THE ORIGIN OF STELLAR ELLIPTICITY IN ULTRA-FAINT DWARF GALAXIES

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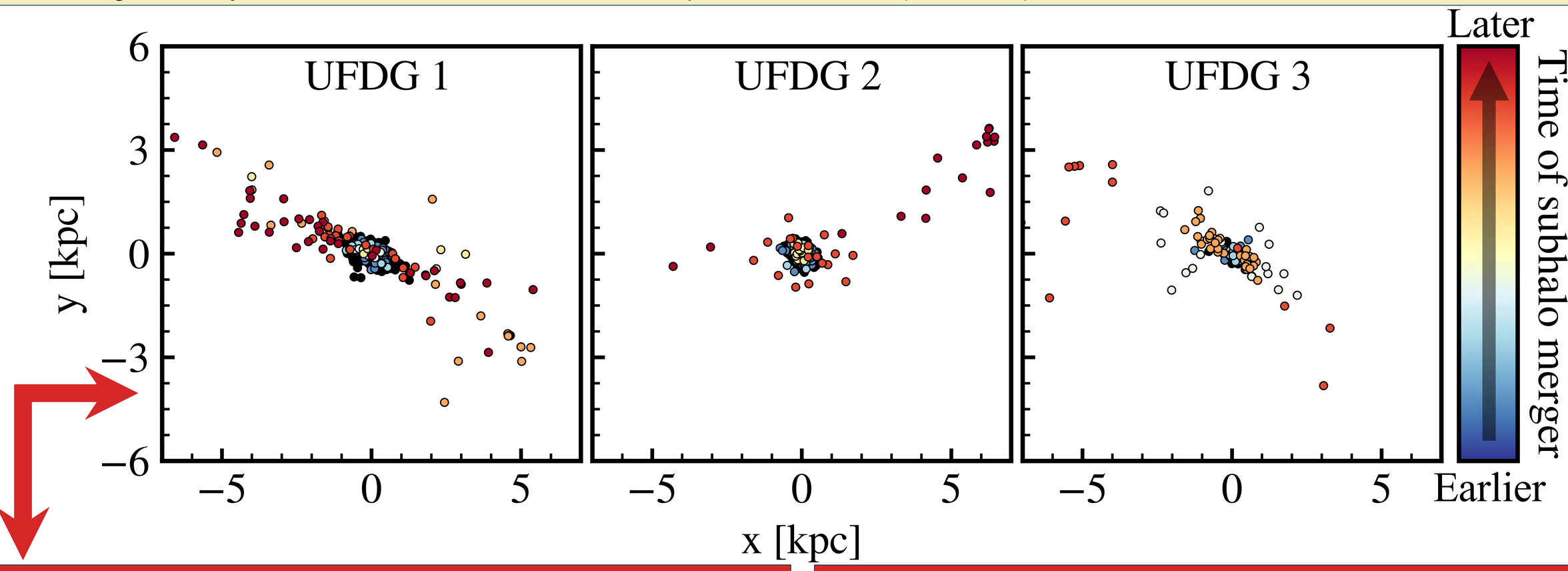
Engineering Dwarfs at Galaxy formations' Edge

- EDGE is a cosmological dark matter simulation of a 50 Mpc void region, in which ultra-faint dwarf galaxies (UFDGs) are simulated in under dense regions of space. Certain UFDGs are then resimulated to a higher resolution, if they are isolated from nearby structure.
- Due to the small mass sizes of UFDGs ($M \sim 10^9 M_\odot$), they are susceptible to the effects of reionization.
- If an UFDG cannot retain its gas content after it becomes heated via reionization, the star formation in that UFDG will cease.
- In most cases, the UFDG will then proceed to grow its mass solely via the 'dry' accretion of other smaller objects.

The 'not so tidal' tails in the EDGE UFDGs…

- In EDGE, we find that all tidally isolated UFDGs are found to possess anisotropic and extended stellar outskirts.
- Their structure resembles tidal tails; however, we know our UFDGs are chosen based on their isolation from other systems.
- Recently, extended stellar distributions have also been found in UFDGs from observations, a notable example being Tucana II (an UFDG also thought to be tidally isolated [1]).
- The existence of extended stellar distributions in isolated environments prompts us to study the origin of our EDGE UFDGs. We do this by creating assembly histories of our UFDGs in the form of spatial distributions (see below).

