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The VISTA view on Milky Way Globular Clusters

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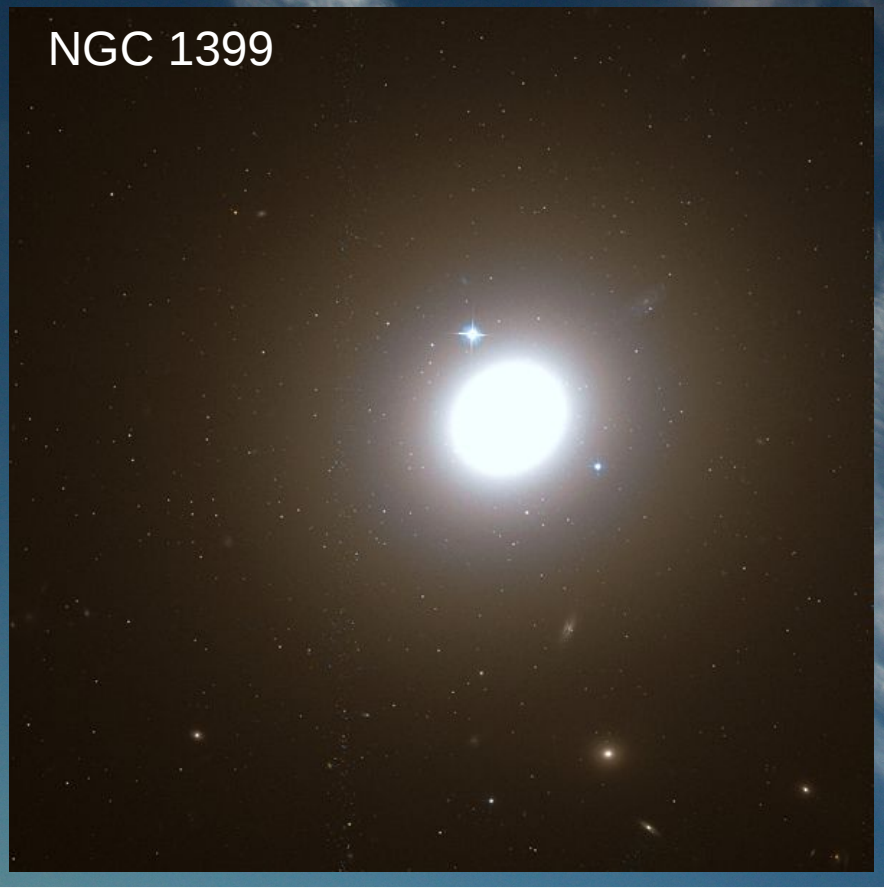
When do galaxies form the majority of their stars?

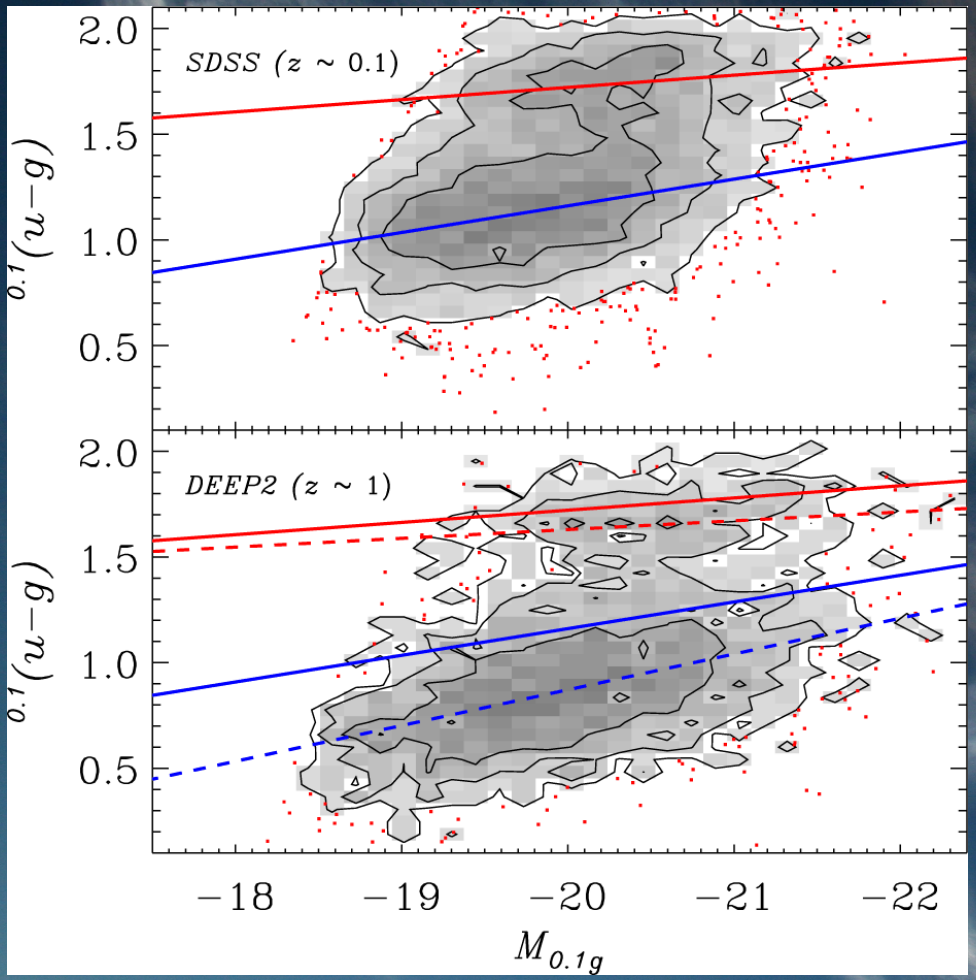
How does that depend on galaxy parameters
- environment ?
- mass ?

