# Proper Motion Studies of Stellar Populations in the Local Group and Beyond

Special Session Maximizing the Science from Two Great Observatories
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AAS 235, Hawaii, January 2020

Local Group Intrigue

Pawlowski/Bullock/Boylan-Kolchin

Garisson-Kimmel et al.
2014; Ostriker et al. 2019)

- Planes of Satellites (e.g.,
  Santos-Santos et al. 2018,
  Pawlowski et al. 2013,
  Ibata et al. 2013)

- Shape of dark matter halo
  (e.g., Law & Majewski
  2010)

Diemand et al.
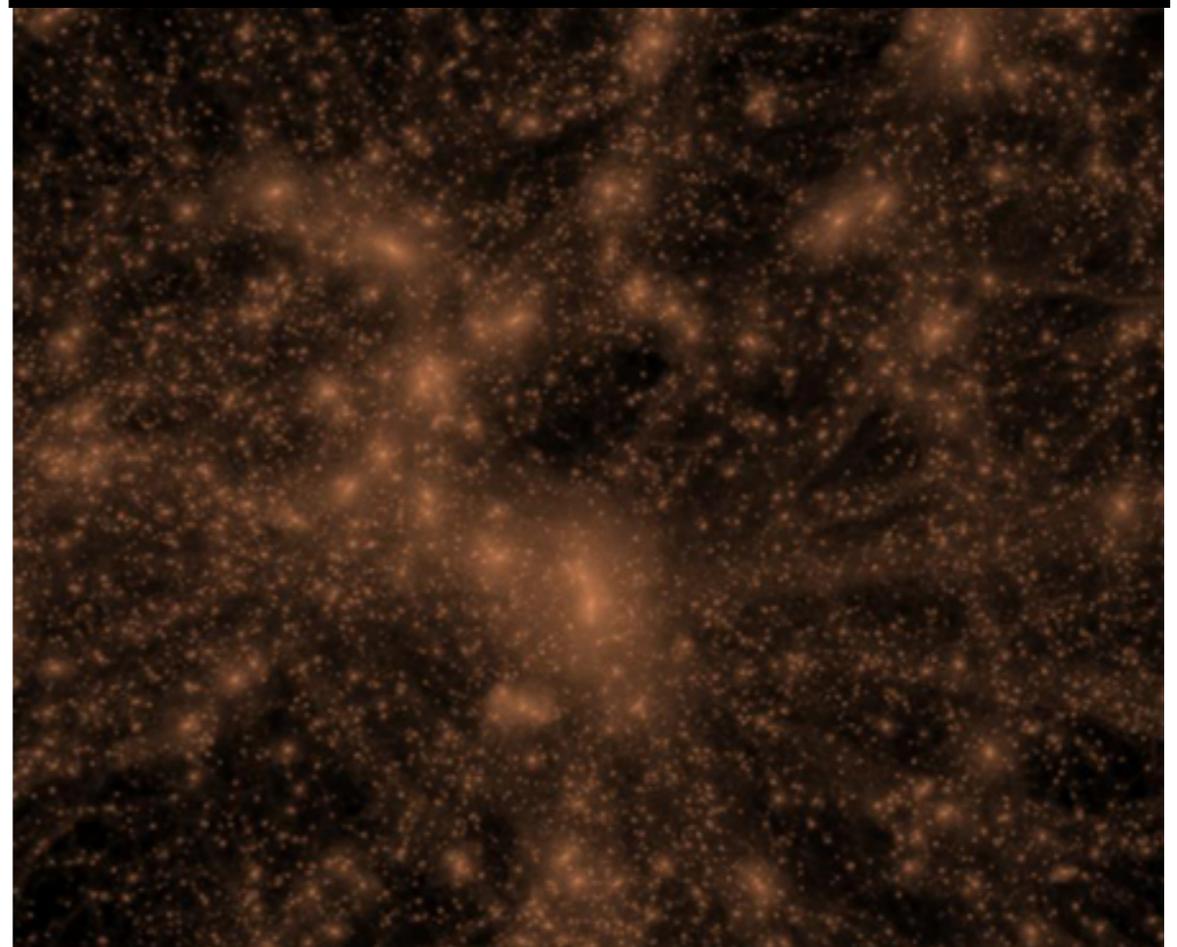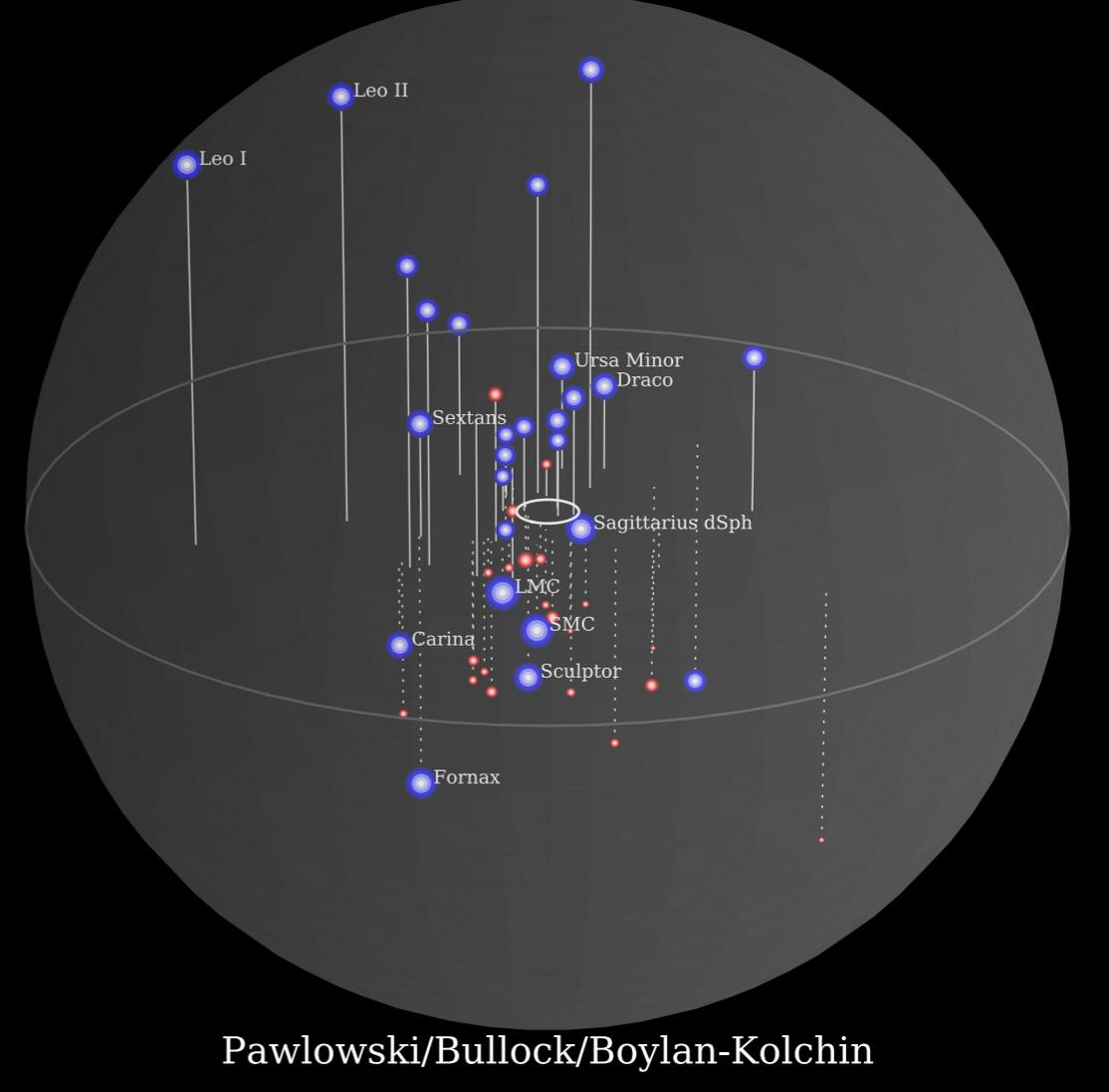
Two HST Treasury Programs


