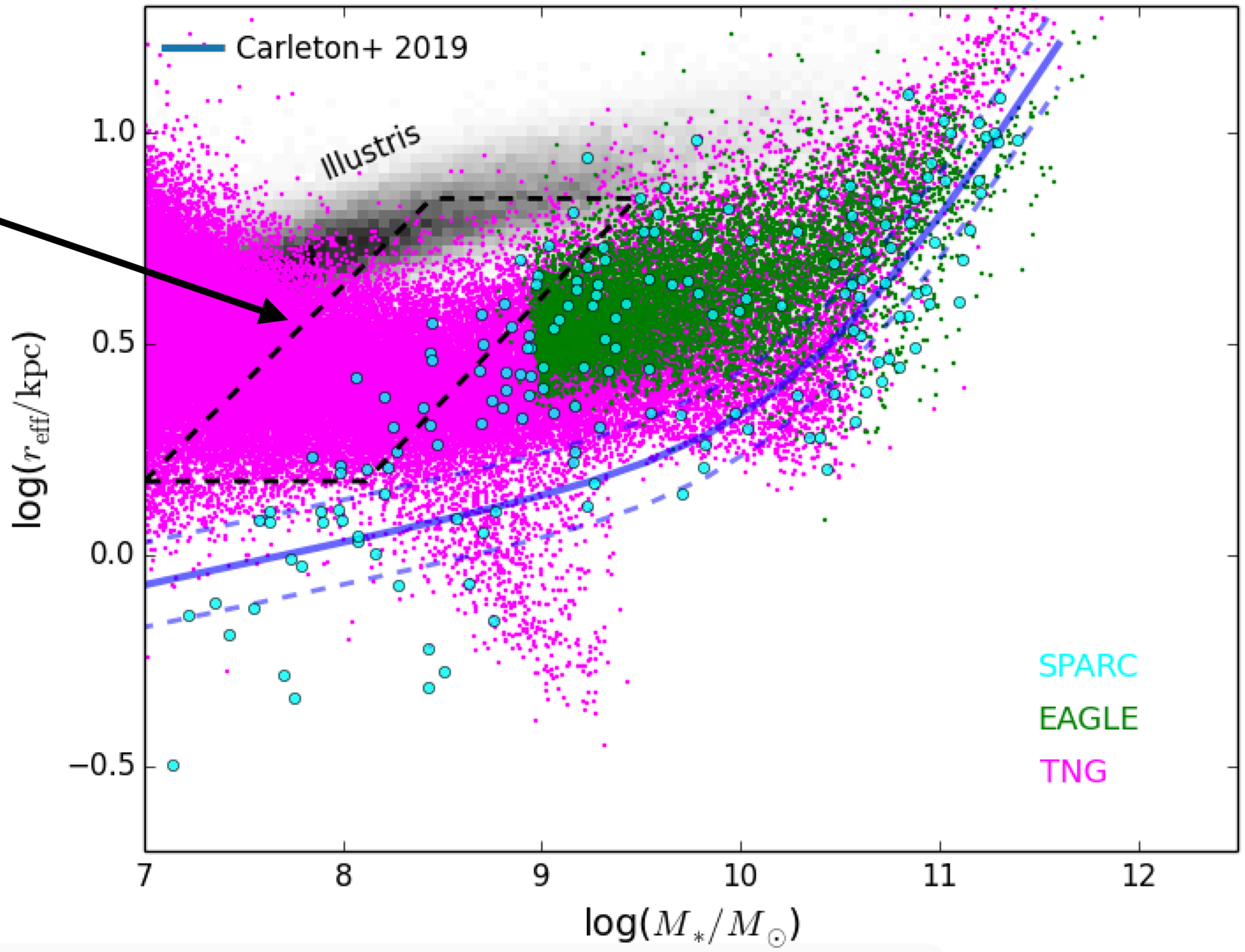
Louis Penafiel

Rich diversity of dwarf galaxies in clusters



Rich diversity of dwarf galaxies in clusters

They are all UDGs!



