MANTRAS AND CHALLENGES IN GALACTIC ARCHAEOLOGY

João A. S. Amarante

Chervin F. P. Laporte

Matthew D. A. Orkney

Institut de Ciències del Cosmos
UNIVERSITAT DE BARCELONA

ERC VIA LACTEA PROJECT

Chervin F. P. Laporte

PI: ERC VIA LACTEA

João A. S. Amarante

Postdoc

Matthew D. A. Orkney

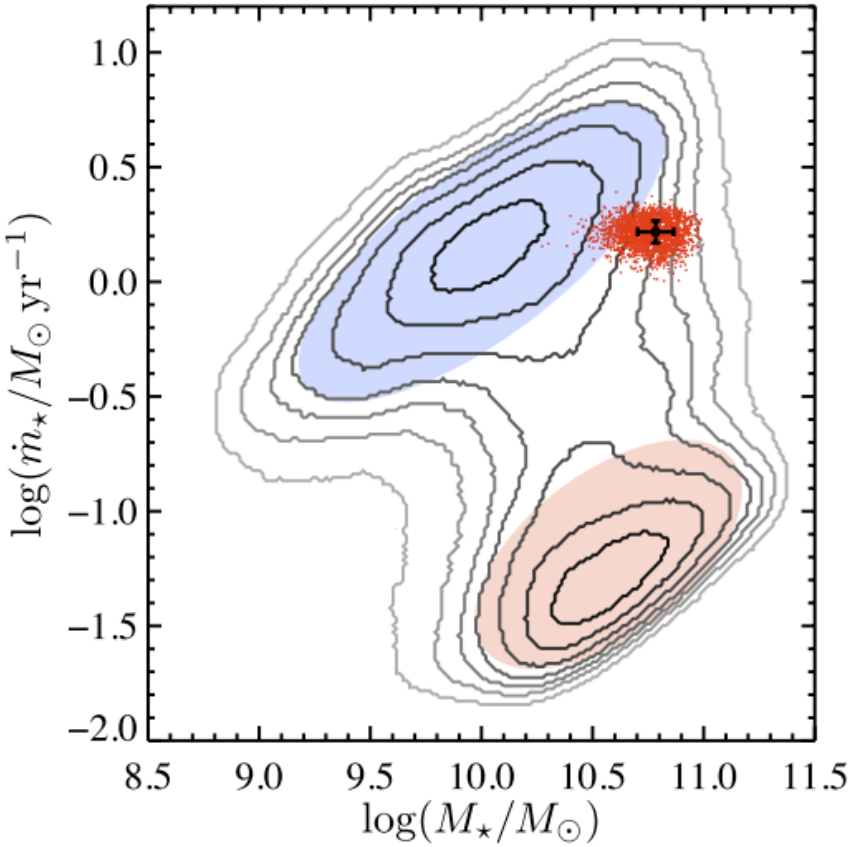
Postdoc

erc

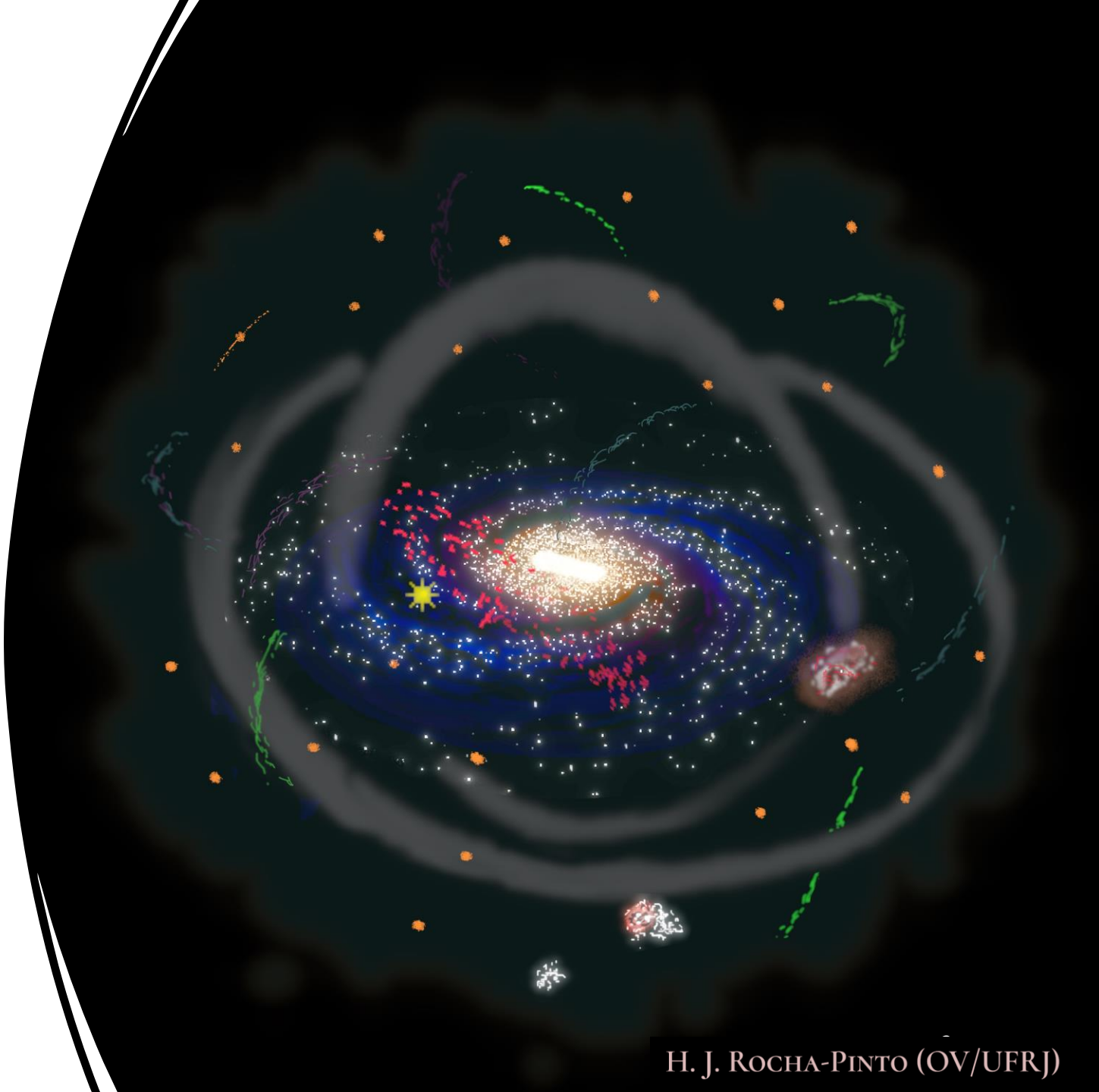
ICCUB

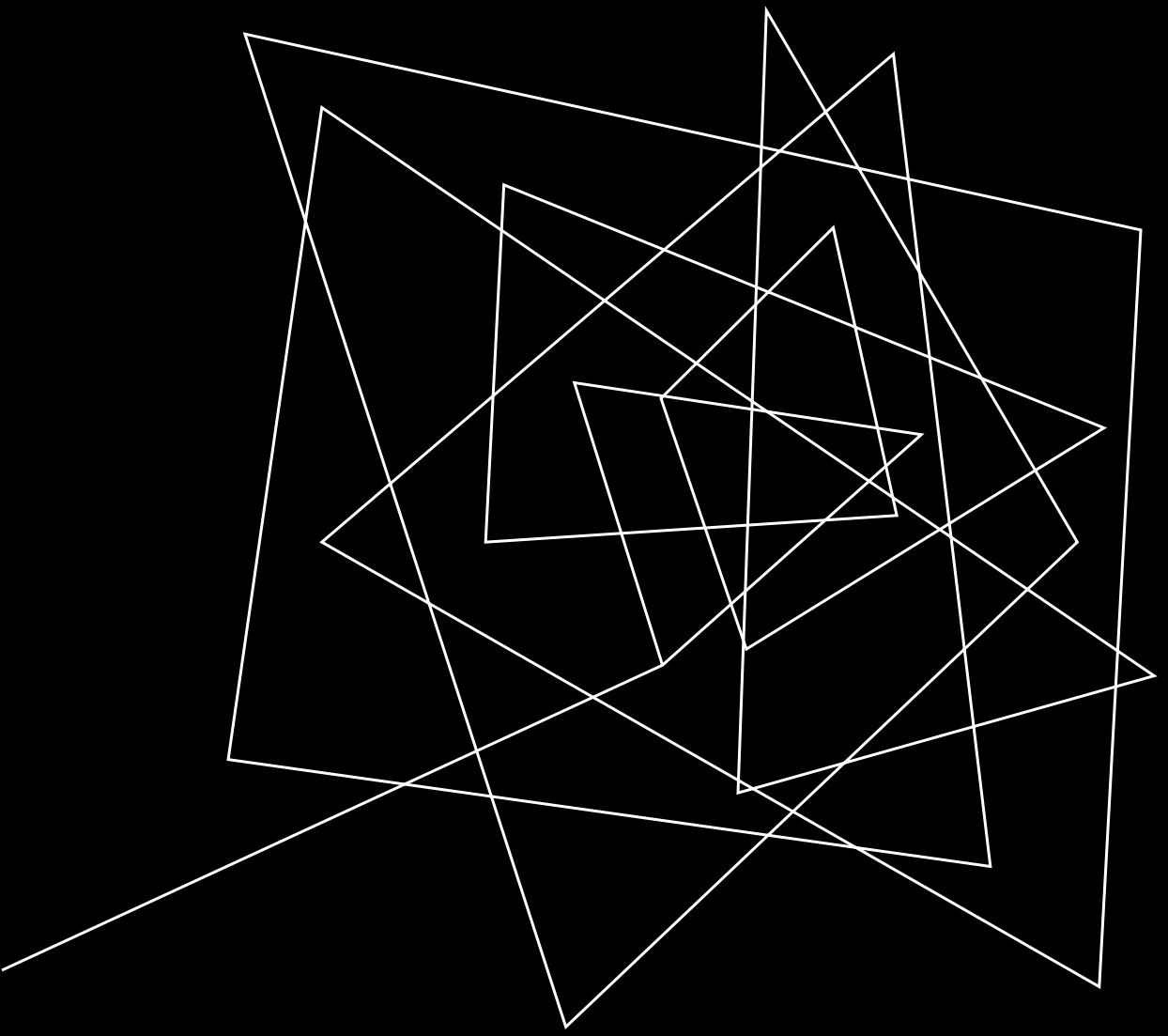
Institut de Ciències del Cosmos
UNIVERSITAT DE BARCELONA