**Milky Way: 30 dwarf galaxy targets
164 orbits**

**M31: 23 dwarf galaxy targets
 244 orbits**

PI: Nitya Kallivayalil
Co-PI: Andrew Wetzel

PI: Dan Weisz
Co-PIs: Nitya Kallivayalil &
Andrew Wetzel
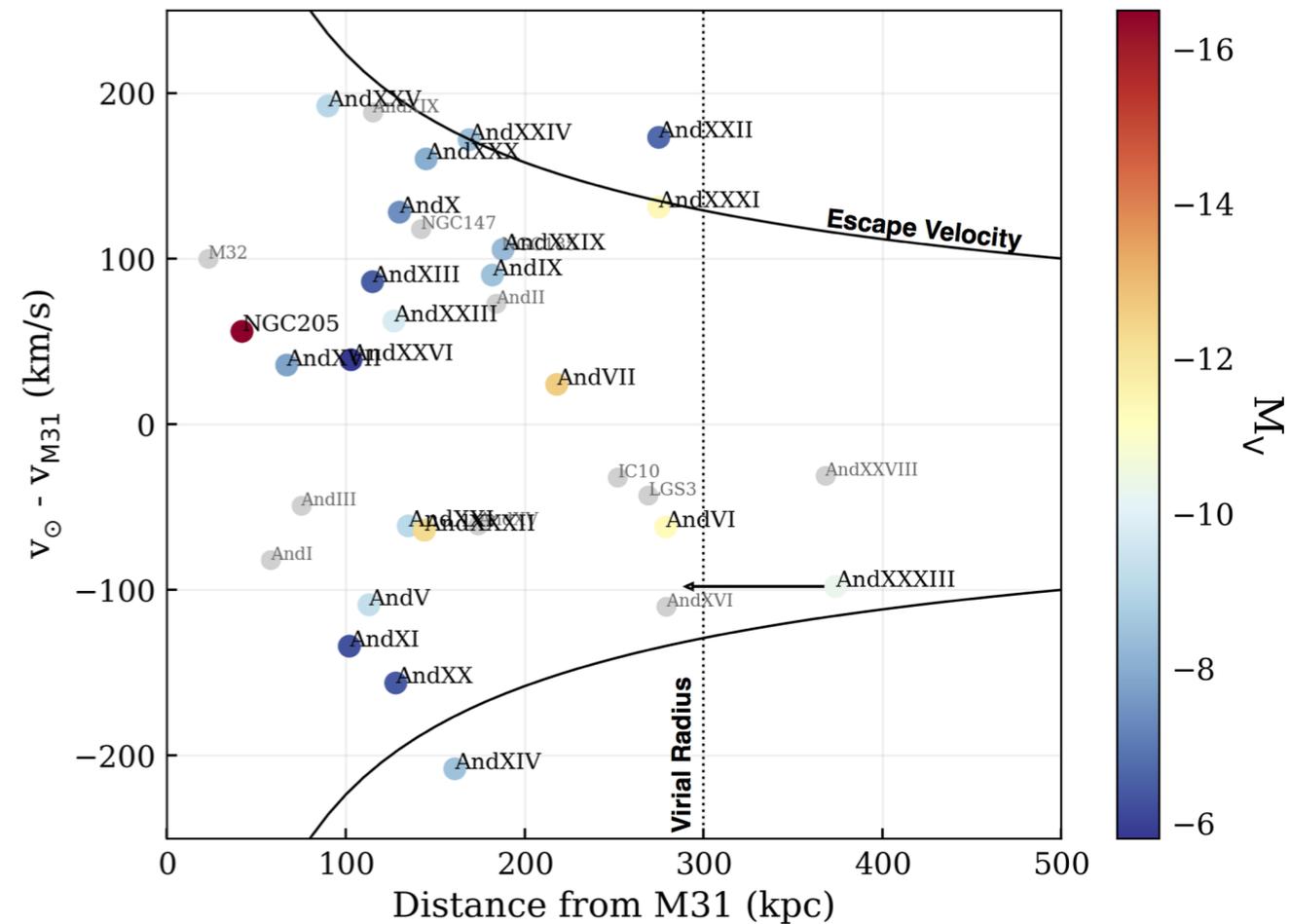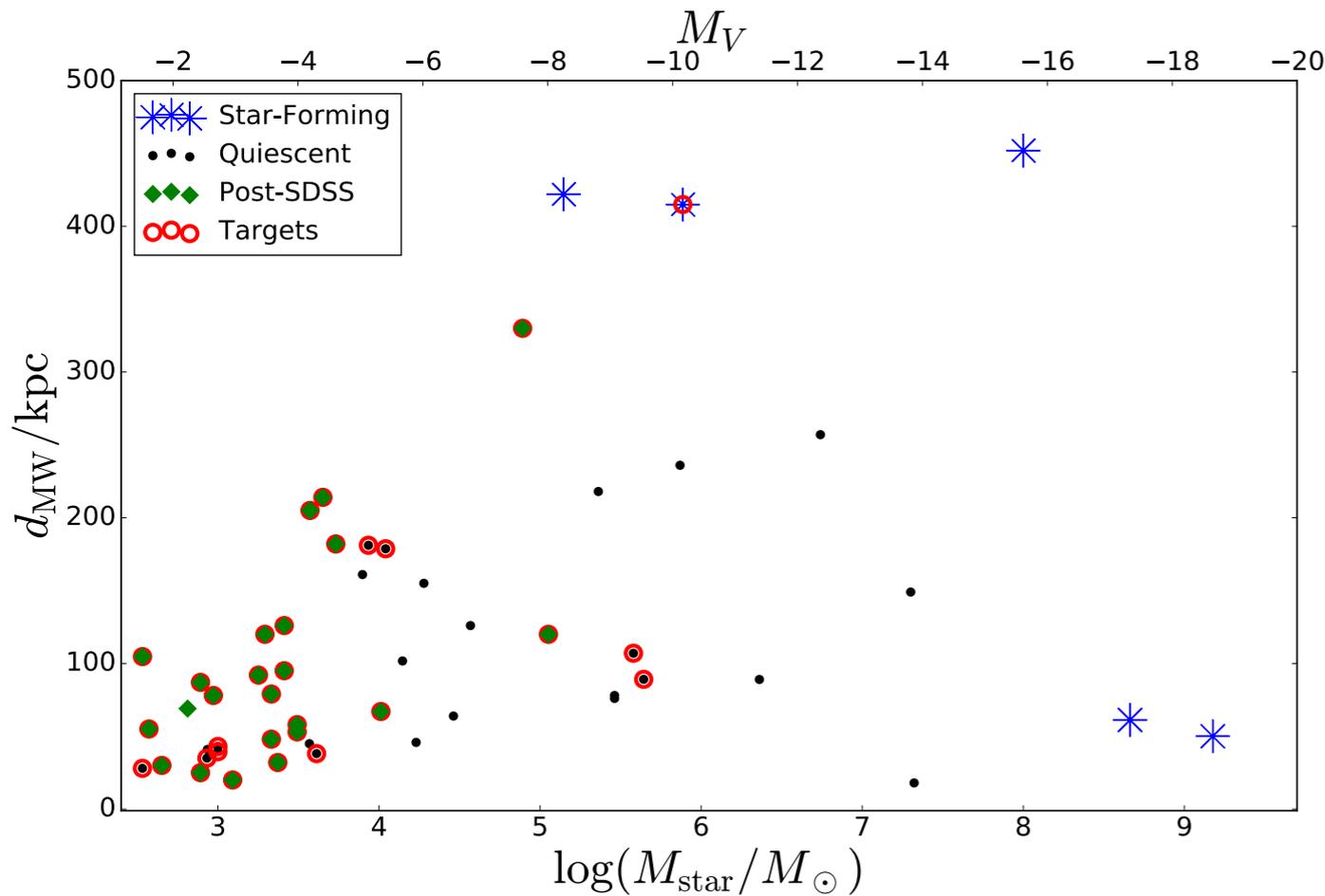
Internal Kinematics of Dwarf Galaxies

