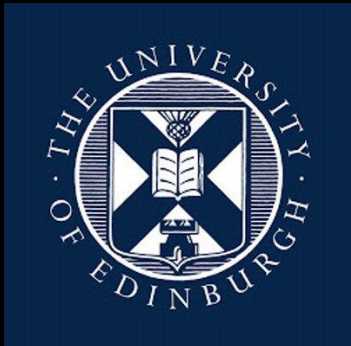


# Euclid Early Release Observations – Showcase Galaxies

Jess Howell – University of Edinburgh – on behalf of the Showcase  
ERO team (PI Hunt)

Supervisors: Prof. Annette Ferguson and Dr. Olivia Jones



22<sup>nd</sup> Nov 2024 – Paraty



Photometric Depth

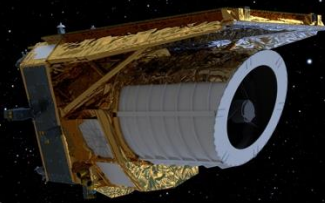
Image Quality

Field of View

$5\sigma$  detections reach  $\sim 27$  mag in  $I_E$ ,  $\sim 24.5$  in  $Y_E J_E H_E$

VIS: 0.1 arcsec/pix  
NISP: 0.3 arcsec/pix

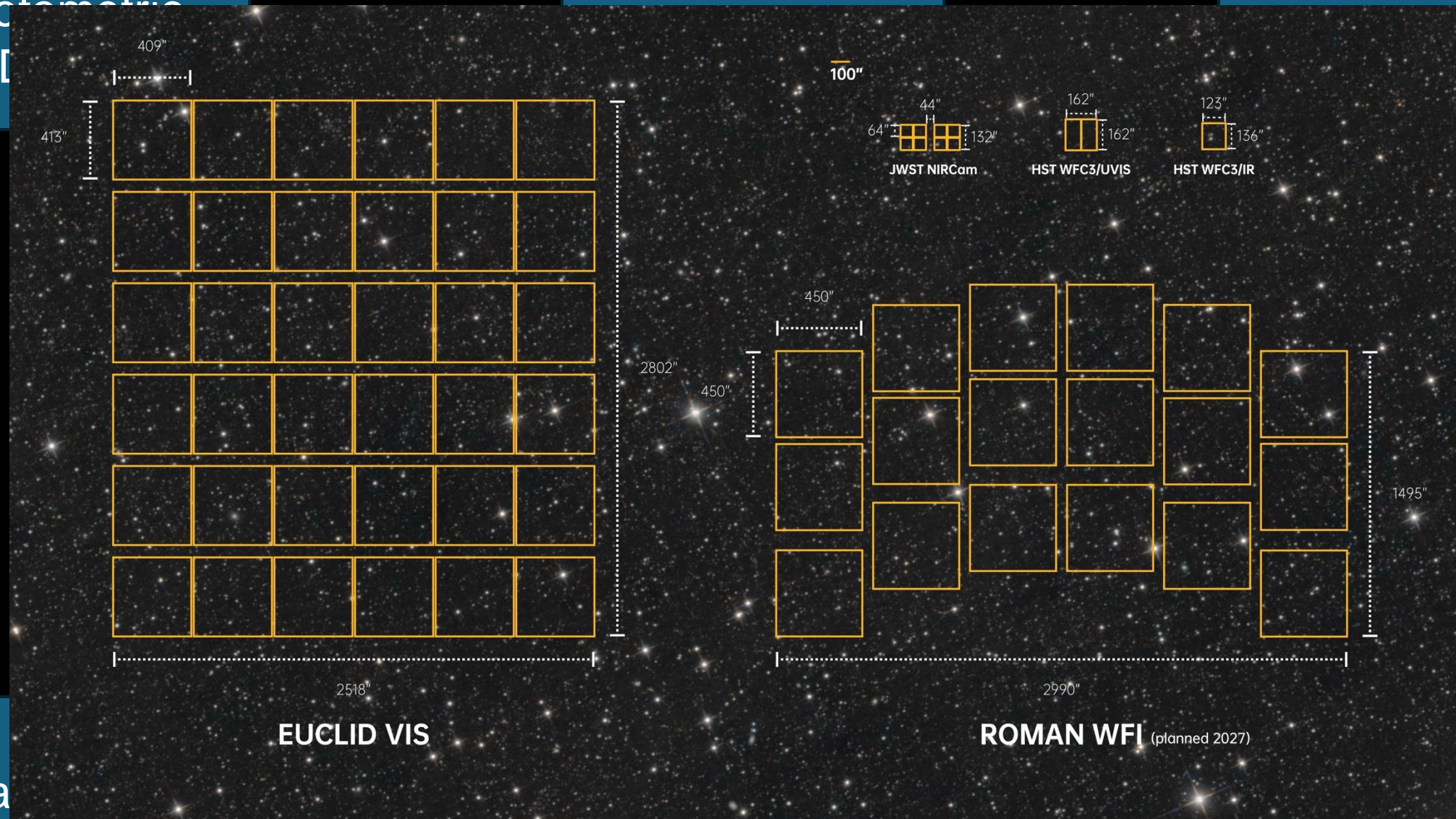
$\sim 0.6 \text{ deg}^2$



Star Clusters

Resolved Stellar Pops

Dwarf Satellites



Credit: Yuzheng Kang (Euclid Consortium)

Photometric  
Depth

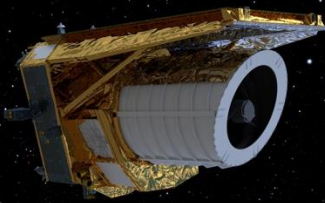
Image Quality

Field of View

$5\sigma$  detections  
reach  $\sim 26.8$  mag  
in  $I_E$ ,  $\sim 24.5$  in  
 $Y_E J_E H_E$