Early-type galaxies: Red and Dead- REALLY??



Why Early-Type galaxies?

- most massive stellar structures
- dominate galaxy clusters



M. Blanton ApJ 2006

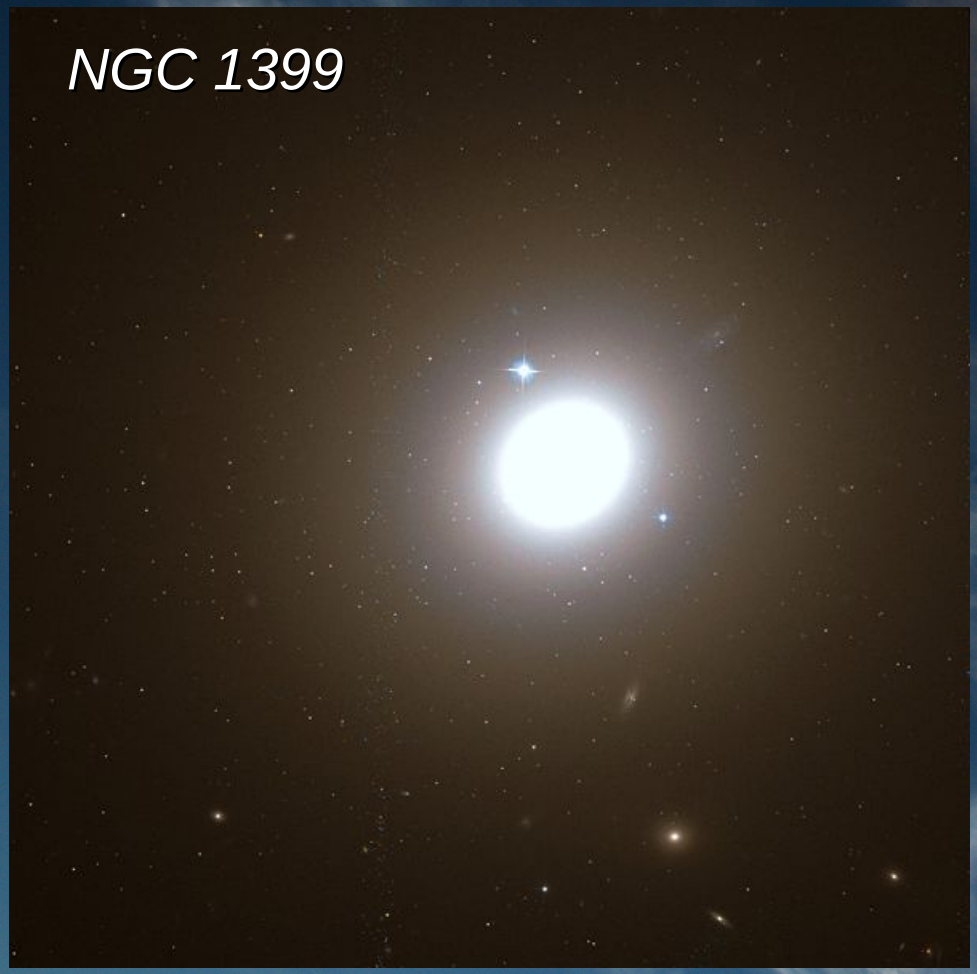
SDSS galaxy survey

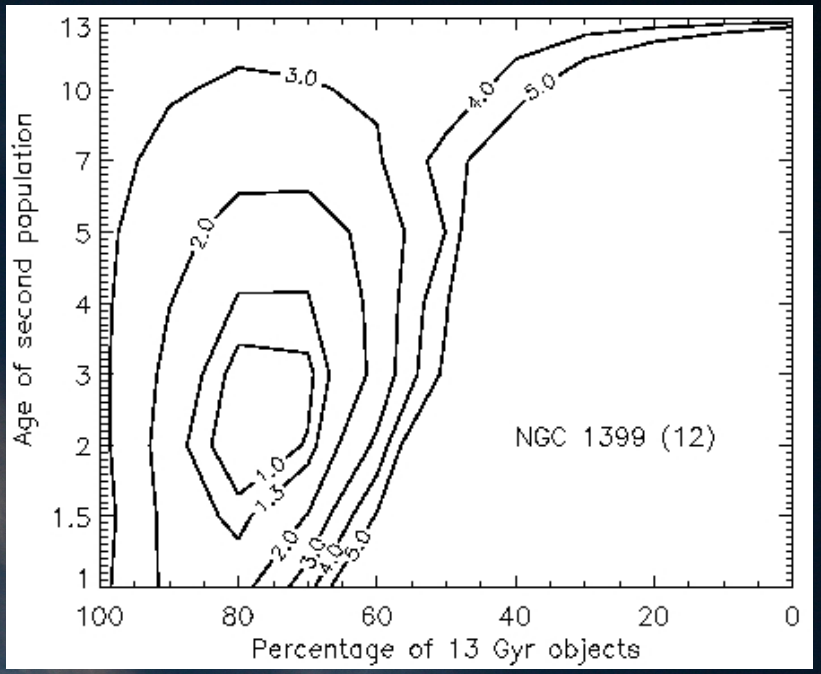
predicted

