

<https://hubblesite.org/contents/media/videos/2018/44/1188-Video.html>



Using Roman and Rubin to Detect Globular Cluster Systems

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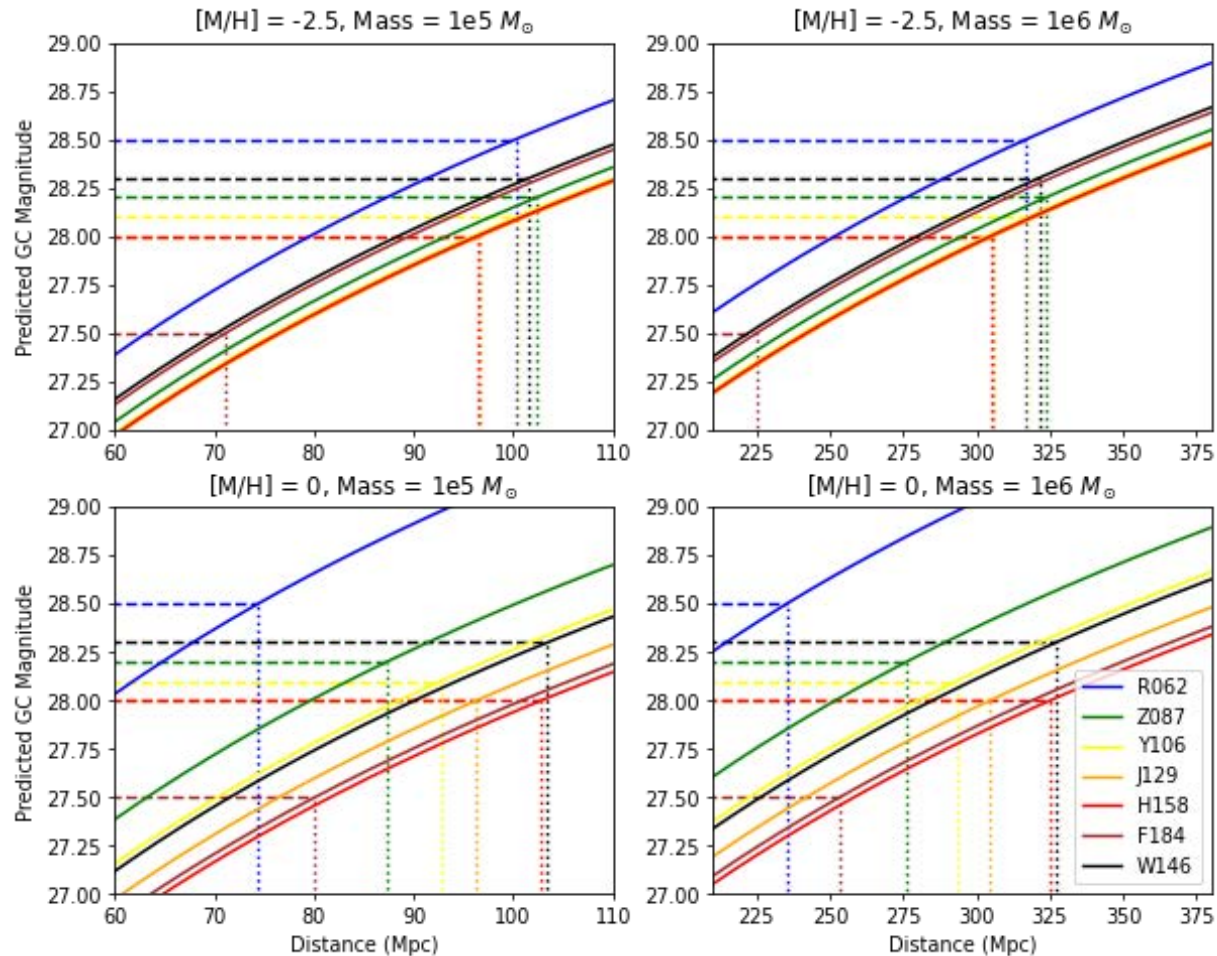
University of Utah