VIS: 0.1 arcsec/pix  
NISP: 0.3 arcsec/pix

$\sim 0.6 \text{ deg}^2$

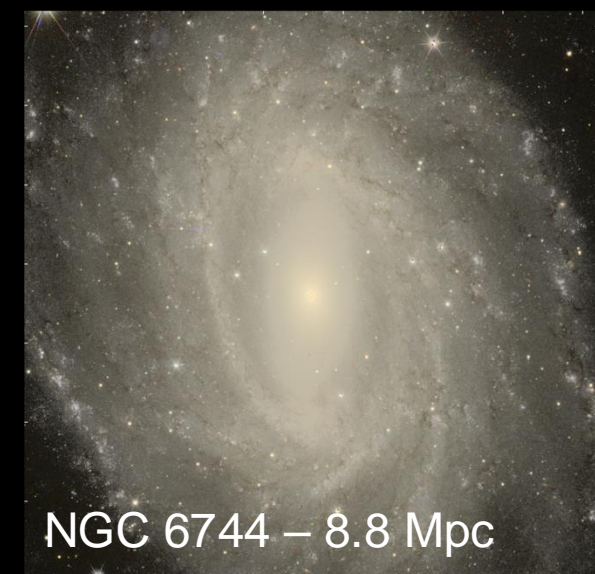
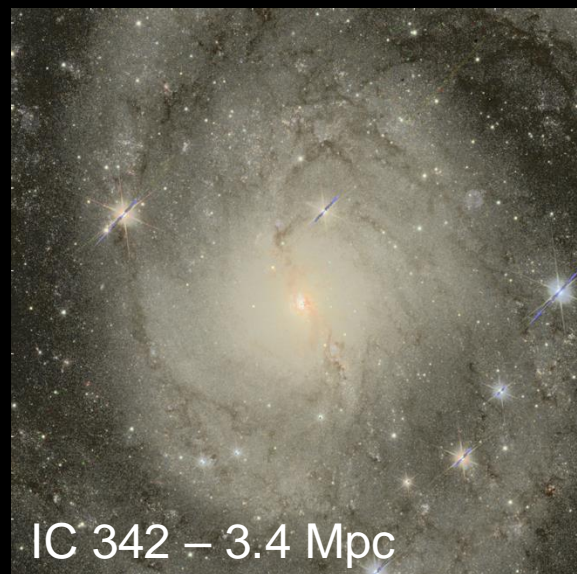
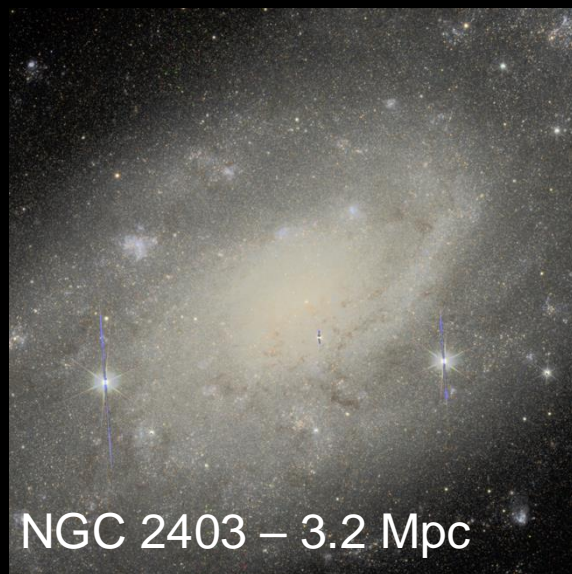
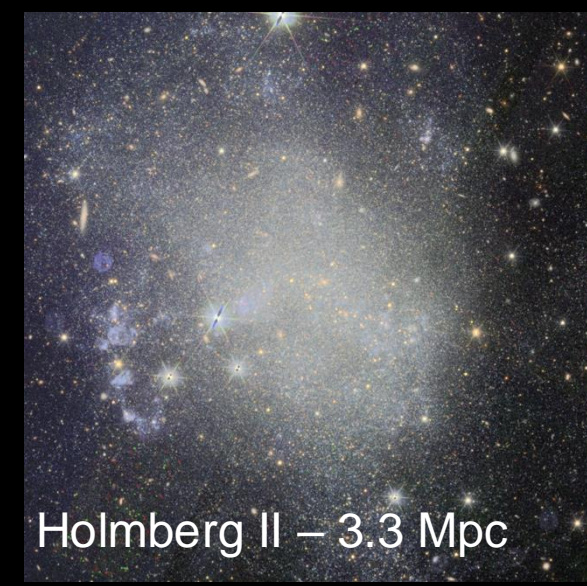
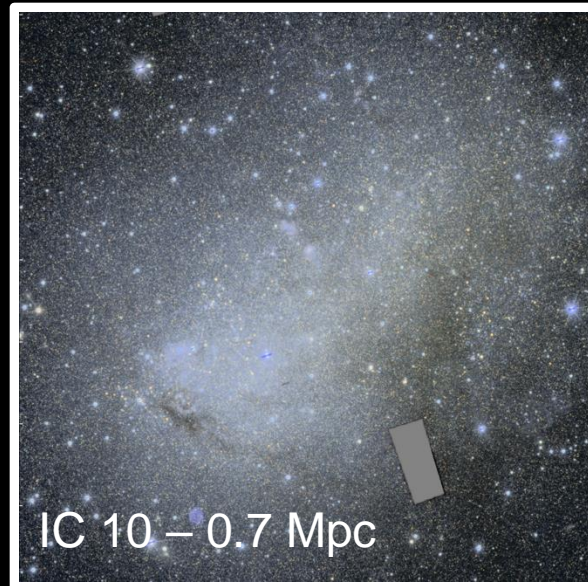
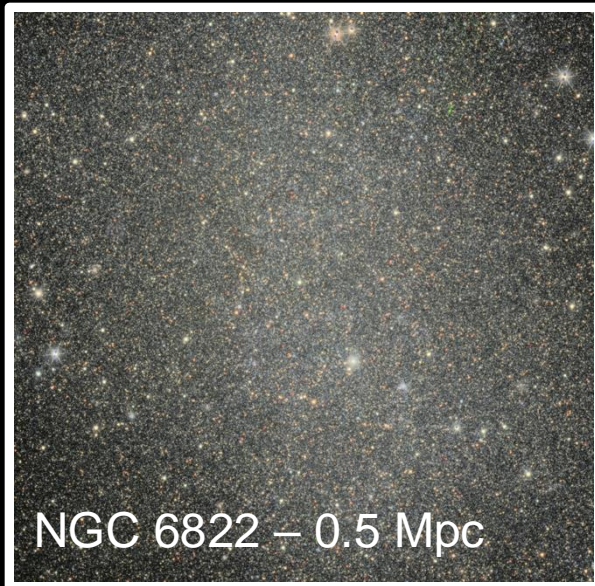