Fritz et al. 2015, Kallivayalil et al. 2015
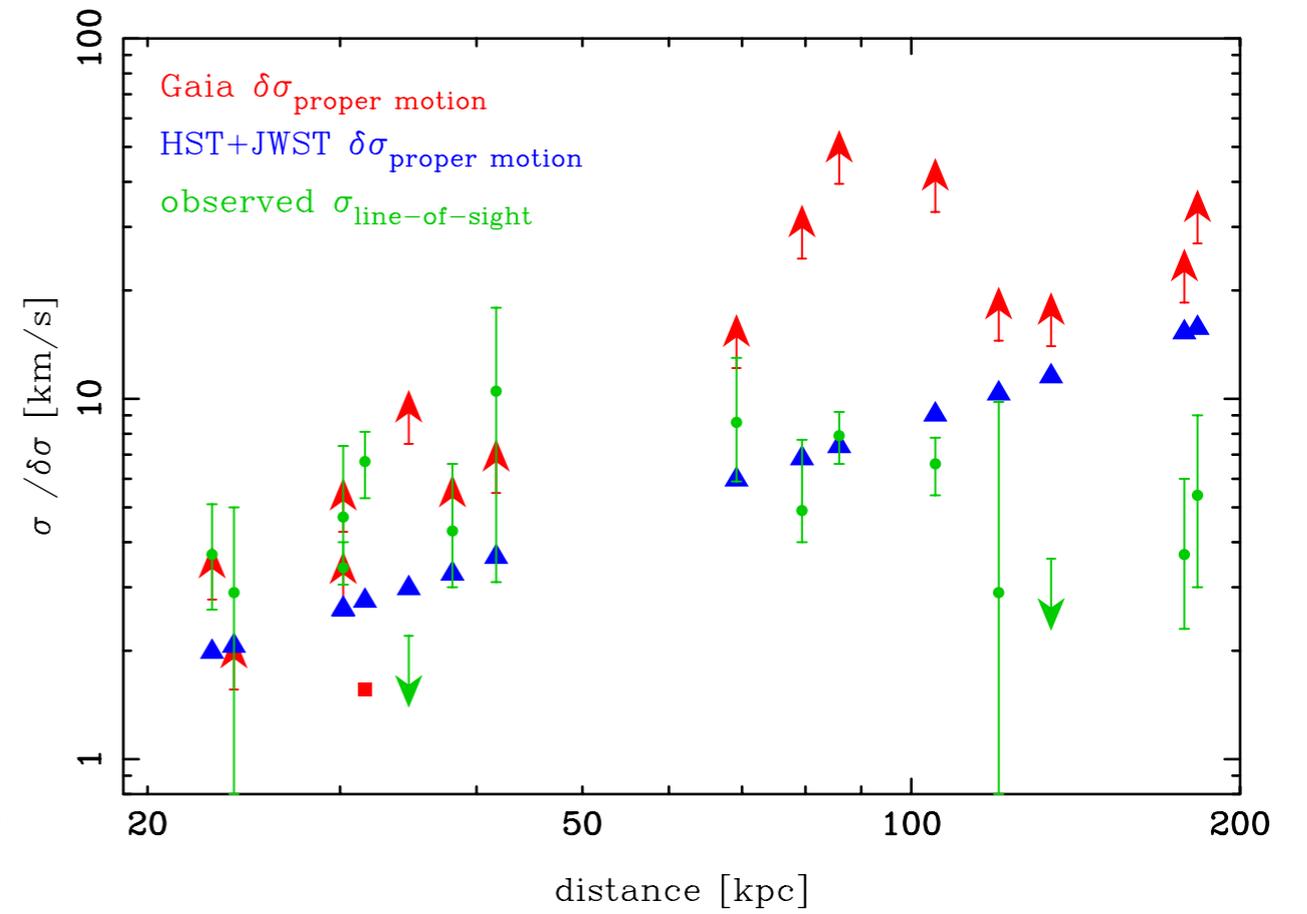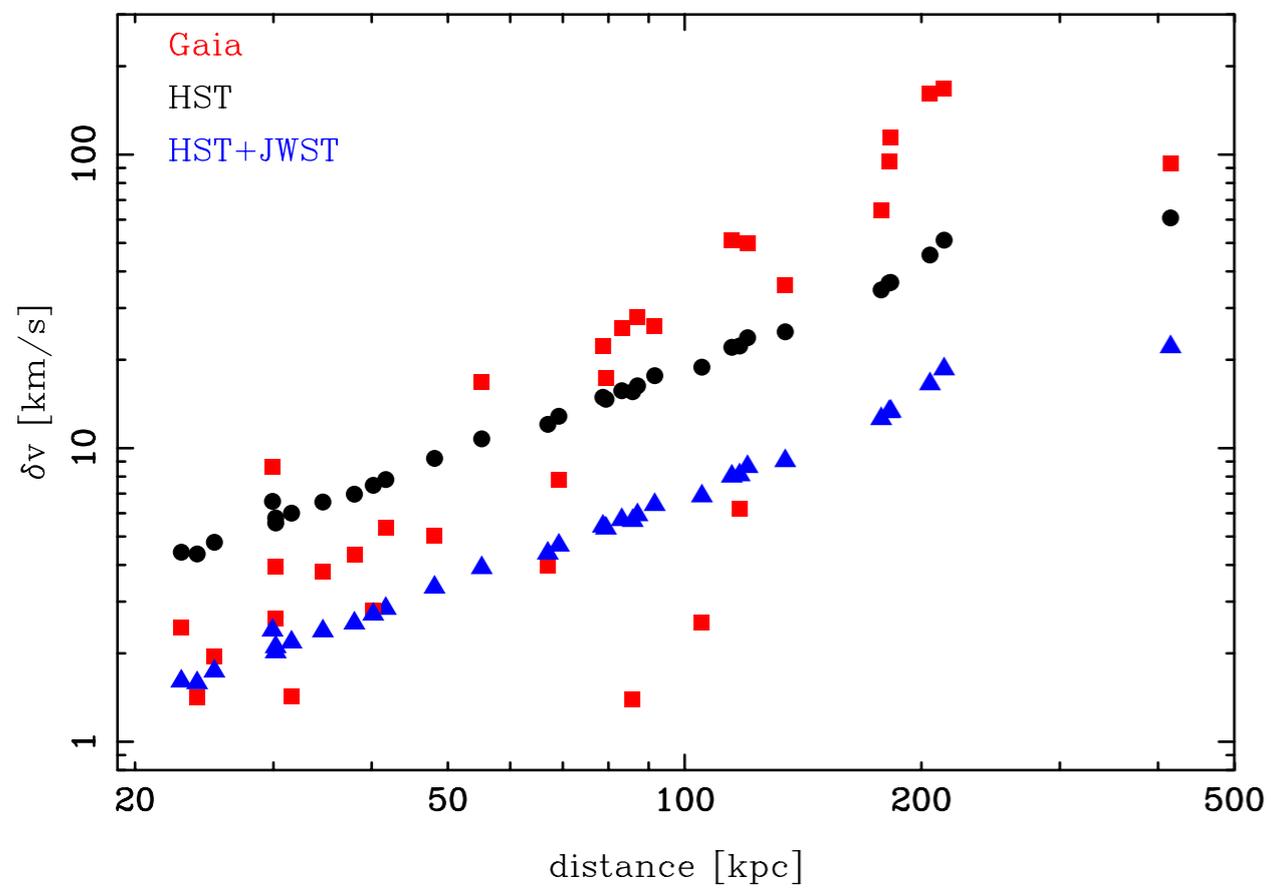
The Effect of Environment on Low-Mass Galaxy Evolution