THE MILKY WAY



Bland-Hawthorn & Gerhard (2016)

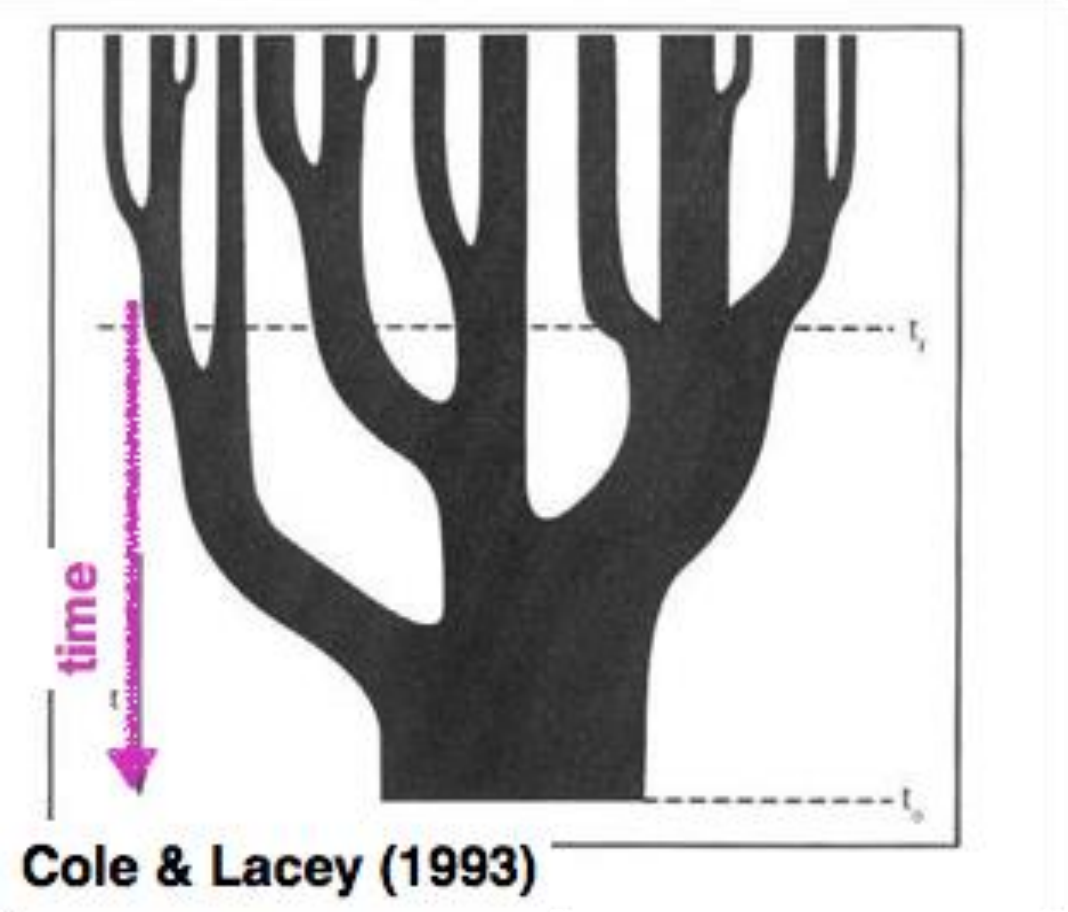


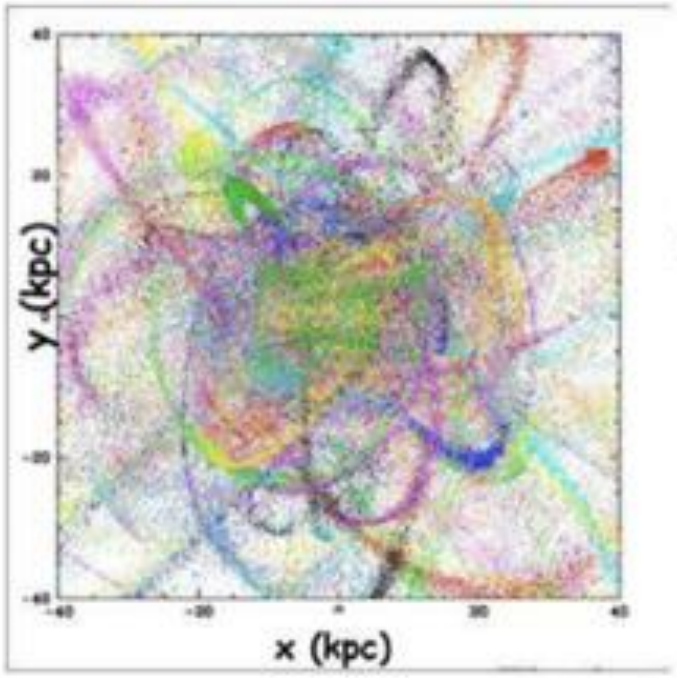


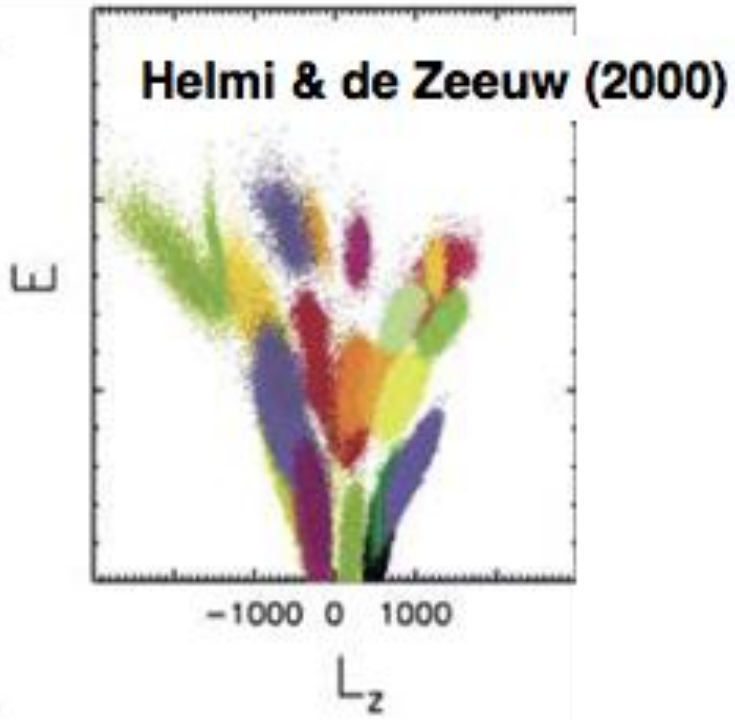
MANTRA 1

Our local stellar halo formed hierarchically from the accretion of many low mass dwarf galaxies

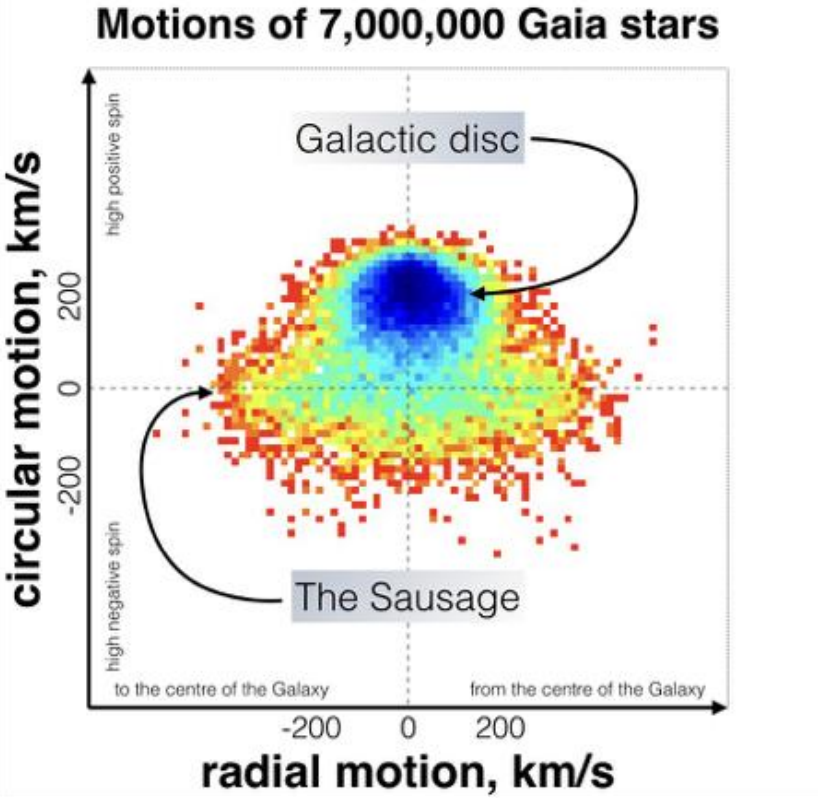
STELLAR HALO HIERARCHICAL FORMATION







THE GAIA-SAUSAGE-ENCELADUS



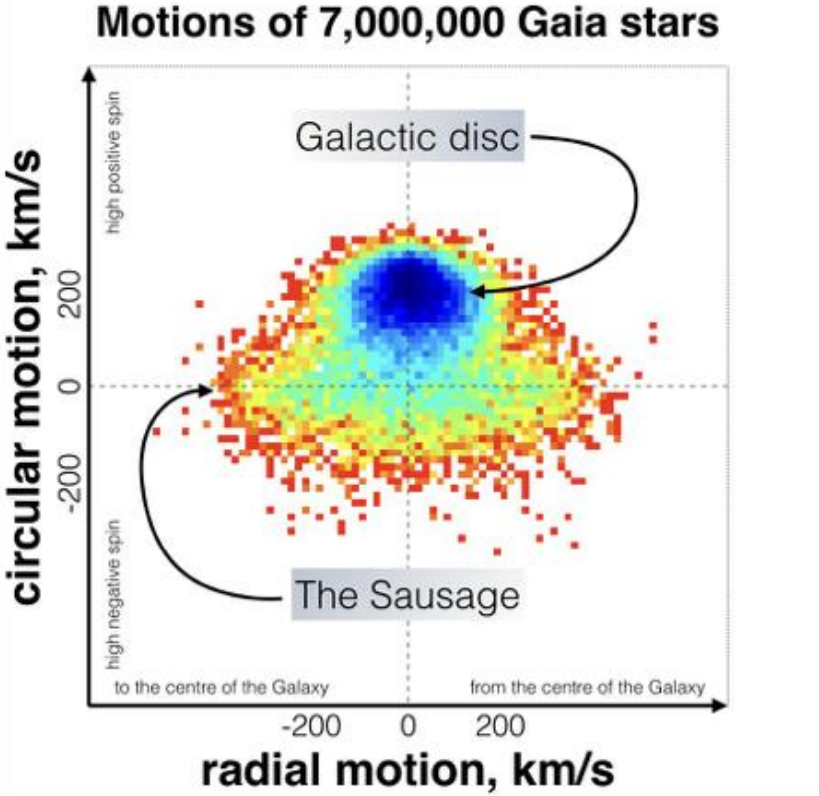
Belokurov+18, Helmi+18 (see also, e.g. Gilmore+02, Deason+13, for pre-Gaia "hints")

