ON A NEW EMPIRICAL CALIBRATION OF SYNTHETIC STELLAR LIBRARIES

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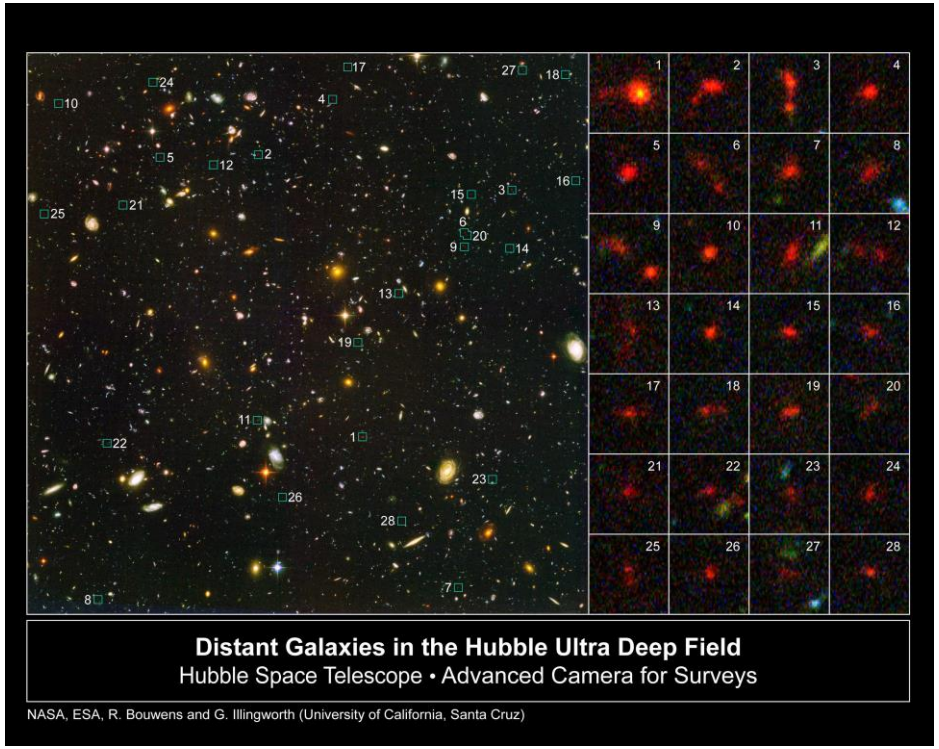
Cosmology and fundamental physics with current and future ESO facilities

Azores School

SUMMARY

- Galaxy SEDs
- Theoretical/Empirical stellar libraries: diagnostics and uncertainties
- My research project: calibration on local systems
- Current and future work

MODELLING GALAXY SEDs

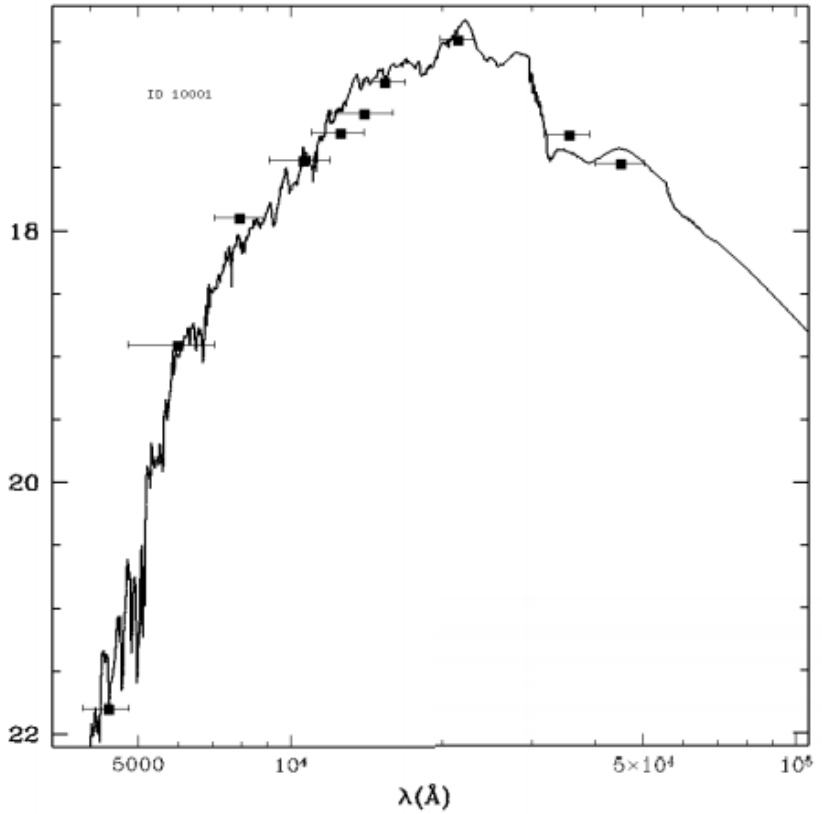


Stellar Population Synthesis Models:

Initial Mass Function, Spectral Library, Stellar Evolution, Star Formation History, Dust Metallicity

Fit on SEDs, observed magnitudes

Physical Parameters



Merlin et al., 2016

High Redshift Galaxies:
UNRESOLVED Stellar Populations!

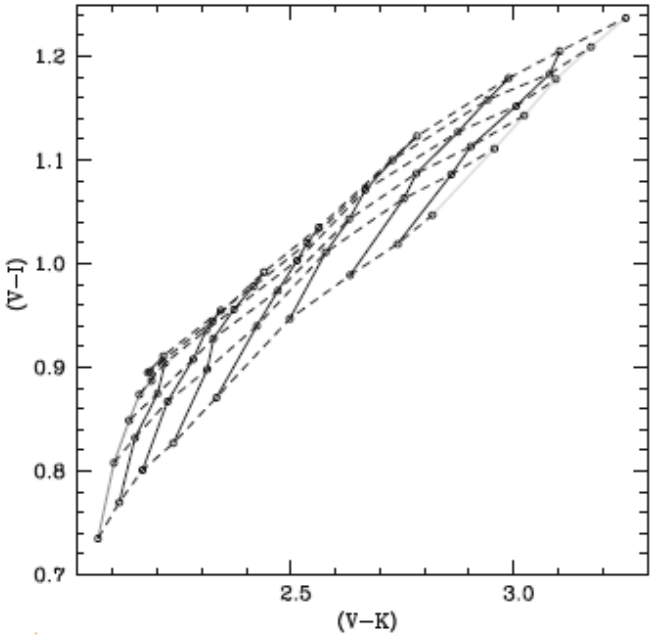
MODELLING GALAXY SEDs

DIAGNOSTICS:

AGE AND METALLICITY

Photometric:

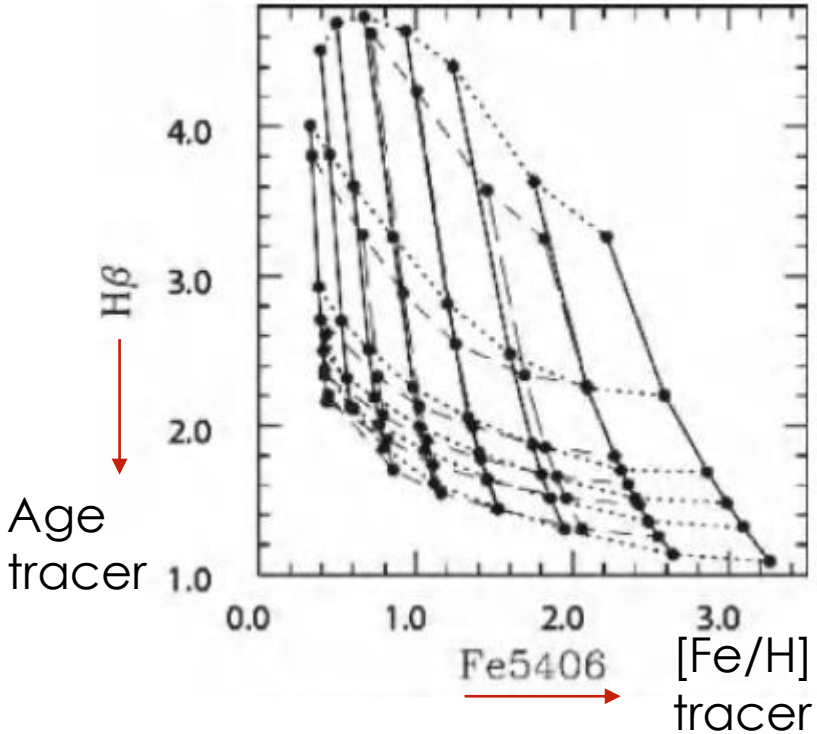
Integrated colours



Cassisi & Salaris, *Old Stellar Populations-How to study the Fossil Record of Galaxy Formation*, (2013)

