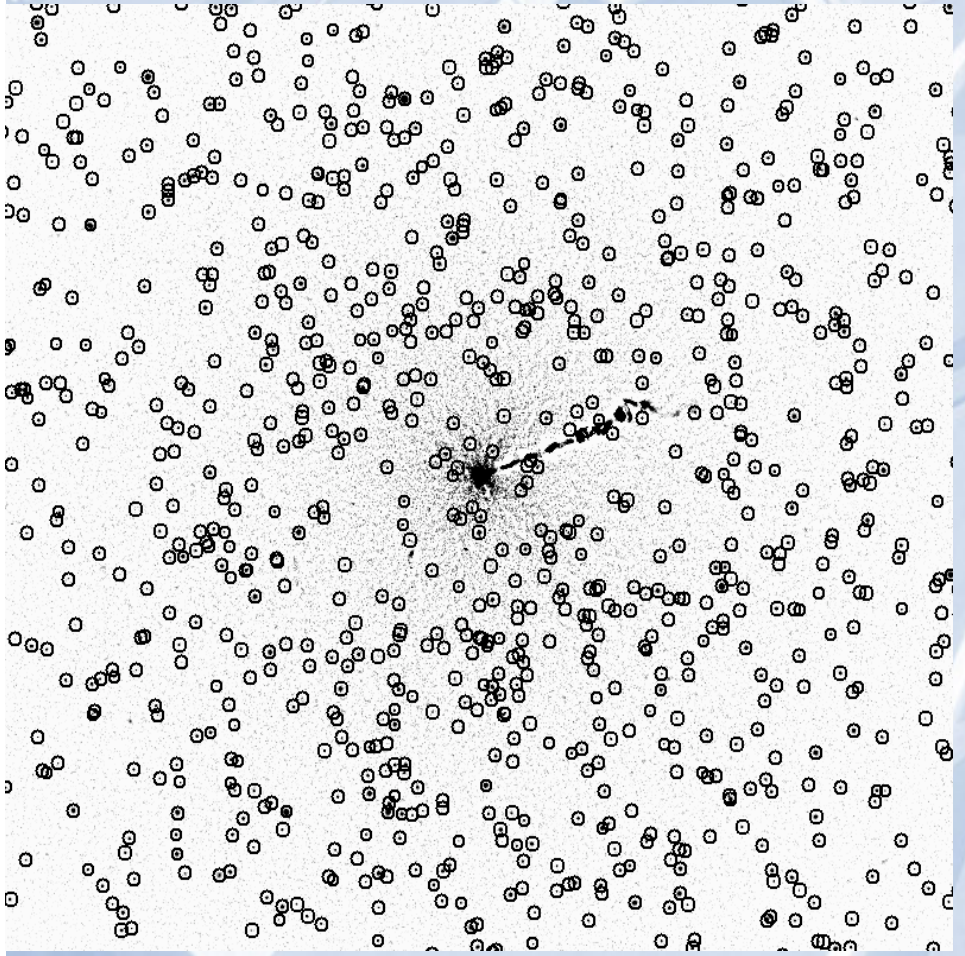
Structural Parameters of Globular Clusters and UCDs in Virgo and Coma



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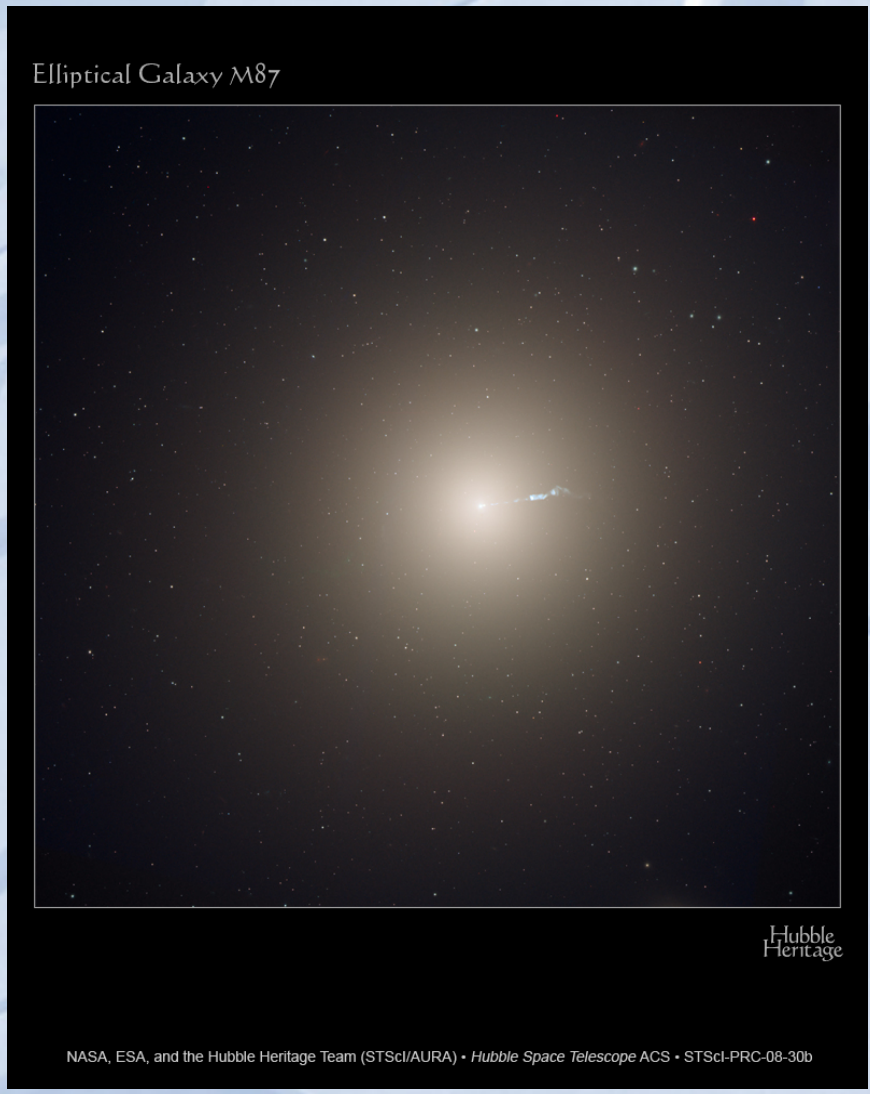
The M87 Ultra Deep Field