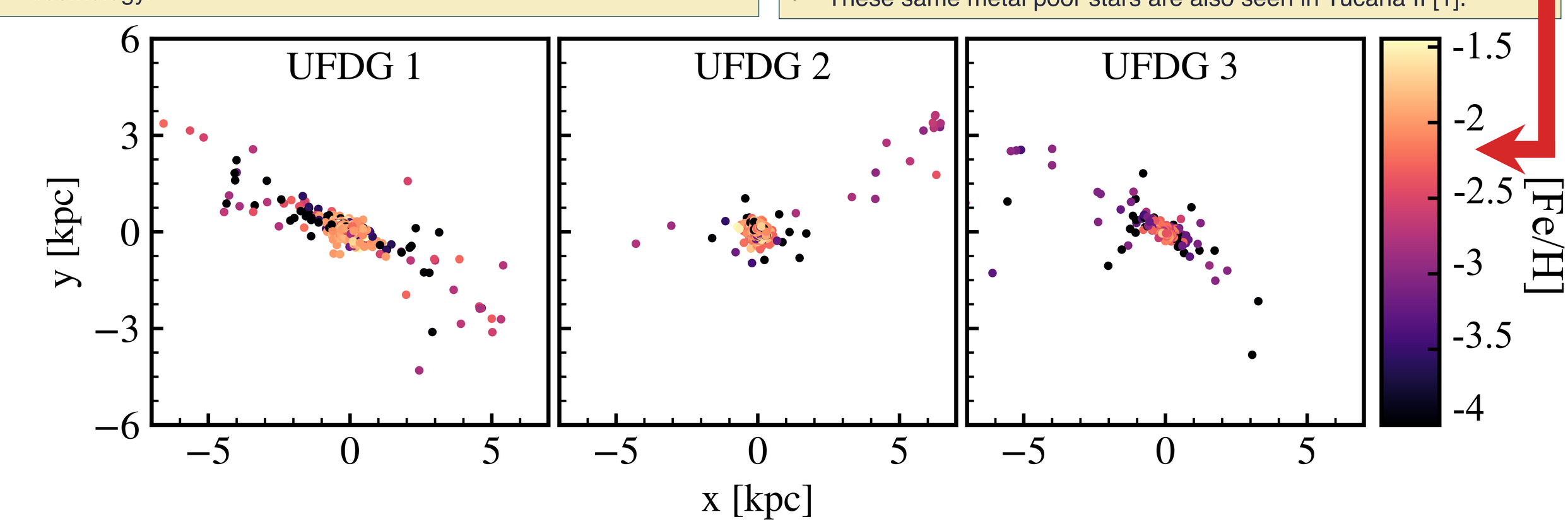


LATE-TIME ACCRETION EXTENDS UFDGs SHAPE!

- The extended stars in EDGE UFDGs originate from the late-time 'dry' accretion of smaller dark matter sub-halos onto the main halo.
- We see this UFDG late-time merger mechanism emerging naturally in a fully cosmological context, where several dark matter sub-halos undergo hierarchical minor mergers, following ΛCDM cosmology.

UFDGs HAVE VERY METAL-POOR STELLAR HALOS!

- Massive spiral galaxies and many nearby dwarf galaxies have faint, metal-poor, stellar halos formed from the accretion of smaller systems.
- We find this is the case for UFDGs in EDGE, as their stellar outskirts are also very metal-poor, with [Fe/H] ~ -4.
- These same metal poor stars are also seen in Tucana II [1].



What about the more massive systems in EDGE?

- In future work, we will gauge the dependence of stellar mass on this accretion origin by examining the more massive EDGE dwarf galaxies.

[1] A.Chiti et al., 'An Extended Halo Around an Ancient Dwarf Galaxy', Nat Astron 5 (2021), pp. 392–400