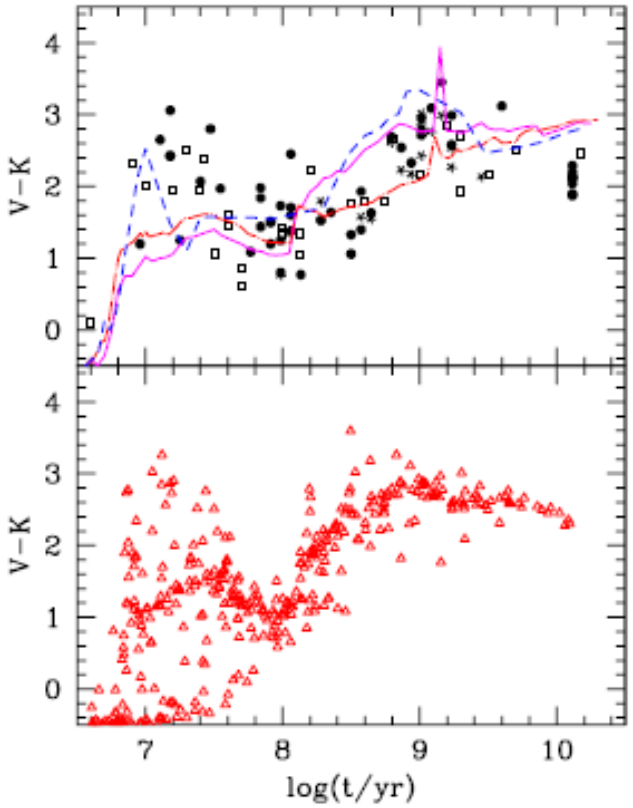
Spectroscopic:

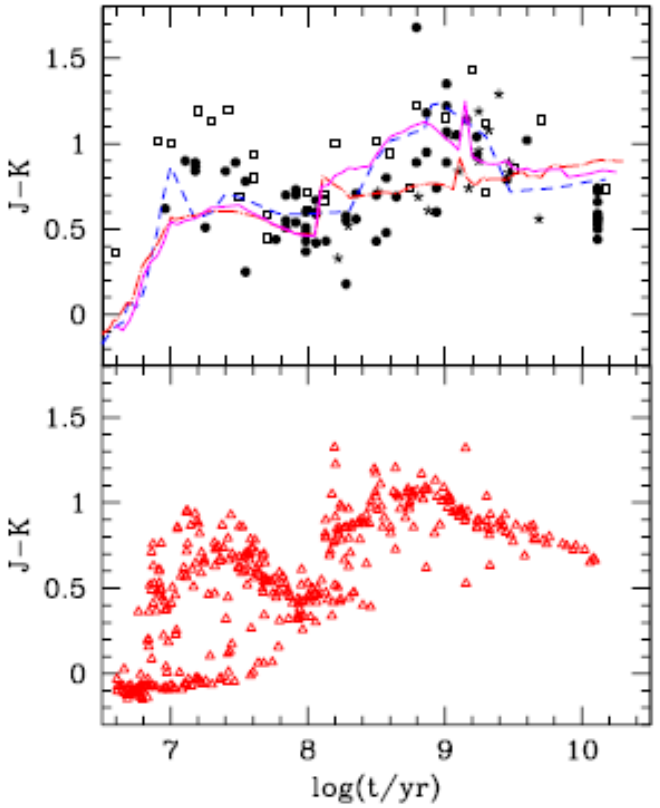
Indices



MODELLING GALAXY SEDs

Effects of different models





Marigo et al., 2008

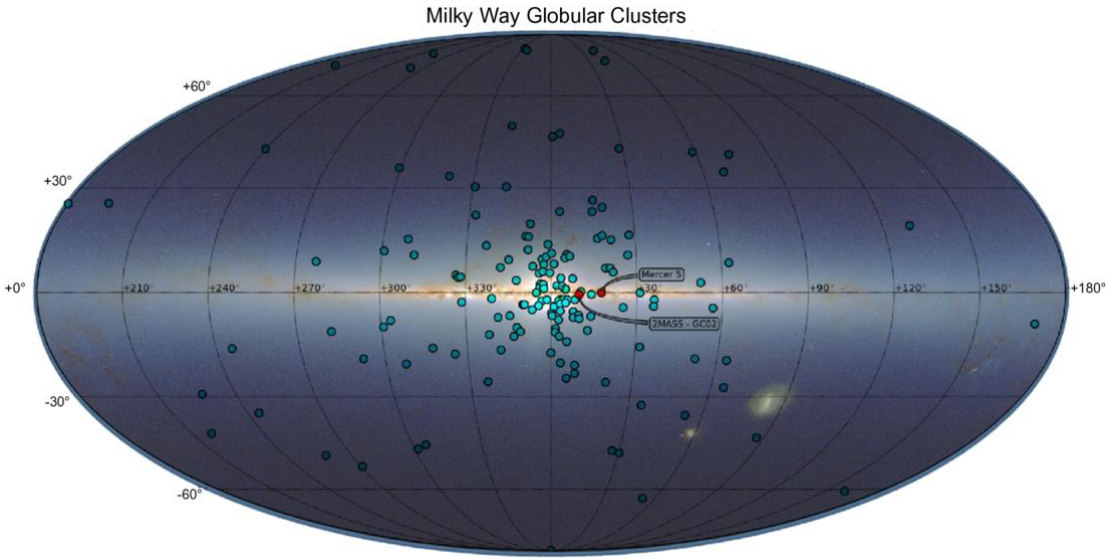
Bruzual & Charlot, 2003
Maraston 2005
Marigo 2008

MY RESEARCH PROJECT

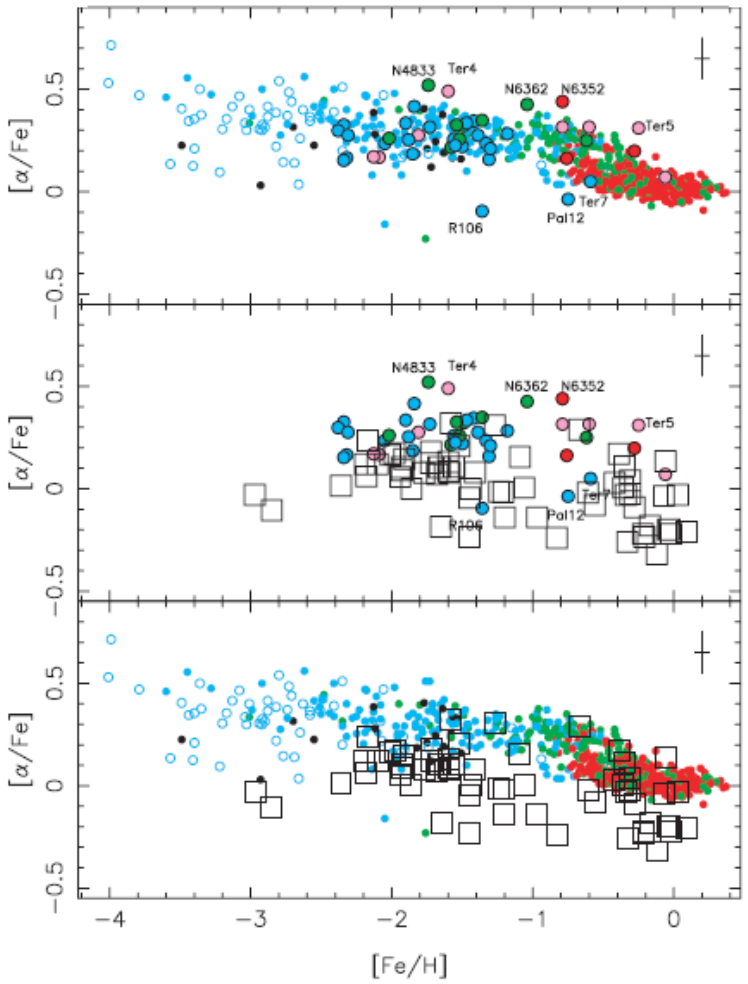
- Models already used to study distant galaxies; rarely compared with observations of local populations.

- Calibration on Open and Globular Clusters (age and metallicities), Dwarf Galaxies (dynamics).