- The data was acquired using two filters:

✓ F606W (V) 49 images
24500 s

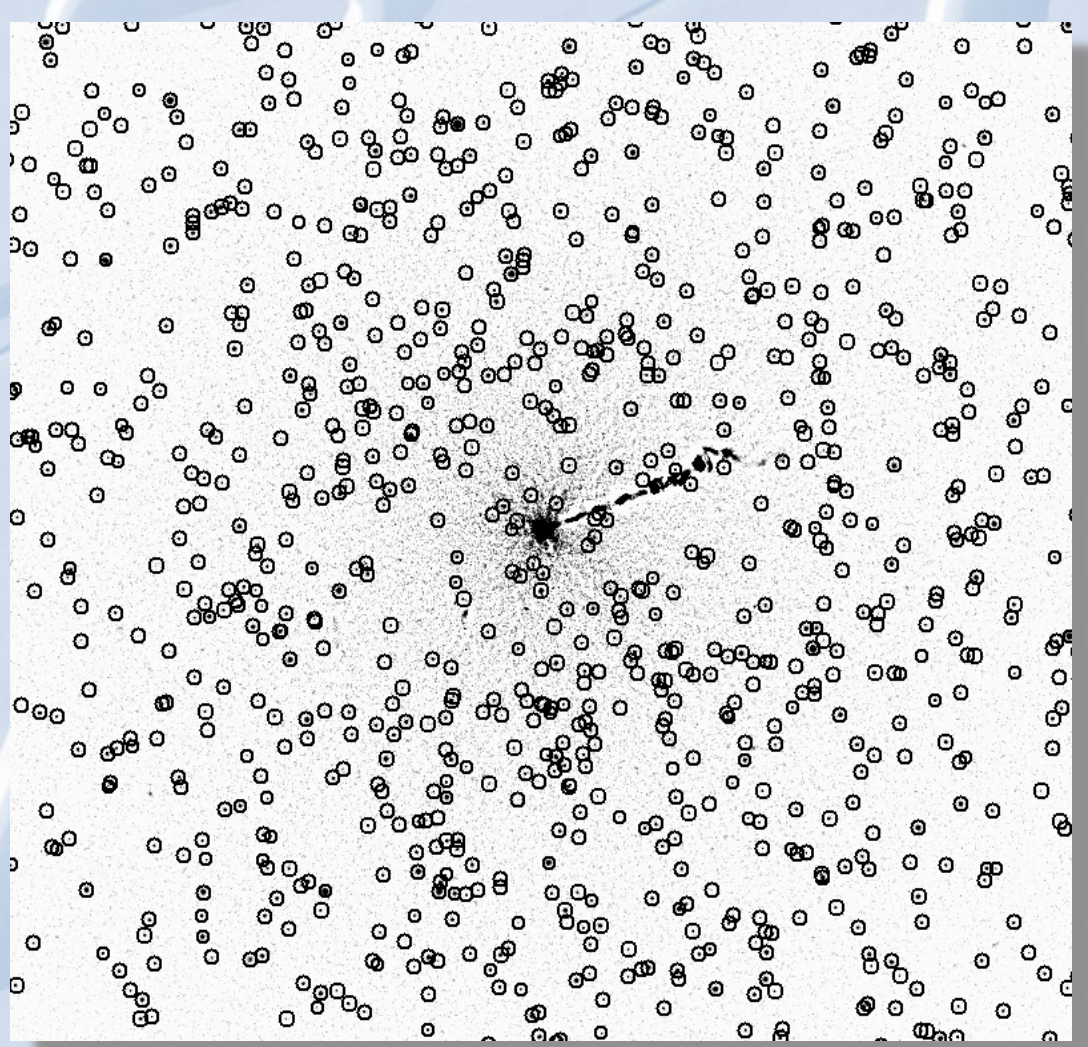
✓ F814W (I) 205 images
73800 s

- APSIS the original ACS pipeline was used for final image combination (Blakeslee, 2003)



M87 Globular Cluster System

- M87 contains the largest GCS of the local Universe with 14000+ members
  (Tamura et al. 2006)
- We have detected 2010 cluster candidates
- Superb statistical sample!



ISHAPE

User-friendly software developed by Soren Larsen (Larsen, 1999)

ISHAPE convolves an analytical model of the cluster SB profile (e.g. King, Sersic model) with the PSF