Star Clusters

Resolved  
Stellar Pops

Dwarf Satellites

- 6 galaxies were selected:



# Euclid's view of NGC 6822 & IC 10



# Euclid's view of IC 10 & NGC 6822



Dwarf Irregulars  
Both  $\sim 0.2-0.3 Z_{\odot}$



## NGC 6822

Stellar Mass:  $\sim 1.5 \times 10^8 M_{\odot}$

$\text{Log}(M_{200})$ :  $10.5 M_{\odot}$

May be isolated

## IC 10

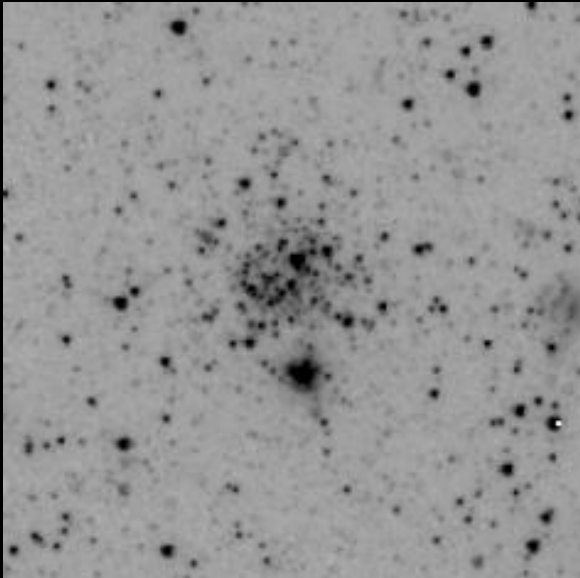
Stellar Mass:  $\sim 4.4 \times 10^8 M_{\odot}$

$\text{Log}(M_{200})$ :  $10.2 M_{\odot}$

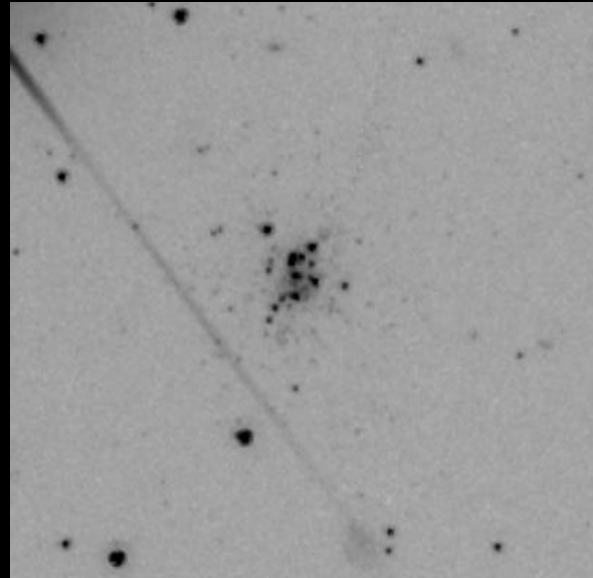
Appears to be part of M31 group

- Performed a blind cluster search
- Classified into high, medium and low confidence clusters
- ~25% increase in number of clusters in IC 10 and ~80% increase in NGC 6822 (across all classes)
- Demonstrating high-quality, wide-field imaging is a requirement for thorough cluster studies