Roman Filter Depths for Globular Clusters

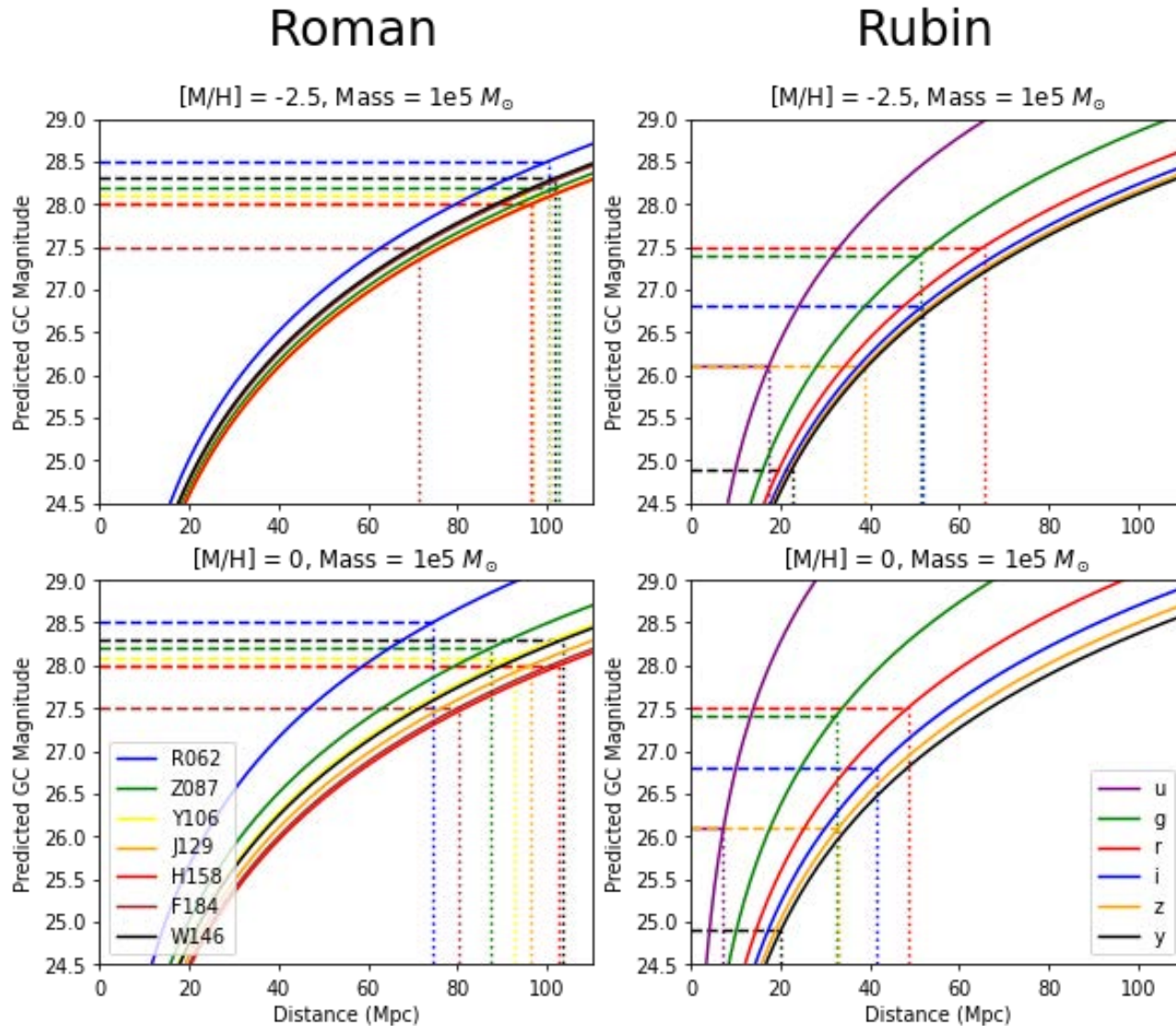
Faint; $10^5 M_{\odot}$

Bright; $10^6 M_{\odot}$



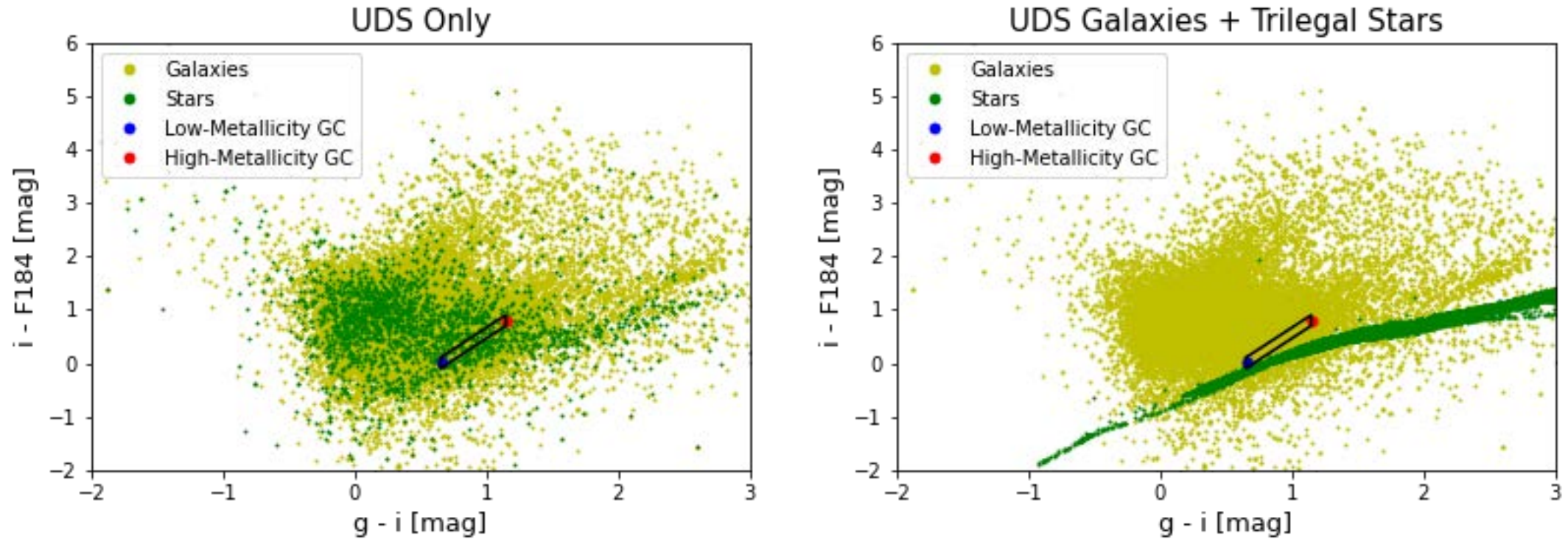
- In a 1 hour exposure:
 - Majority of GCs visible out to ~ 100 Mpc in most filters
 - Bright GCs visible out to ~ 300 Mpc
- Red-blue dependence on metallicity