T_merger ~ 10-11 Gyr (e.g. Gallart+2019)

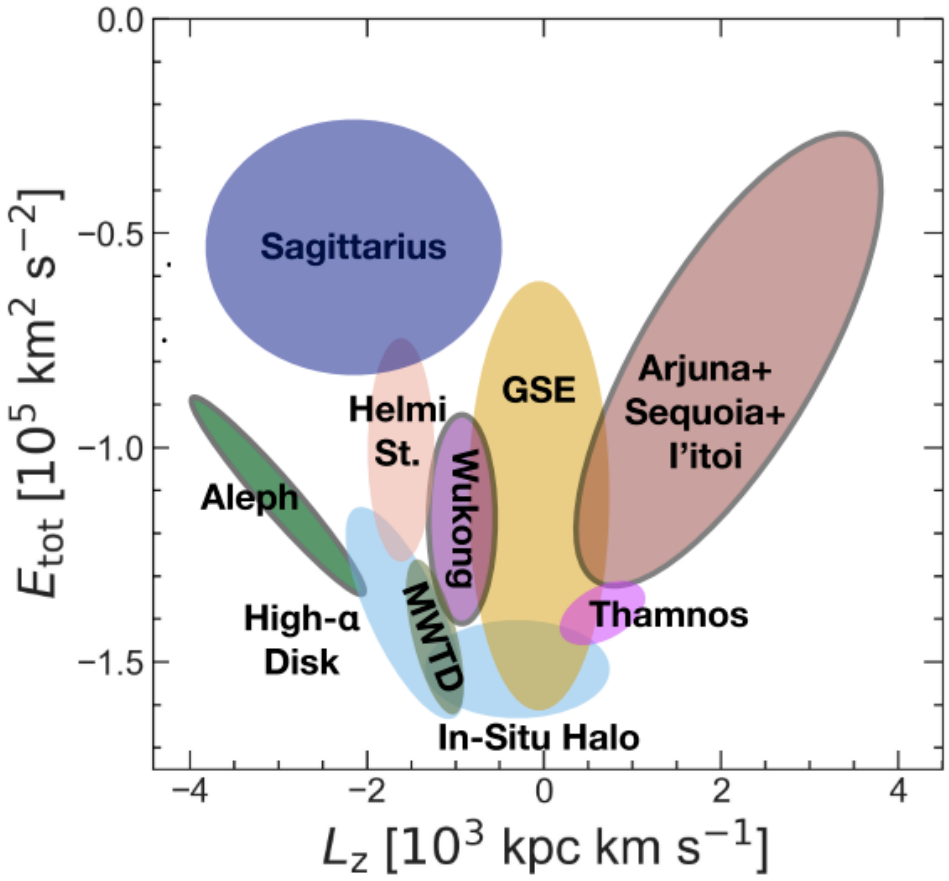
Stellar mass ~7×10^8 (e.g. Naidu+2020)

~1/3 MW-like galaxies in Auriga simulation have GSE-like halo (Fattahi+19)

THE GAIA-SAUSAGE-ENCELADUS

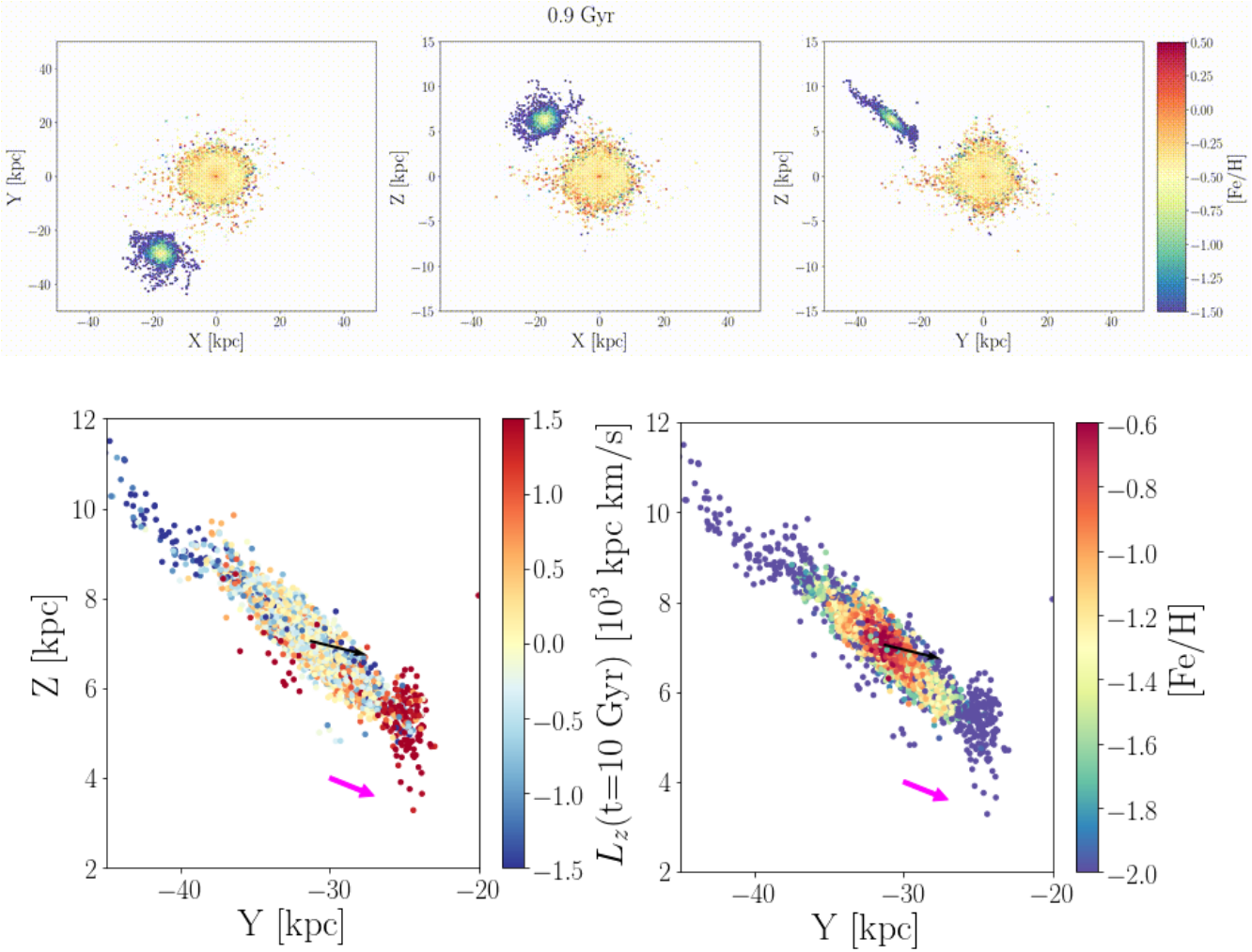


Belokurov+18, Helmi+18 (see also, e.g. Gilmore+02, Deason+13, for pre-Gaia "hints")

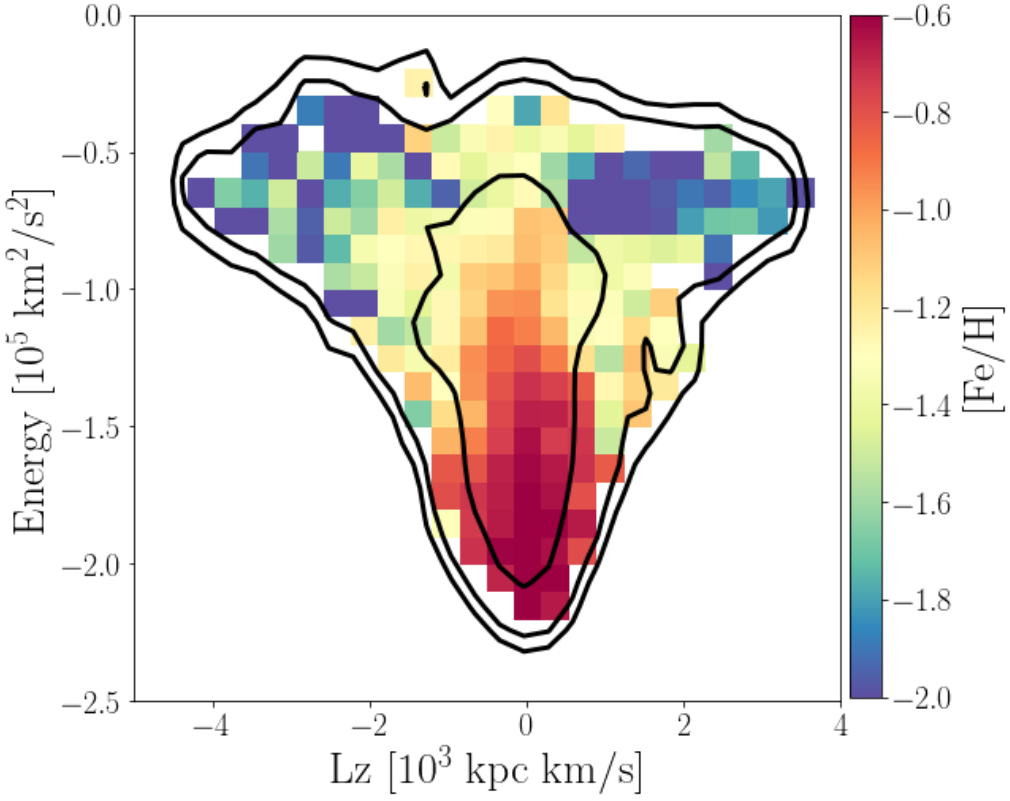


Naidu+20 (see also, e.g. Malhan+2022)