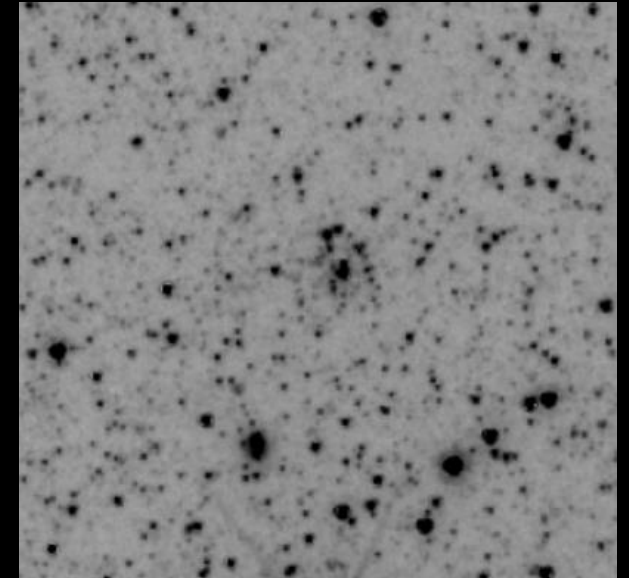
High confidence



Medium confidence



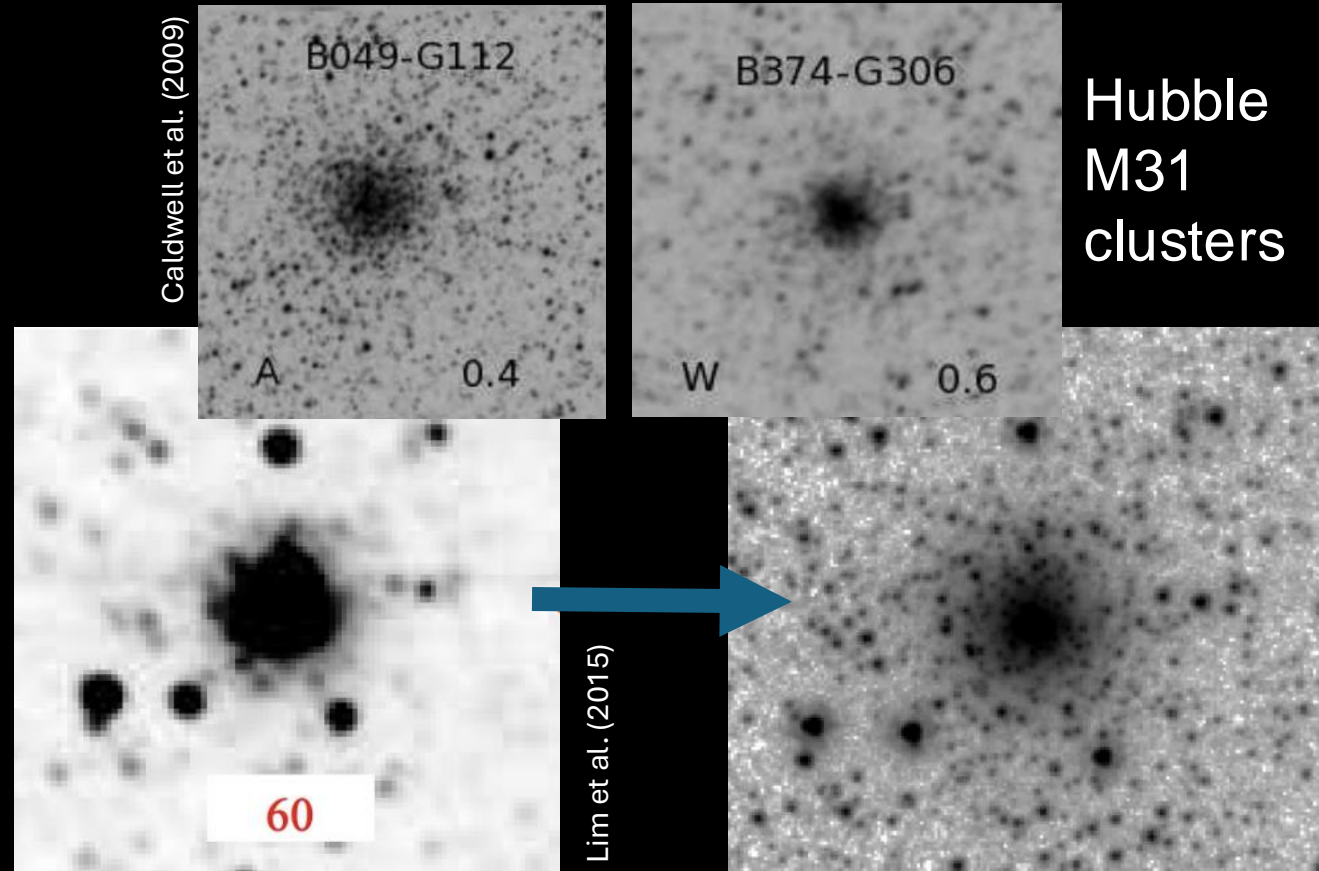
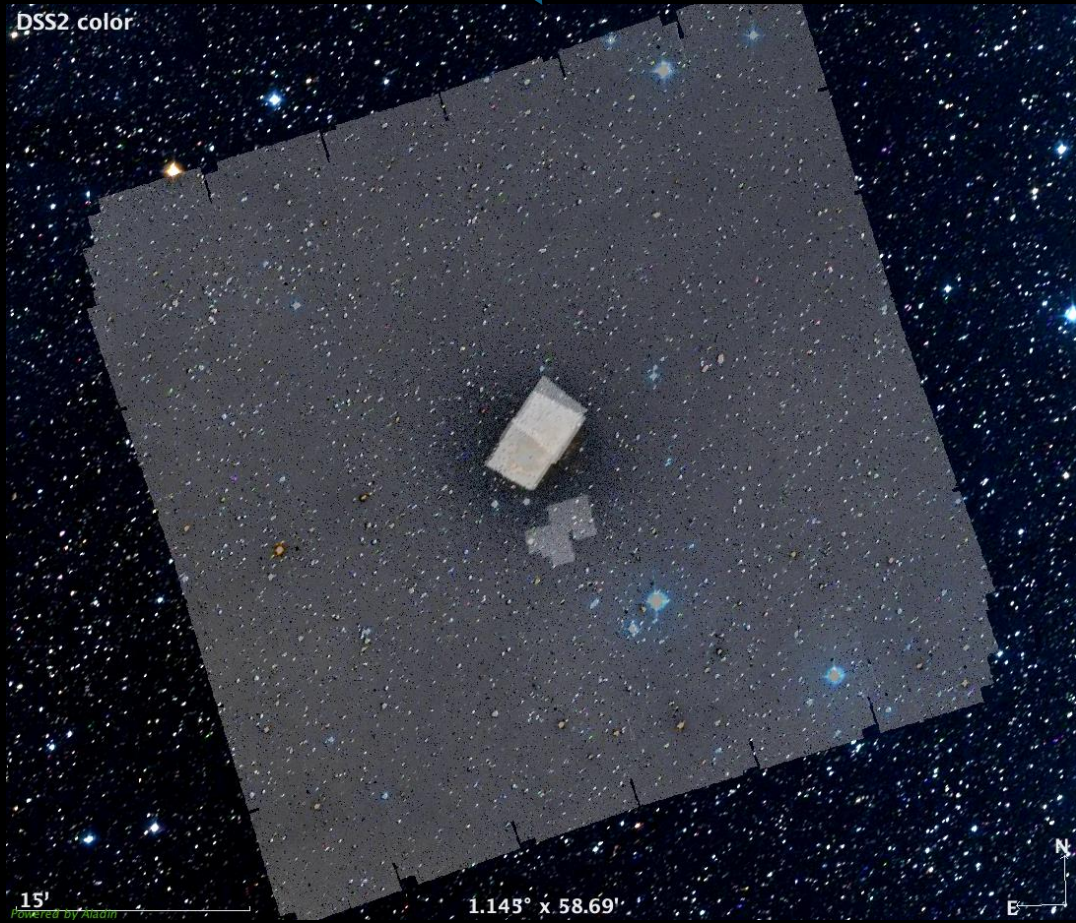
Low confidence