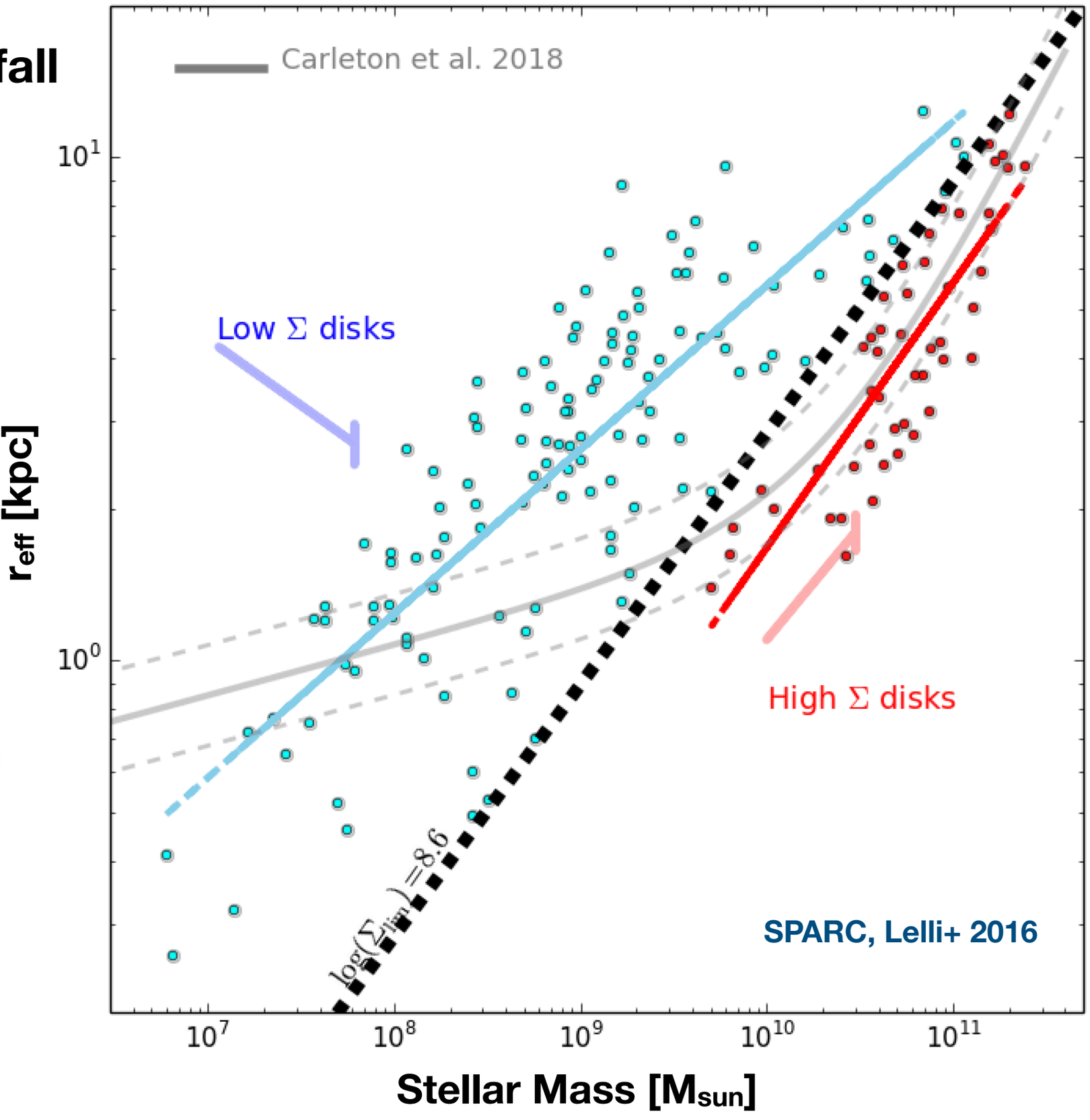
Big box simulations currently cannot be used directly to study dwarf structure

The method:

1) Assign galaxy sizes at infall

(We assume M*-size relation of observed disks + z-evolution)