Roman and Rubin Depth Comparison



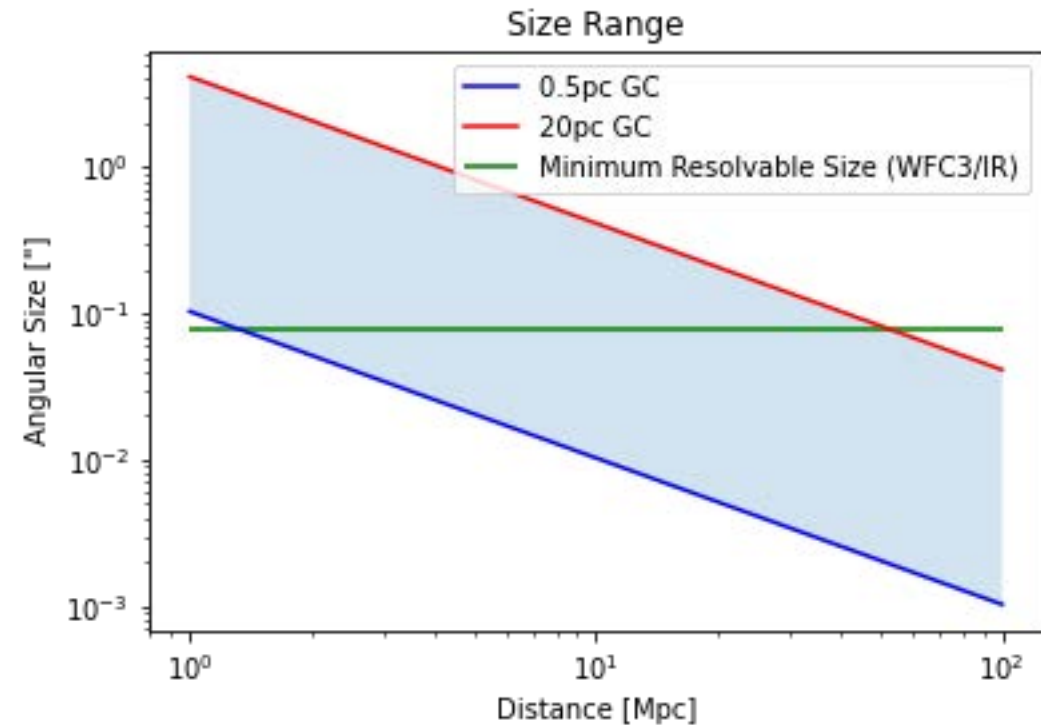
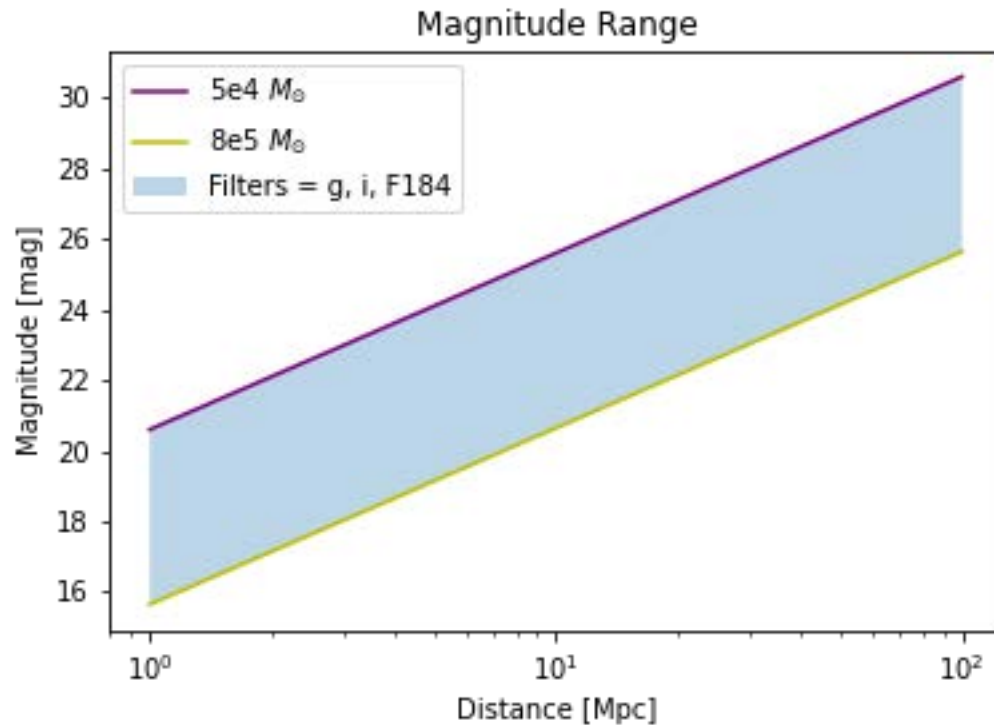
- Rubin final images shallower than Roman 1 hour images.
- Roman resolution $\sim 0.1''$
- Rubin seeing $\sim 0.7''$

Quantifying Contaminants



- GCs expected to populate small range of colors
- Consider contaminants using CANDELS/UDS data (mapped into Roman/Rubin filters) & Trilegal
- Find optimal combinations of Roman & Rubin filters