THE GAIA-SAUSAGE-ENCELADUS

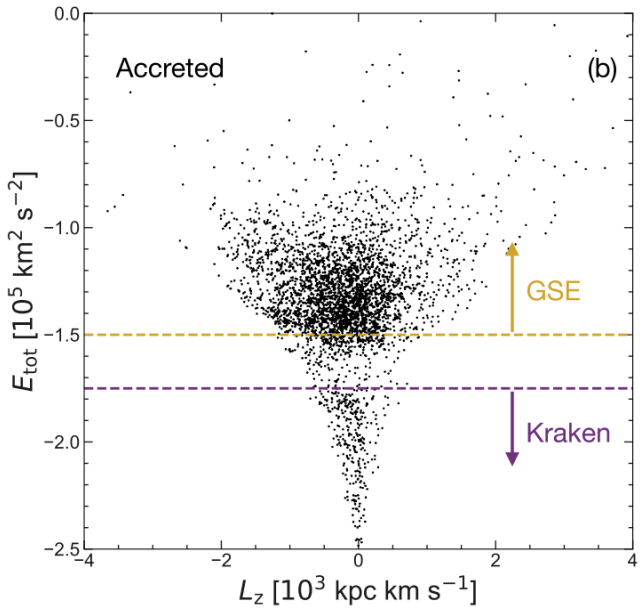


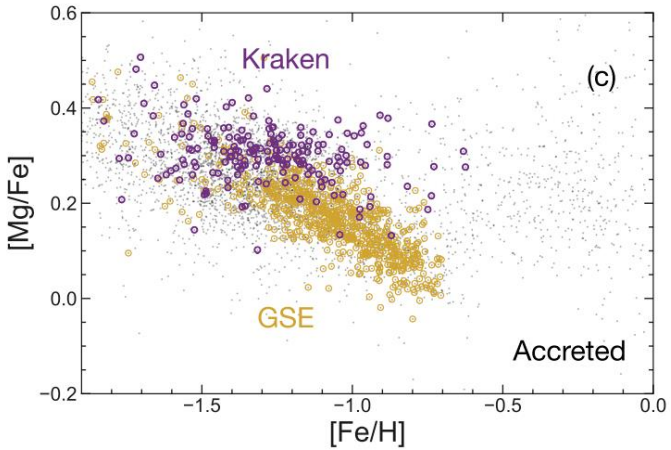
Amarante+22



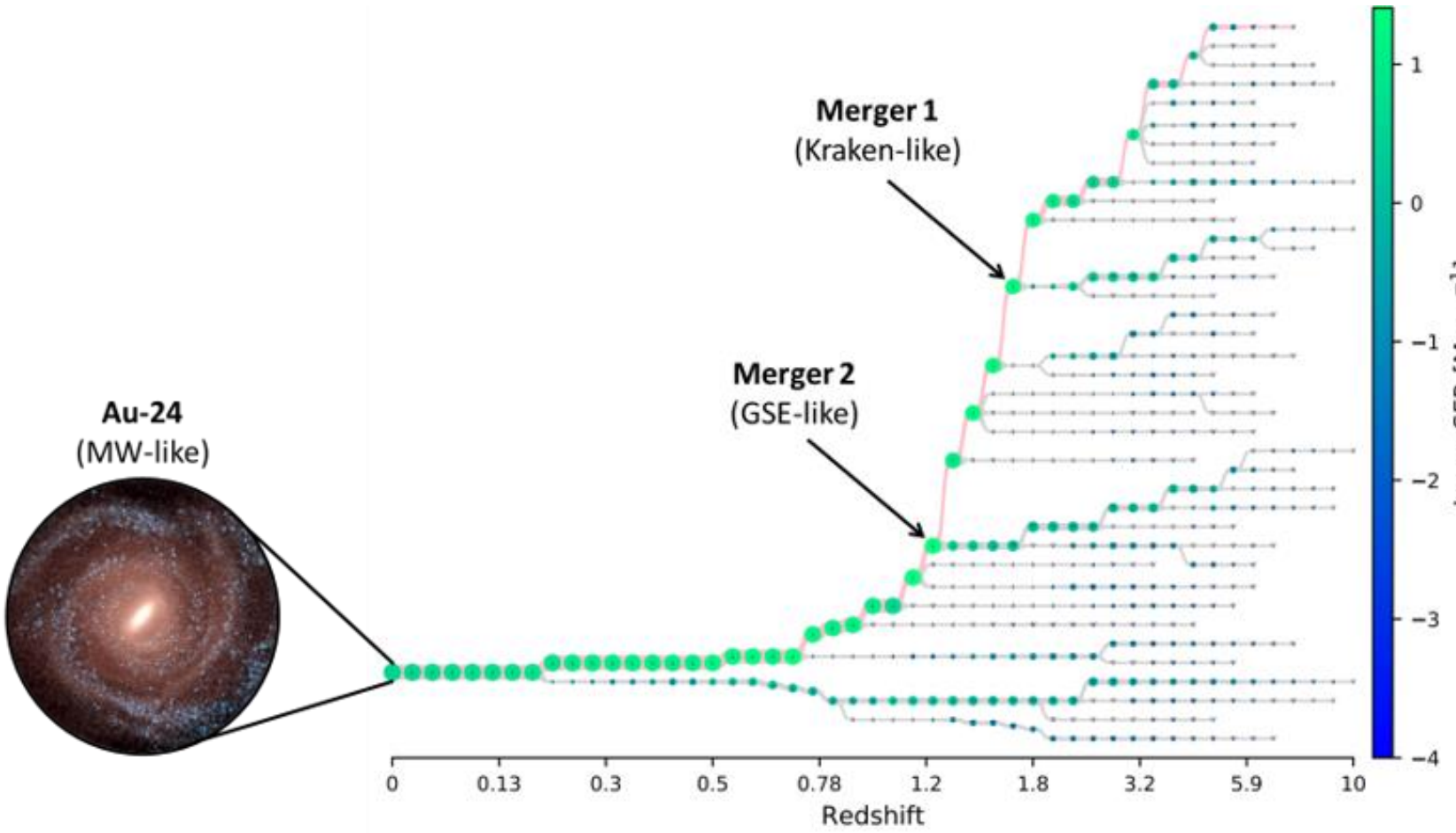
Amarante+22 (see also Koppelman+20, Naidu+21)

THE KRAKEN/HERACLES (?)





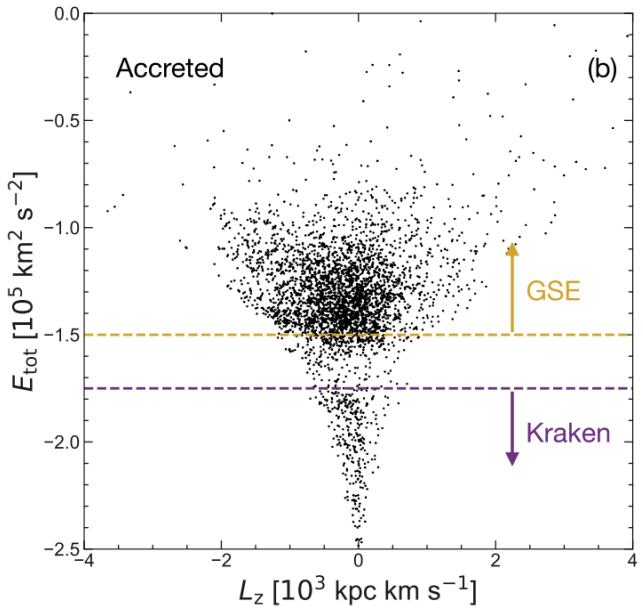
Naidu+21 (see also, e.g. Kruijssen+19, Horta+21)

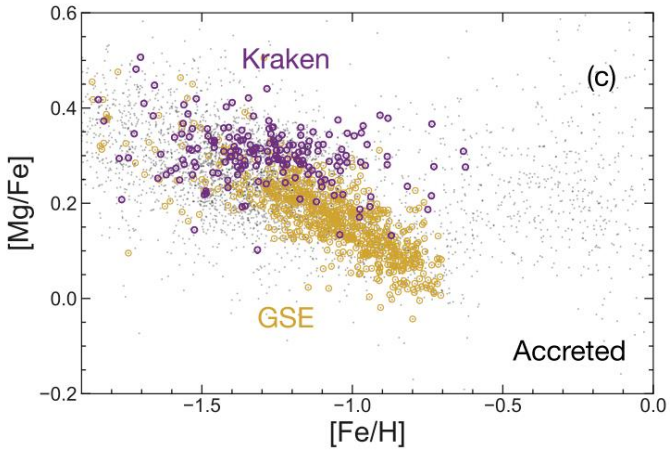


Auriga simulation

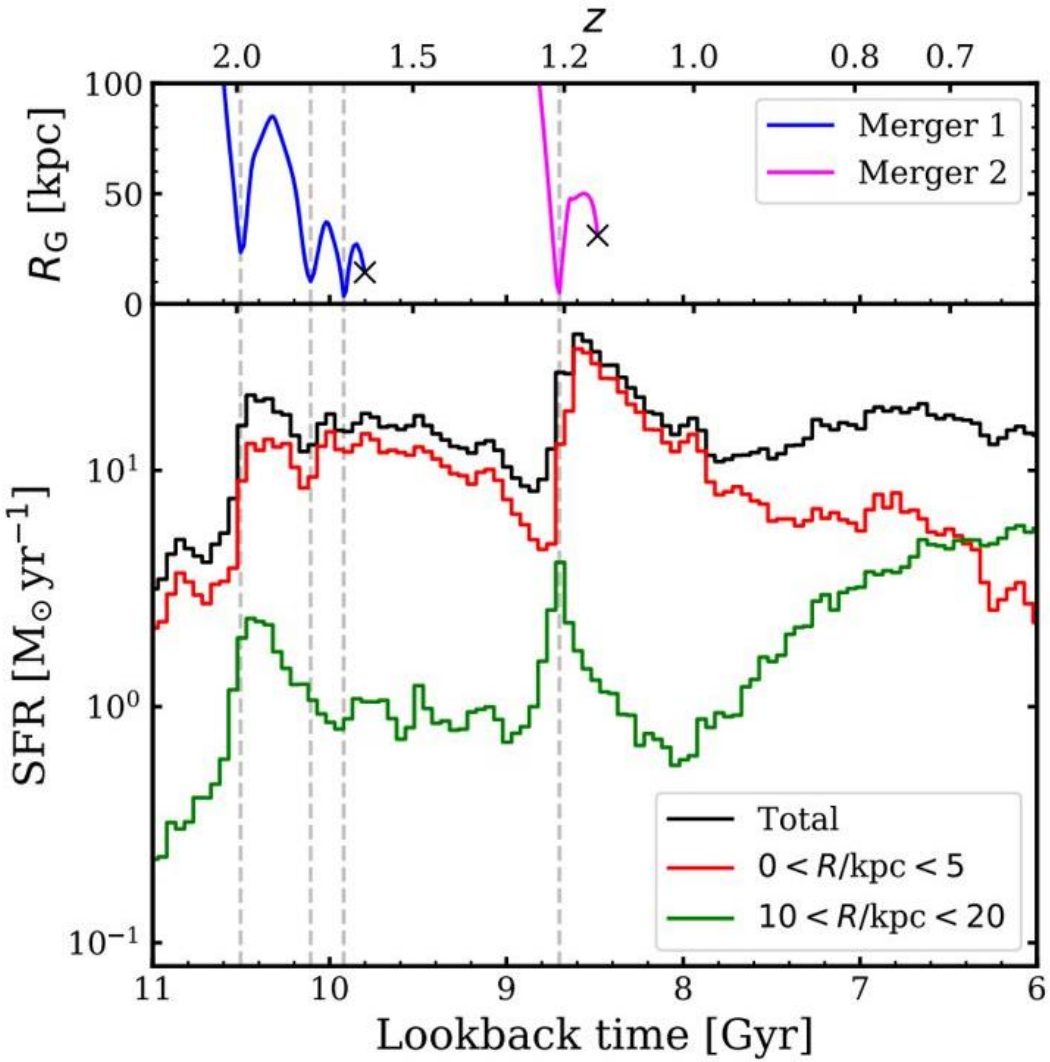
Orkney+22

THE KRAKEN/HERACLES (?)





