Signatures of tidal disruption in the Hercules ultra-faint dwarf galaxy

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UFDs are pristine and dark systems in the local group.

Ultra-faint dwarf galaxies (UFDs) are the **oldest, least luminous, and least chemically evolved** stellar systems in the local group. As a result, they provide a unique window into the study of **first galaxies**. They are also the **most dark matter dominated** systems, allowing us to learn more about the behavior of **dark matter on small scales**.

Near the Milky Way, UFD gets **tidally disrupted**. The tidal interaction complicate the modeling and interpretation of the original properties of the UFDs before in fall.
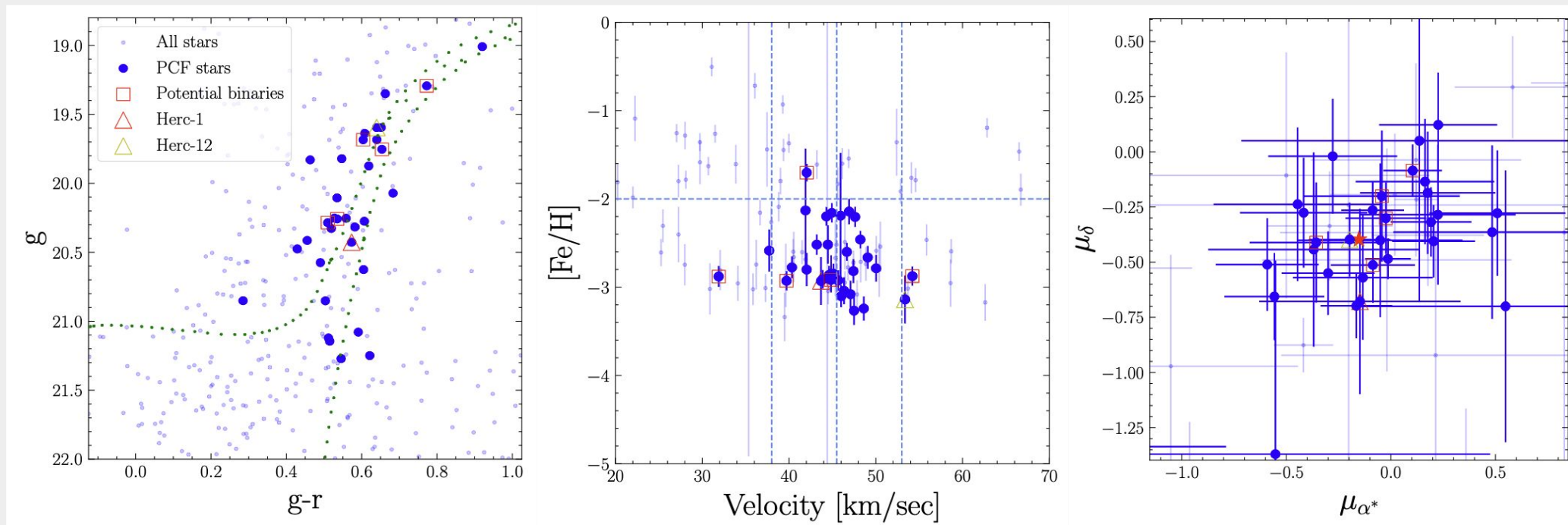
Hercules is a prime target for studying the tidal interaction between UFD and the MW.