Magnitude and Size Cuts



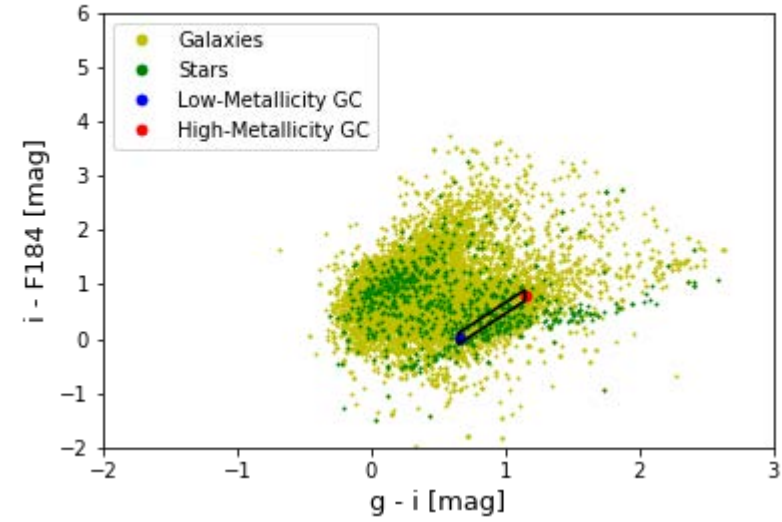
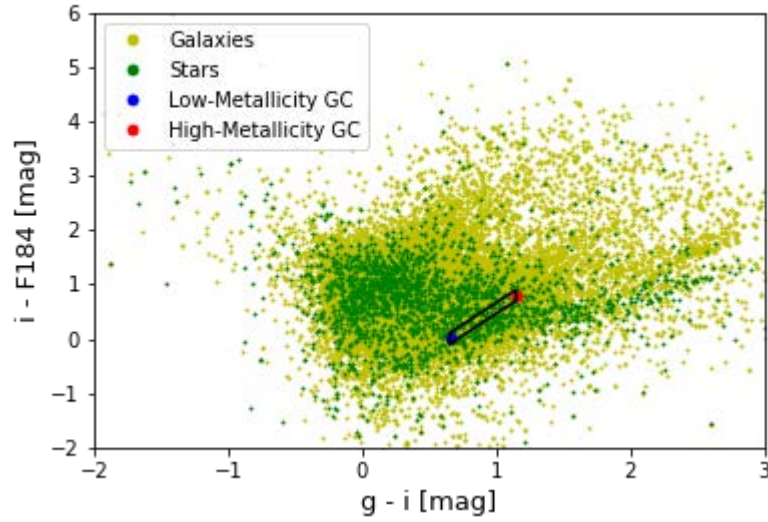
- Consider mass range that contains 75% of GCs
- Based Roman resolution on F160W UDS size data – objects resolved if >0.08''

UDS Contaminants

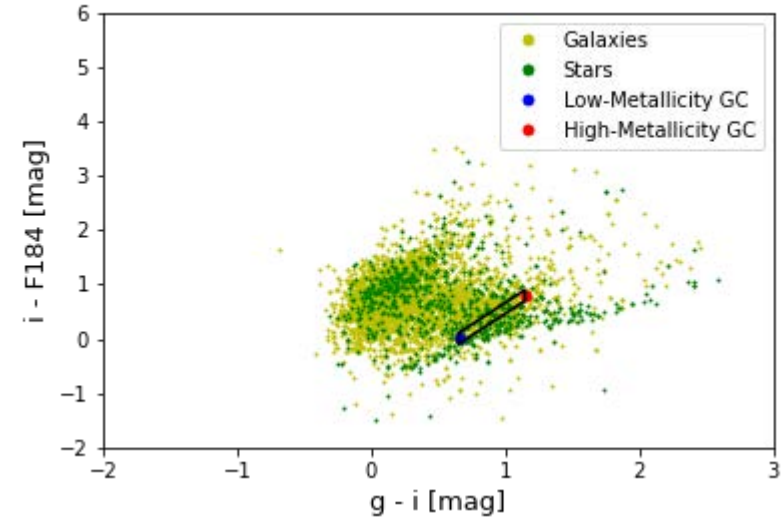
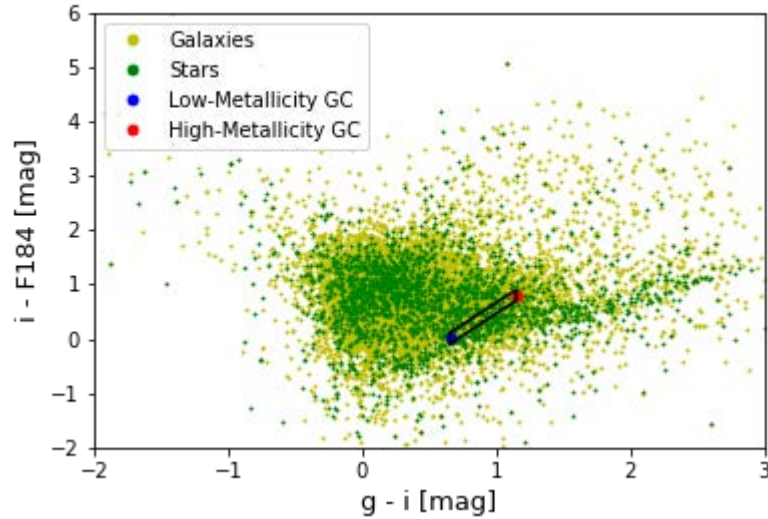
Without magnitude cuts