47 Tuc, Dieter Willasch (Astro-Cabinet)

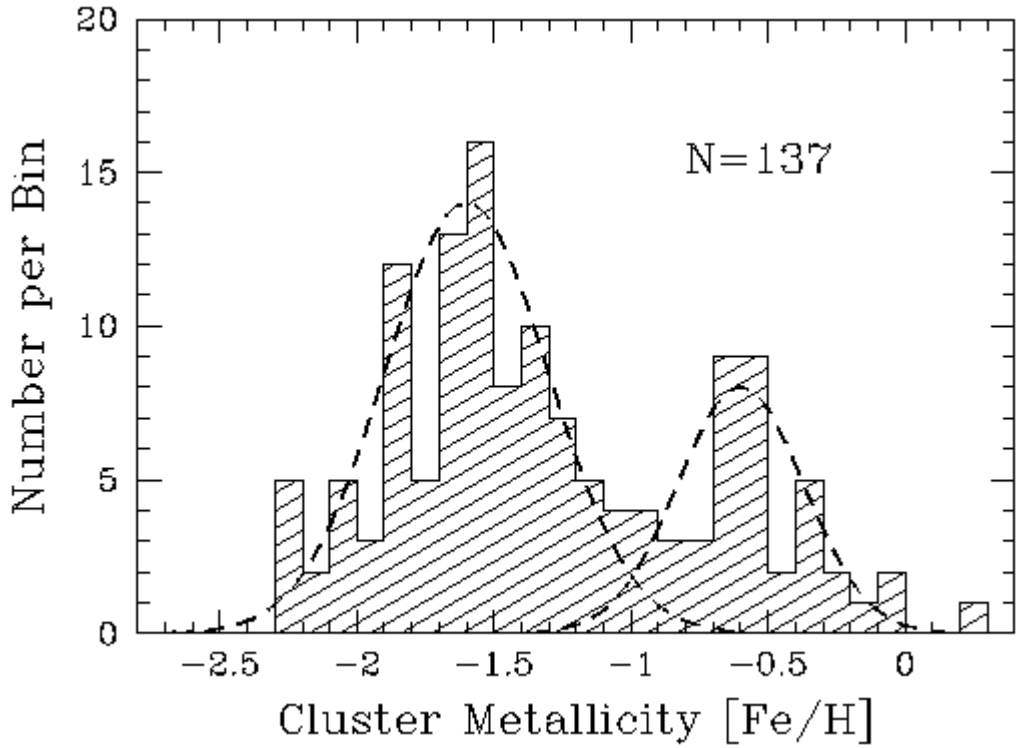


Milky Way Globular Clusters

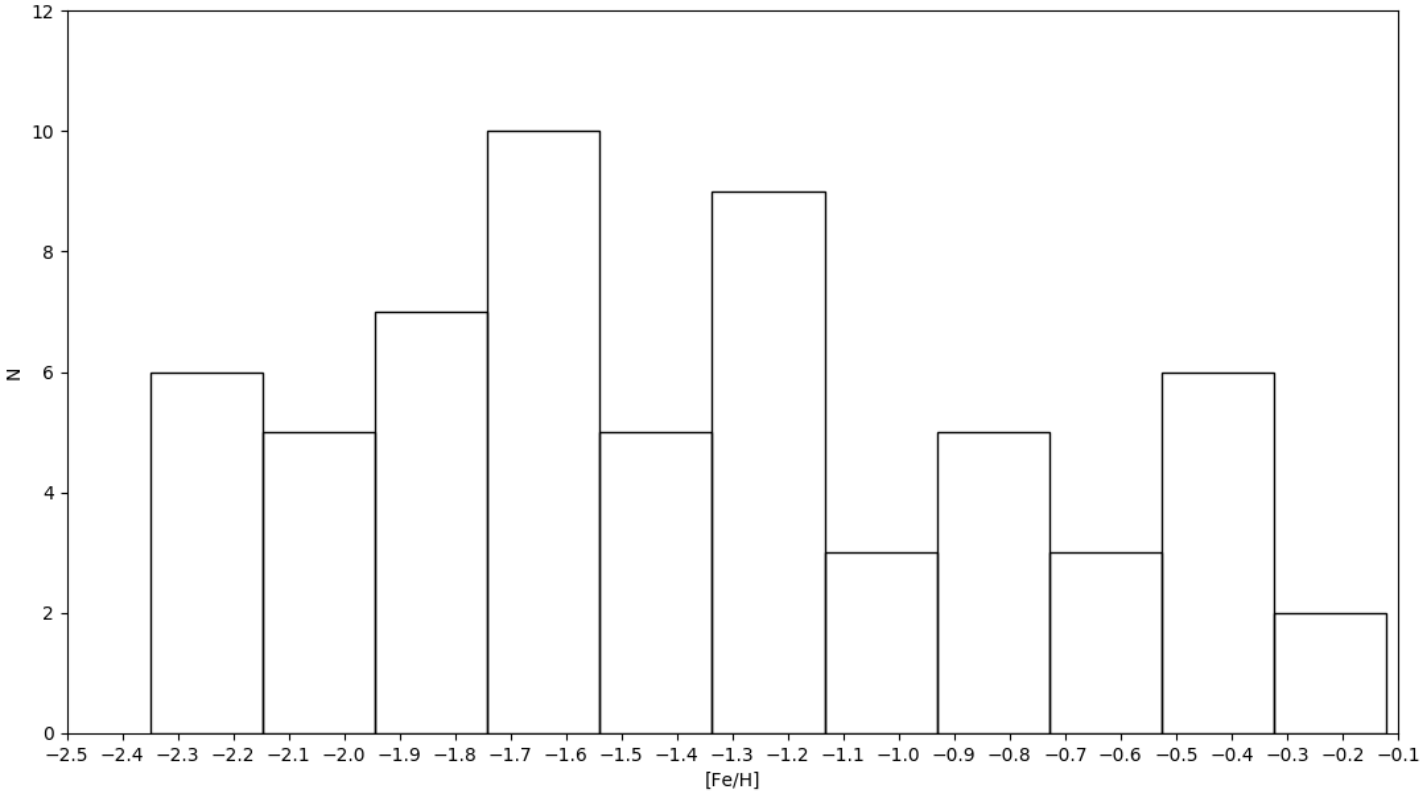


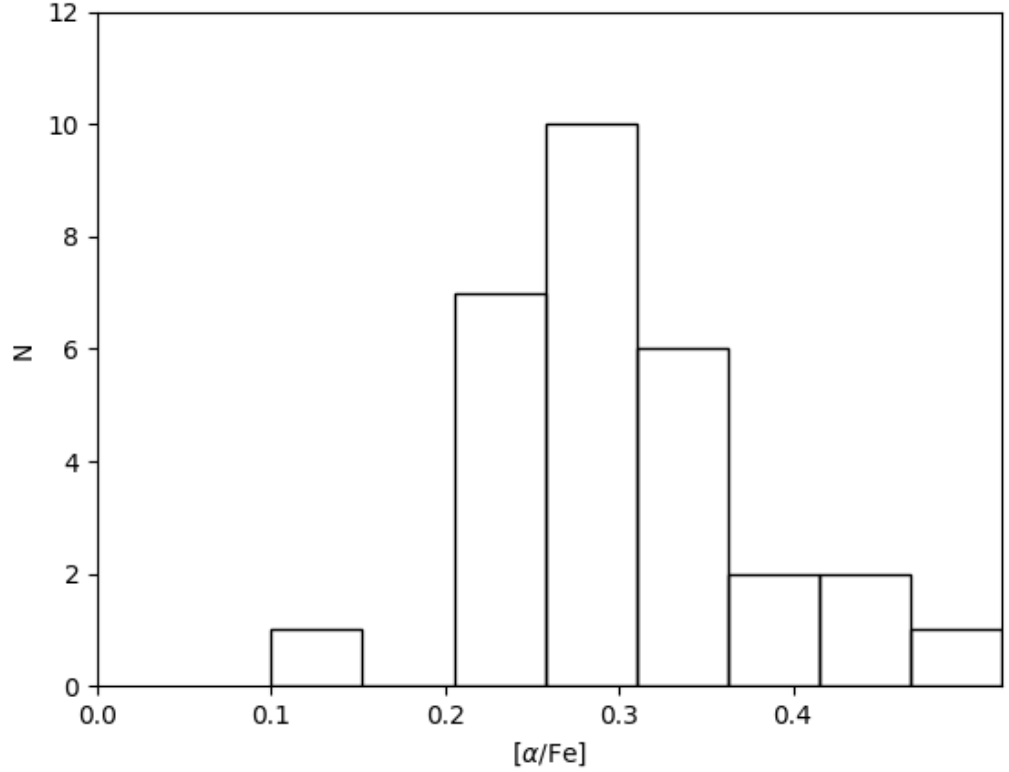
Pritzl, Venn, Irwin, 2005

Harris, W. E., 1999



~ 65 catalogues of globular clusters by ACS-HST (V,I bands) and by ground telescopes (U, B, V, R, I bands)