Penafiel, Sales, et al., in-prep



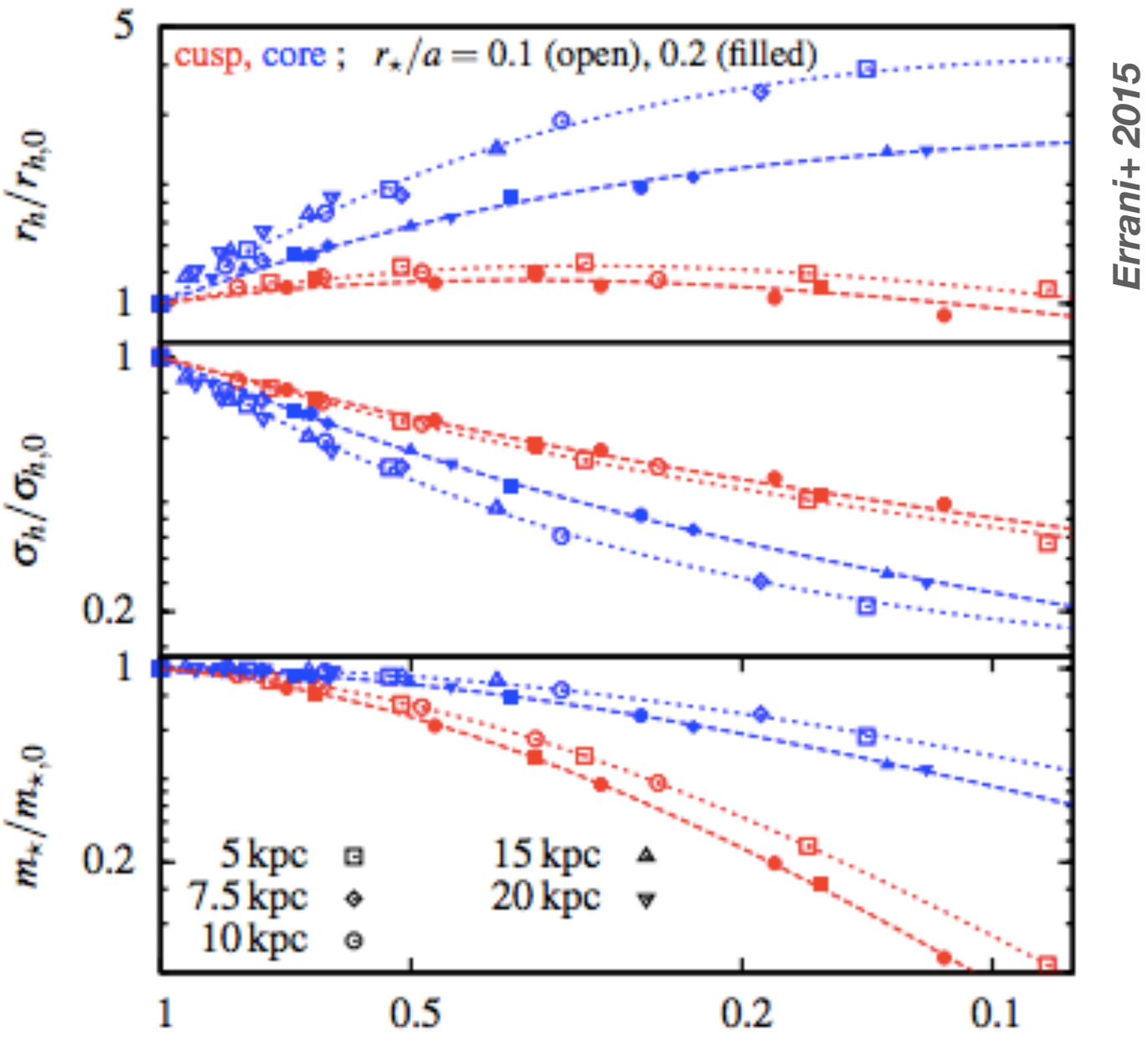
The method:

2) Evolve quantities according to tidal disruption model (Peñarrubia+ 2009, Errani+ 2015)