↓

Finds best fit to data by varying cluster FWHM

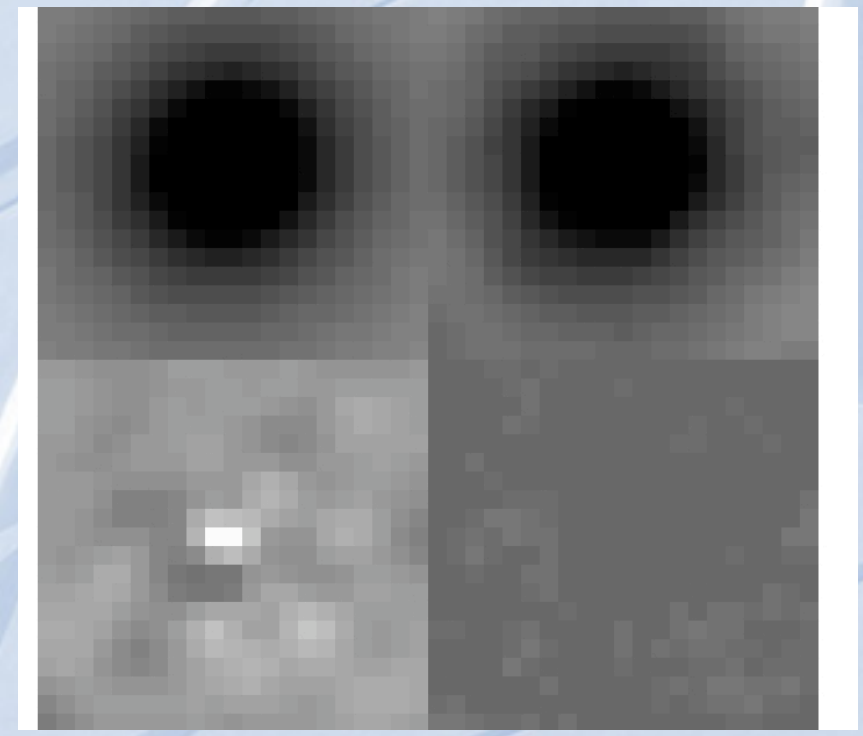
↓

Obtain r_h , ellipticity, position angle, $c=r_t/r_c$

ISHAPE, an example

Model | Original

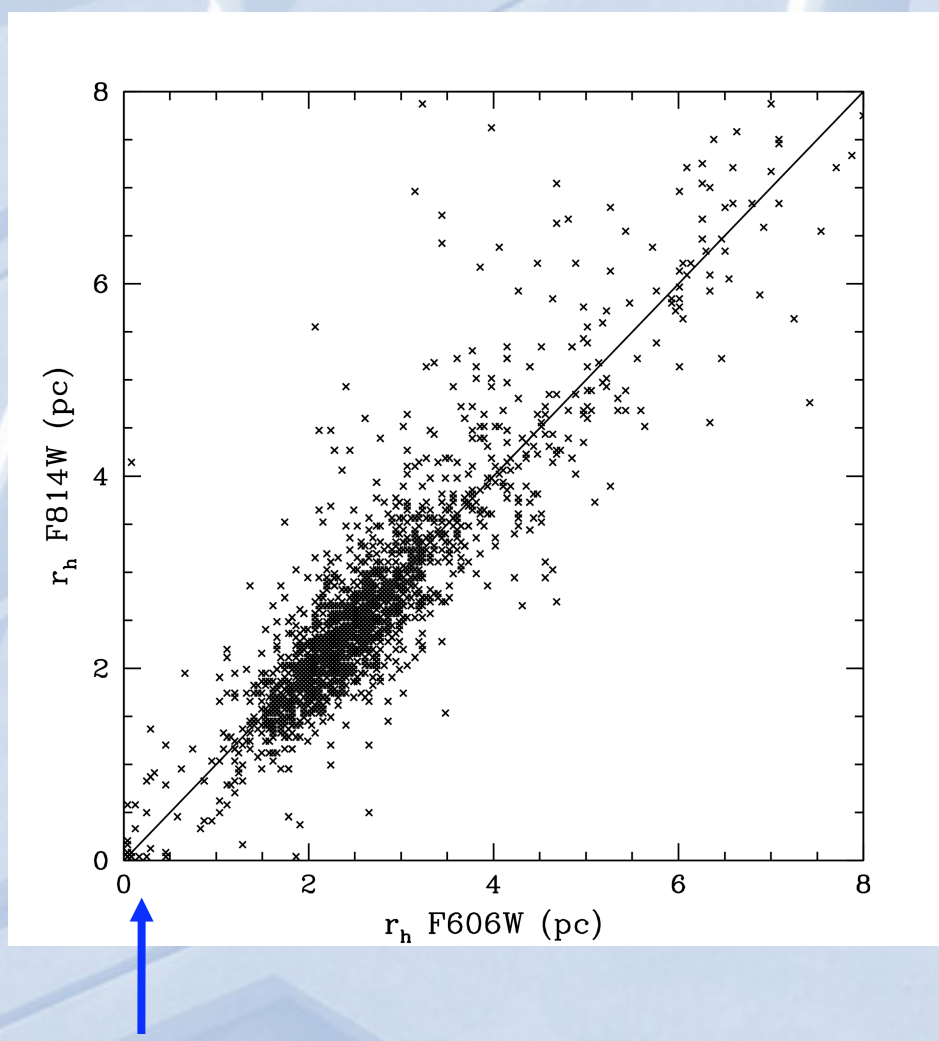
Residual | Weight



We performed this fit for 2010 M87 clusters

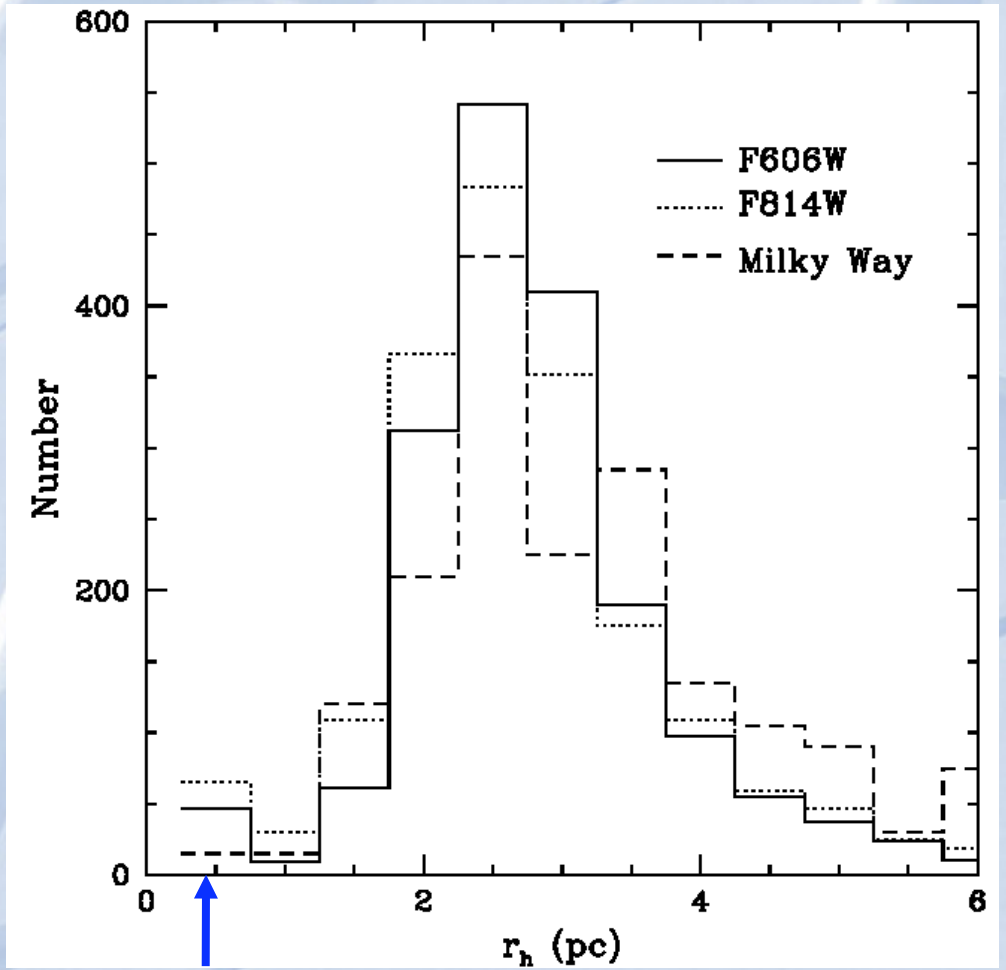
Effective Radius F606W, F814W

- ISHAPE yields a robust measurement of r_h