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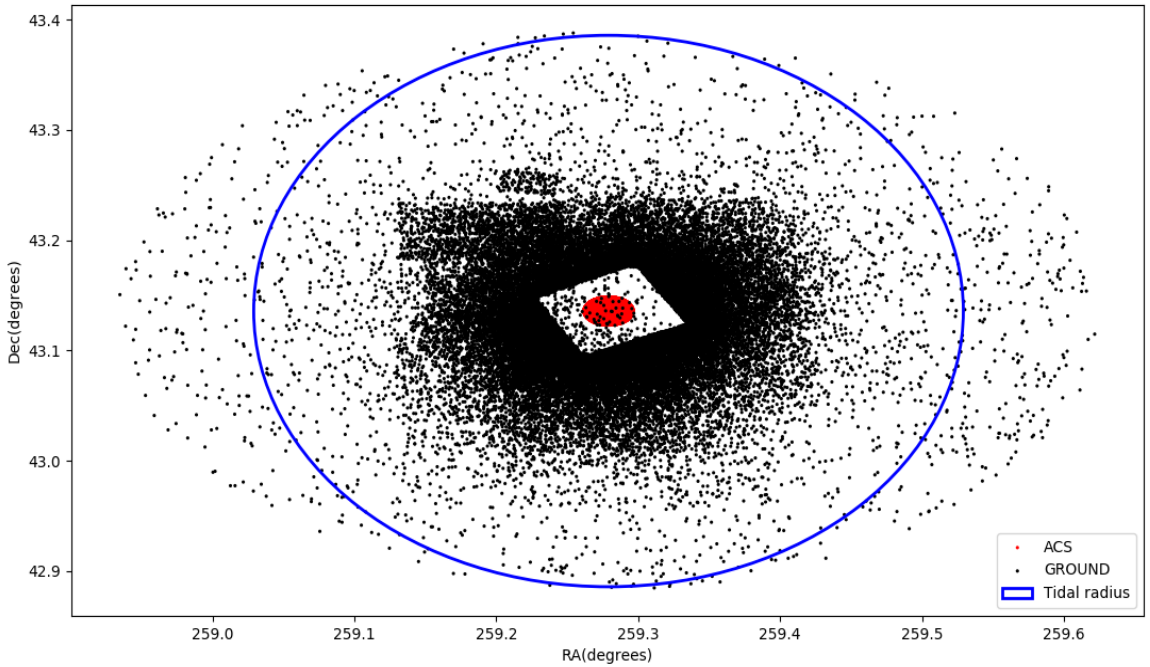
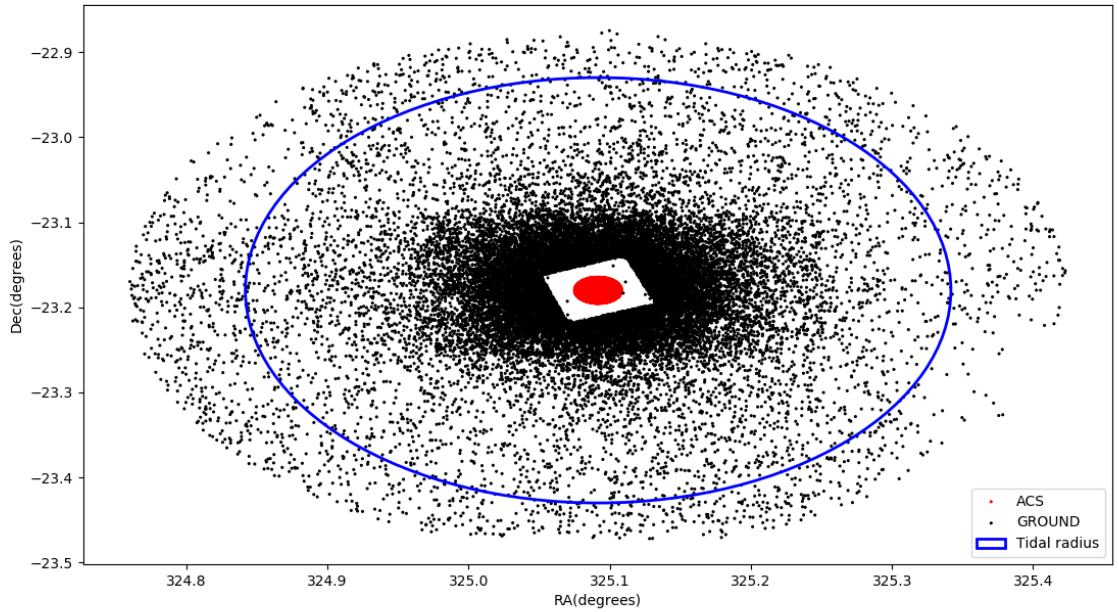
NGC 6341 (M 92)

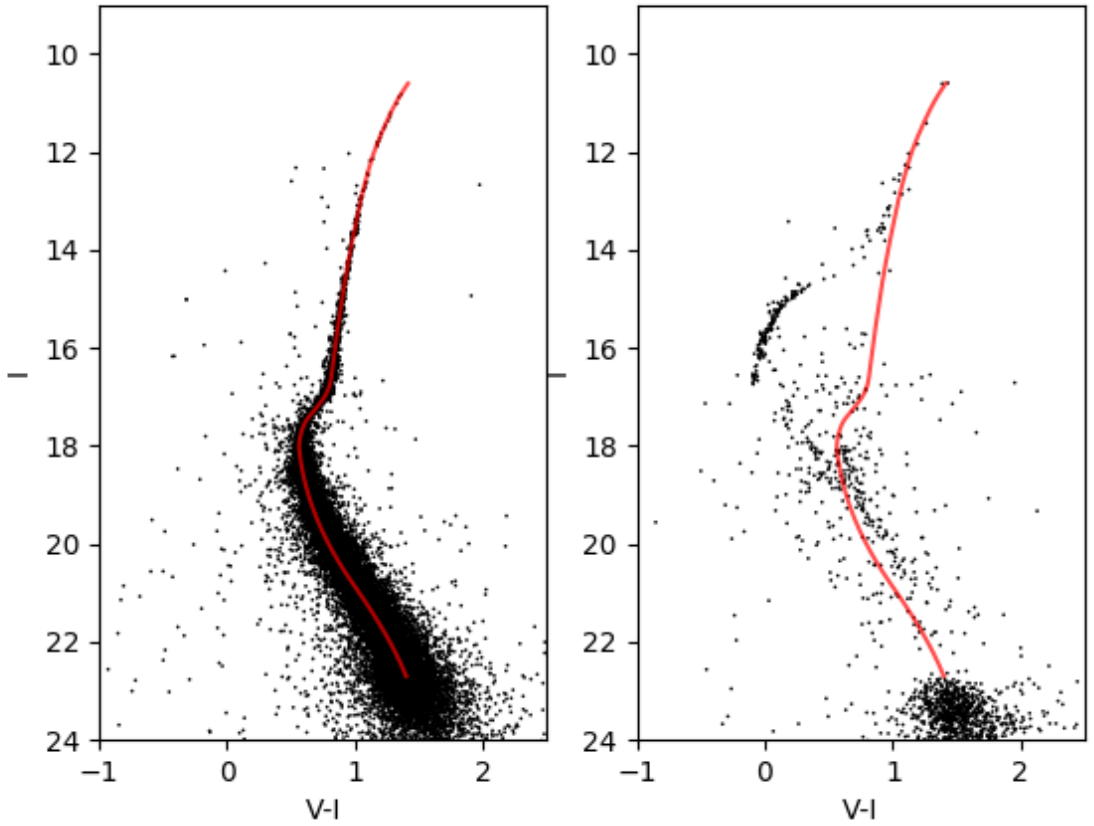


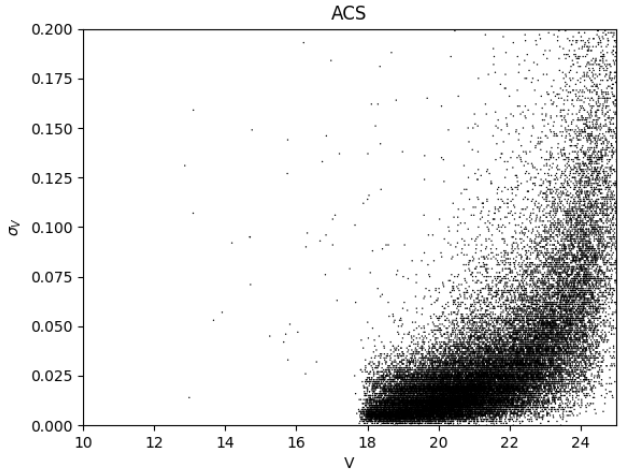
NGC 7099 (M 30)