With magnitude cuts

Without
size cuts

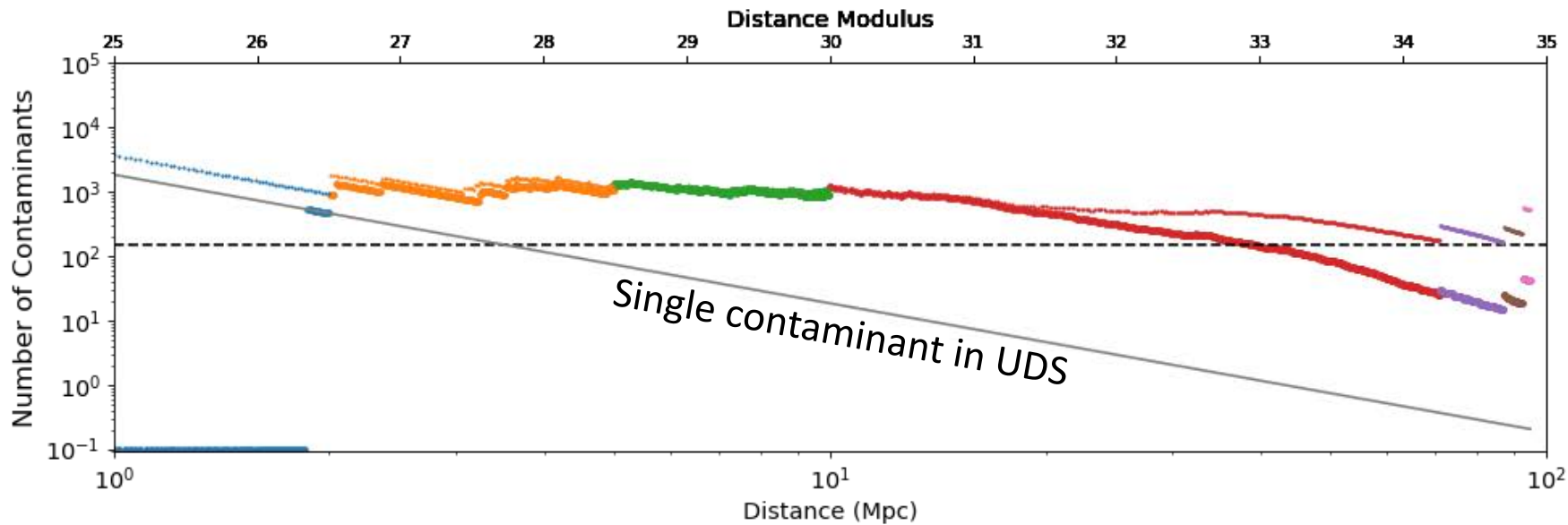


With
size cuts



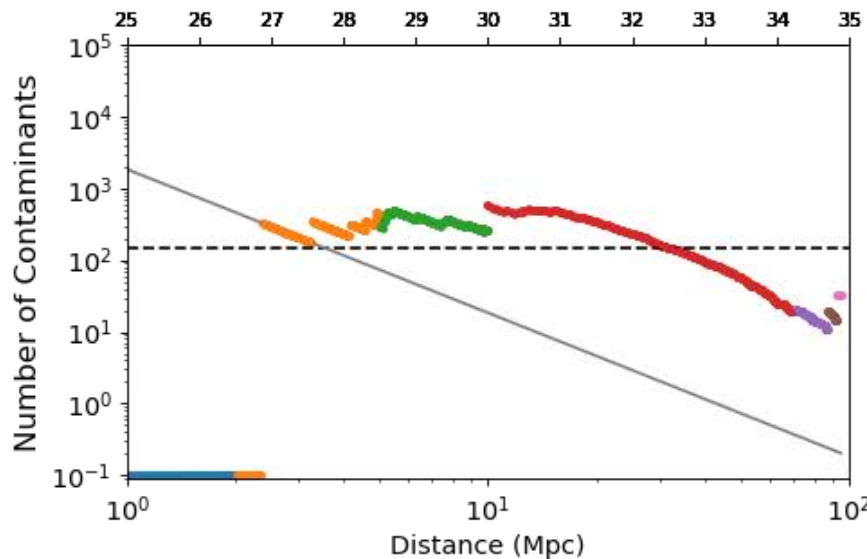
Contaminants vs Distance (Roman Filters Only)