orbit direction

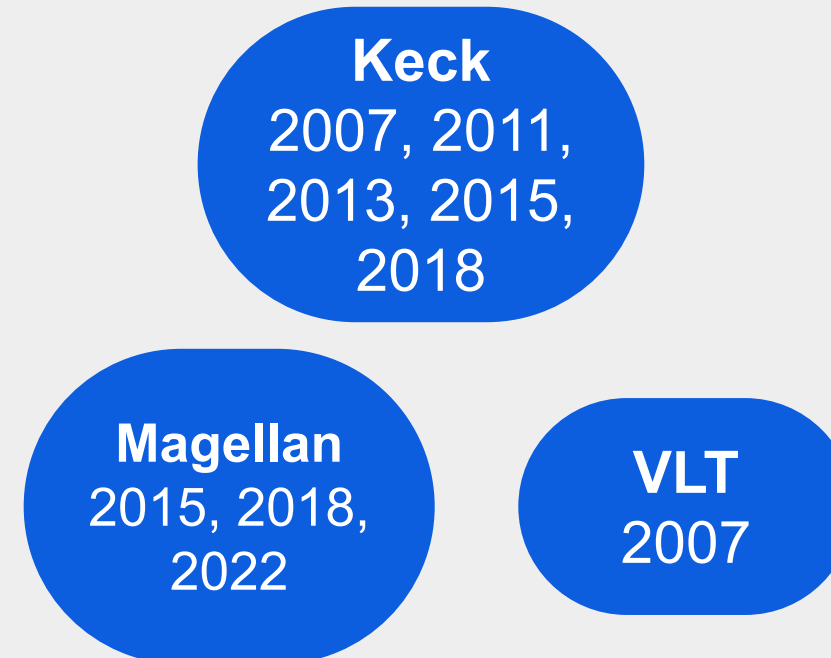LBT / Max-Planck-Institut für Astronomie
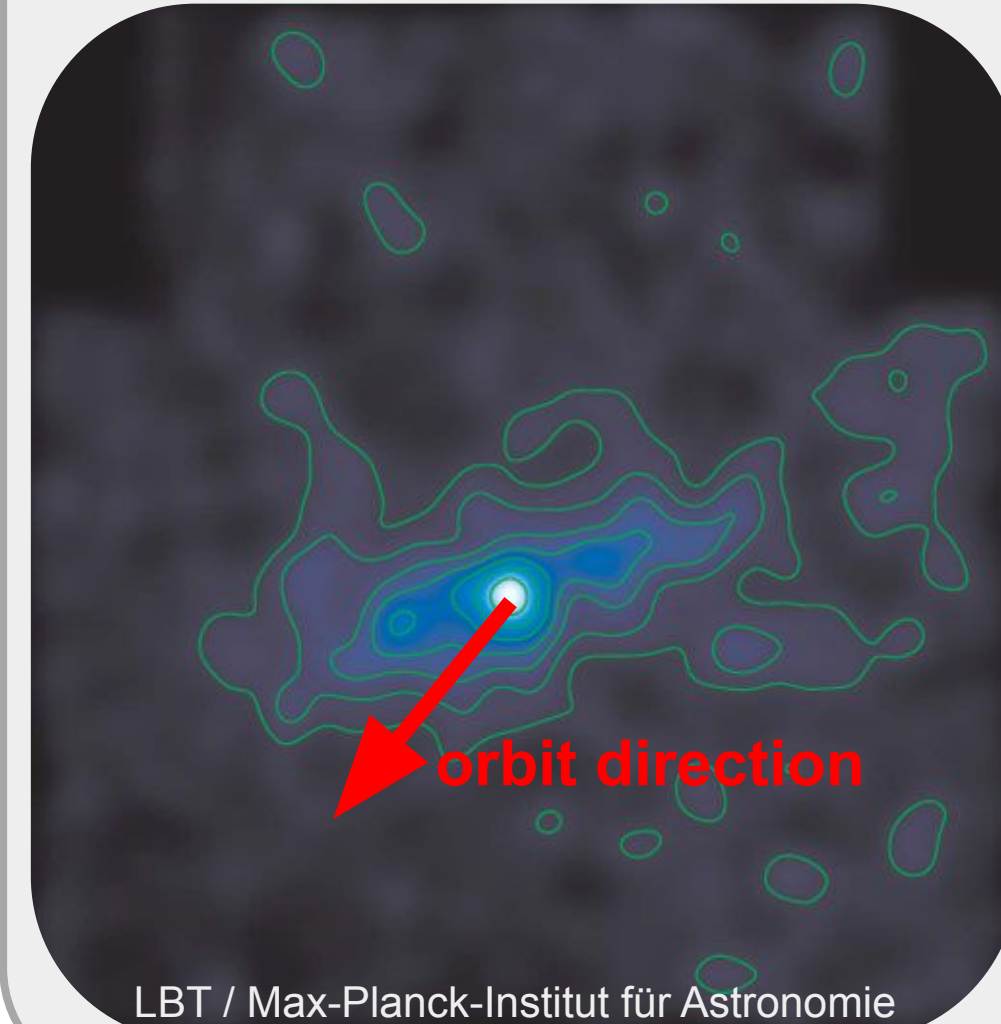
Elongated with a 3:1 axis ratio (photometry)