- If $FWHM_{cluster}$>0.1 $FWHM_{PSF}$ ISHAPE recovers structural parameters
- King model, $c=r_t/r_c$ =30
- All clusters have S/N>50



Effective radius

- The effective radius of most clusters lies between 1 and 6 pc
- Good agreement with MW clusters
- M87 & MW different Hubble type same r_h for globular clusters! (Ashman & Zepf 1998)

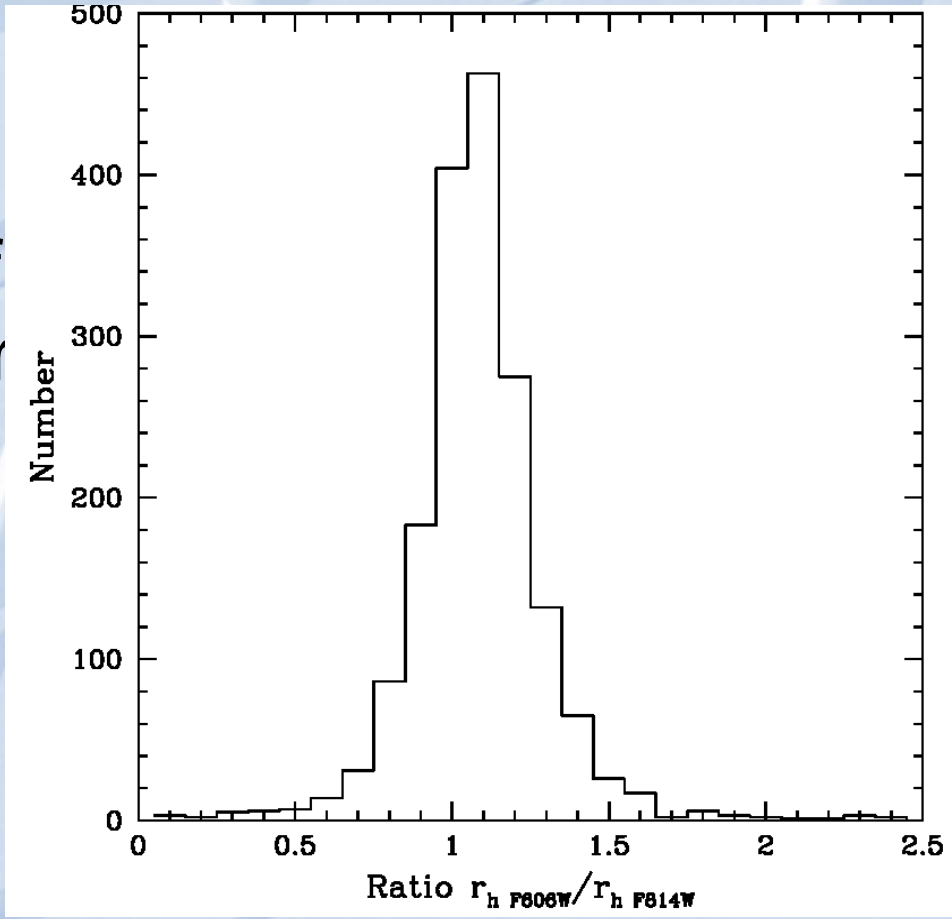


Madrid et al. 2009, ApJ, 705, 237

Mass Segregation?