HST SFH and PM of Leo I

First R$_{vir}$ crossing: ~2-3 Gyr ago

Pericentric Approach: ~1 Gyr ago
at ~ 90kpc

Quenched SF: ~ 1 Gyr ago
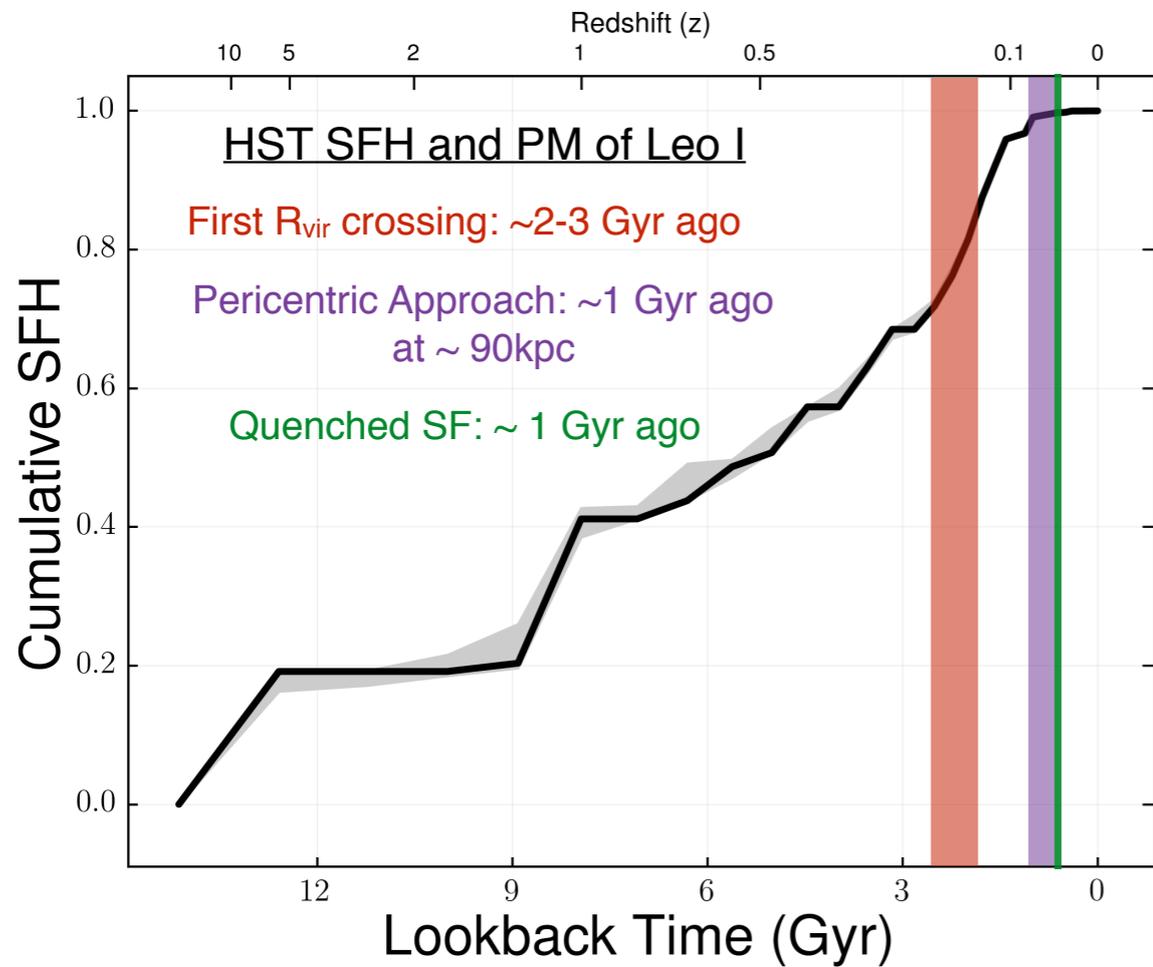
Sohn et al. 2013; Boylan-Kolchin et al. 2013
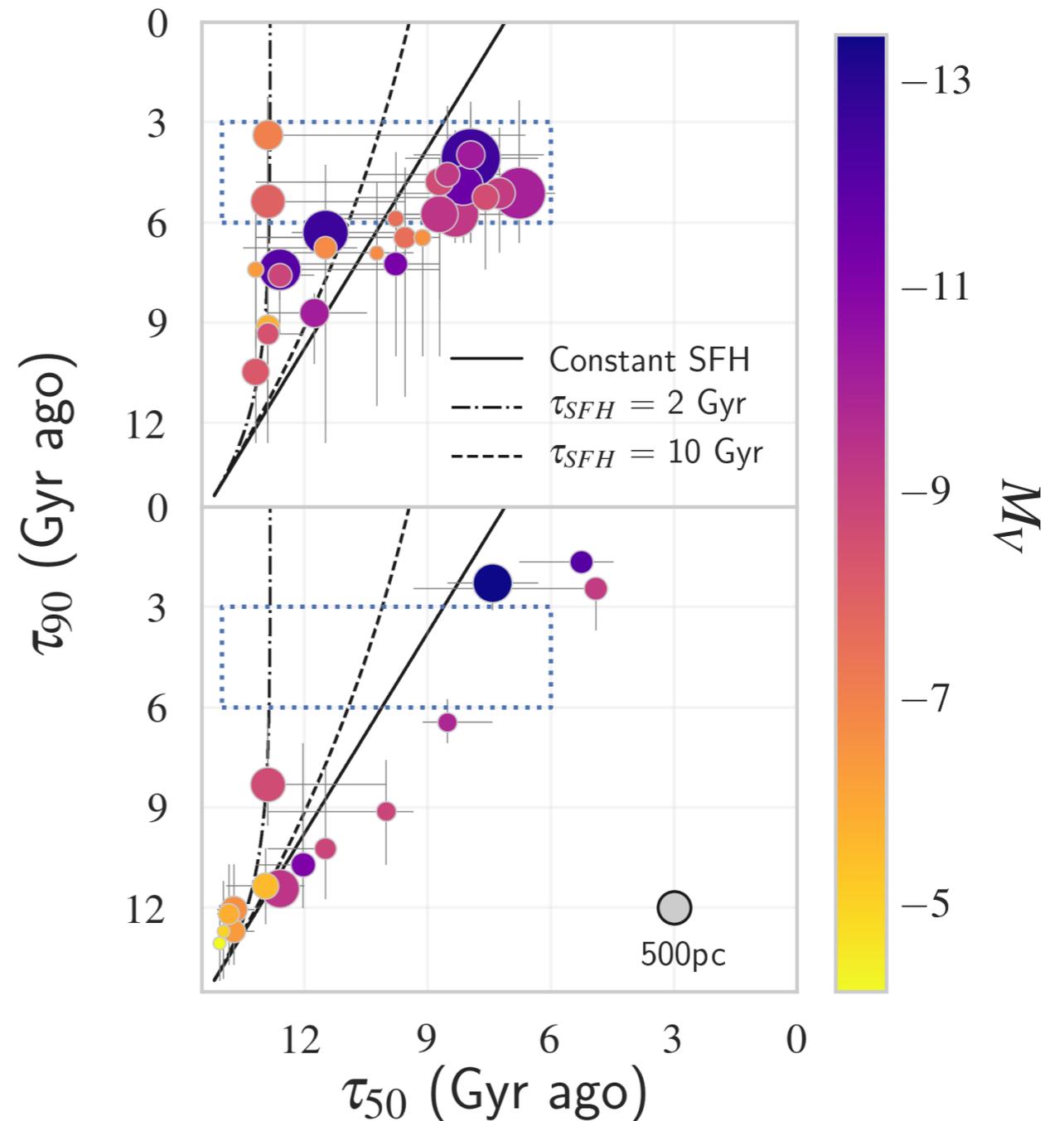
Weisz et al. 2019