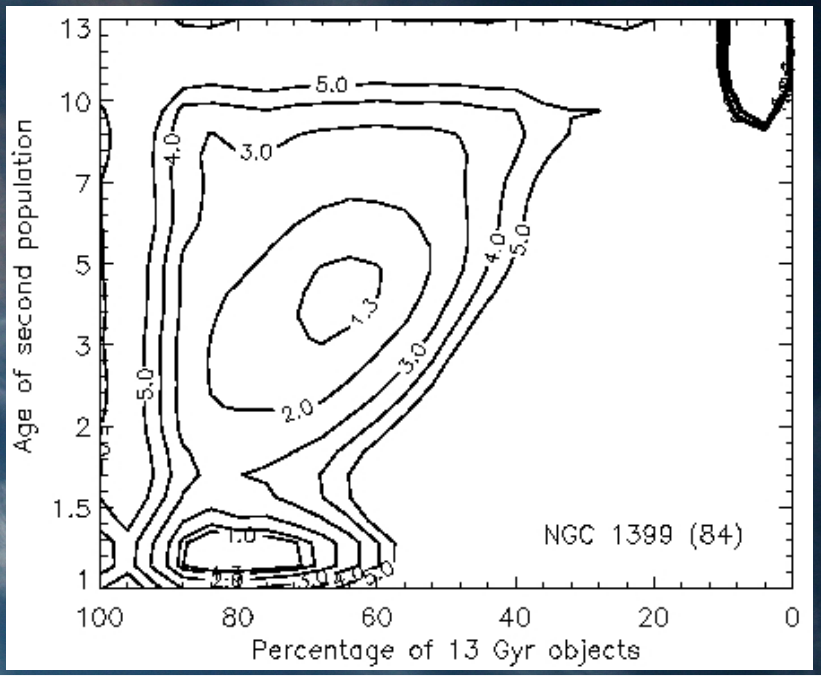
&

observed color-magnitude distribution,

assuming NO change in galaxy population between z=1 and z=0.1