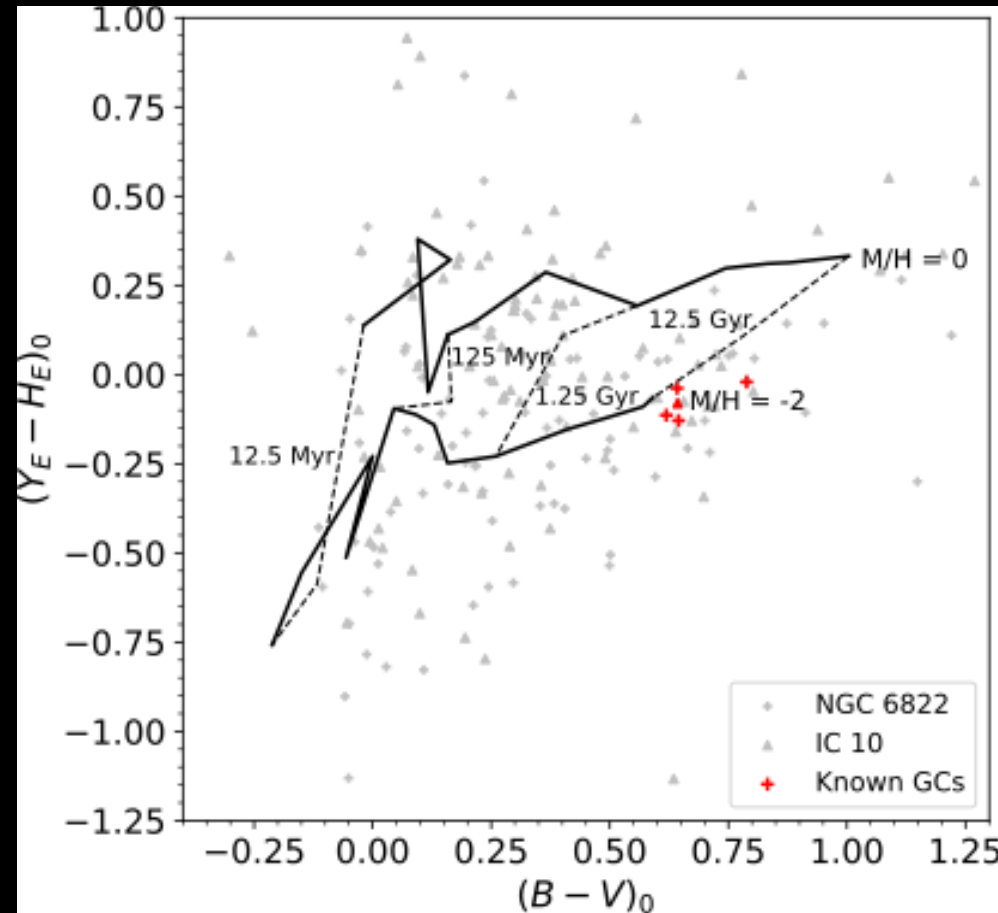
# Clusters: Improvement from previous studies

Euclid FoV vs previous  
Hubble pointings of IC 10

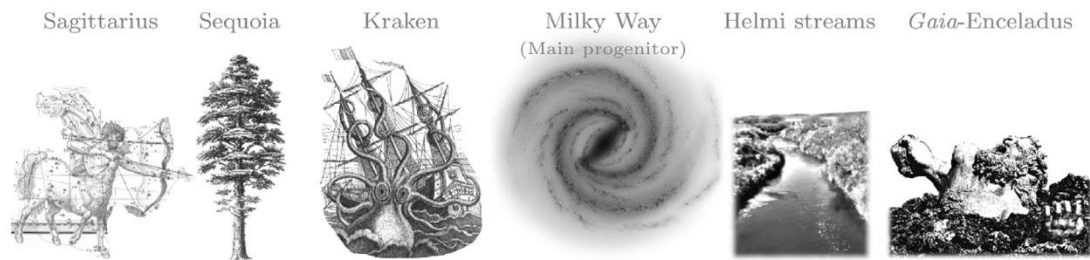


Subaru Suprime-Cam R-band vs *Euclid* VIS band

- Homogeneous photometry across all clusters, in ground-based UBVRI + *Euclid* VIS YJH ( + completeness testing and synthetic photometry validations)
- In depth analysis including half-light radii estimates and SED fitting providing mass, metallicity, age estimates and extinction