Size difference vs. λ

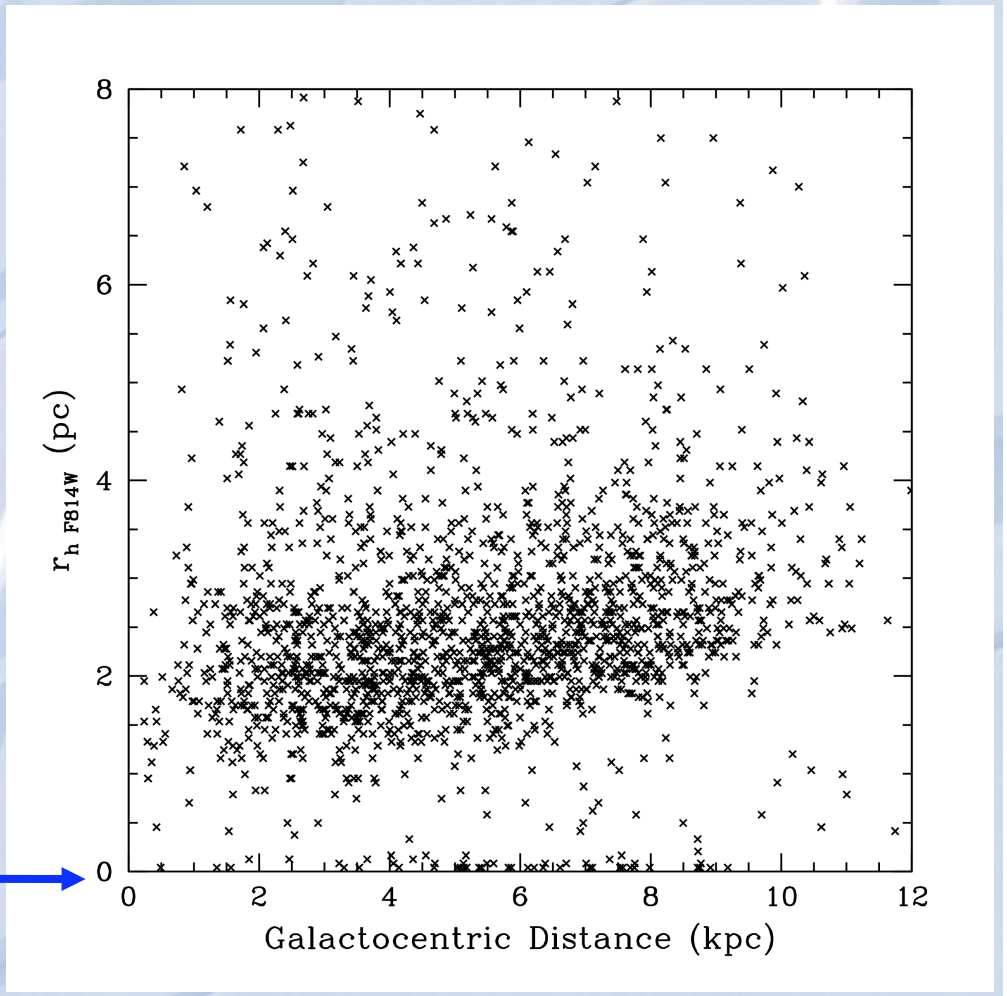
- r_h F606W > r_h F814W
- Massive stars sink to center of cluster ---> r_h becomes smaller in redder bandpasses
- N-body code predicts r_h in V ~5% larger than in I (Hurley 2008) (10^5 $M_\odot$ 10-12Gy)



Median=1.02 +/- 0.006 STD=0.24

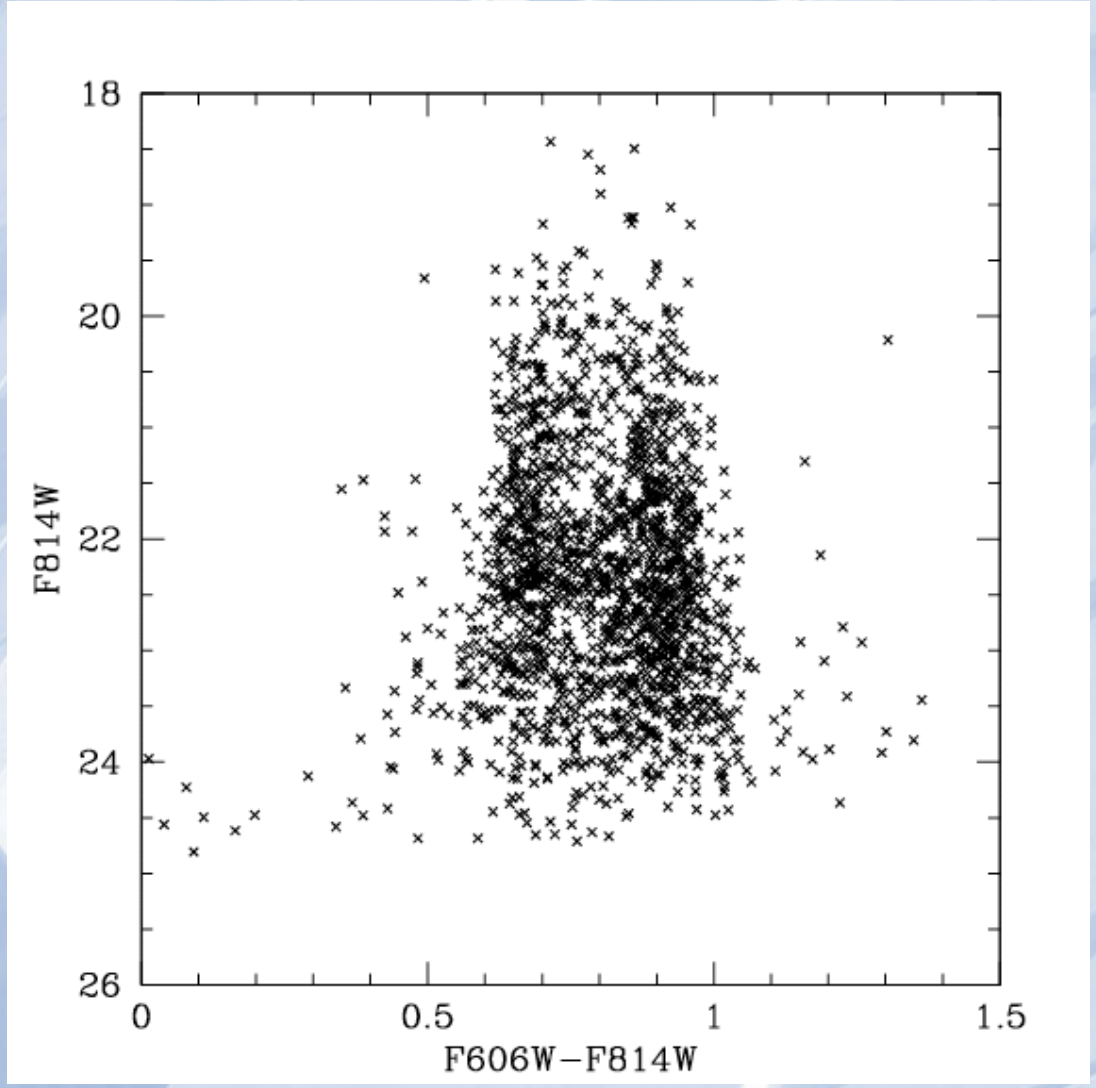
Effective Radius vs. Galactocentric Distance