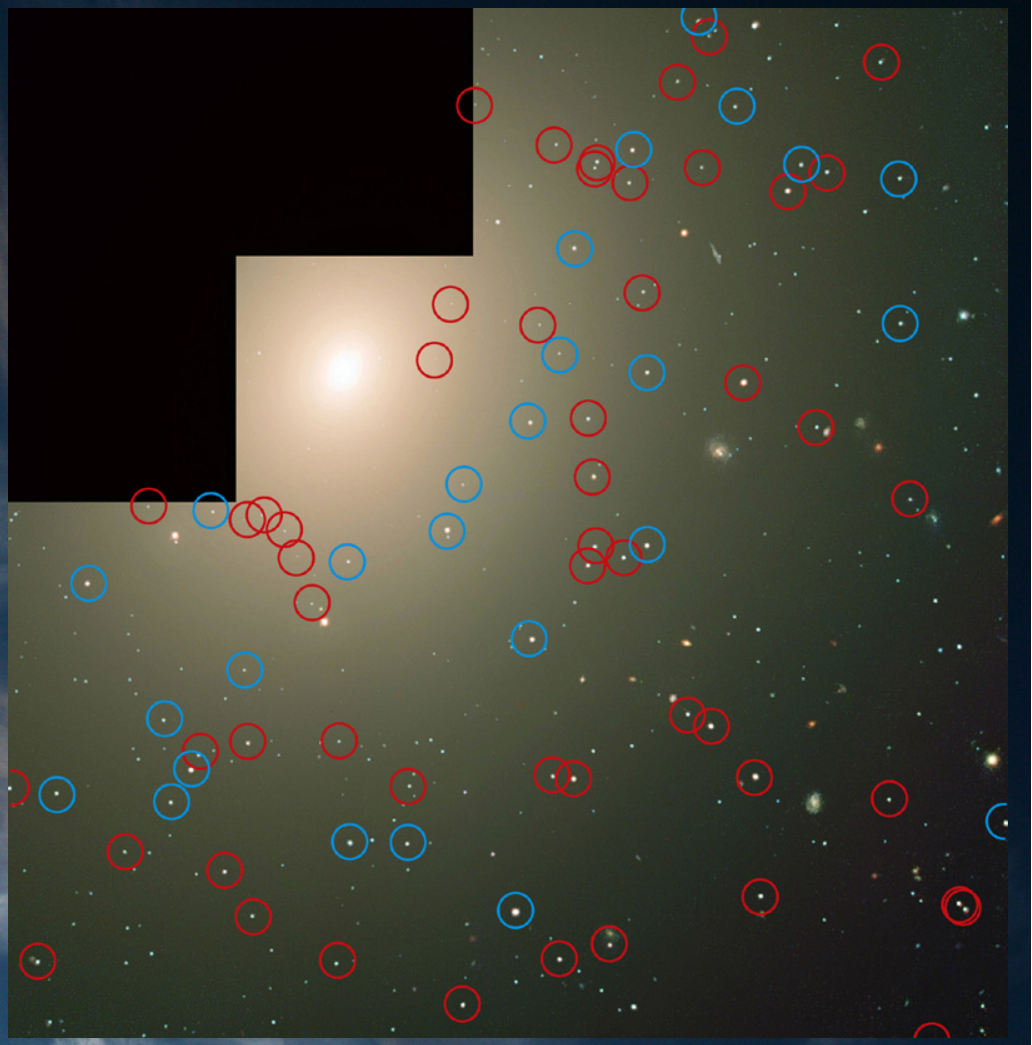


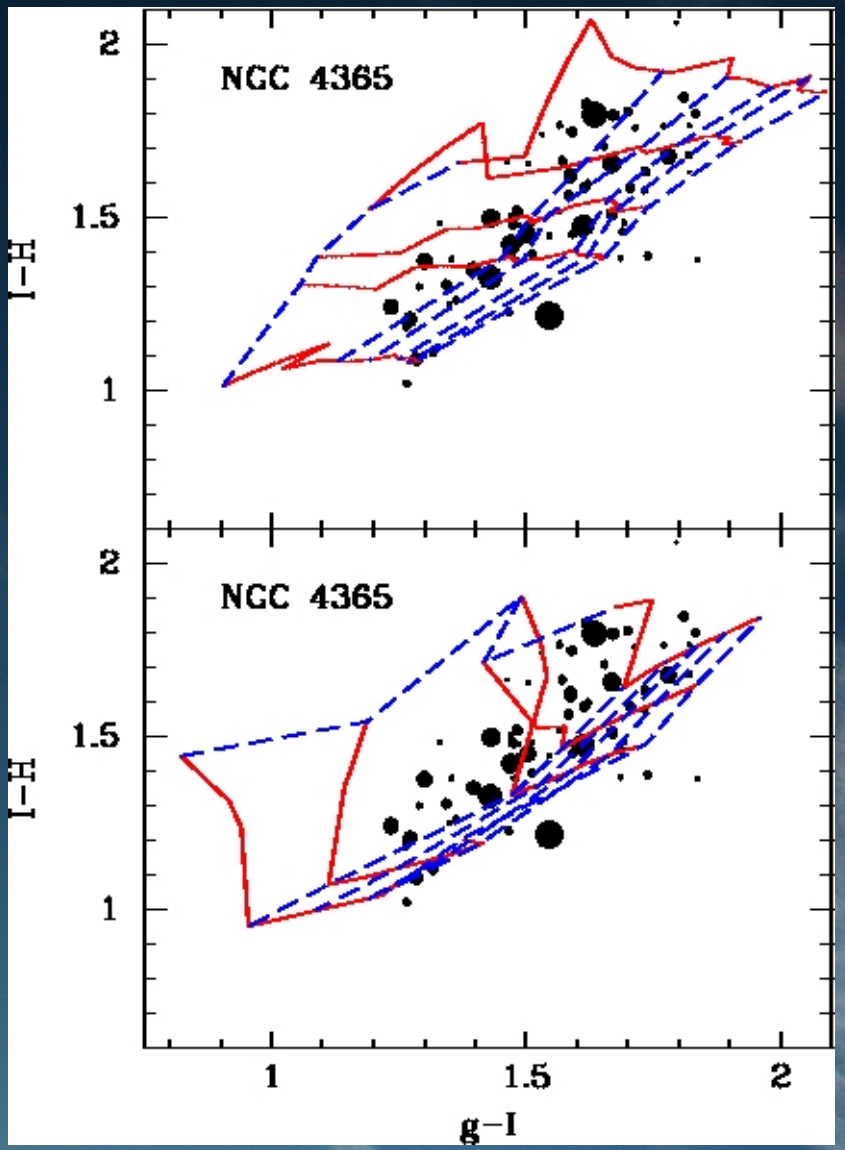


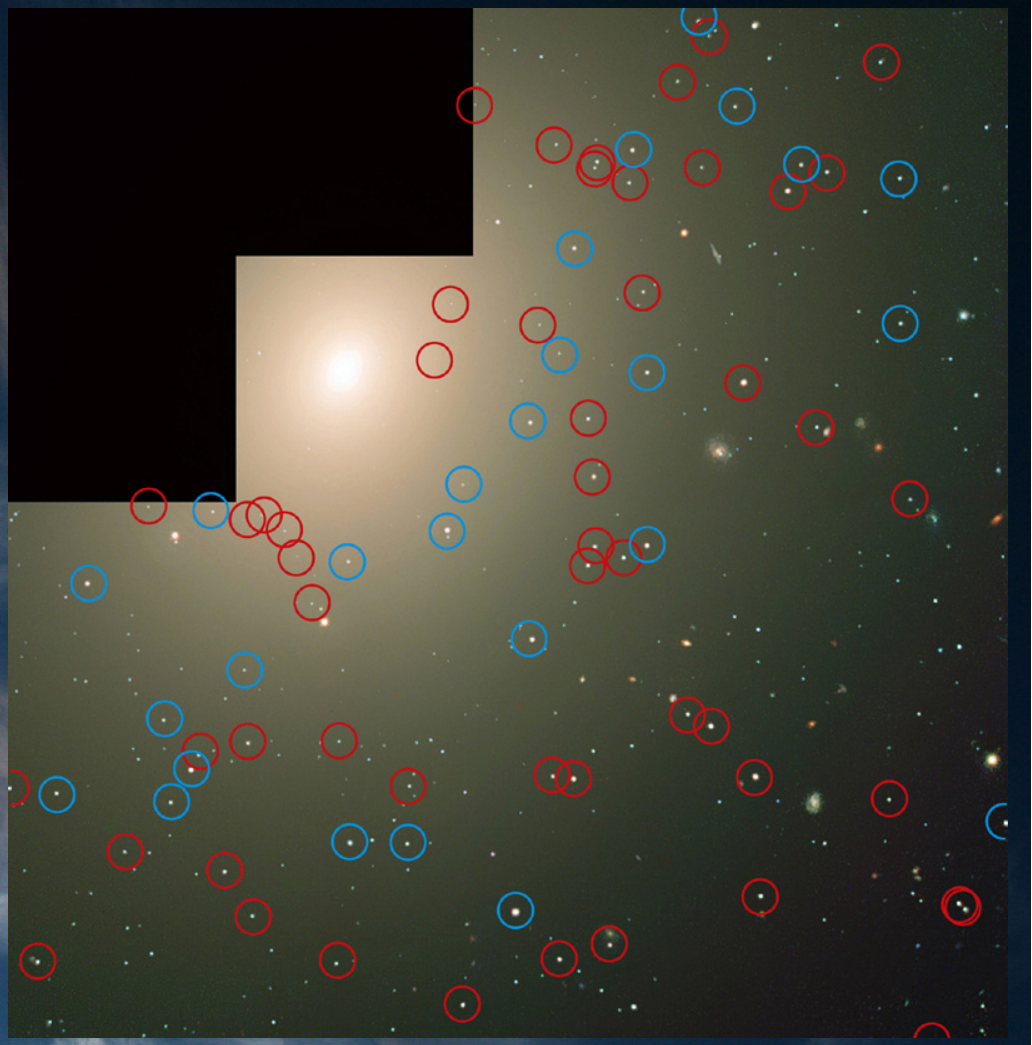