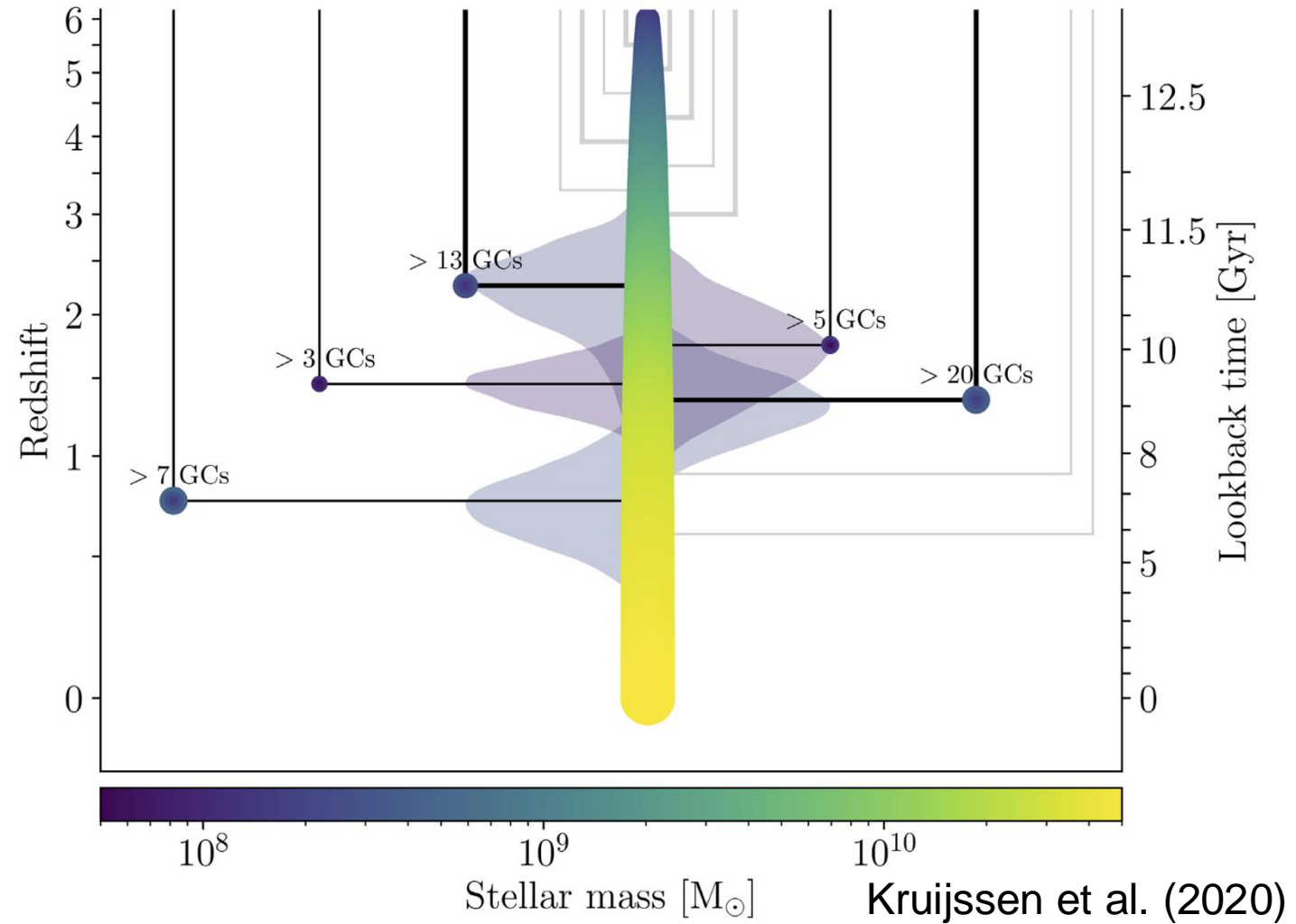


Howell et al. (in prep)



# GC populations

- Globular clusters probe galaxy assembly, accreted from smaller dwarfs.



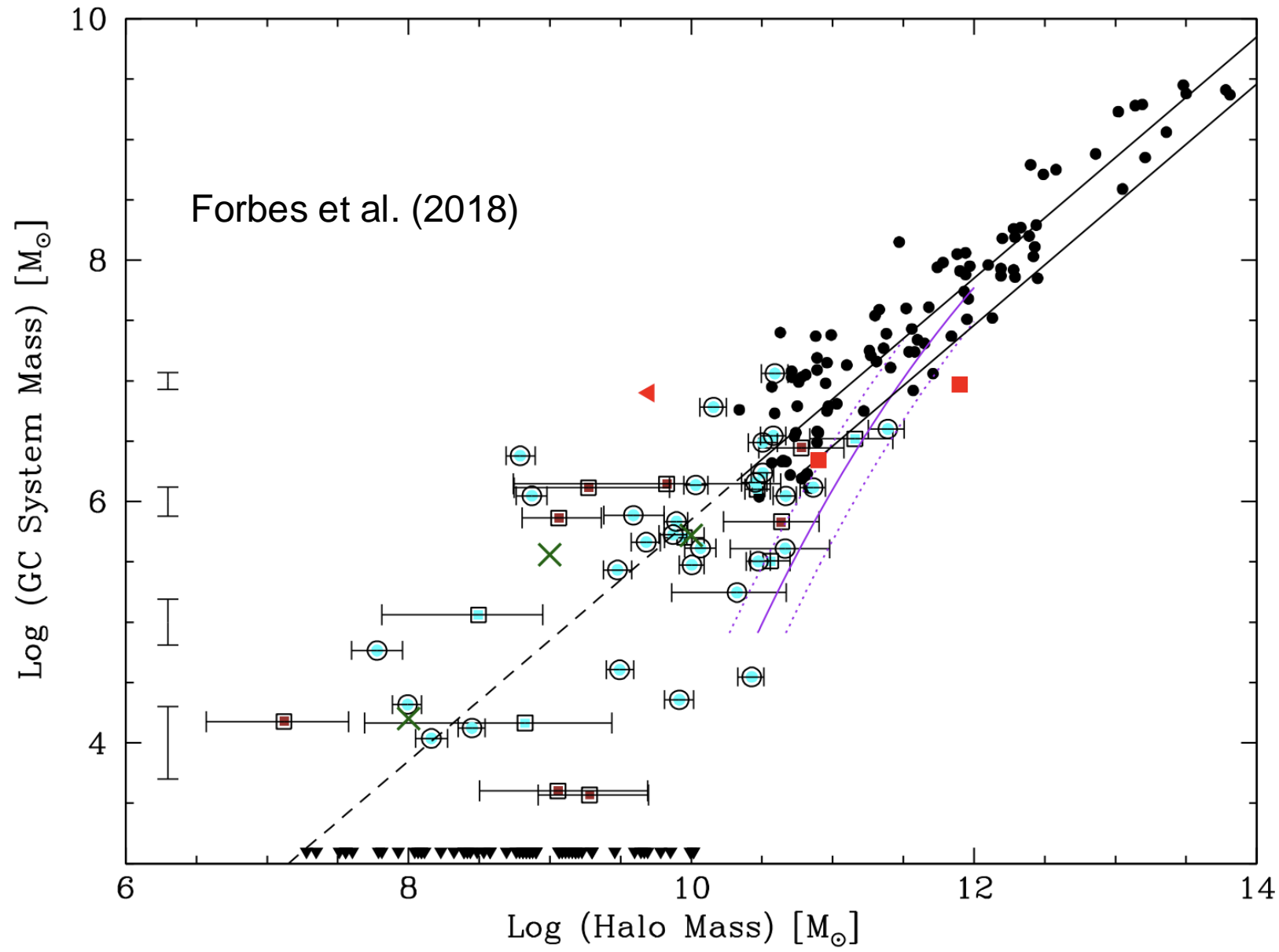
- Studying GCs in nearby dIrrs helps us understand their formation and evolution in MW progenitors.

# GC populations

- Our GC sample:
  - High confidence clusters
  - Old (>6 Gyr)
  - + morphology
- 11 in NGC 6822 (2 new) and 9 in IC 10 (1 new).