Naidu+21 (see also, e.g. Kruijssen+19, Horta+21)

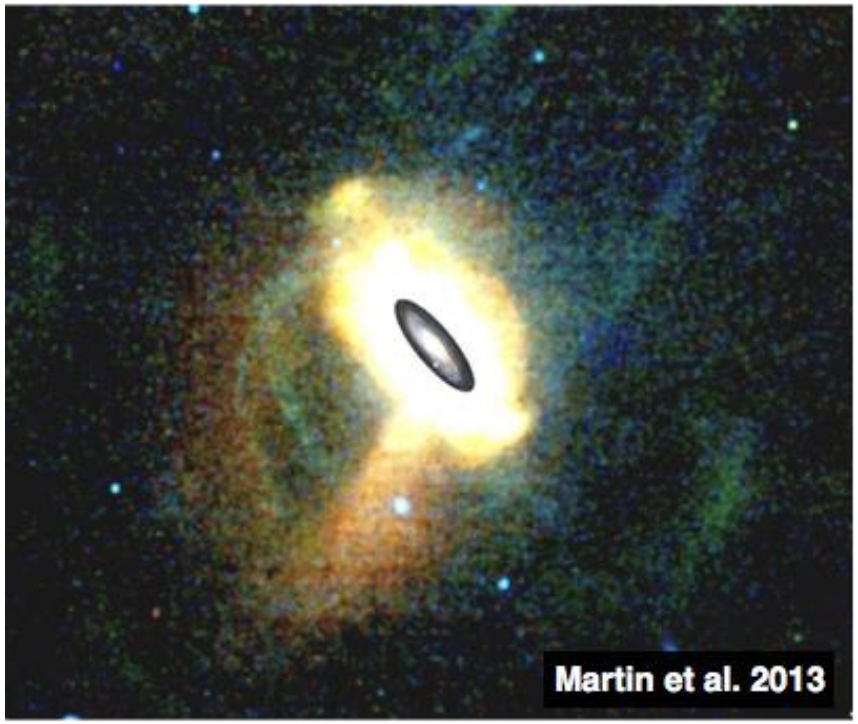


Orkney+22

MANTRA 2

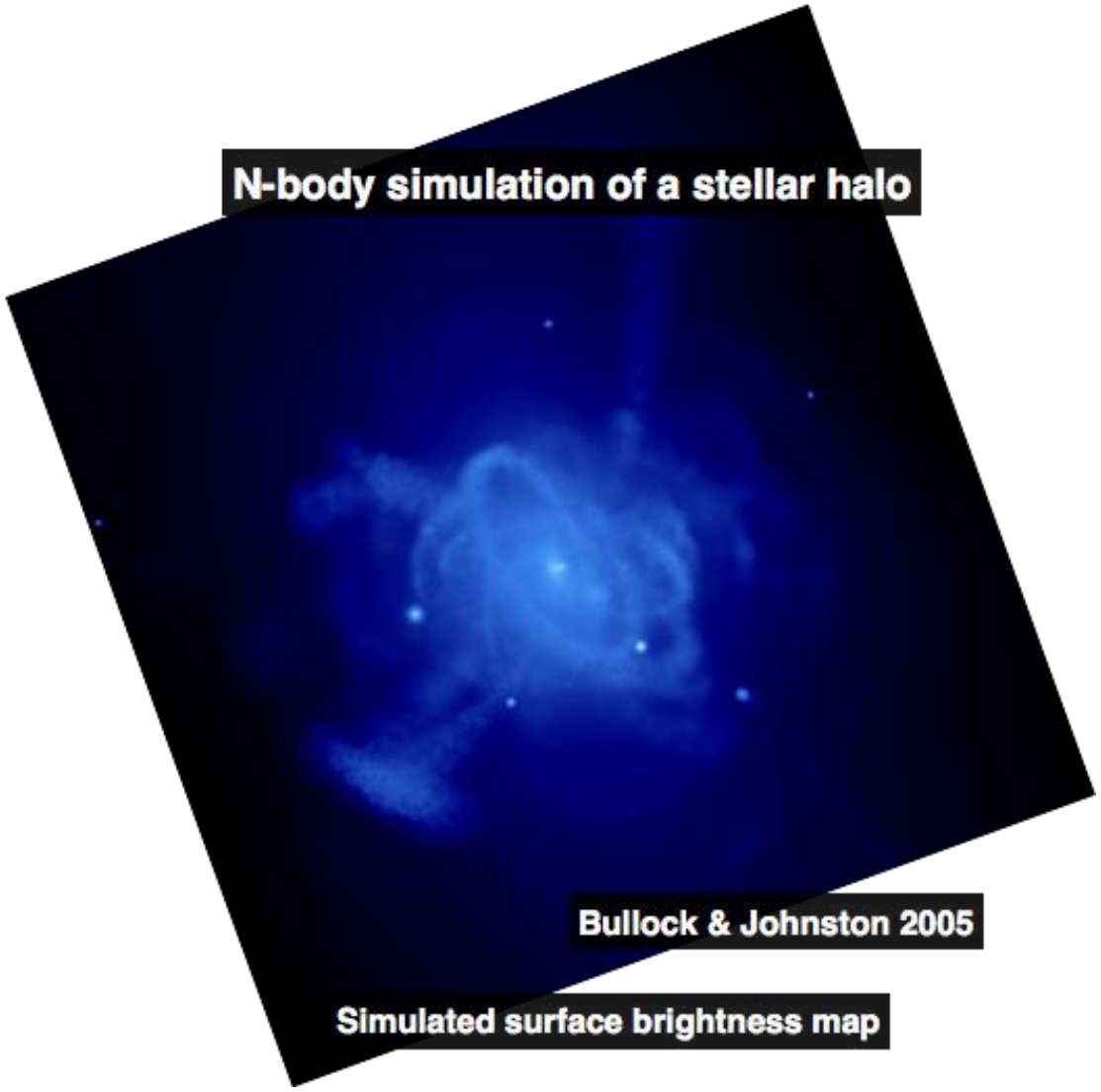
The stellar halo is inhabited by stellar streams of accreted objects

Andromeda Galaxy PandAS survey



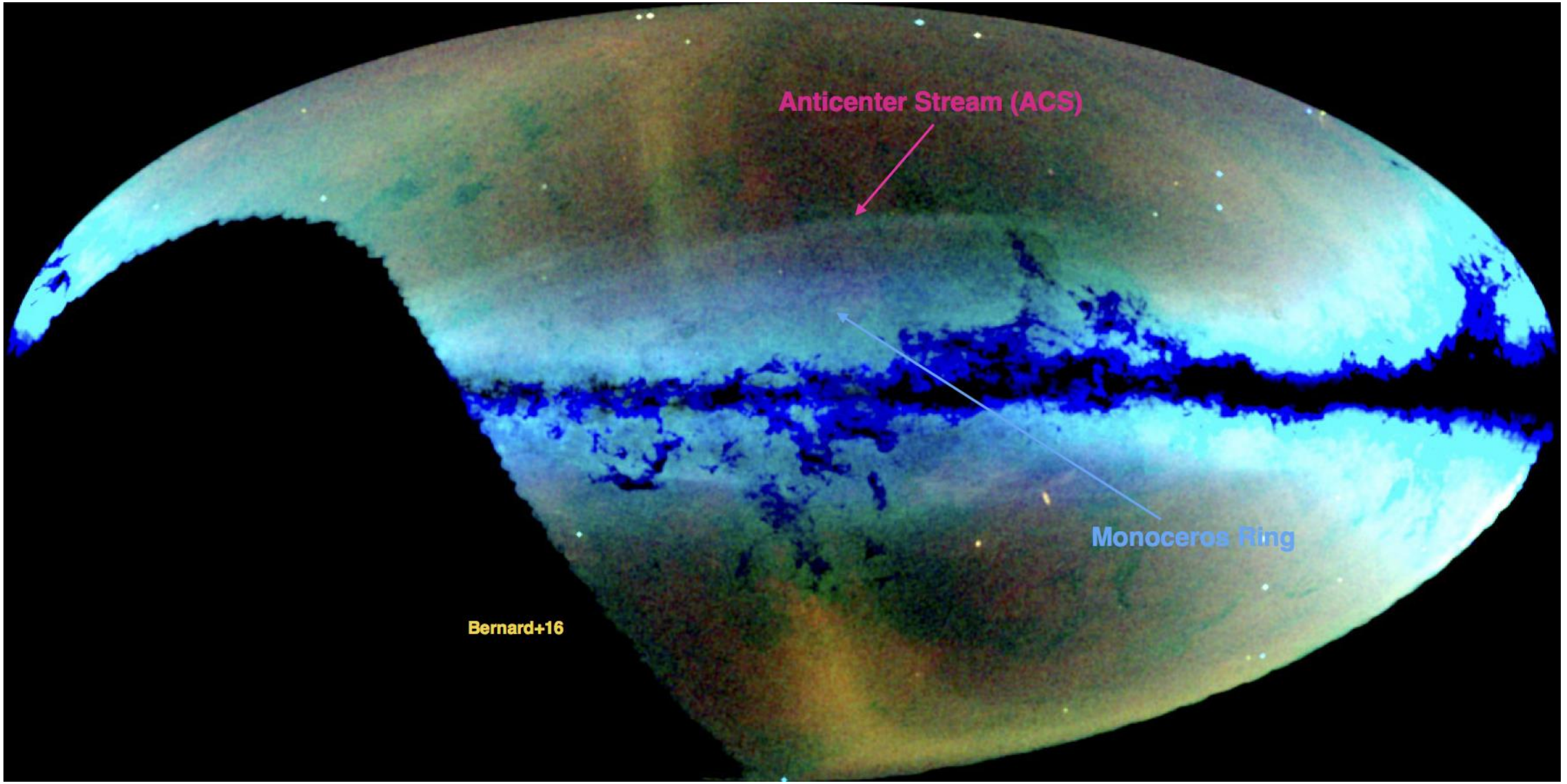
Surface Brigthness map through star count colour-coded by metallicity