Hempel et al. 2007


NGC 4365


NGC 4365

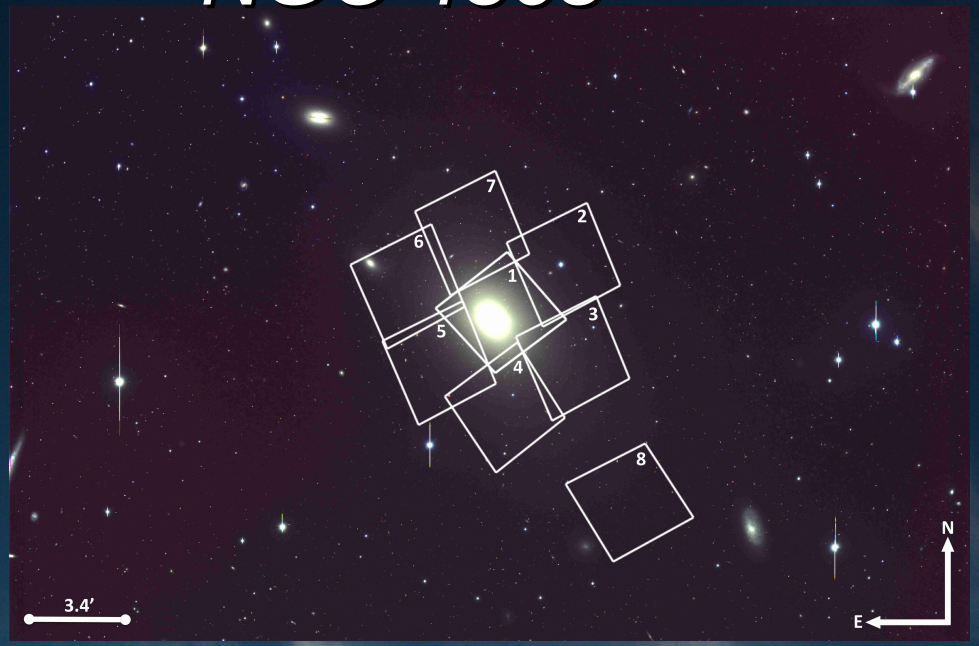




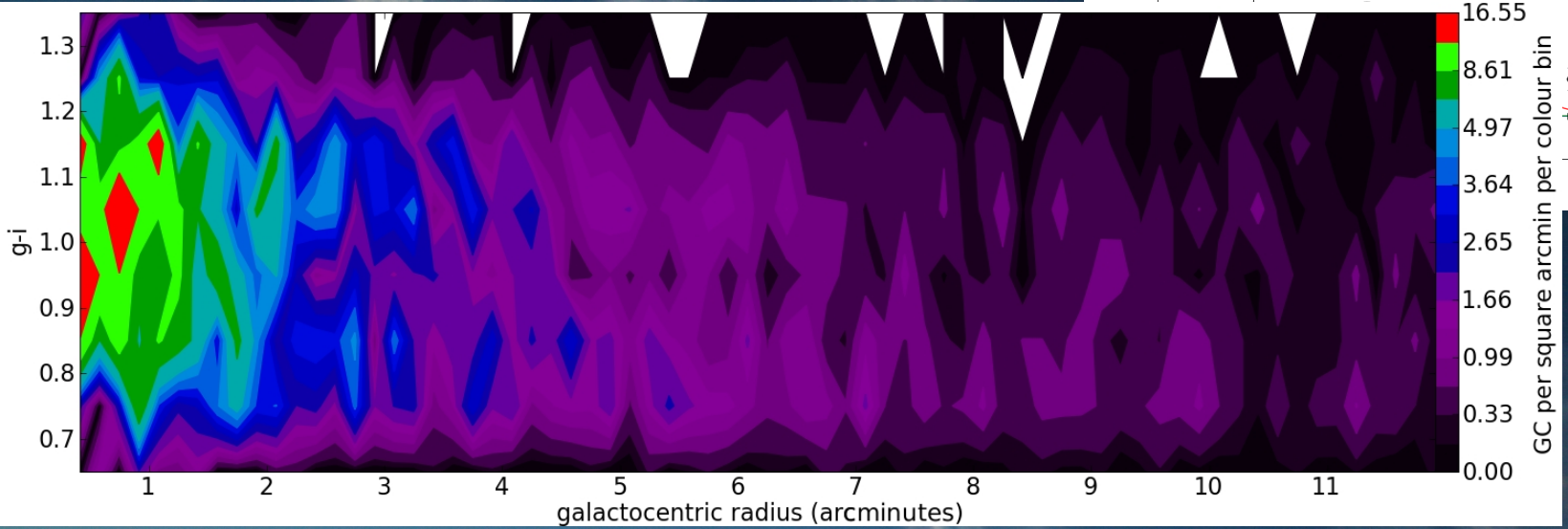