Orbital direction misaligned with elongation (astrometry)

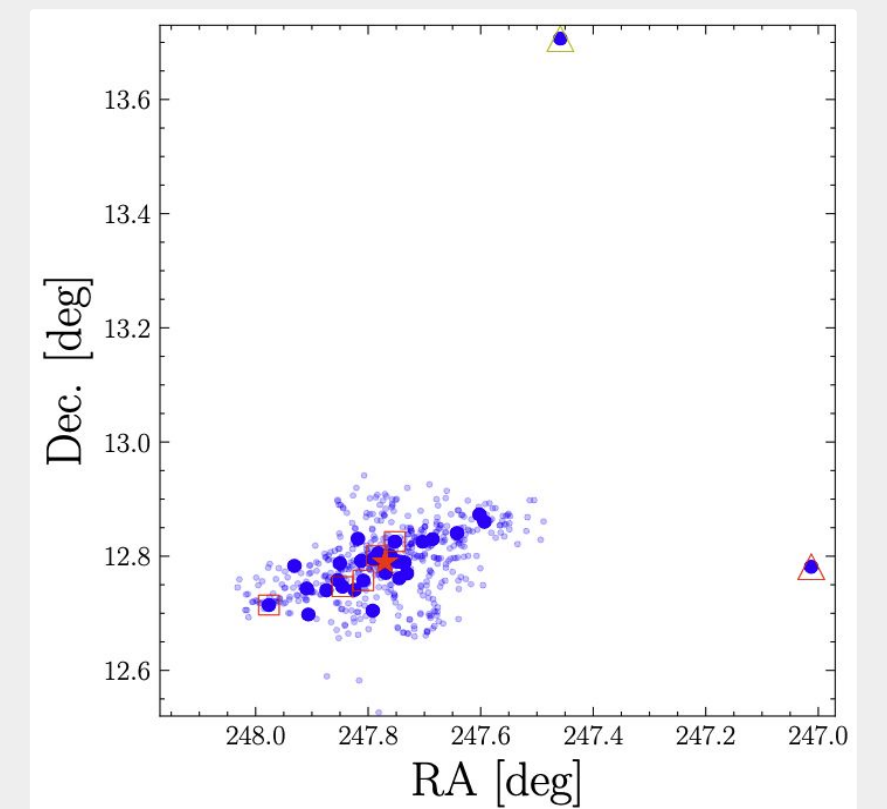## Addressing two challenges: Foreground and Binary Systems

Photometry & chemodynamic selection yielded 33 stars from over 400 candidates.