Total Contaminants



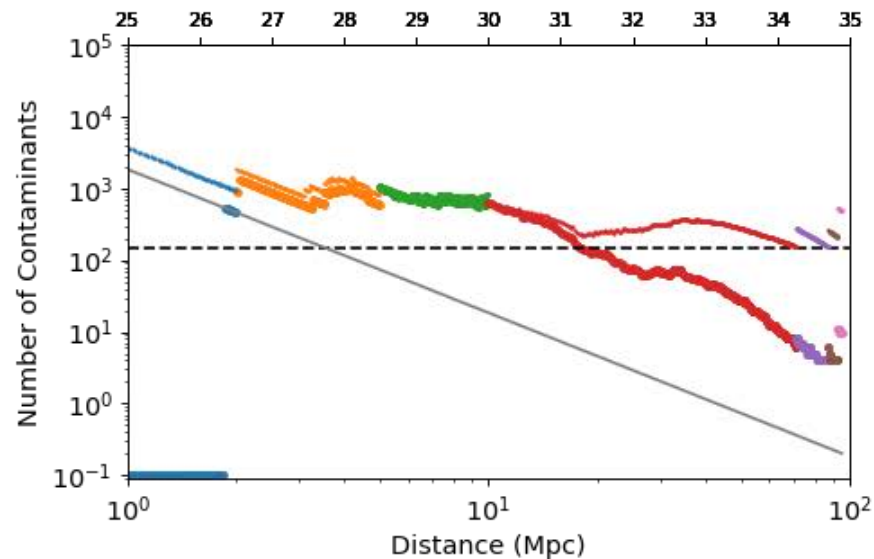
Star Contaminants

Distance Modulus



Galaxy Contaminants

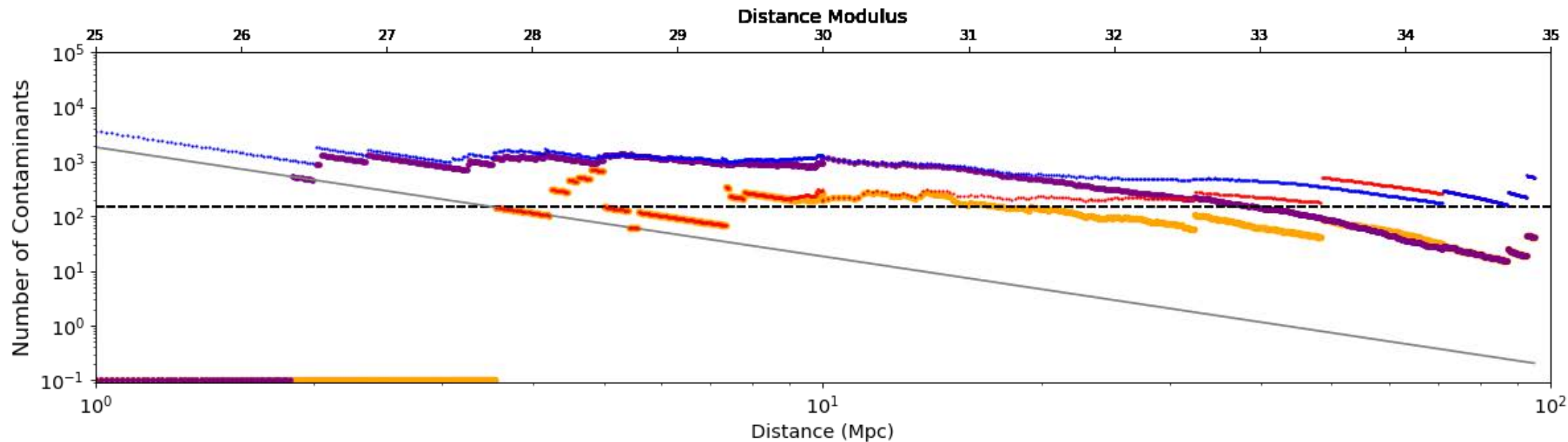
Distance Modulus



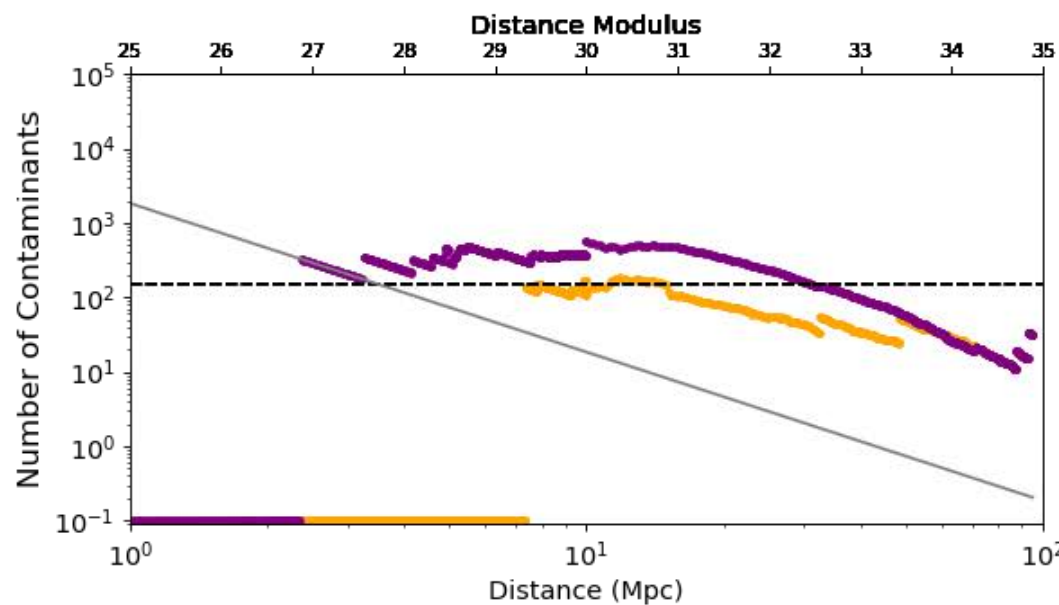
- Scaling Factor
- - - MW GC System
- R062 - Z087 vs Z087 - F184
- Z087 - Y106 vs Y106 - F184
- R062 - Z087 vs Z087 - F184
- H158 - F184 vs J129 - H158
- W149 - H158 vs Z087 - W149
- W149 - H158 vs Y106 - W149
