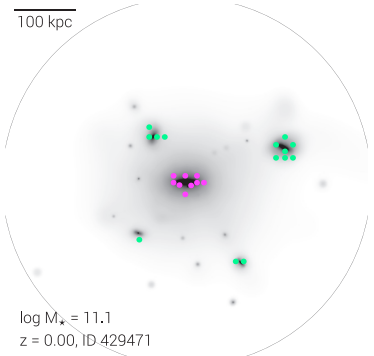
A new classification of ex-situ and in-situ Galactic globular clusters based on a method trained on Milky Way analogues in the TNG50 cosmological simulations

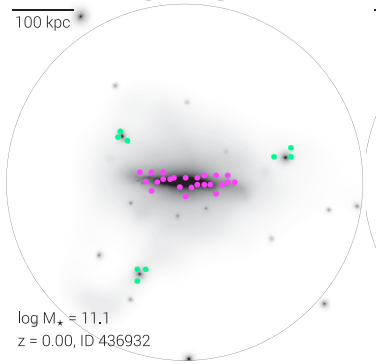
Boldrini, Di Matteo, Laporte et al.+25, submitted to A&A

SCIENTIFIC QUESTION

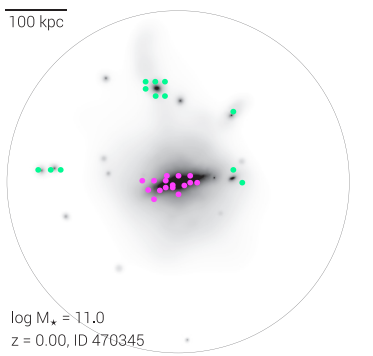
What is the origin of the MW globular clusters?

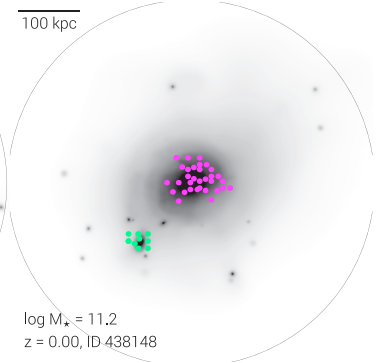
EX-SITU





IN-SITU



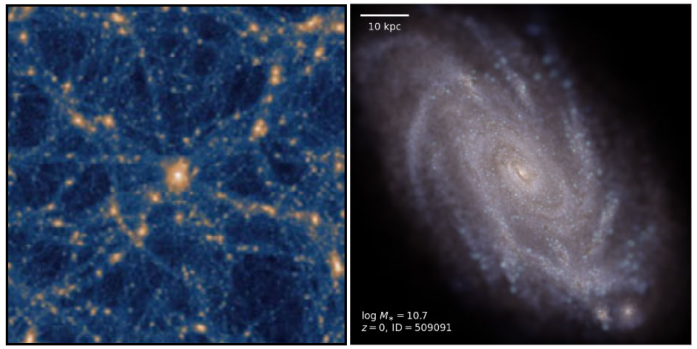


OUR NEW APPROACH

New post-processing GC model

- Used TNG50 cosmological simulations with **198** Milky Way-like galaxies.
- Combined with orbit integrations of **18,000** globular clusters from redshift z = 3 to 0.
- Tracks mass loss and dynamical friction in evolving galactic environments.

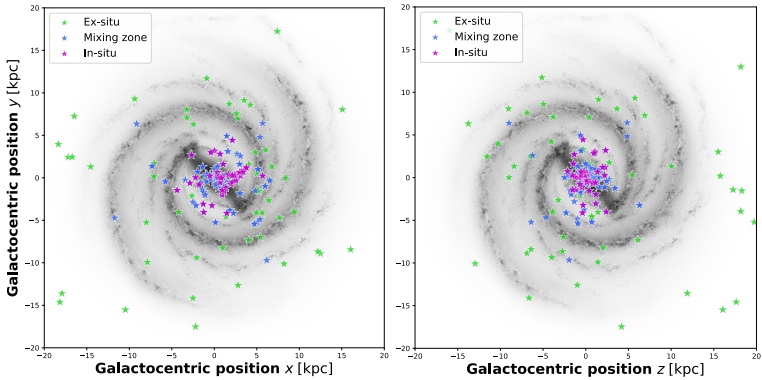
Hydrodynamical cosmological simulation TNG50



Pillepich+24

KEY RESULT

Boldrini+25



- **New classification**: 79 in-situ versus 82 ex-situ GCs — more ex-situ than previously thought.
- Kinematics alone are insufficient to trace GC origins.
- Full cosmological modeling is essential to understand the globular cluster population's assembly history.