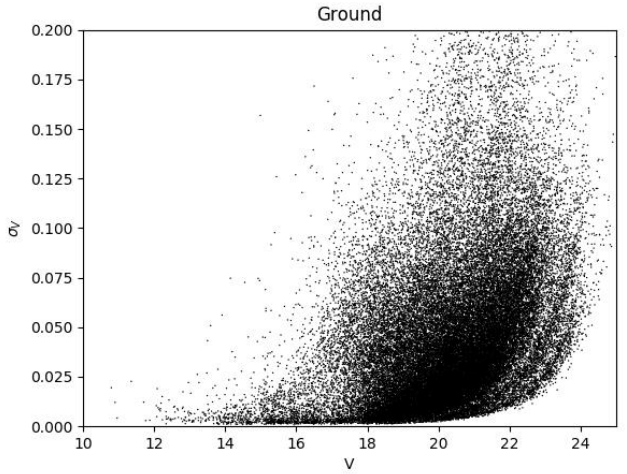


INTEGRATED MAGNITUDES FROM RIDGELINE SELECTION

NGC 6341 (M92)







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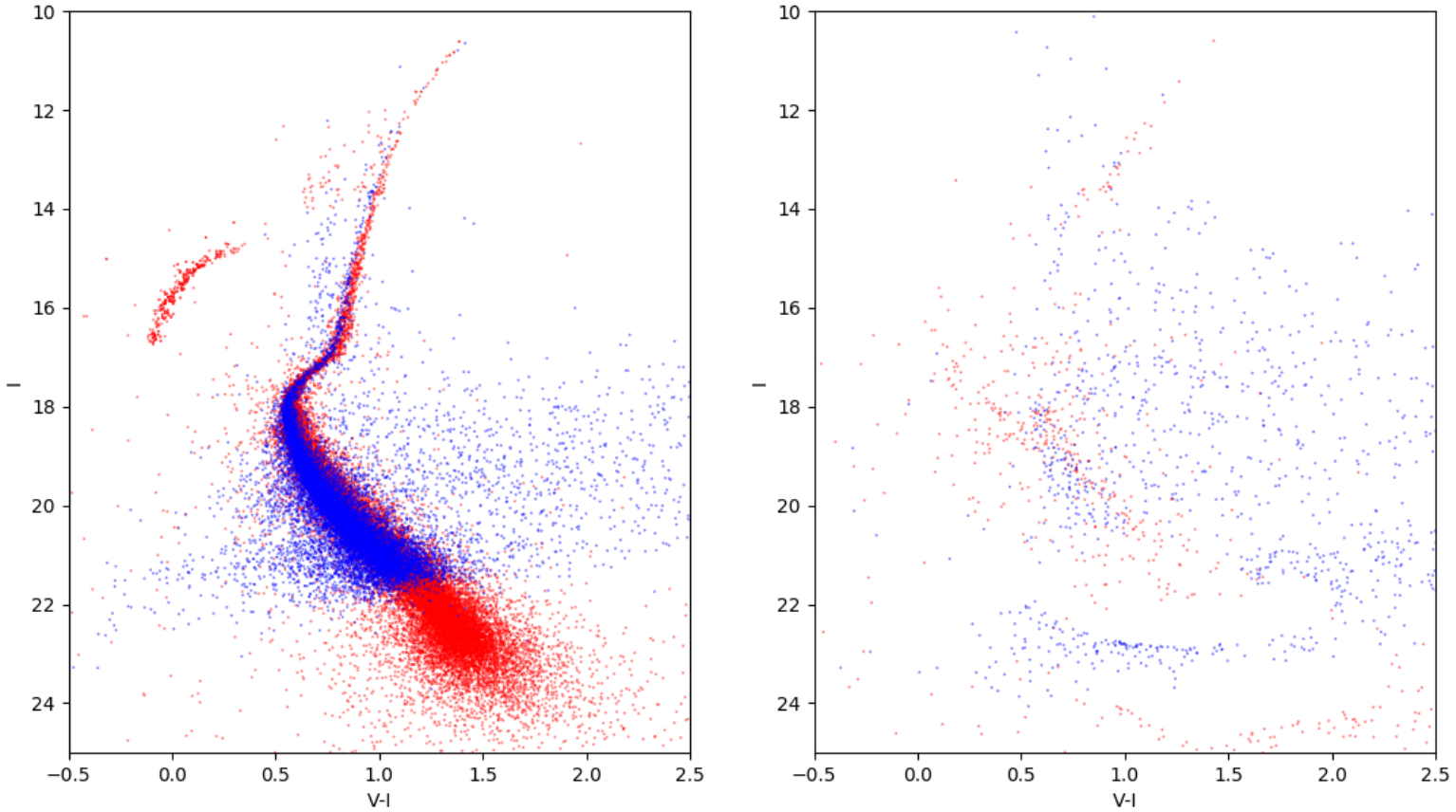
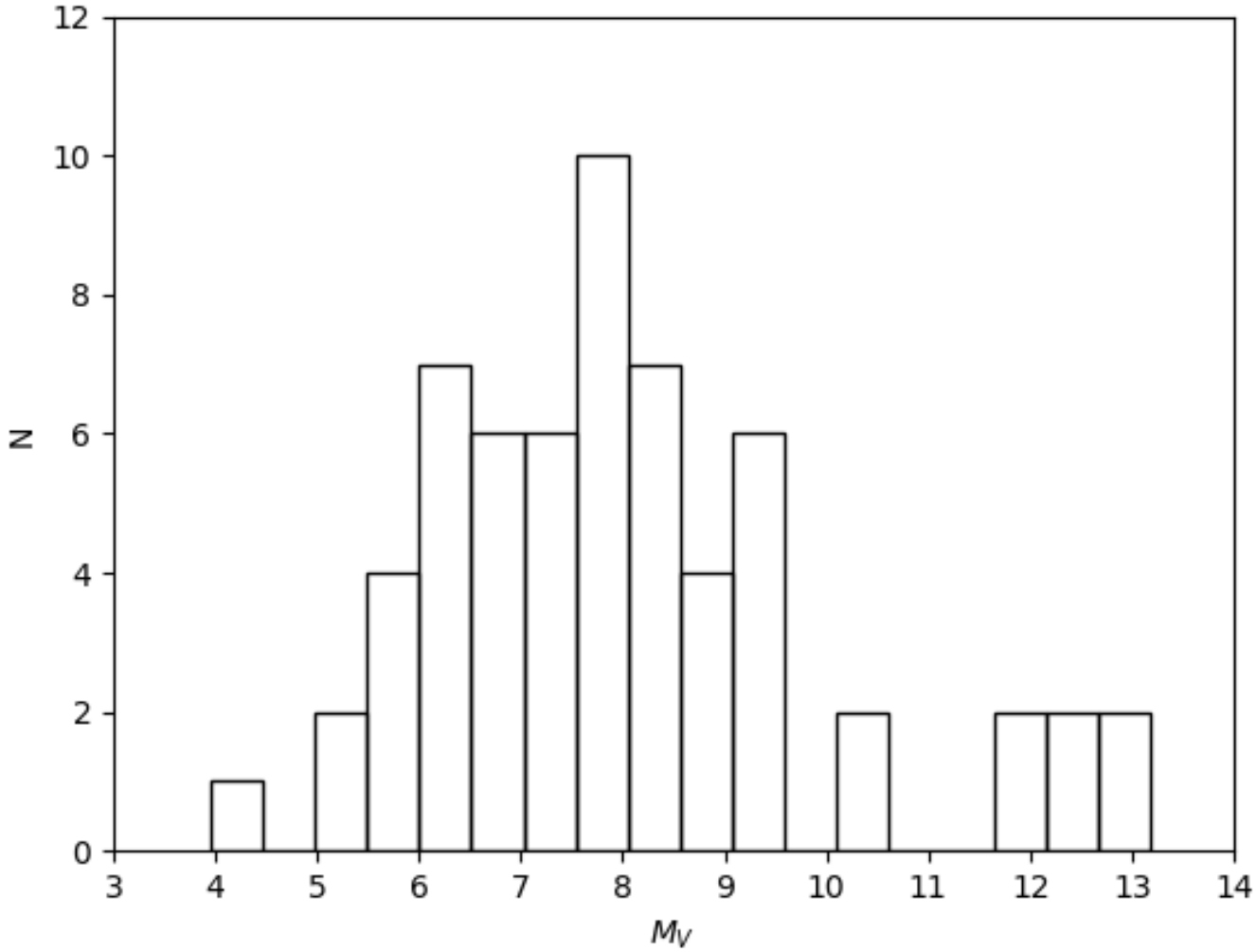