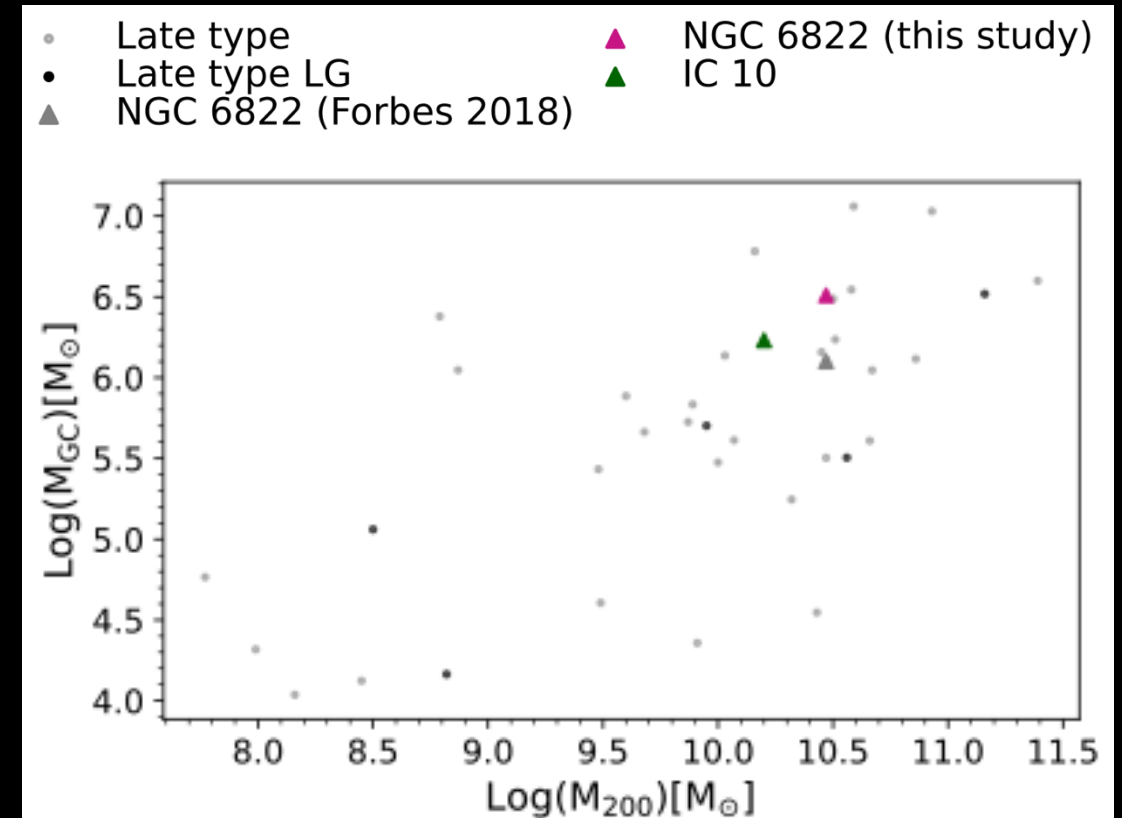
# GC

- Our GC sample
  - High concentration
  - Old (>6 Gyr)
- 11 in NGC
- 10 (1 new)



# GC populations

- Our GC sample:
  - High confidence clusters
  - Old (>6 Gyr)
  - Morphology
- 11 in NGC 6822 (2 new) and 9 in IC 10 (1 new).
- Occupy positions within the existing scatter of the relations.

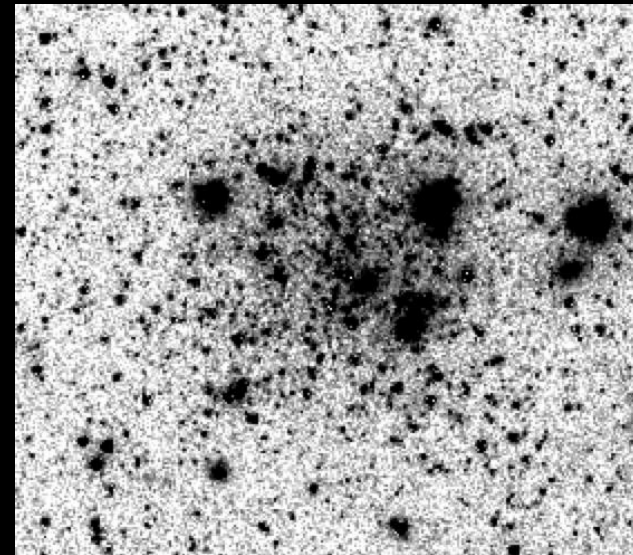
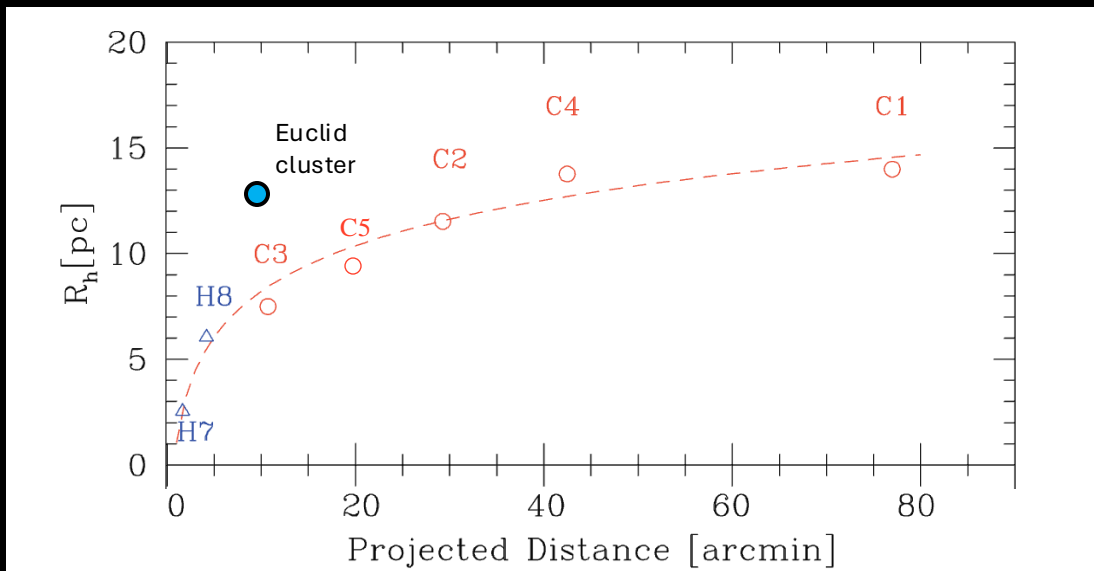


Howell et al. (in prep)

# A new "extended" globular cluster in 6822

- Extended clusters are characterised by large half-light radii  $> \sim 10$  pc
- Bringing NGC 6822's total of these objects to 6
- Lowest projected distance ( $\sim 1.5$  kpc, within NGC 6822's main body)