Keck 2007, 2011, 2013, 2015, 2018

Magellan 2015, 2018, 2022

VLT 2007

We use multi-epoch RV data for 22 stars to identify five stars potentially in **binary systems.**
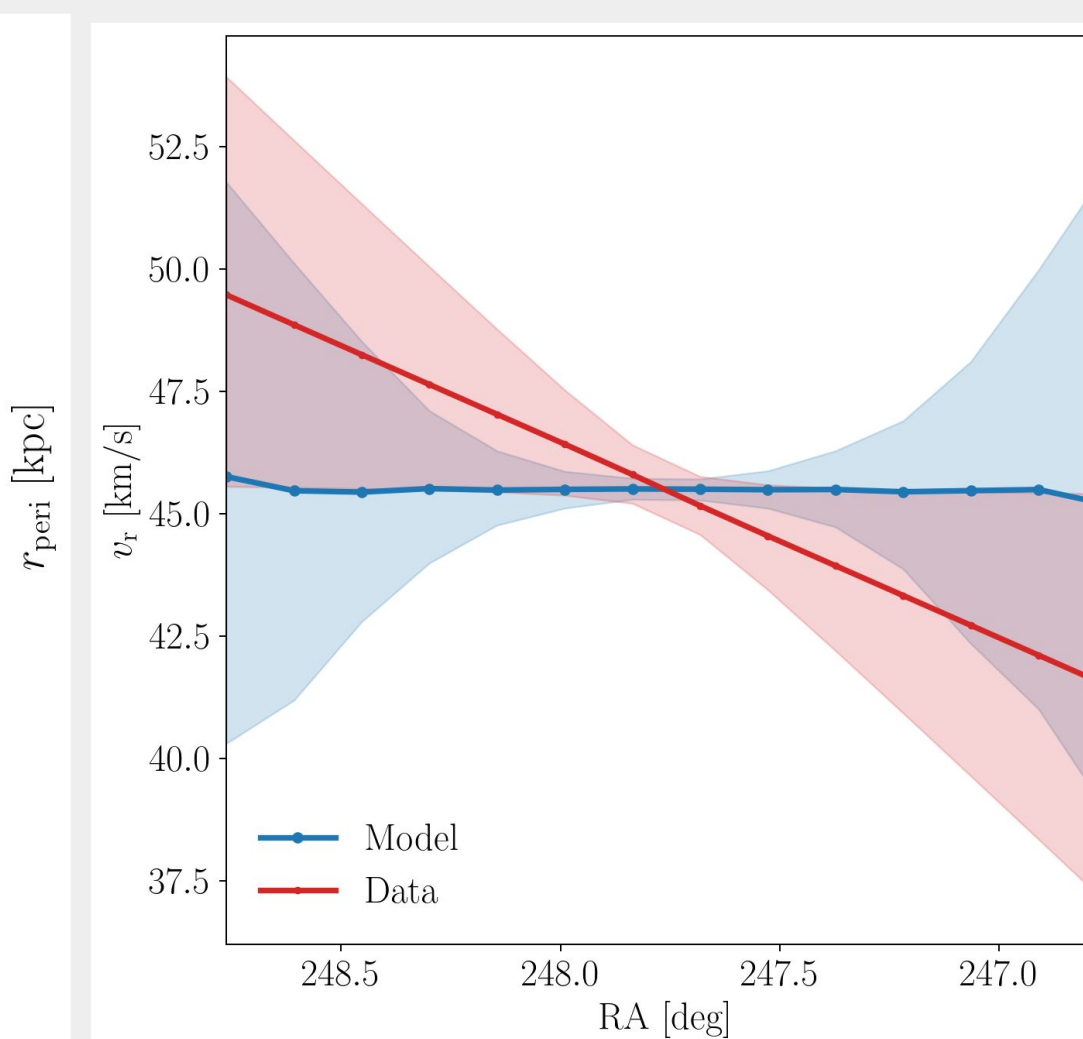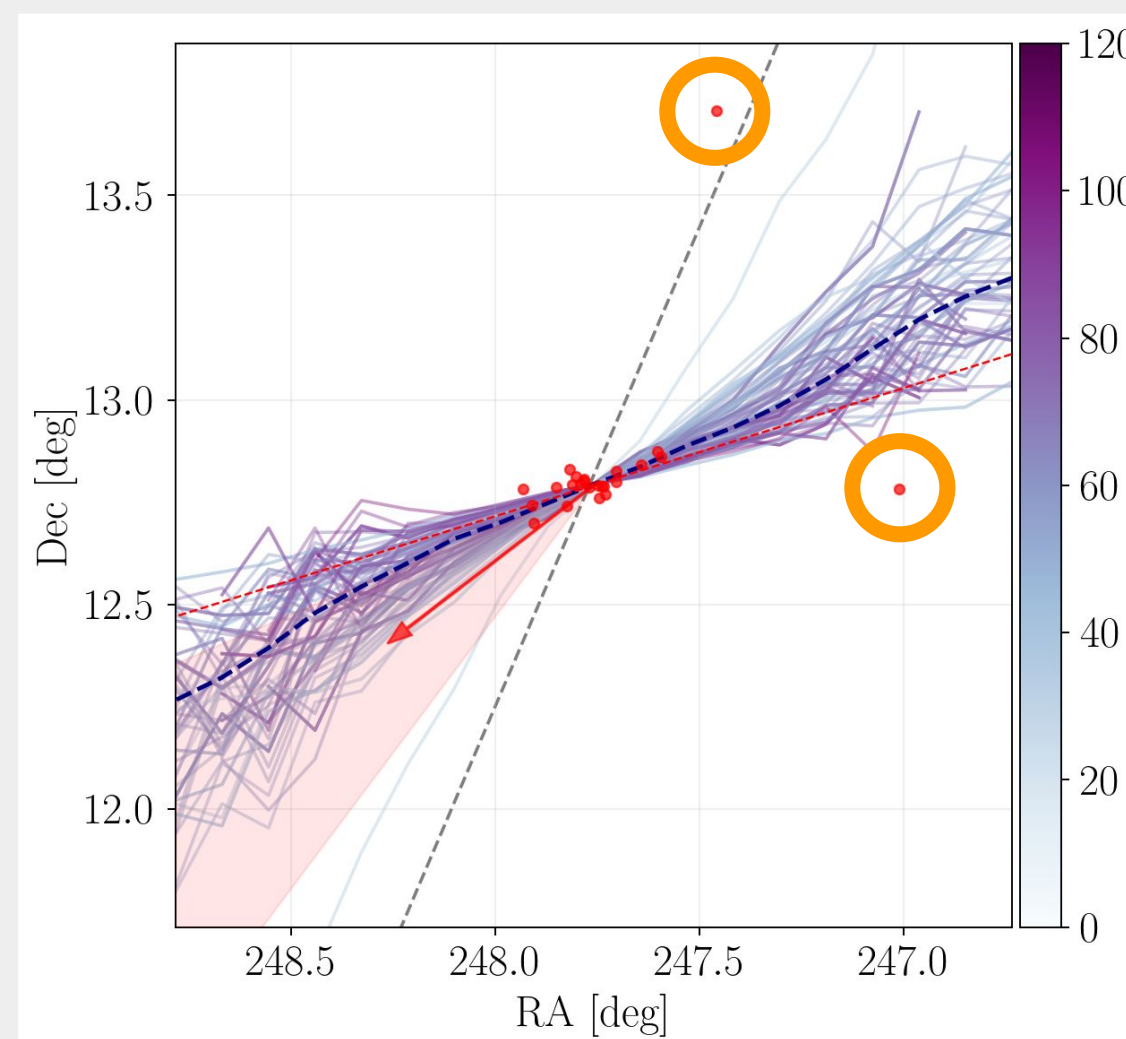
Final sample size: **28** stars

