Metallicity Gradients in Simulated Tidal Streams

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Glossary

Simulation: Astronomers simulate the formation of galaxies from the beginning of the universe to the present-day in order to make predictions about the past and make comparisons to observations in the present. These simulations include all known physics, like star formation and gravity.

Dwarf galaxy: Dwarf galaxies are basically smaller versions of galaxies.

Stream: A stream is a present-day coherent structure in the sky that is an over density of stars that tend to move together. Most streams come from dwarf galaxies getting cannibalized by the Milky Way or Andromeda. The stream is created by the remnants of the cannibalization process.

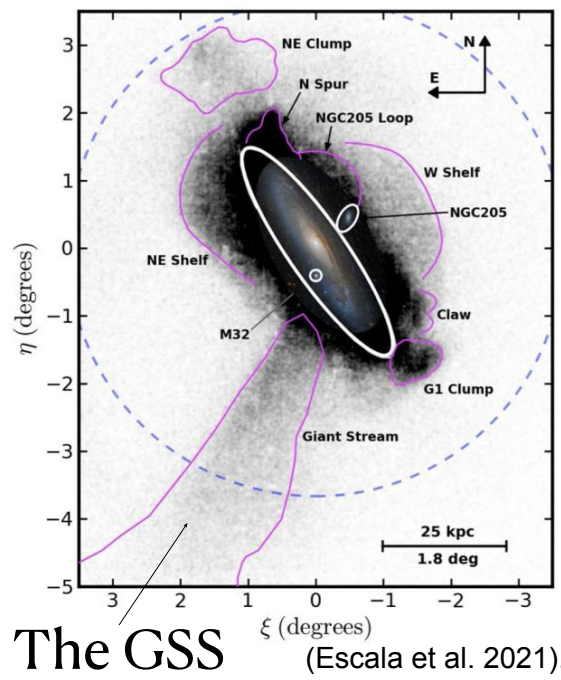
Metallicity ([Fe/H]): The ratio of the amount of iron to the amount of hydrogen in a star. Iron is produced by supernovae explosions, so the amount of iron in newly formed stars tends to increase over time as the galaxy forms stars. So, metallicity tracks stellar age. It also tracks galaxy stellar mass, because more massive galaxies form stars more efficiently.

Gradient: The metallicity gradient is how the ratio of iron to hydrogen changes as a function of position for the different stars in the stream. We want to understand metallicity gradients in streams, so we can learn about the properties of the cannibalized galaxies that formed the streams.

Infall: The time when the merging process starts between the dwarf galaxy and the host galaxy.

Unbound stars: Stars that have been tidally stripped by the merging process

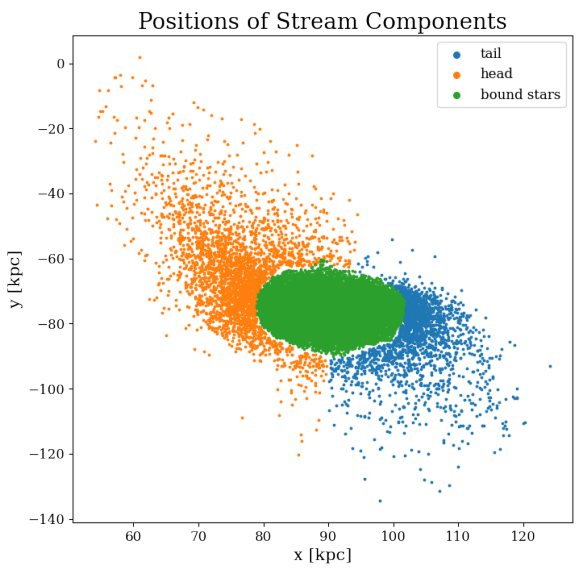
Motivation: metallicity gradient measured in the Giant Stellar Stream of Andromeda



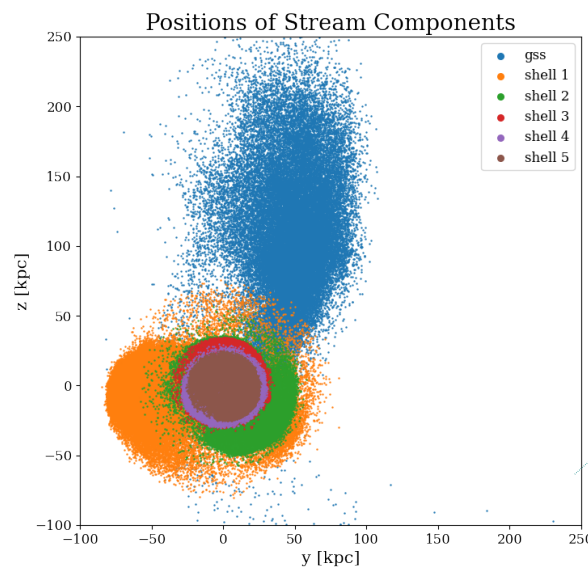
The GSS (Escala et al. 2021).