N-body simulation of a stellar halo

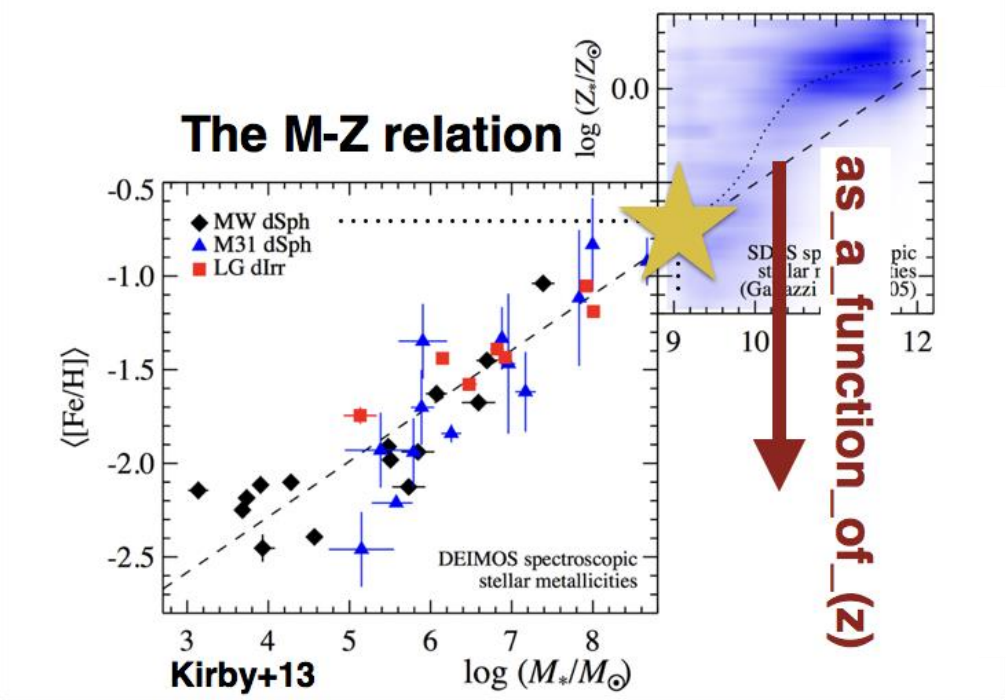


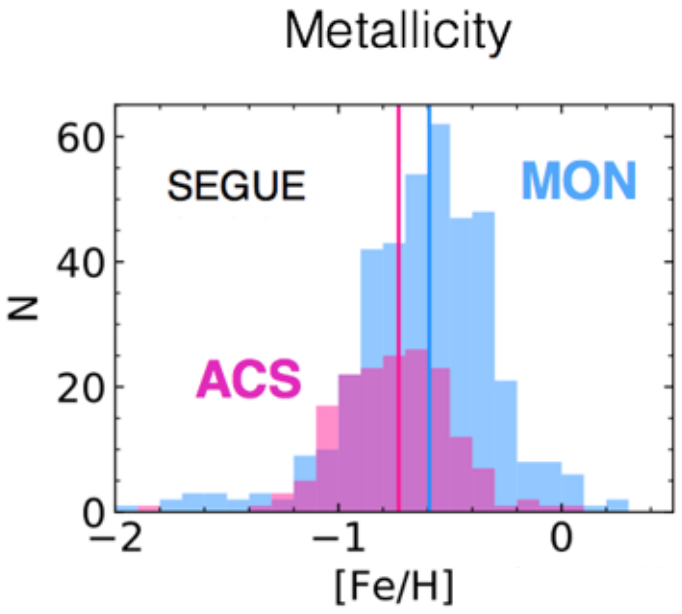
Simulated surface brightness map

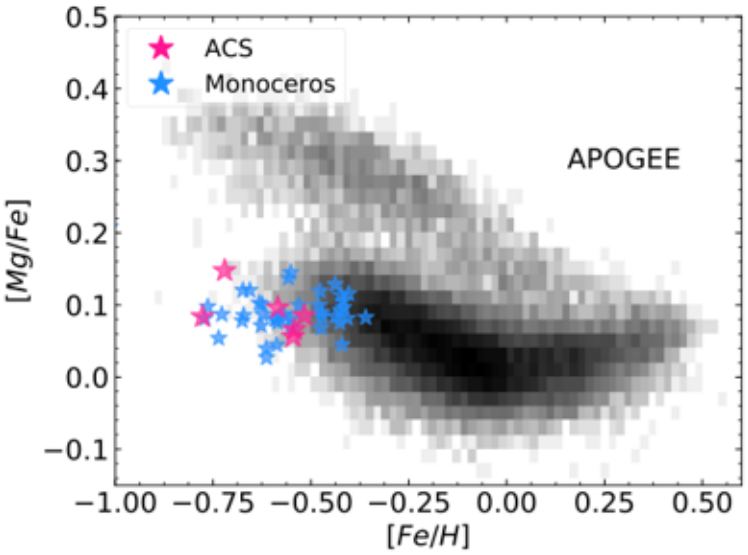
Is everything that is thin on the sky a stream?