- Diameter of GCs in the LMC increases with R_{GC} (Hodge 1952)
- For Milky Way Clusters-**3D** $r_h \sim (R_{GC})^{0.5}$ (van den Bergh 1956, 1991)
- ACS/WFC allows sampling at large R_{GC}



⚠Projected Galoctocentric Distance

The Cosmic H

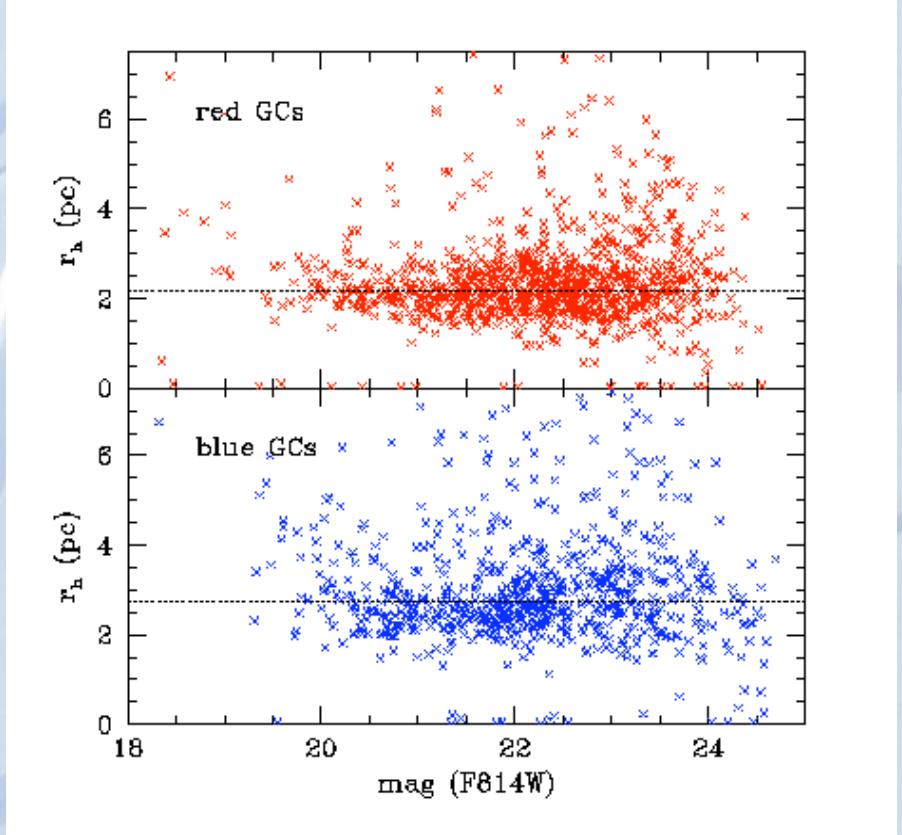


Cosmic H and Petronas Towers credit:
Lee Spitler (M49) & Duncan Forbes

Petronas Towers, Kuala Lumpur

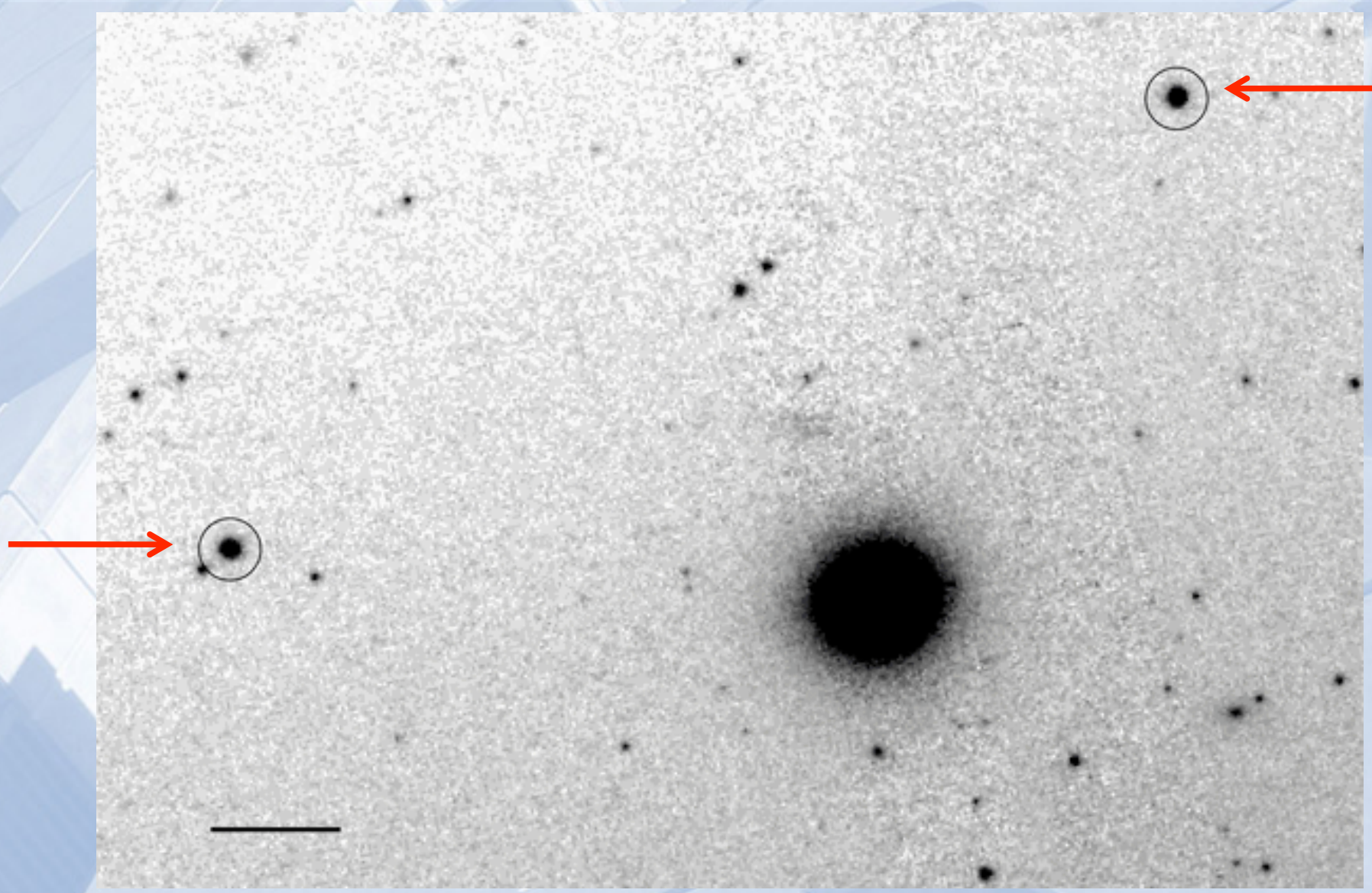
r_h vs. color

- Median r_h for red clusters is 2.1 pc
- Median r_h for blue clusters is 2.6 pc
- *Good agreement with previous estimates of size difference ~24%* *(Larsen 2001, Spitler et al. 2006)*