Divide Stream into Sections

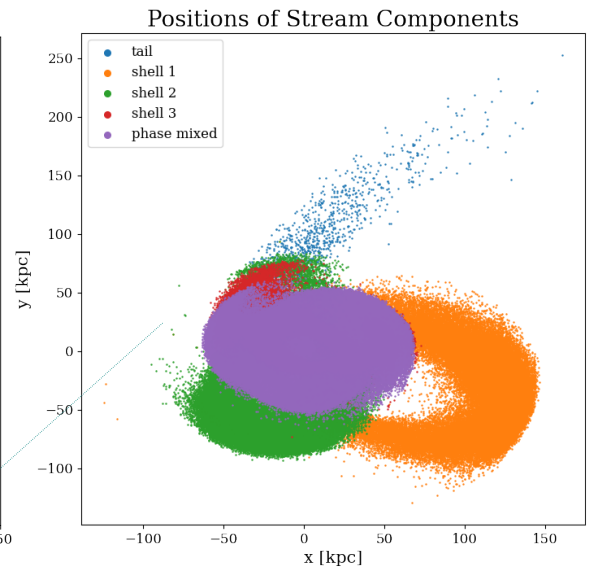
Stream 1



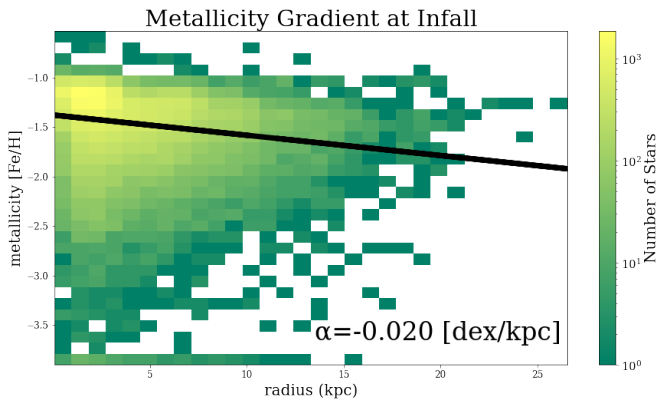
Stream 2



Stream 3

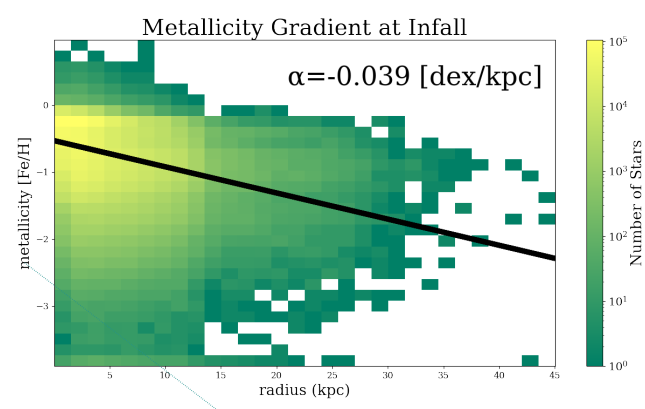


Find Gradient at Infall...

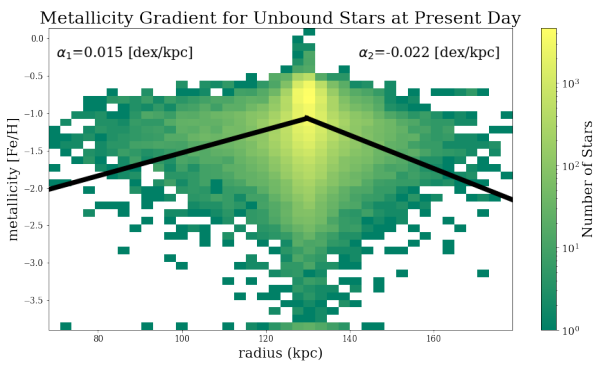


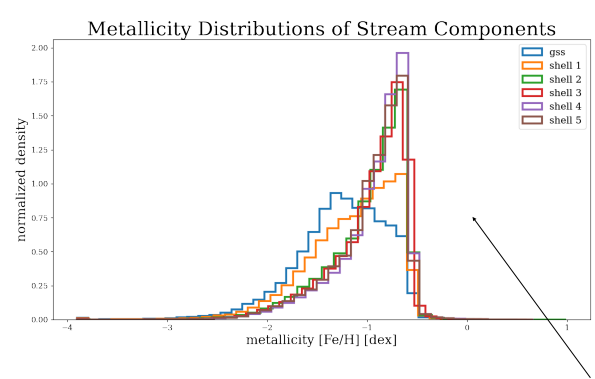
α = -0.035 dex/kpc

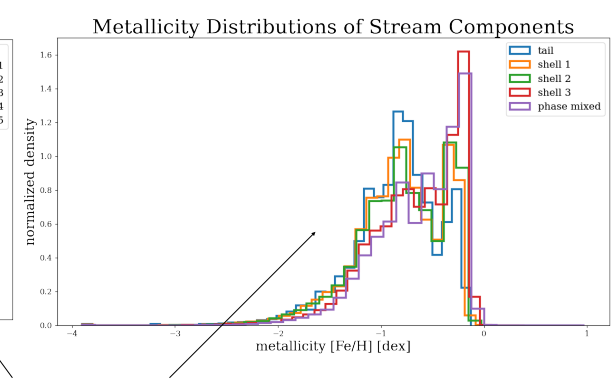
shallow gradients



...then at Present Day







Evolving mean metallicity over the different sections

THE MERGING PROCESS IS NOT WASHING OUT THE GRADIENTS IN EACH GALAXY

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