Anticenter Stream (ACS)
Monoceros Ring
Bernard+16

OUTER DISC OVERDENSITIES

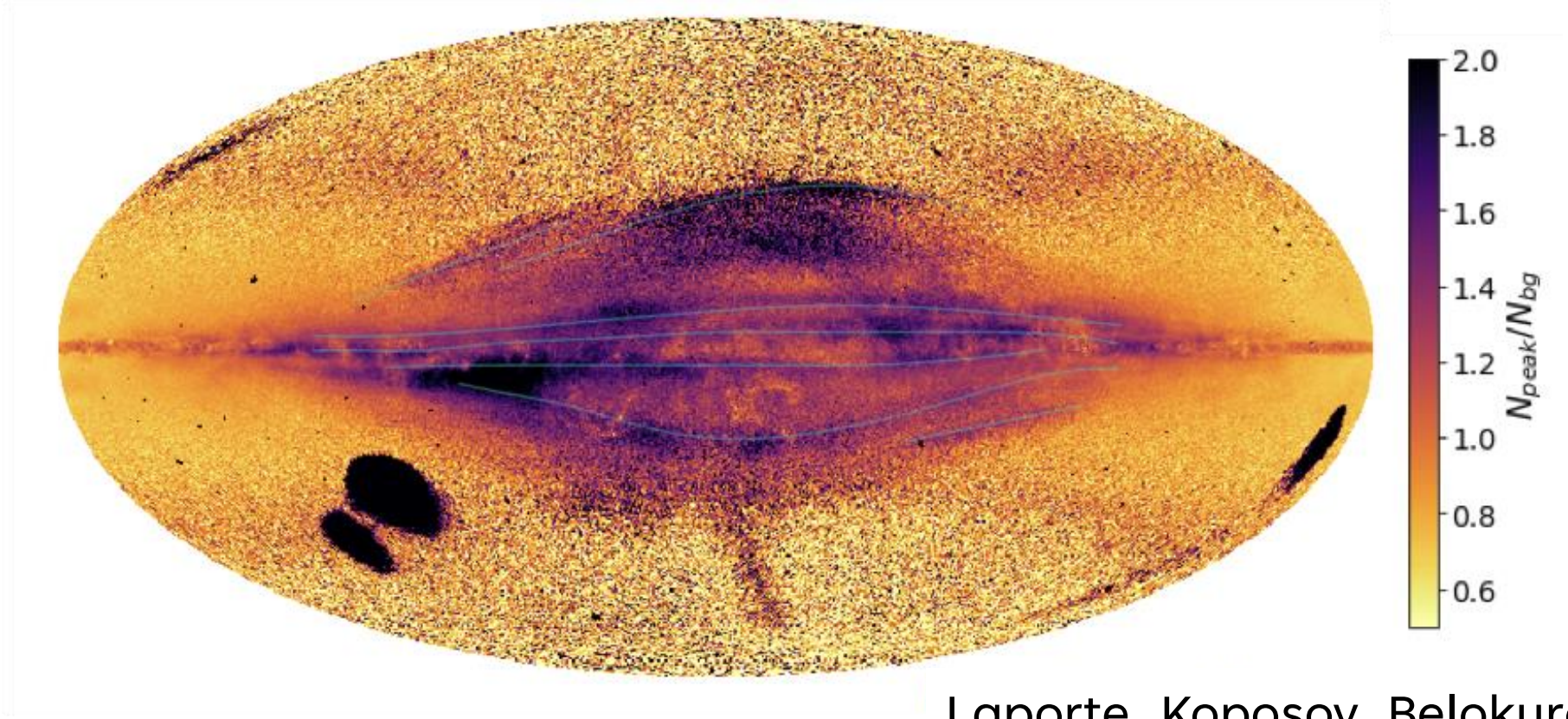




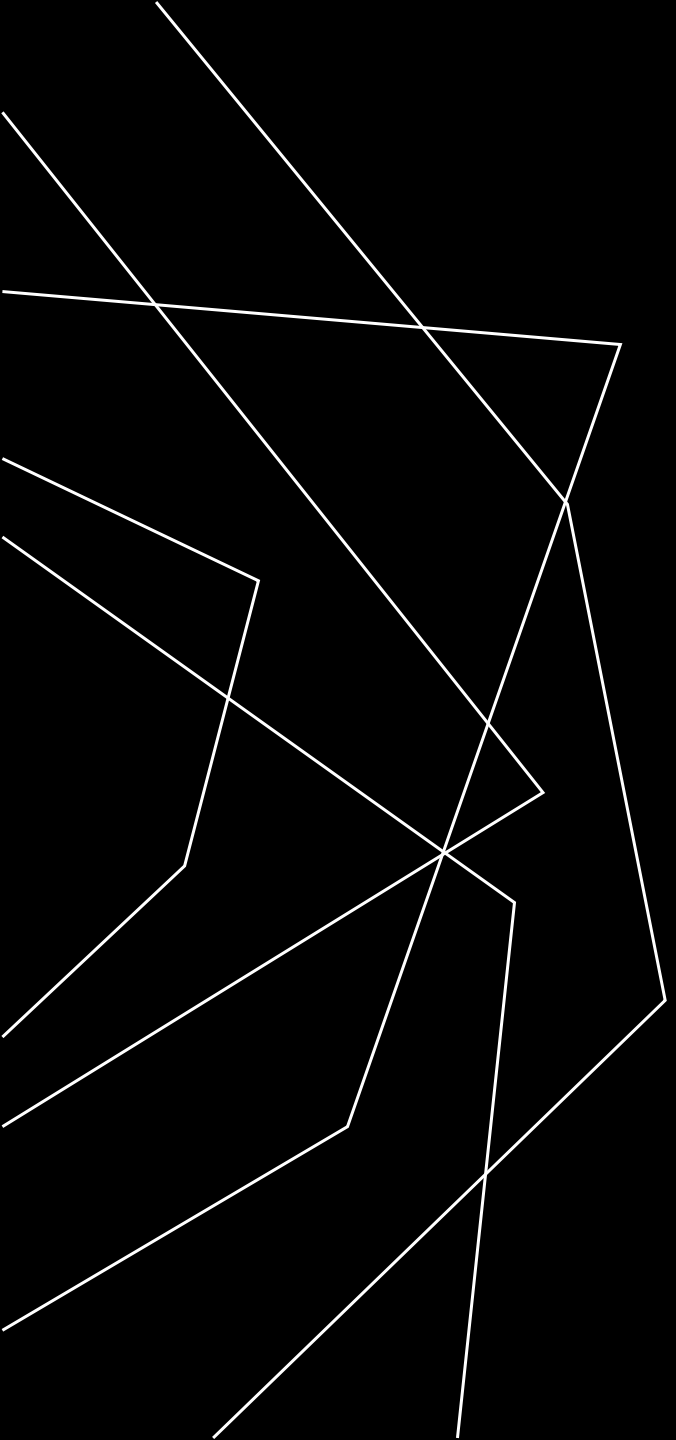


Laporte+20a

OUTER DISC OVERDENSITIES



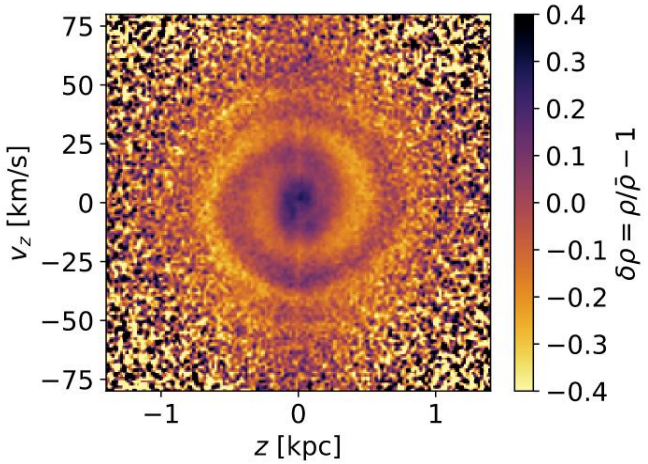
Laporte, Koposov, Belokurov 2022



MANTRA 3

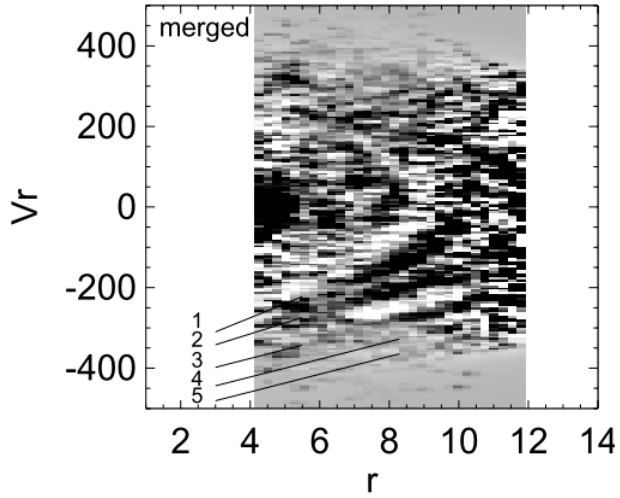
The Galaxy can be considered in a steady state (equilibrium)

Stellar disc



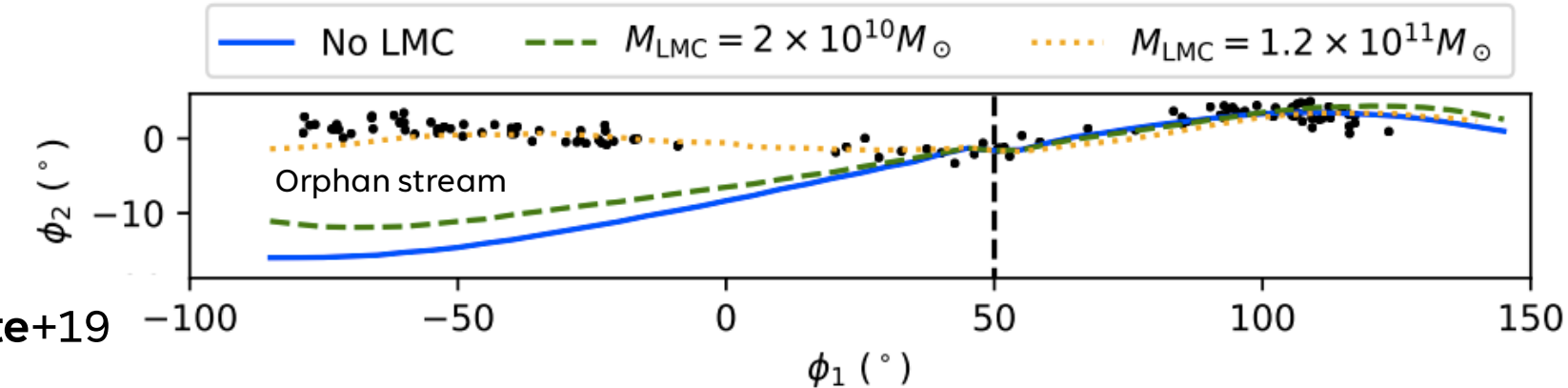
Laporte+19 (see also Antoja+18)

Inner stellar halo



Belokurov+22

Outer stellar halo (r>50 kpc)

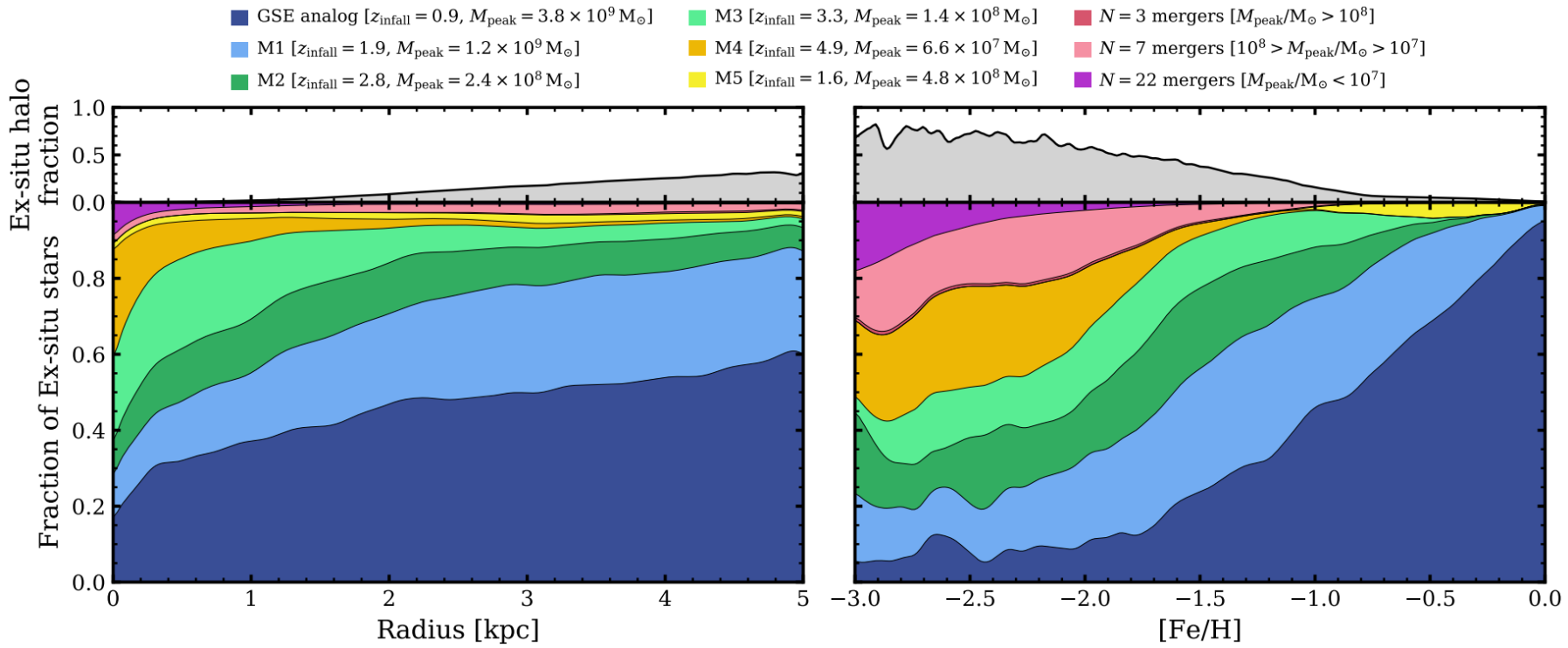


Erkal, Belokurov, **Laporte**+19

CHALLENGES

Mantra 1: Our local stellar halo formed hierarchically from the accretion of many low mass dwarf galaxies.

How do we find the earliest and small accreted satellites?