Dynamical modeling and extended stellar halo reveals ongoing *tidal disruption* in Hercules.
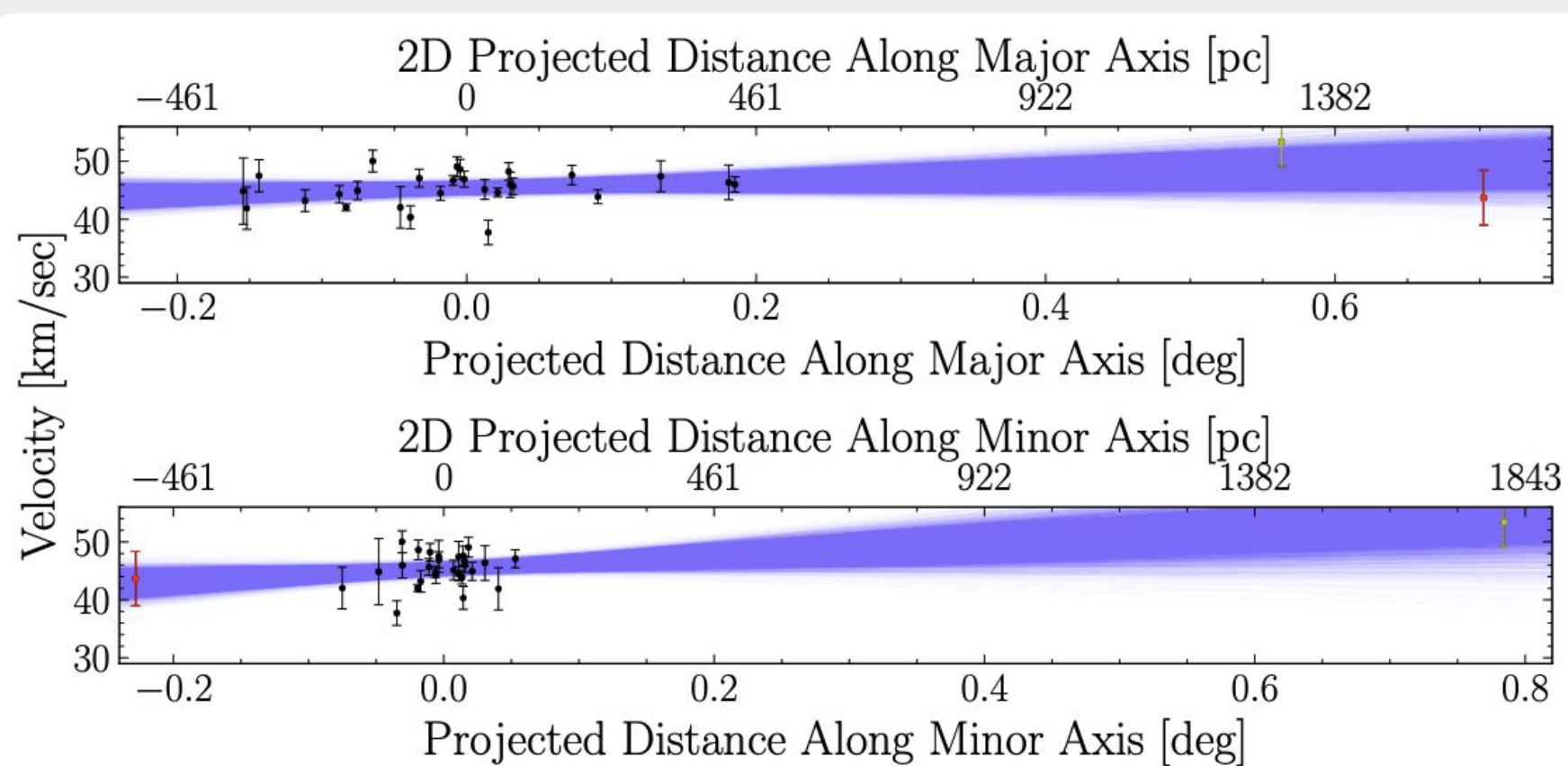
Identified 2 stars at **large separation**