Hwang et al. (2011), adapted



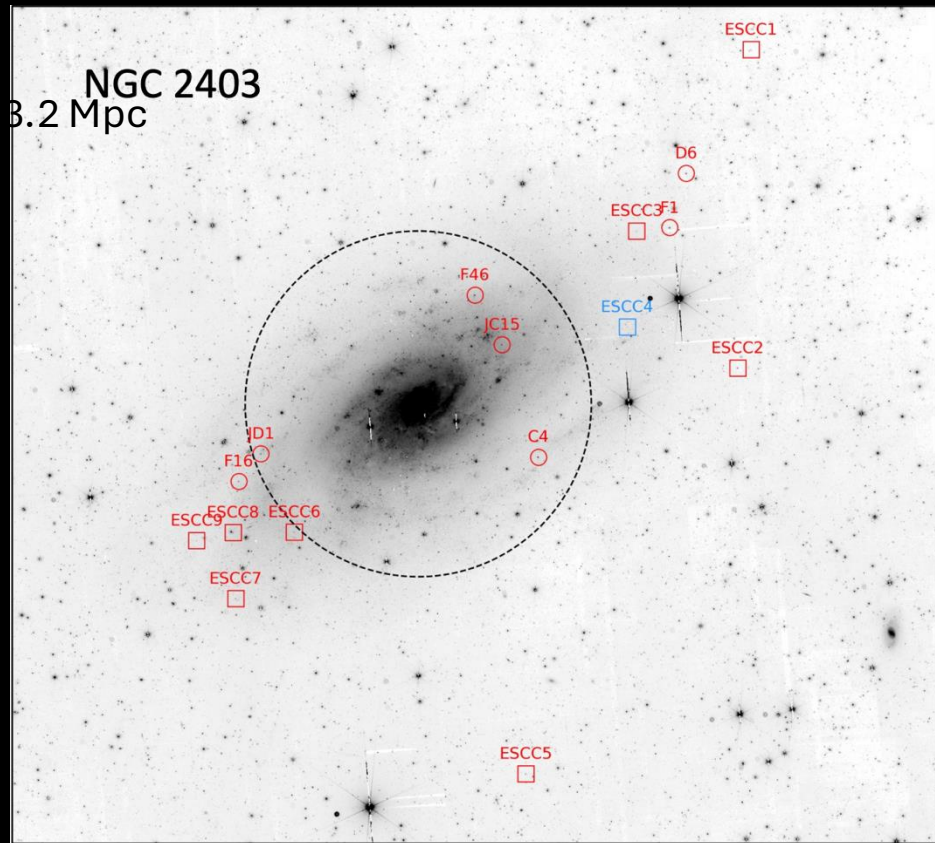
$R_h = \sim 13$  pc

Howell et al. (in prep)

# Showcase results: Collaborators

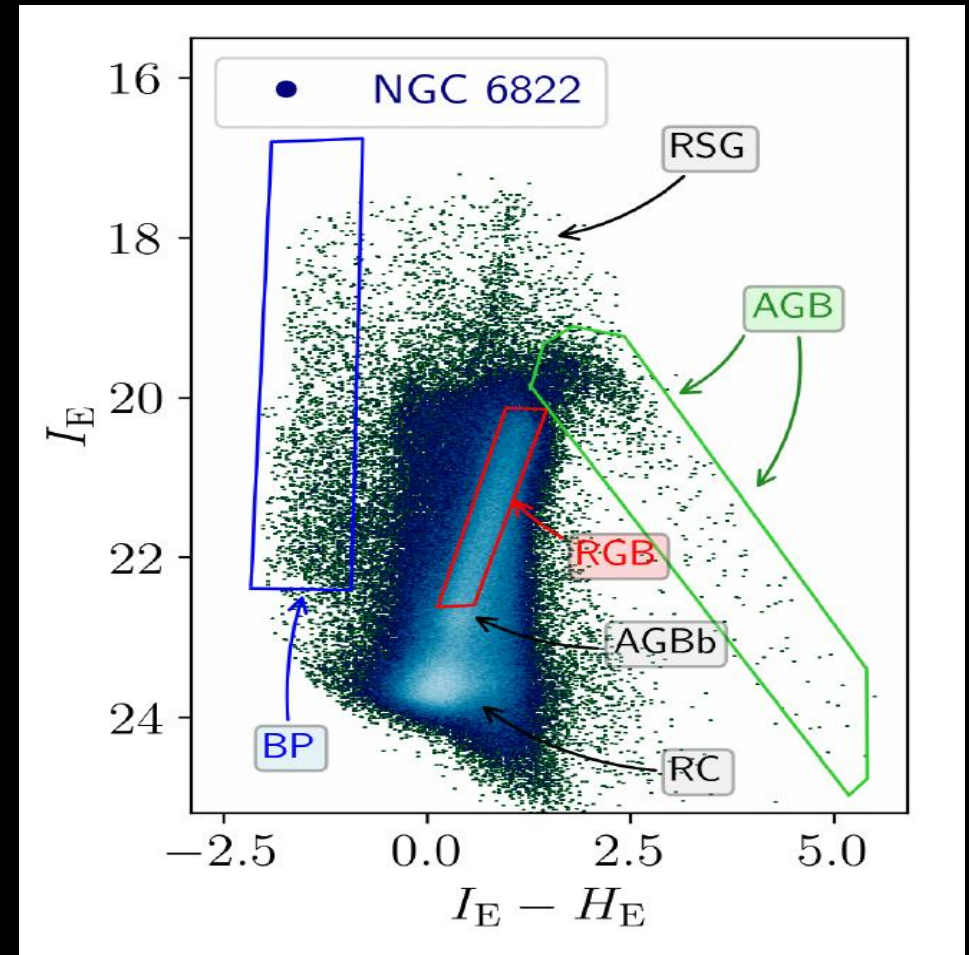
- Euclid has more than doubled the globular cluster numbers and increased their galactocentric distances in NGC 2403

- Confirmed the pre-launch depth expectations
- Lots of diagnostic information available



Hunt, et al. 2024

Further analysis in prep (Larsen, S. et al. 2024)



Hunt, Annibali et al. 2024



# Summary and Future

- *Euclid* greatly improved the completeness of cluster studies in local galaxies
- Enabling in depth analysis across young and old clusters in NGC 6822 and IC 10
- *Euclid*'s FoV, depth and image quality will enable unbiased studies of:
  - Stellar populations their properties
  - Cluster systems
  - Low surface brightness satellite galaxies
  - ...All out to further distances than previously possible, opening this up to all galaxies within  $\sim 5$  Mpc within the Wide Survey footprint (several 100 systems)