Space + Ground

Ground

HARRIS' CATALOG

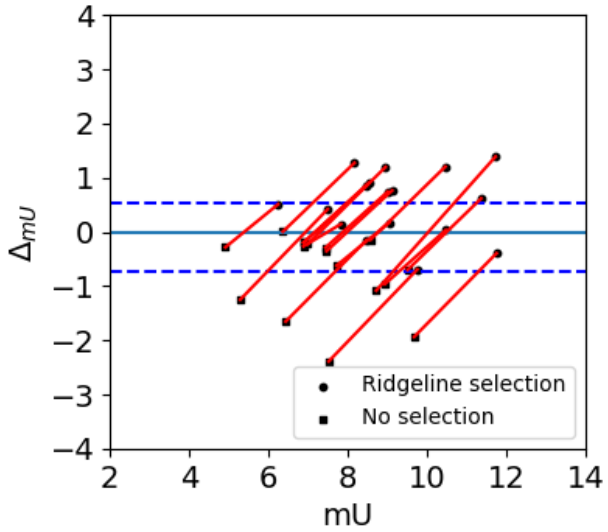
Harris, W.E., Harris, G.L.H, and Alessi, M. 2013, ApJ 772, 82

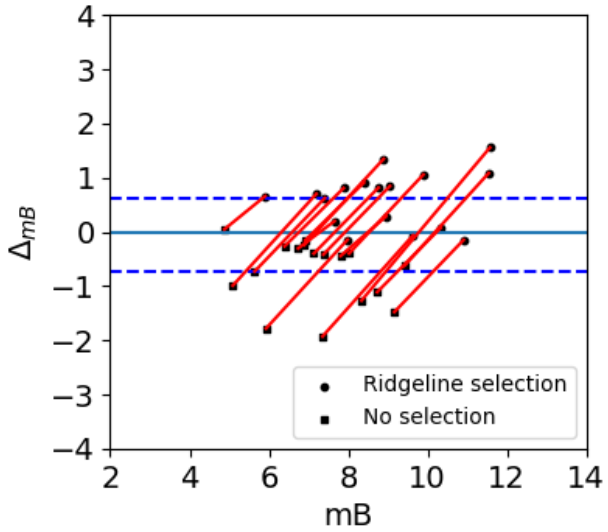


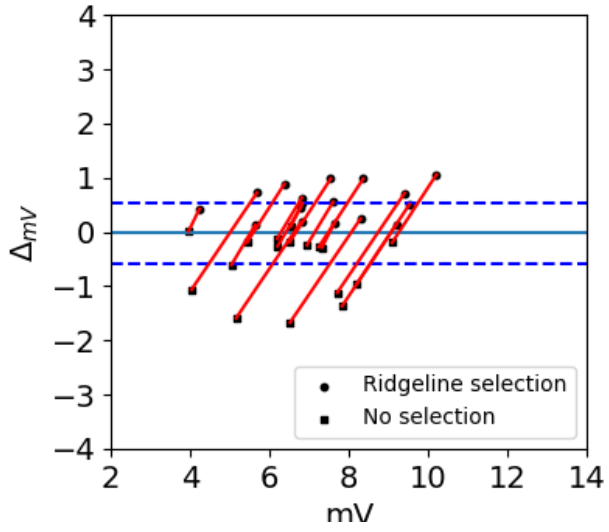
The adopted integrated magnitudes are the straight averages of the data from several sources.

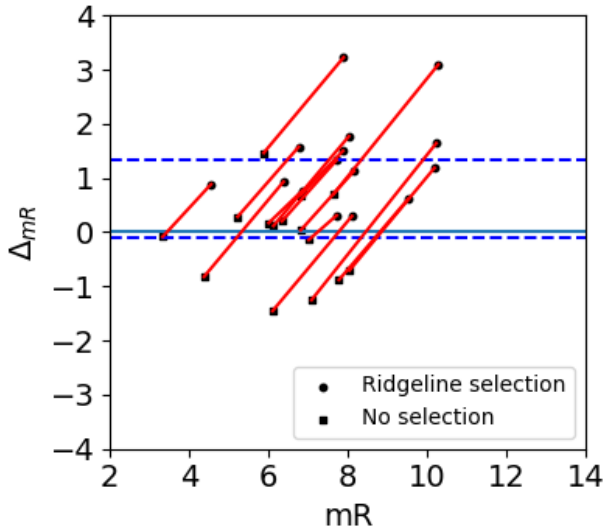
Magnitudes estimated by different curve-of-growth methods.

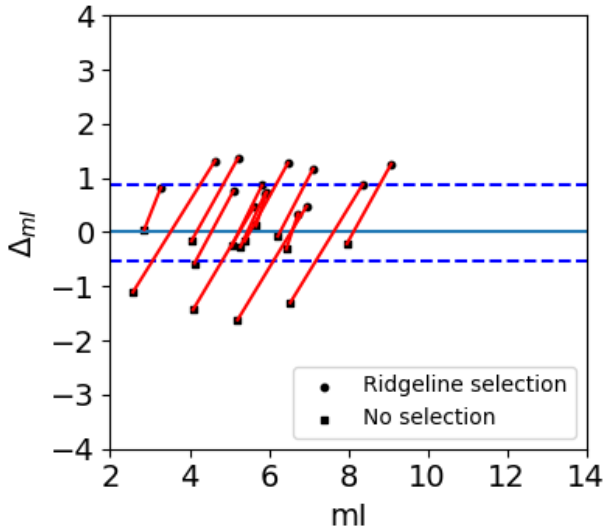
CALIBRATORS











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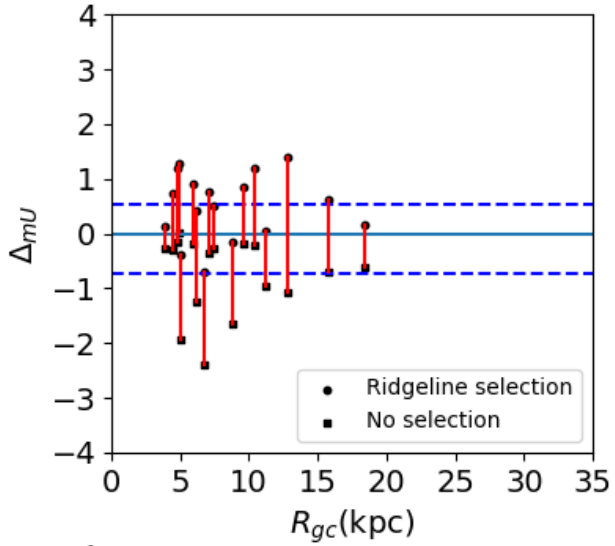