Dwarf Galaxies as Probes of Reionization

Brown et al. 2014, Garrison-Kimmel et al. 2014, Weisz et al 2014
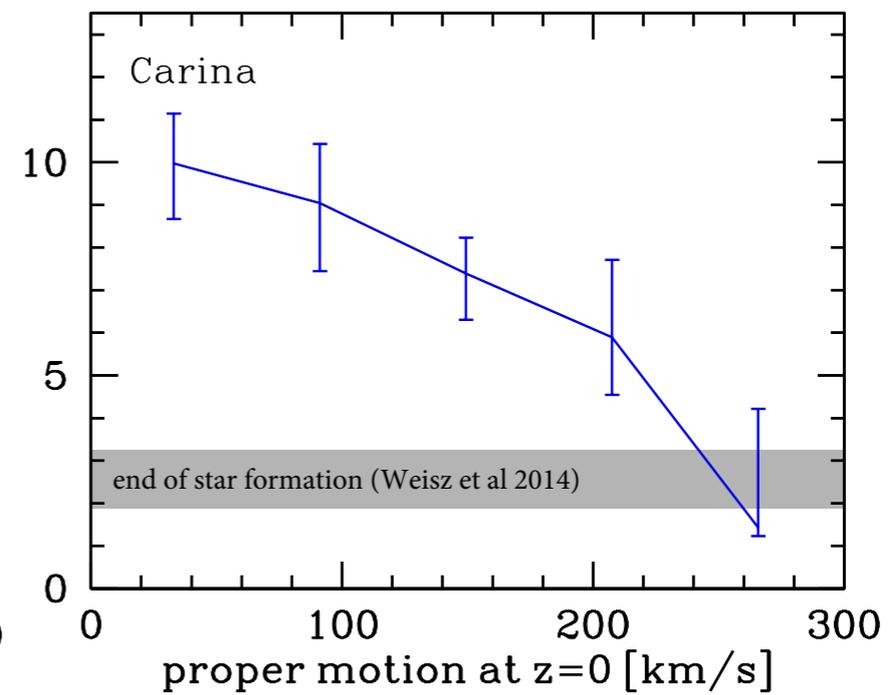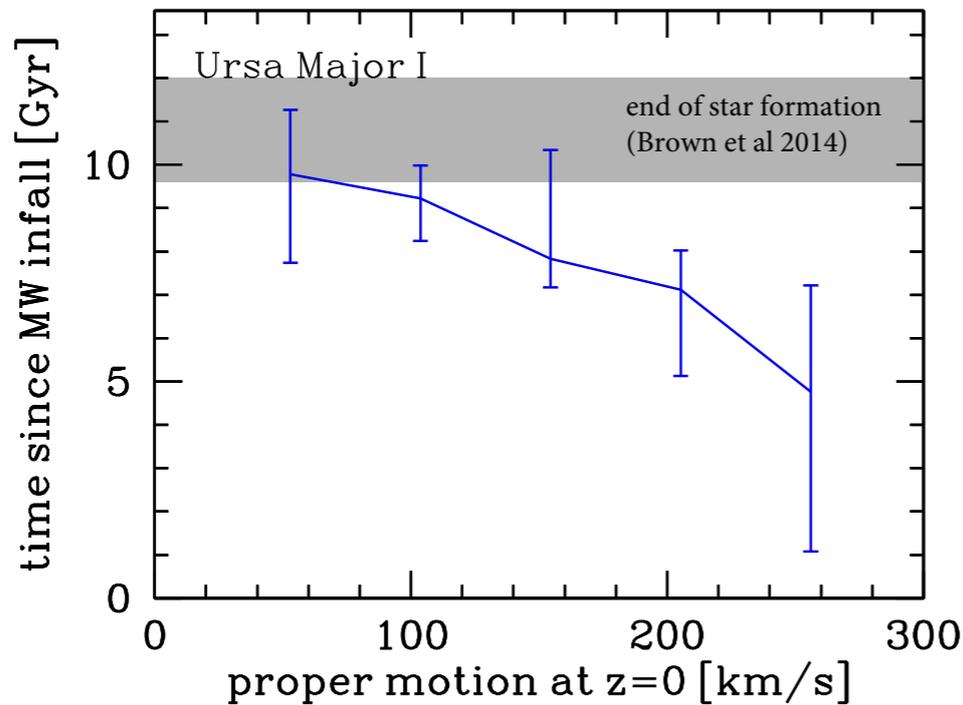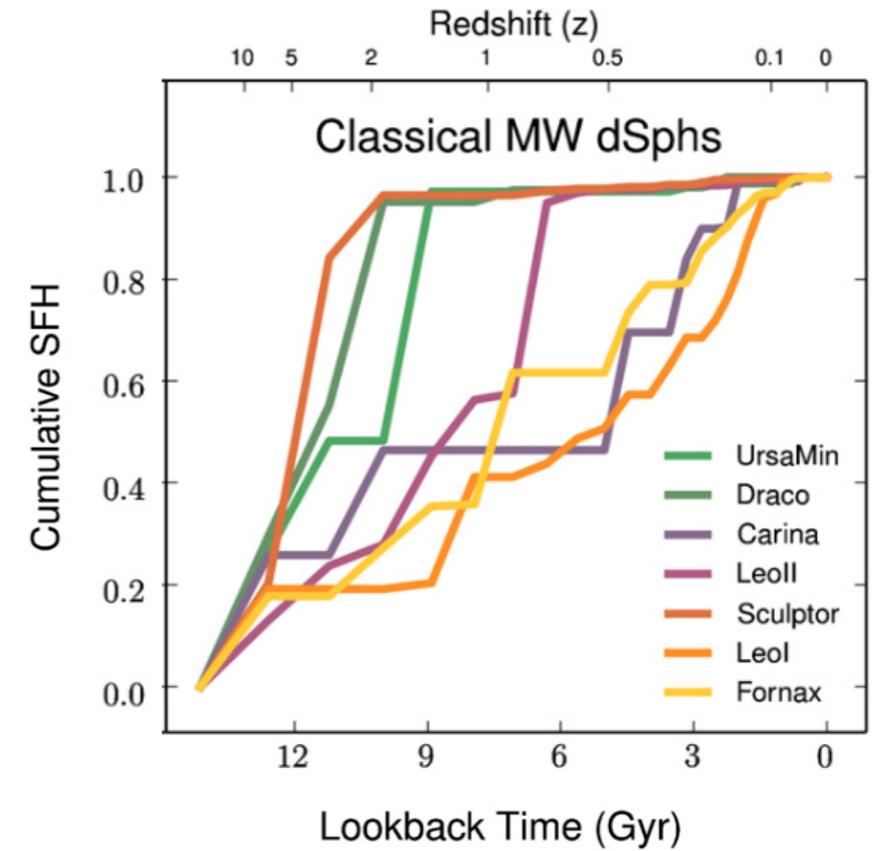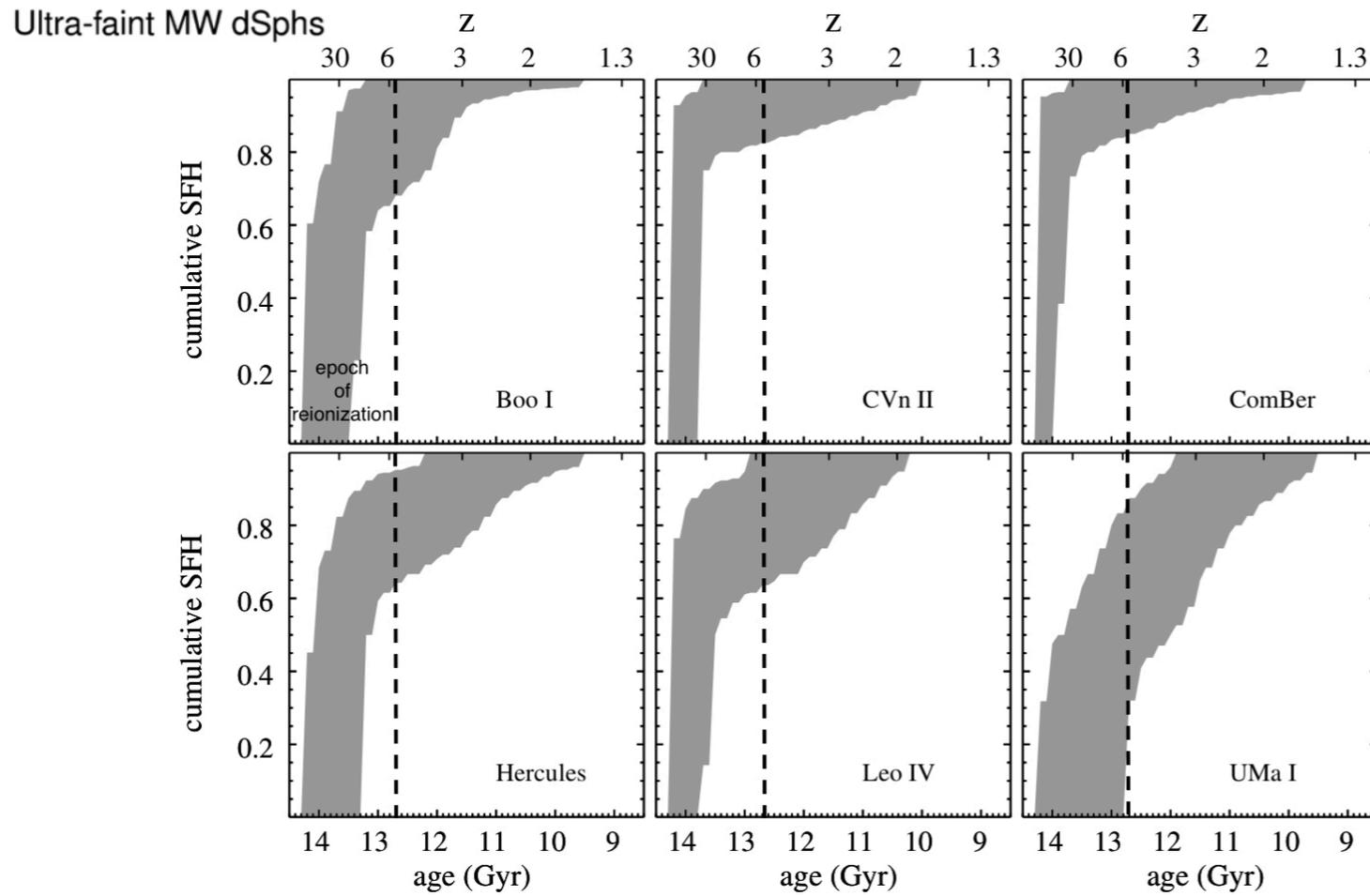
Planes of Satellites: Serious Problem or Distraction?
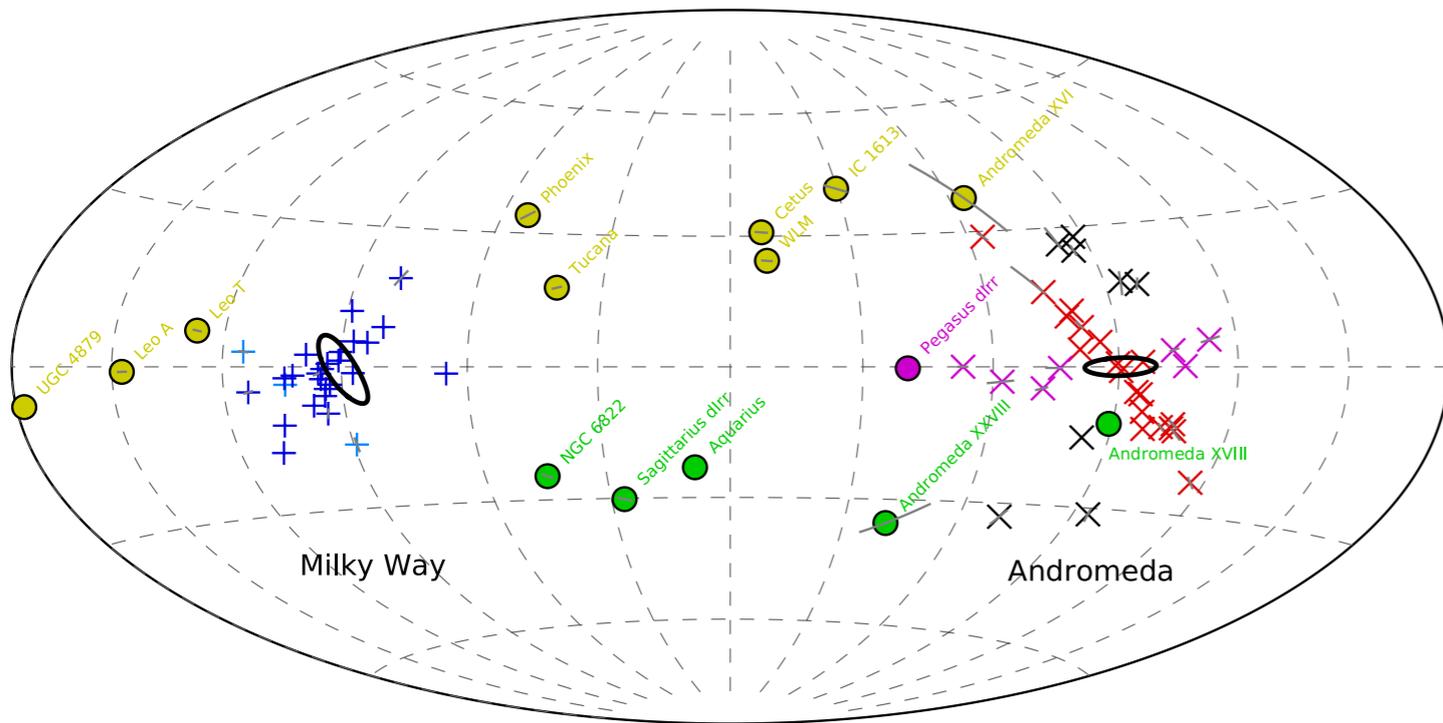
Pawlowski et al. 2013
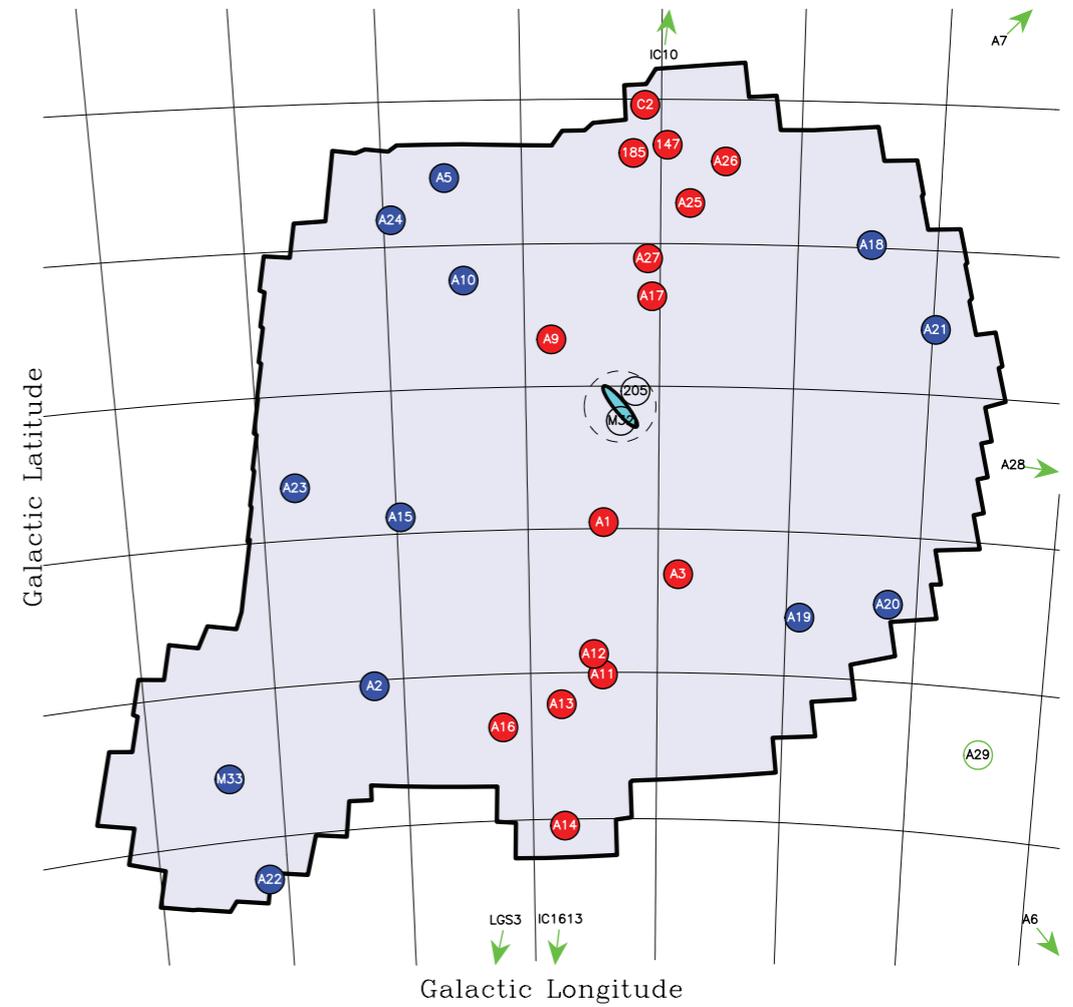
Ibata et al. 2013

JWST ERS Resolved Stellar Populations Program

PI: Dan Weisz

JWST **will resolve individual stars at larger distances, to fainter luminosities, in more crowded areas, and in regions of higher extinction:**

- *Star Formation Histories. JWST* will measure the first MSTO-based SFHs of galaxies beyond the LG, out to distances of ~5 Mpc.
- The Sub-Solar Mass IMF. JWST will easily make sub-Solar mass IMF measurements for dozens of galaxies in the LG, enabling a systematic search for variations at which HST observations have only hinted (e.g., Geha et al. 2013; Kalirai et al. 2013).
- Proper Motions. JWST has the potential to measure proper motions for hundreds of nearby galaxies and can provide complete phase space information for individual stars within ~100 kpc (e.g., Kallivayalil et al. 2015).

Cioni et al. 2011