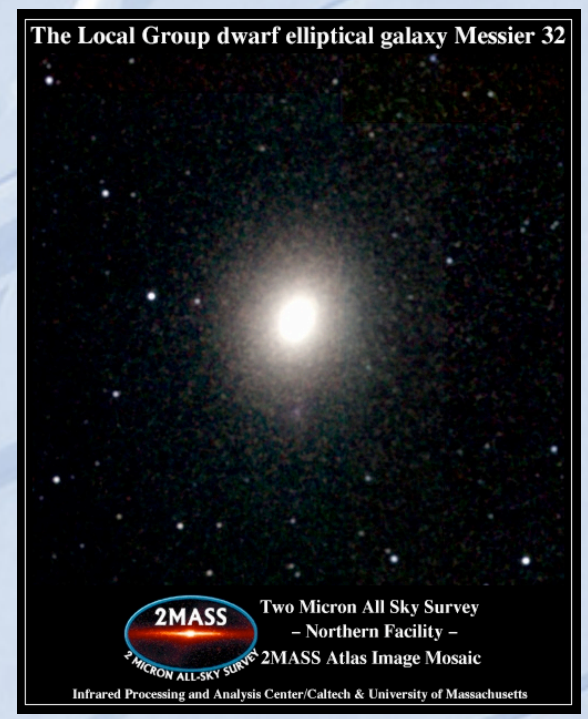


Further away: Coma Cluster

Ultra-Compact Dwarfs



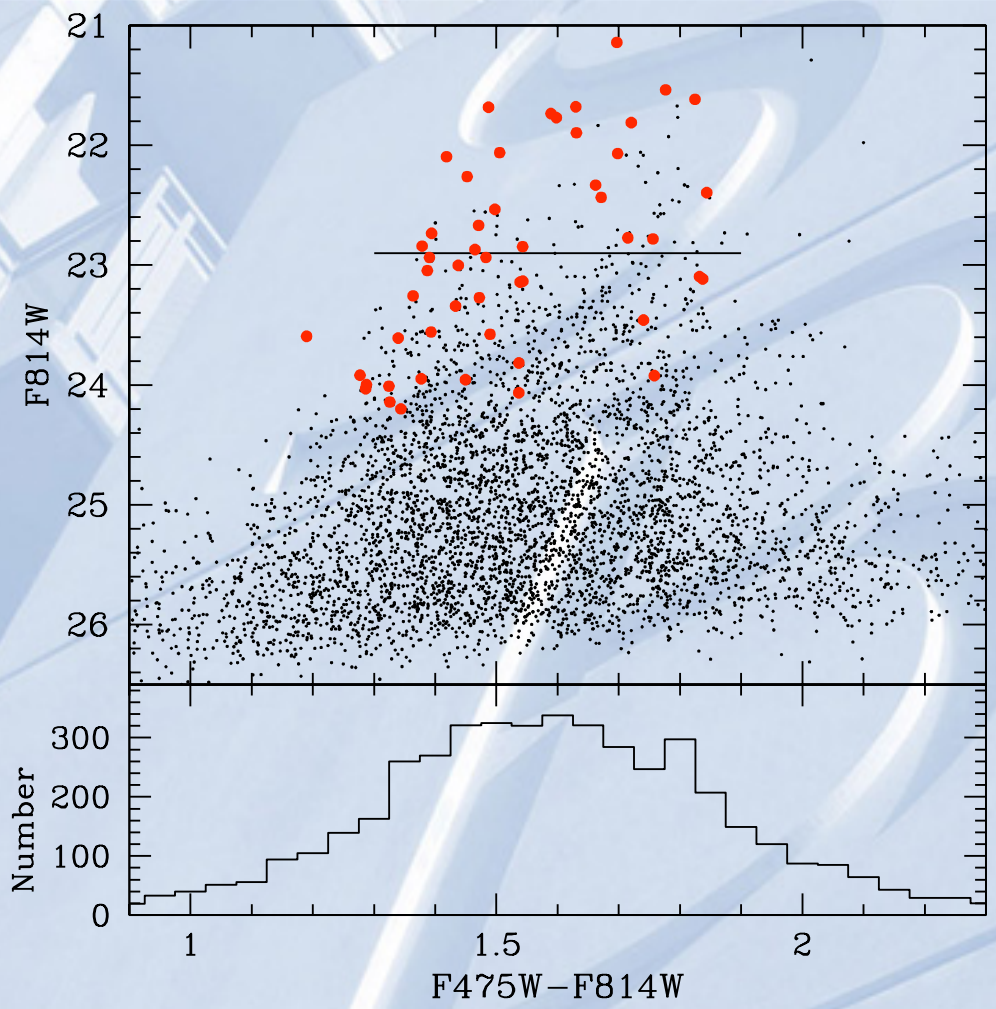
Ultra-Compact Dwarfs



Ultra-Compact Dwarfs: “A Mixed Bag of Objects” (Hilker 2006)

SMSC, UDSC, IMO, DGTO