(~1 degree; 1.7 kpc)

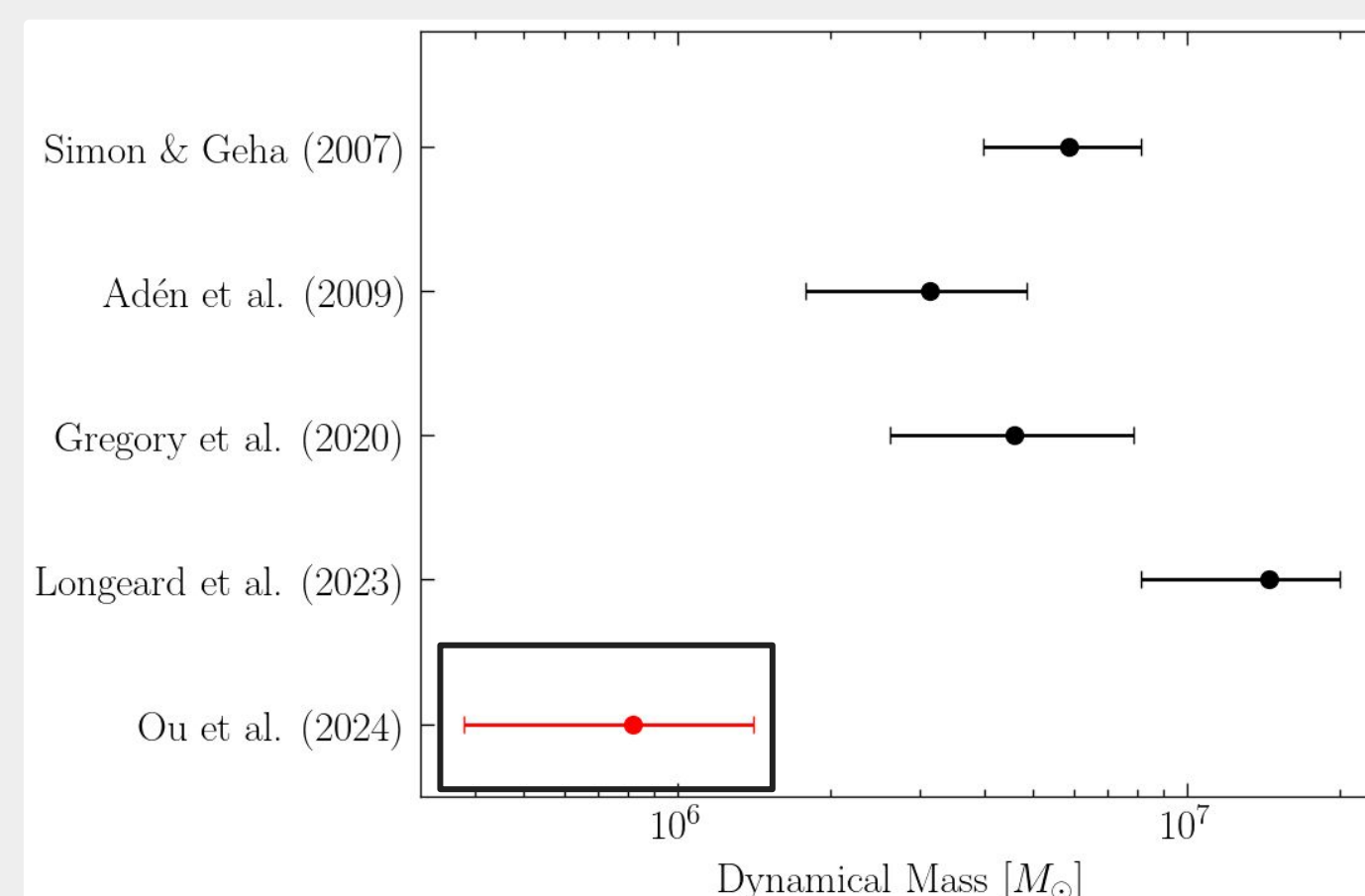**Dynamical modeling of stream formation** predicts the **misalignment**!

Dynamical model predicts a flat line-of-sight **velocity gradient** near the center of Hercules.

Line-of-sight velocity gradient alone is inconclusive.

High-purity sample gives velocity dispersion: 1.9 +\− 0.6 km/s

Dynamical mass of ~ 0.1 × 10^7 solar masses

More reliable sample compared to previous works

arXiv: **2403.00921**