Stellar size →

Velocity dispersion →

Stellar mass →



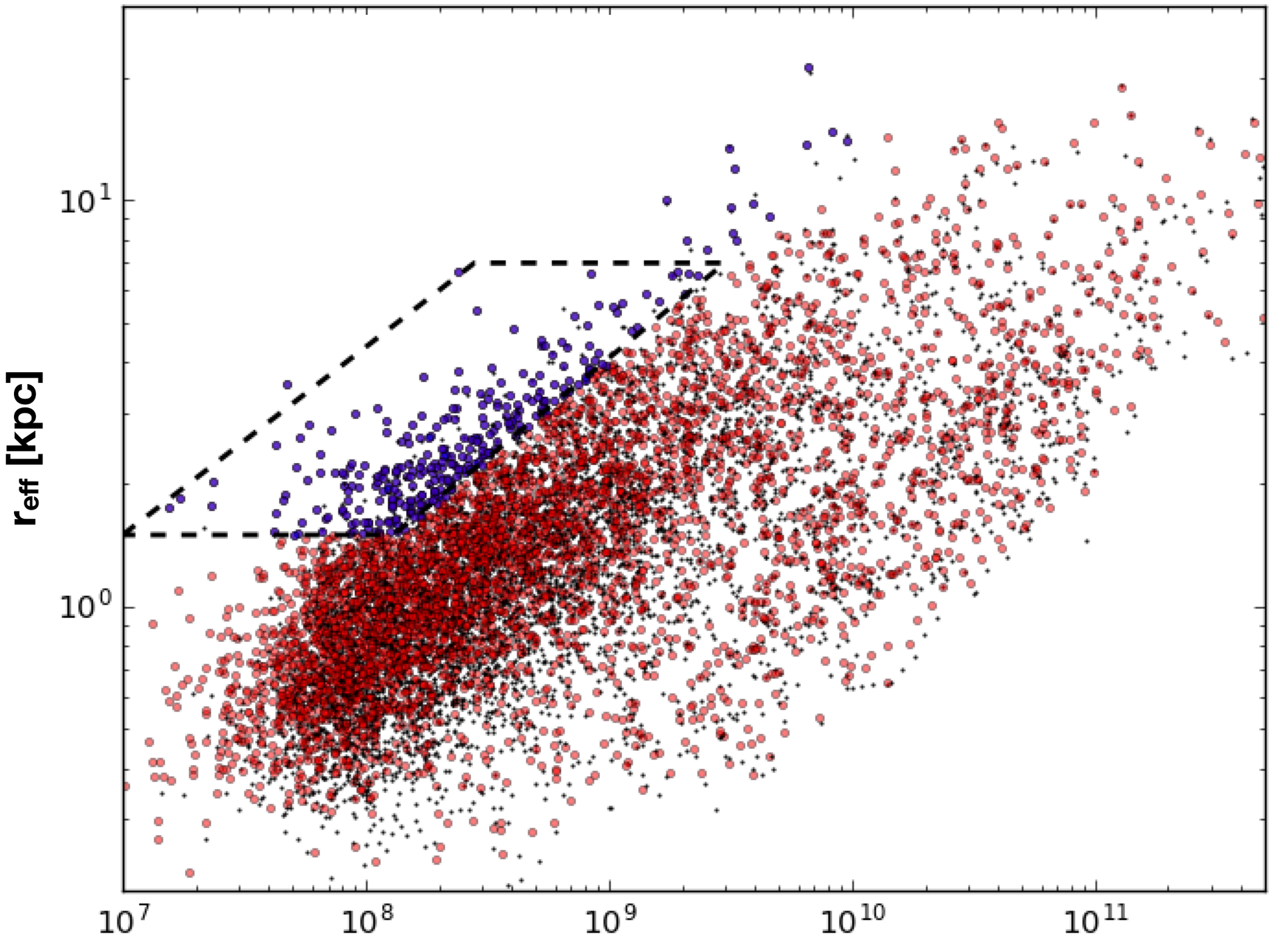
Errani+ 2015

Penafiel, Sales, et al., in-prep

(See also Carleton et al. 2019)