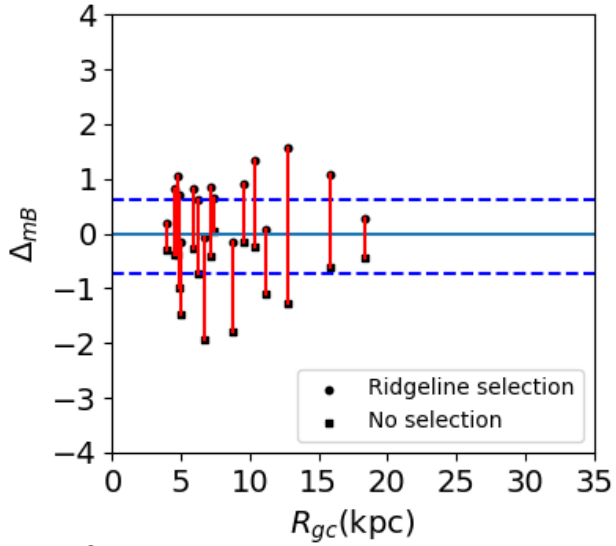

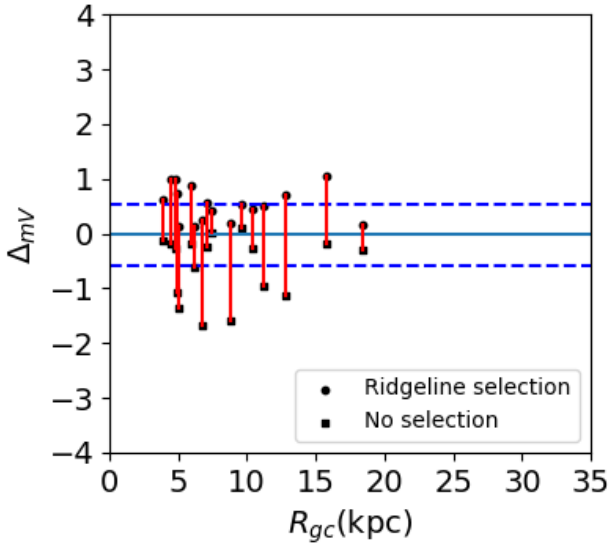

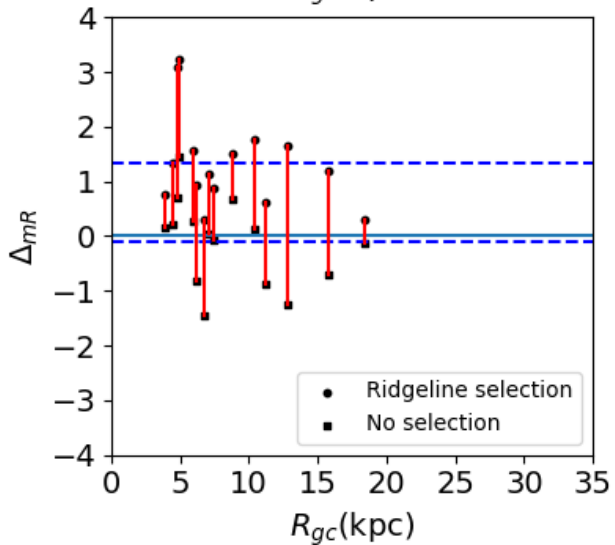

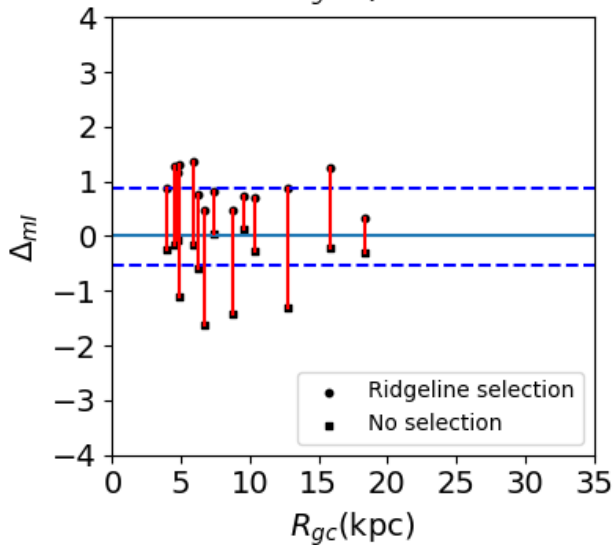

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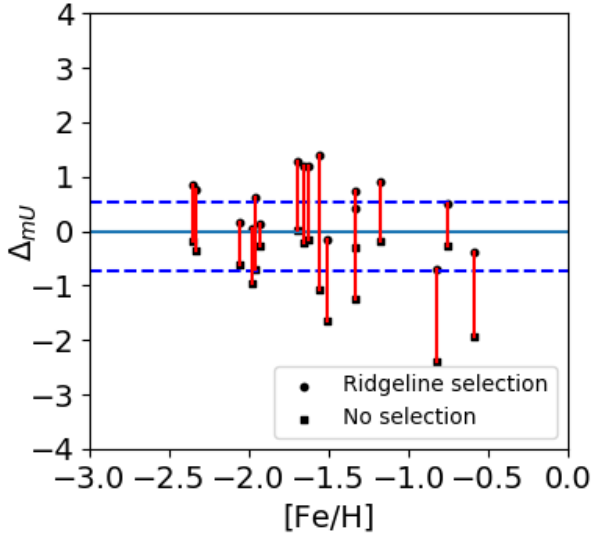
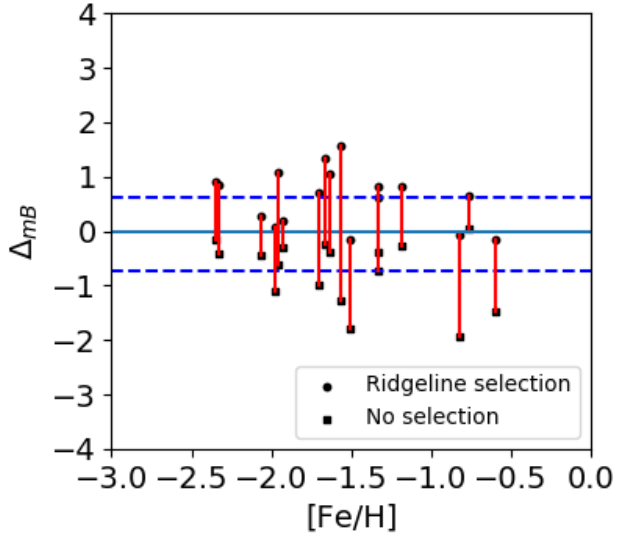
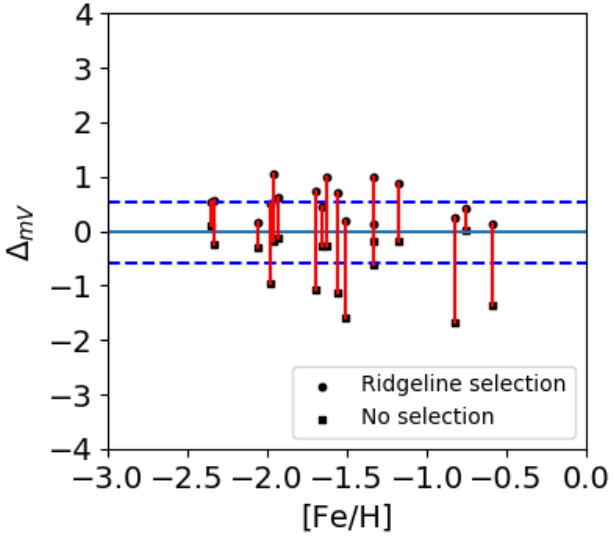
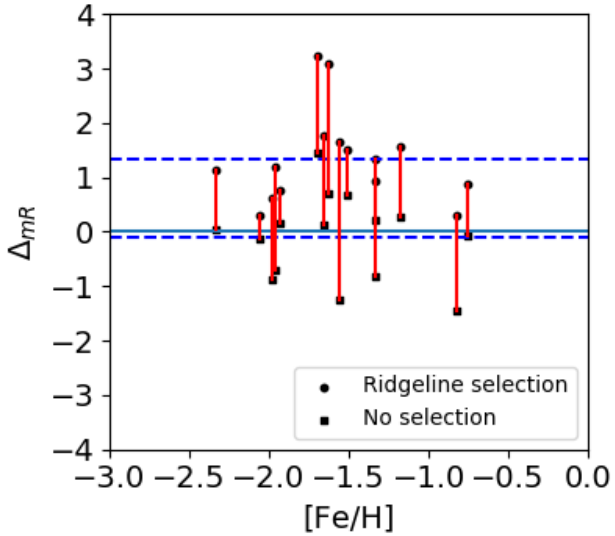
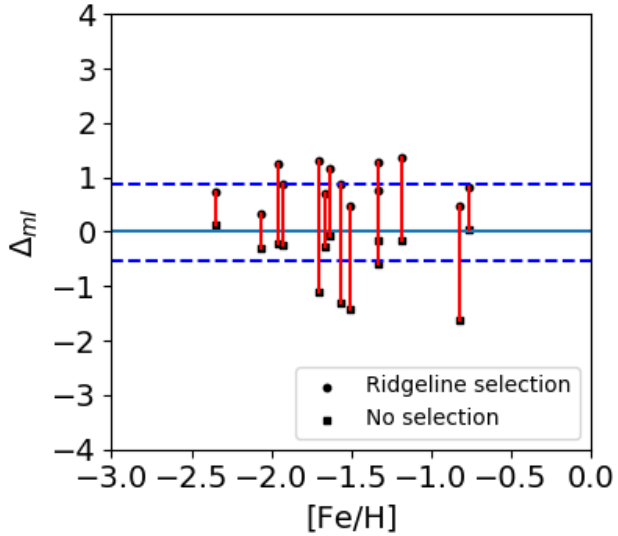