- W149 - H158 vs J129 - W149

Roman Only vs Roman & Rubin

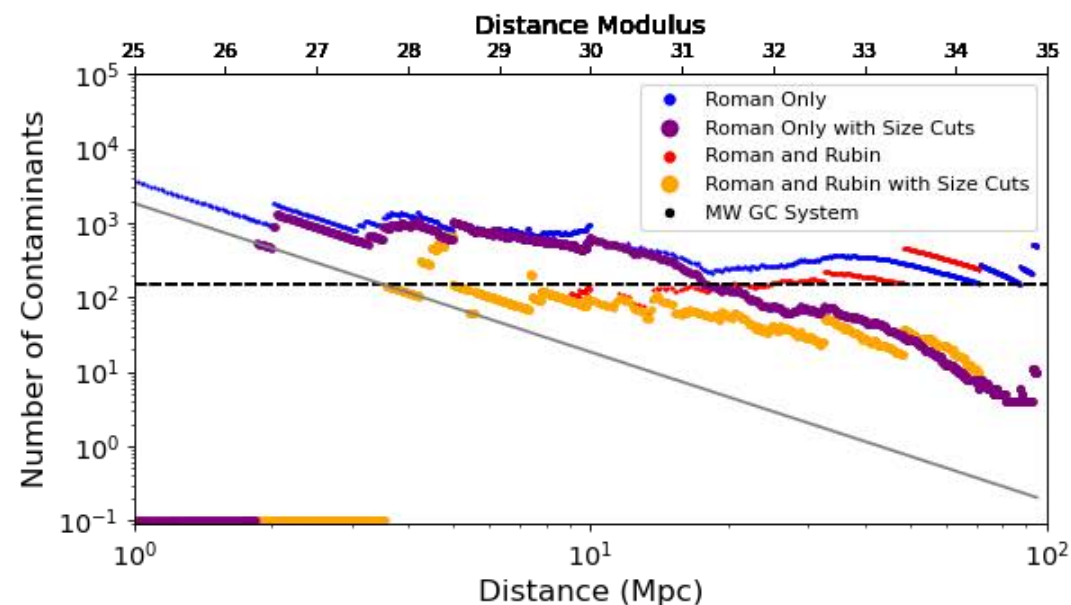
Total Contaminants



Star Contaminants



Galaxy Contaminants



Results

- Roman will efficiently find GCs in galaxies between 30-100 Mpc using color-color & size selection.
- Roman's resolution and depth makes it better for finding GCs than Rubin
- Rubin can help efficiently detect clusters in nearby galaxies