Evolution given by 1-single parameter: the mass fraction retained within rh,0

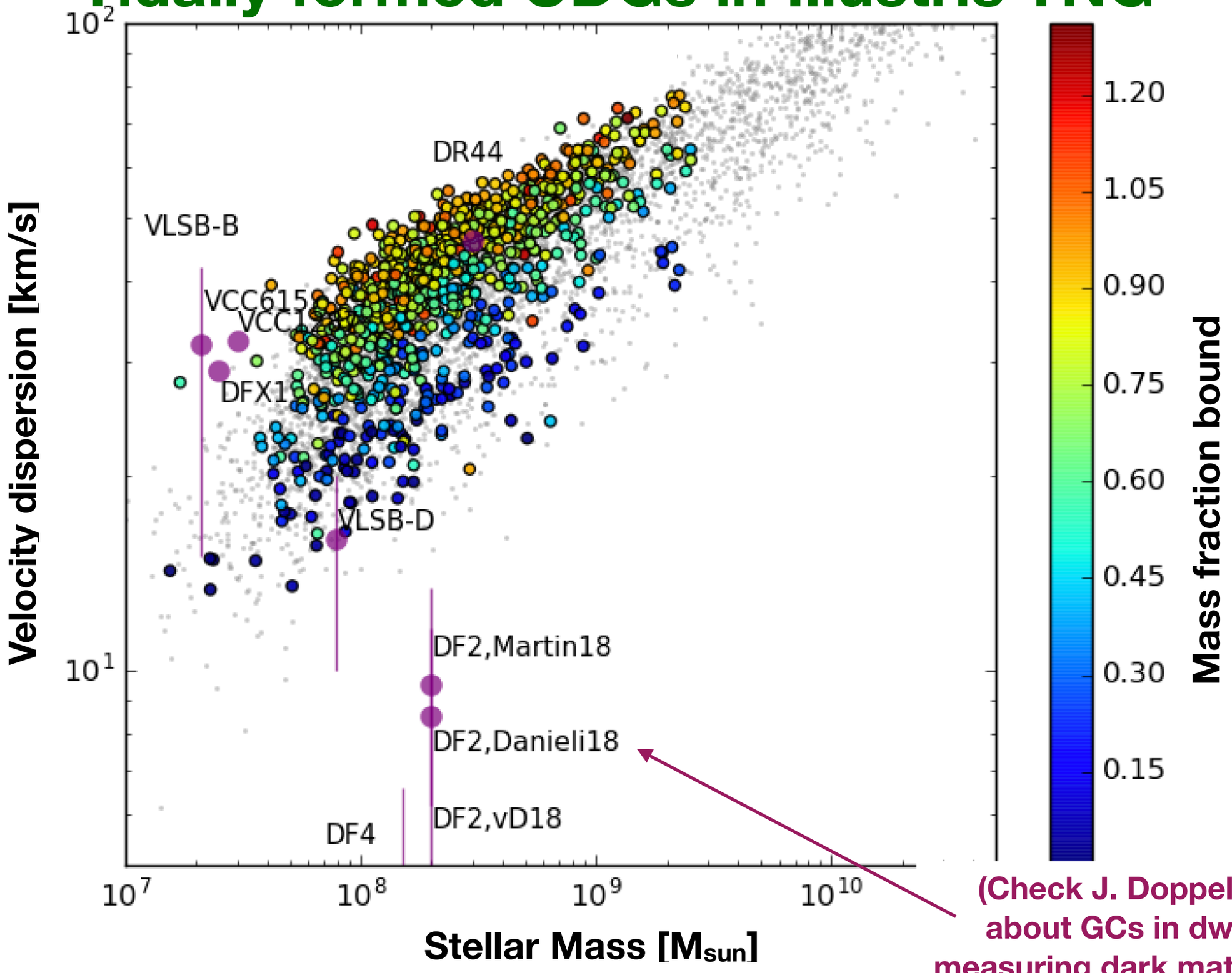
Simulated UDGs formed by tidal stripping



Penafiel, Sales, et al., in-prep

(See also Carleton et al. 2019)