FUTURE WORK

- Magnitudes in IR bands
- SEDs
- New empirical libraries

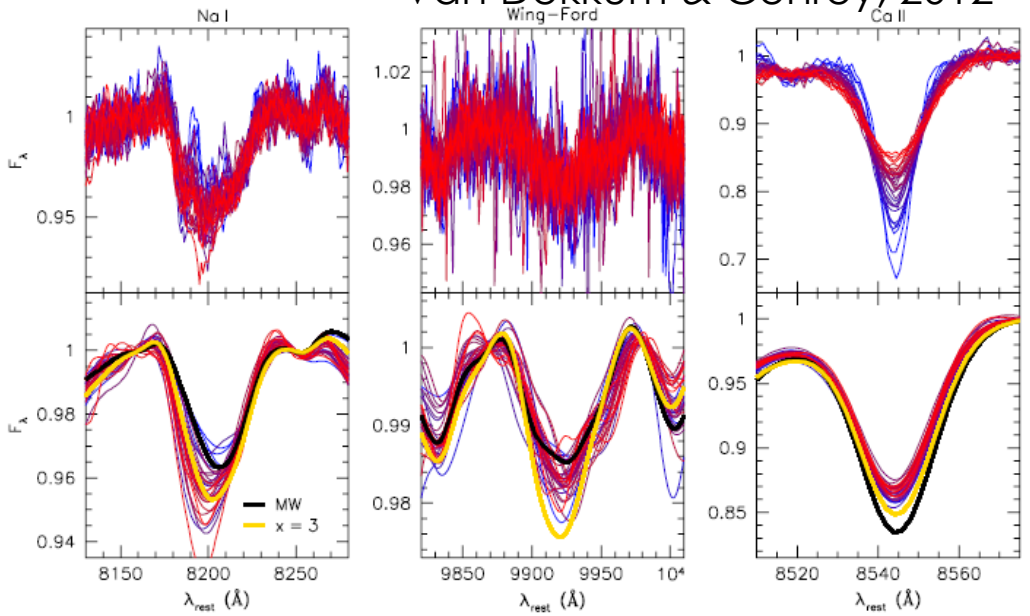
Thank You!!!

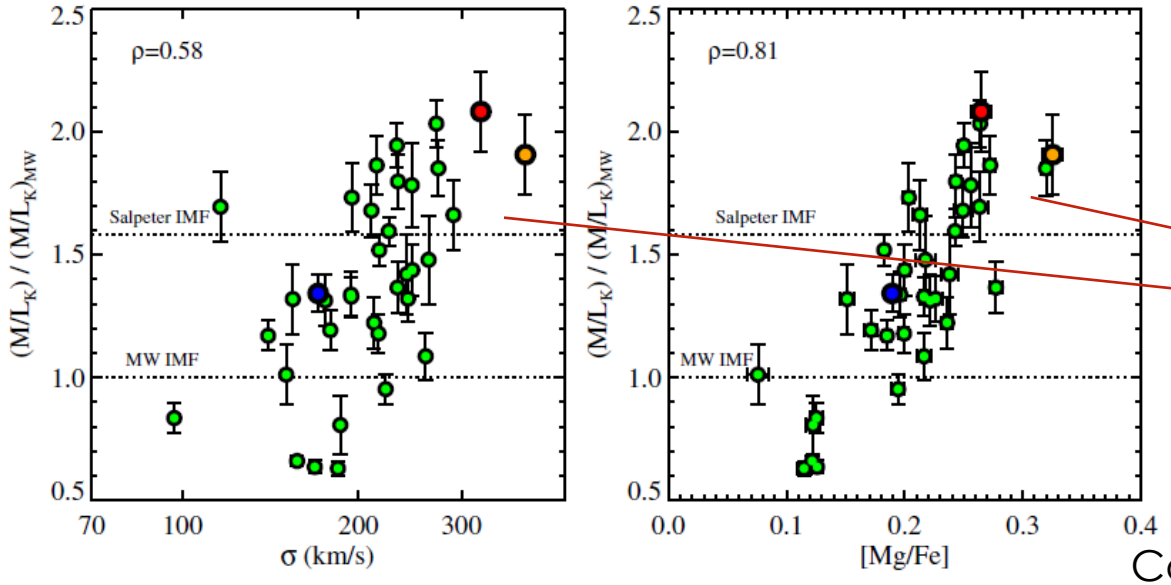
MODELLING GALAXY SEDs

DIAGNOSTICS:

- **IMF**: sensitive spectral features →
  Na I (0.82μm), CaII (0.86μm), FeH (0.99μm)
  → Constraints on IMF and M/L

Van Dokkum & Conroy, 2012





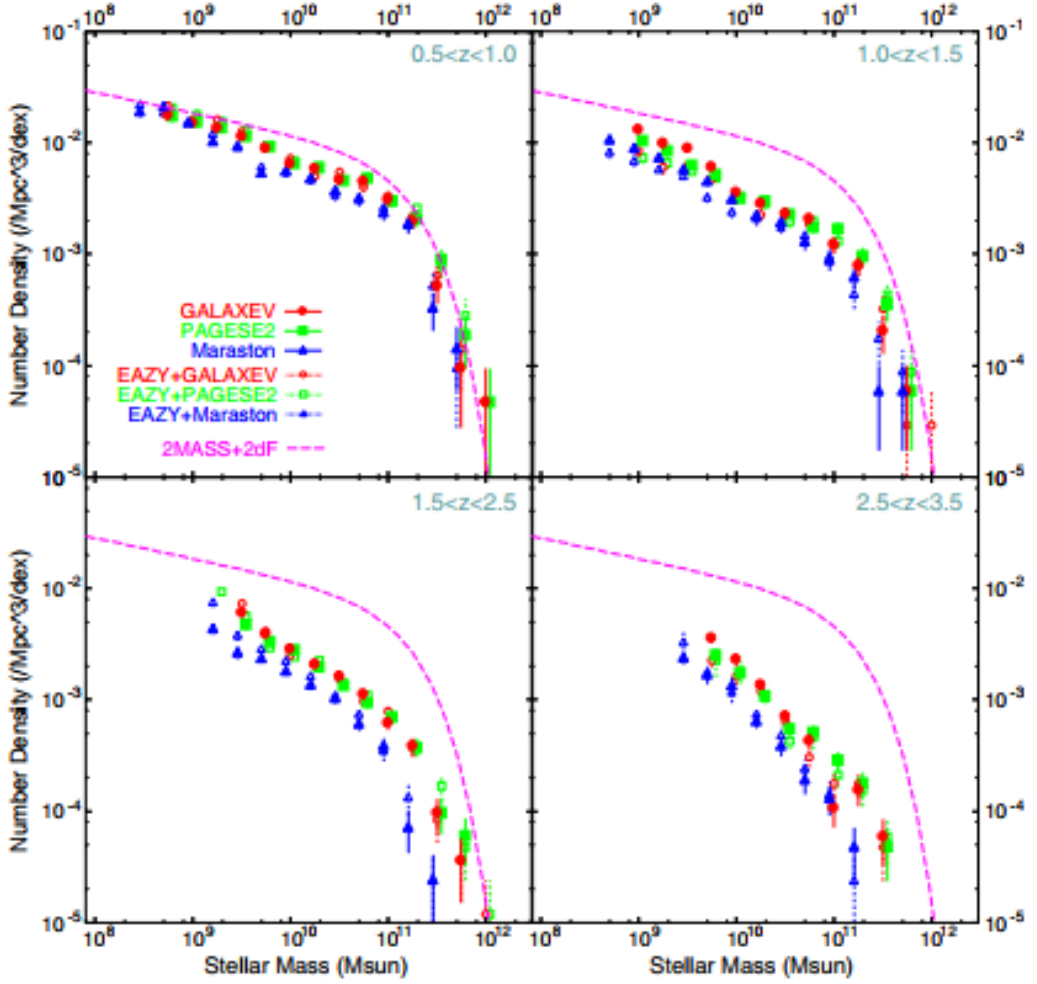
IMF contains more low-mass stars than a Salpeter IMF

Conroy & van Dokkum, 2012

MODELLING GALAXIES SEDs

Propagation of Uncertainties

Offset of a factor ~ 2 in stellar masses estimated from different SPS models



Kajisawa et al., 2009