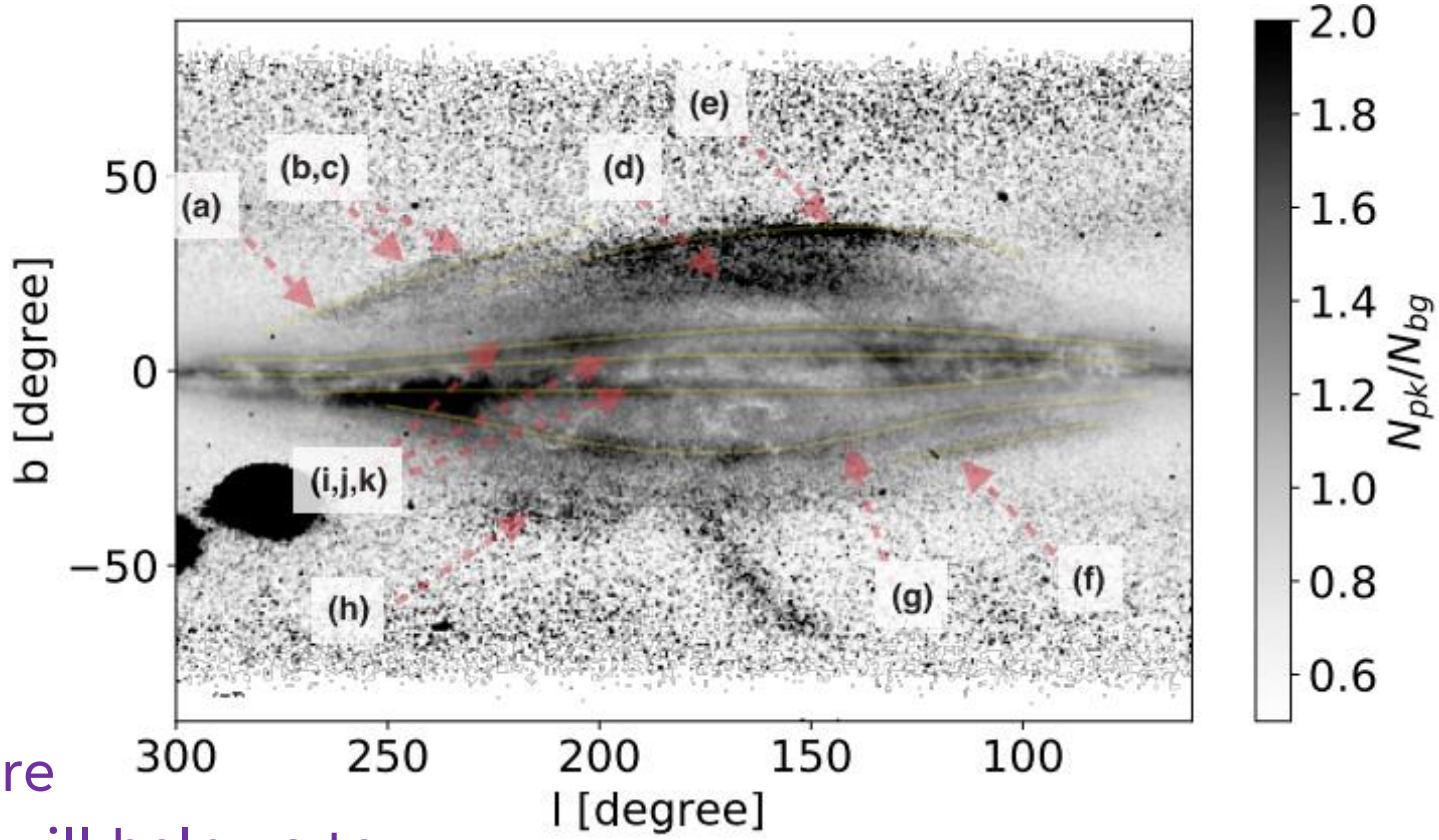


Orkney+ in prep.

CHALLENGES

Mantra 2: The stellar halo is inhabited by stellar streams of accreted objects

What are the origin of other substructures identified in the outer disc?



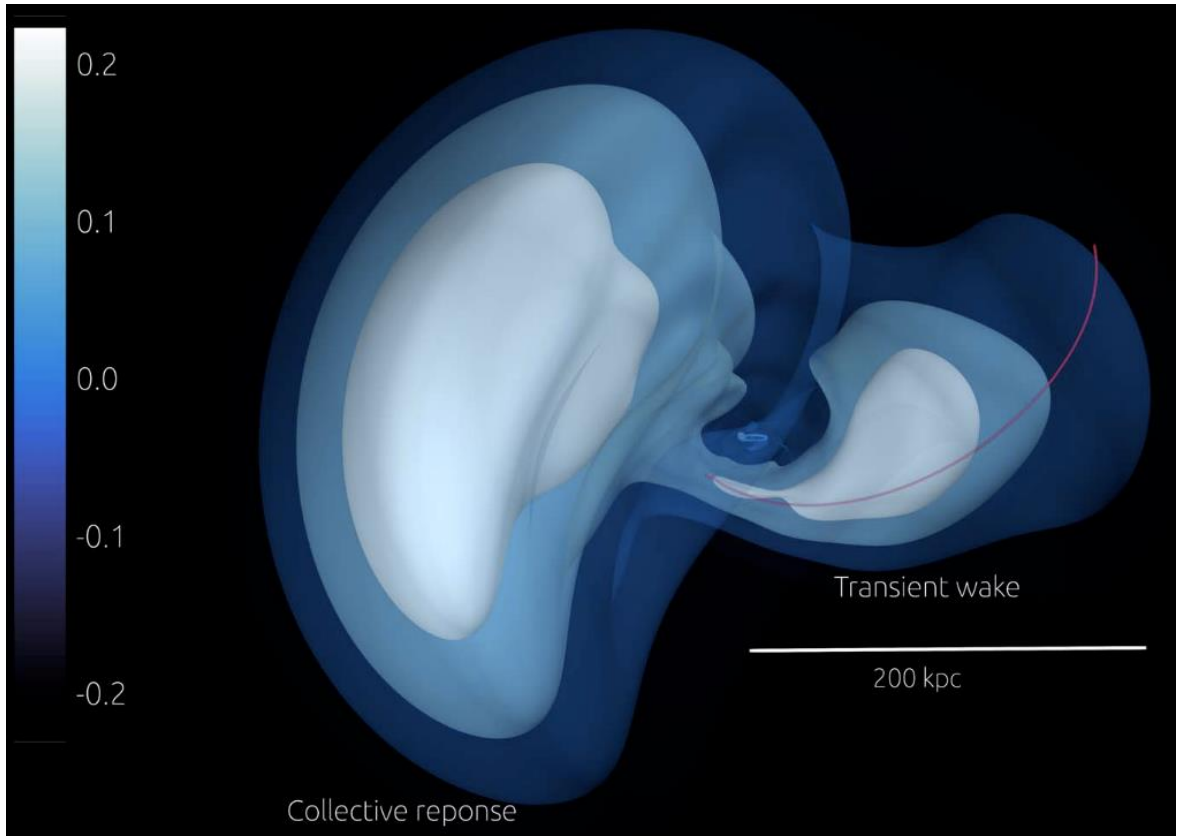
SDSS-V and other future spectroscopic surveys will help us to answer that!

Laporte, Koposov, Belokurov 2022

CHALLENGES

Mantra 3: The Galaxy can be considered in a steady state (equilibrium)

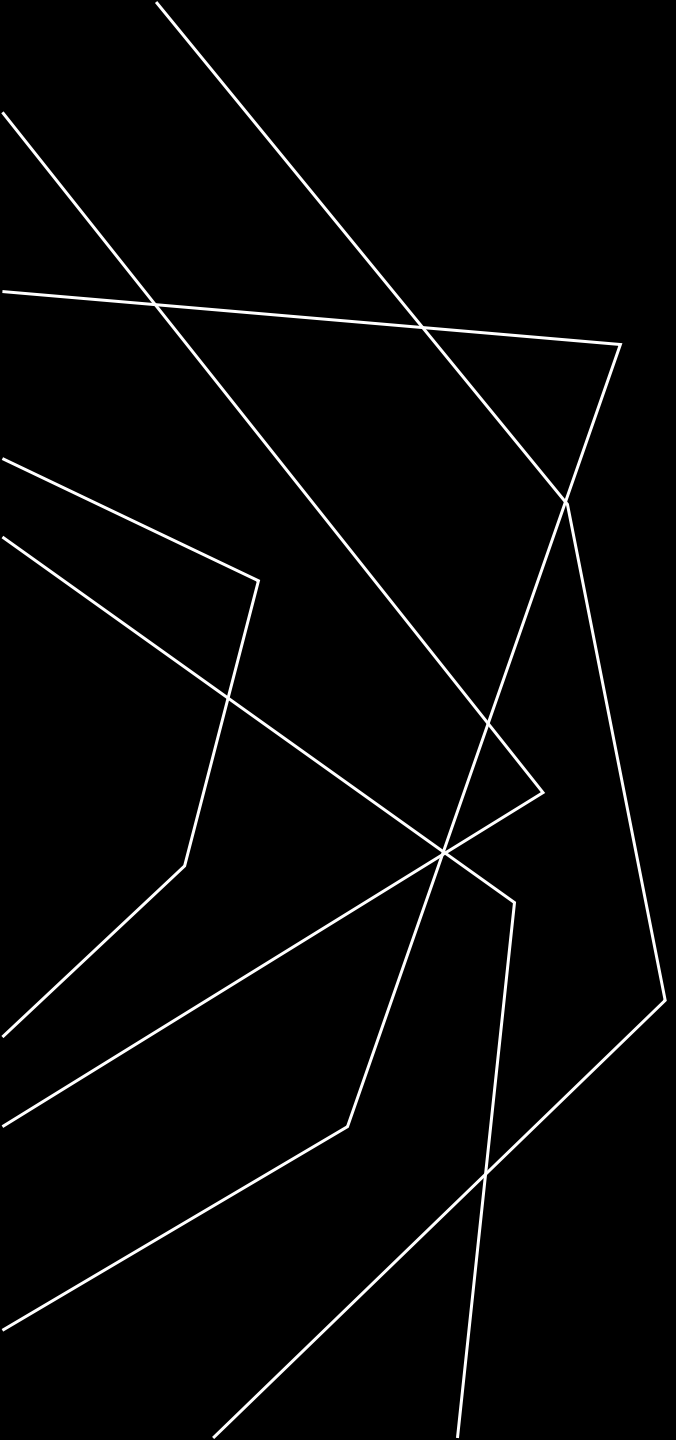
How can we improve the modelling of disequilibrium?



Garavito-Camargo, Besla, **Laporte**+21

Basis Function Expansions is a great tool to understand the non-equilibrium of the MW (see also, e.g. Lilleengen+23)

For example, it helps to quantify the magnitude of a perturbation versus idealized profiles. On other words, disentangle the contribution of, e.g., the disc's self-gravity, dark matter wakes, and how these affect the MW



THANK YOU