Tidally formed UDGs in Illustris TNG

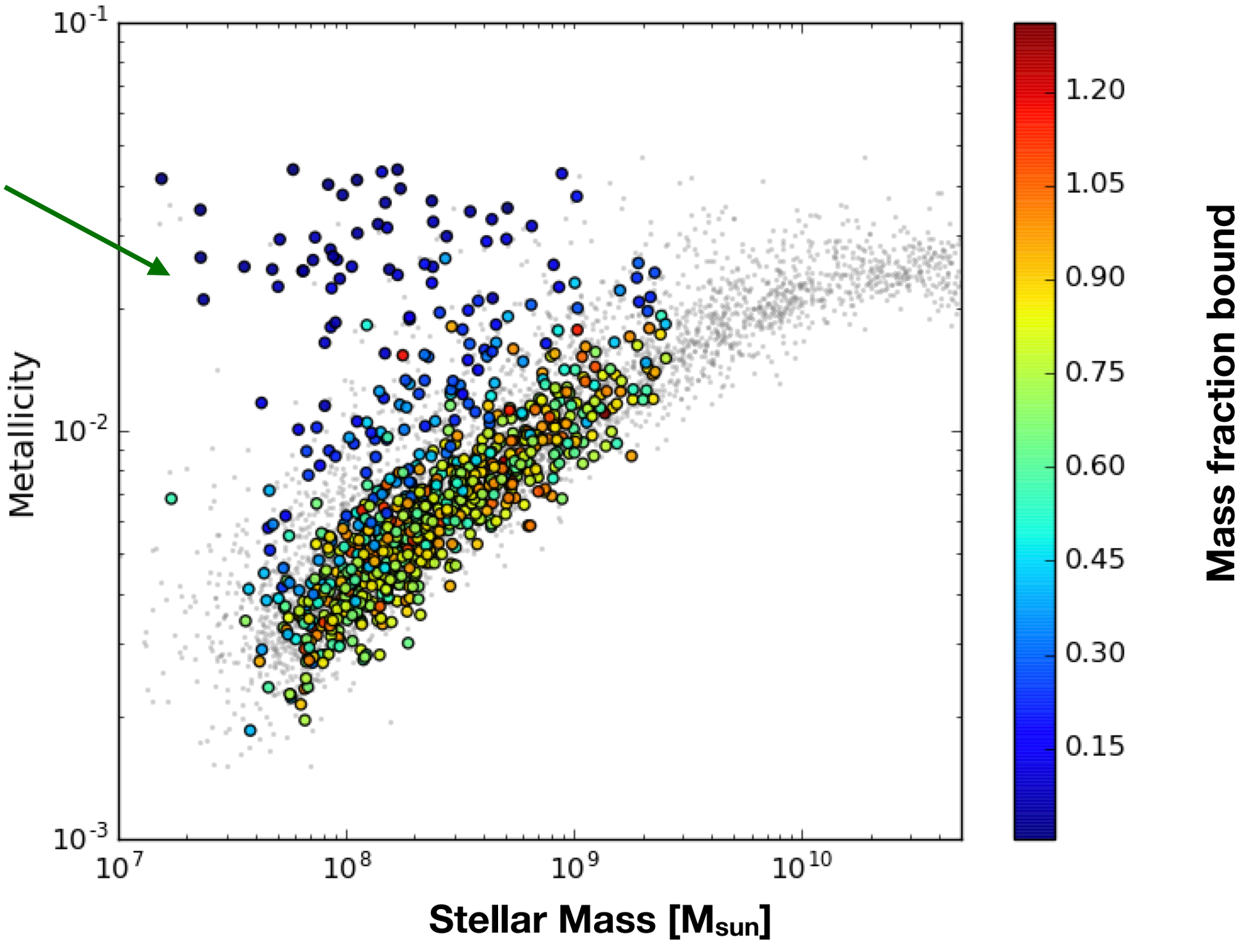


(Check J. Doppel's poster about GCs in dwarfs and measuring dark matter content)

Penafiel, Sales, et al., in-prep

Tidally formed UDGs in Illustris TNG

UDGs with the lowest dark matter content should correspond to metal-rich dwarf outliers



Summary & Implications for WFIRST

- **UDGs and low surface brightness galaxies in general can form via tidal disruption in high density environments**

- **UDGs formed via tidal effects will display <u>low velocity dispersion</u> & <u>high metallicities</u>**

- **Tidal interactions will produce UDG-like objects around L* galaxies**

WFIRST should detect dozens of them helping constrain their numbers, ages and radial distribution

Fattahi+ 2018