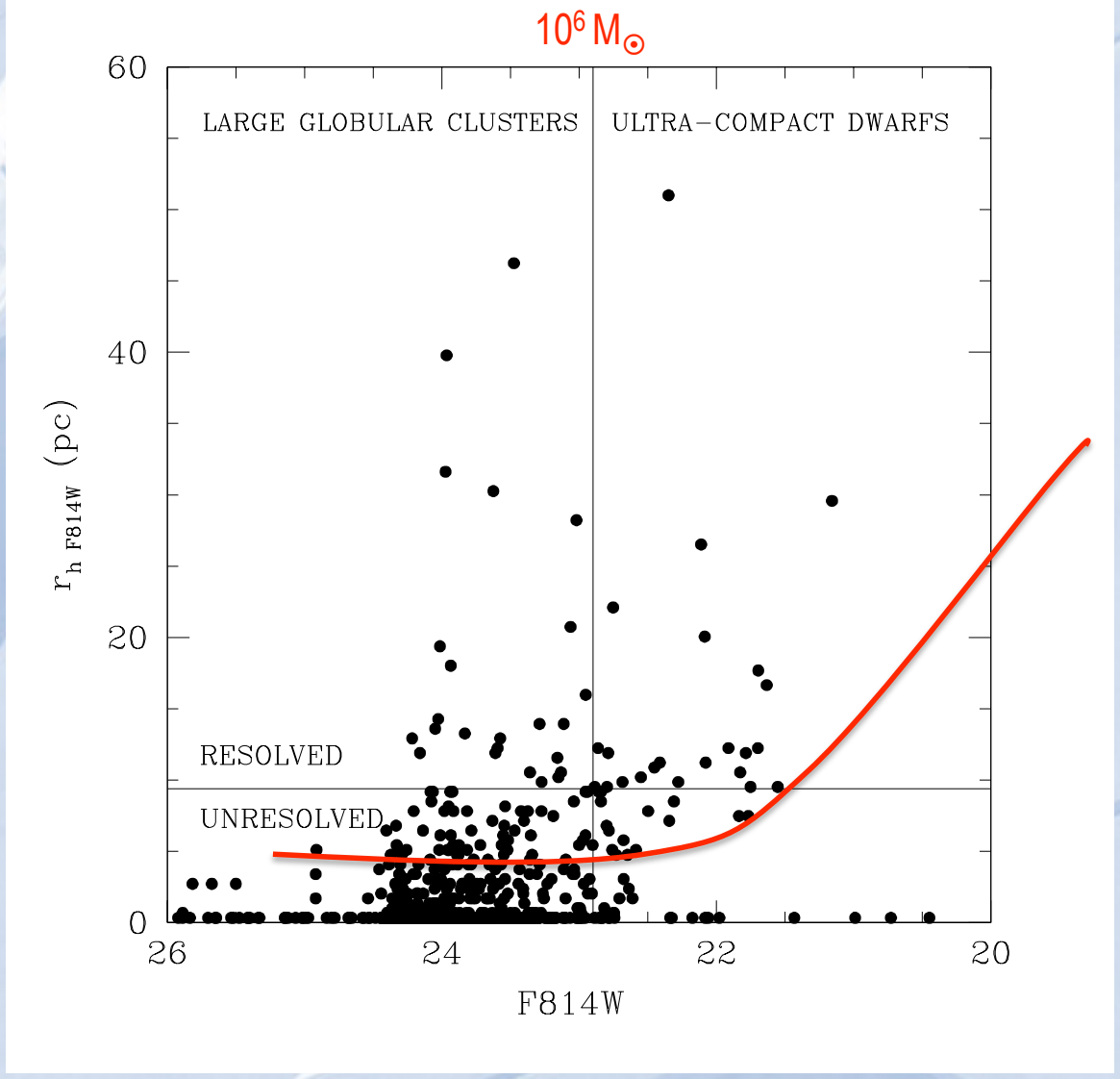
CMD of the Globular Cluster System and UCDs



$10^6 M_\odot$

Madrid et al. 2010, ApJ, 722, 1707

Magnitude-Size relation



Gieles et al. 2010, MNRAS, 408, L16

Spatial Distribution