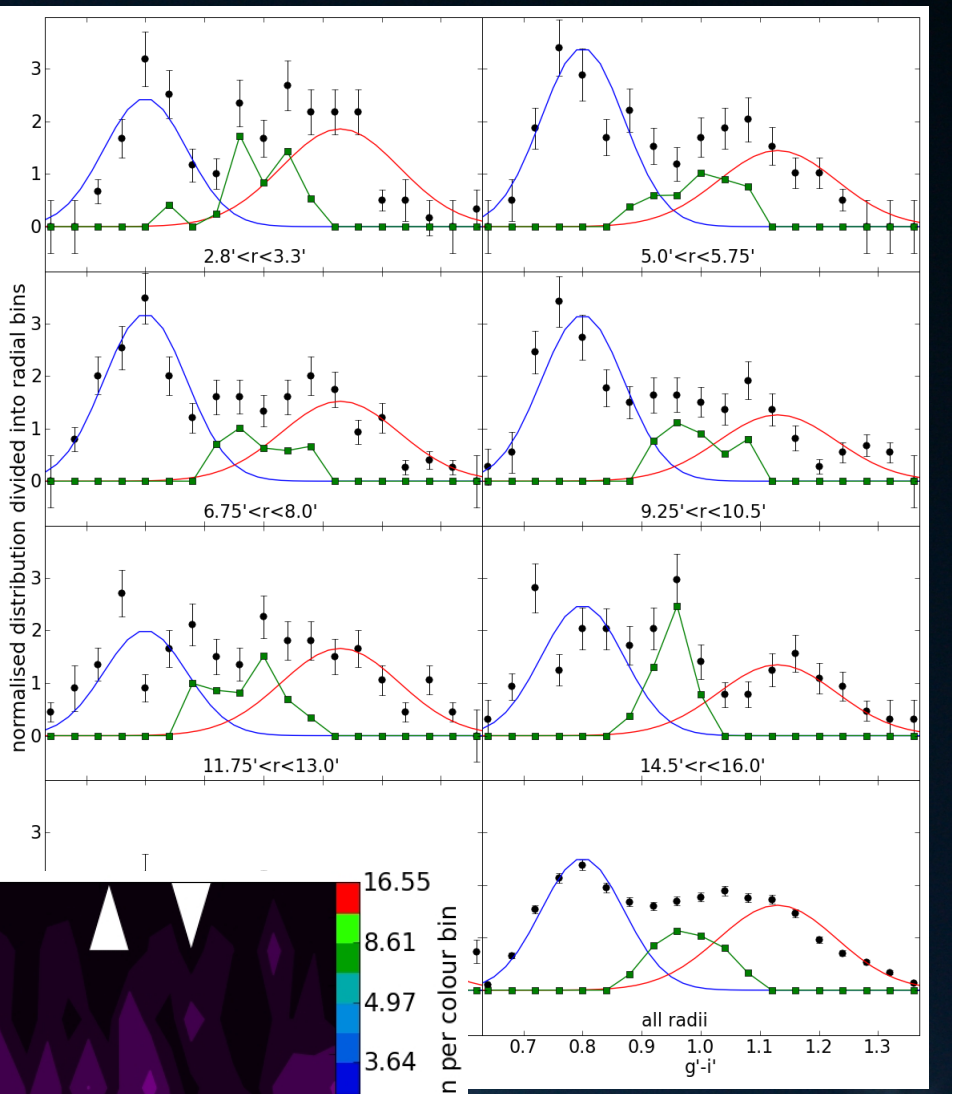
Kundu et al. 2005

NGC 4365



Blom et al. 2012





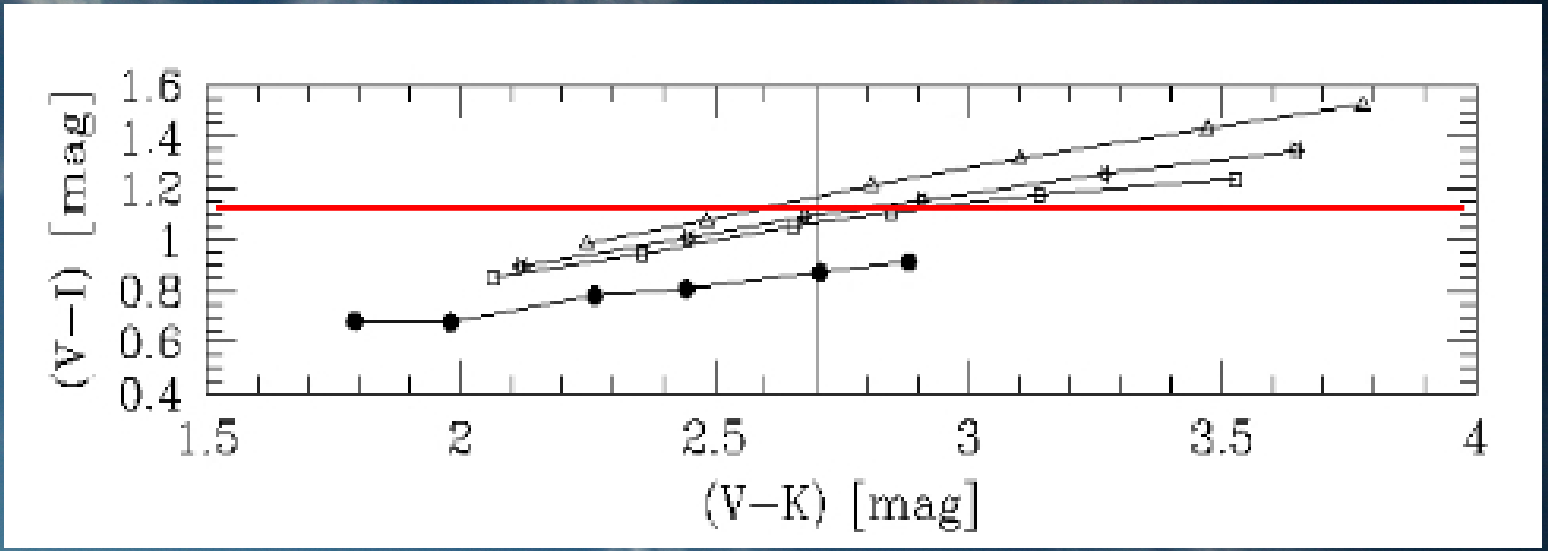
How suitable are Globular Clusters as stellar population probes ?

How suitable are UNRESOLVED Globular Clusters as stellar population probes ?

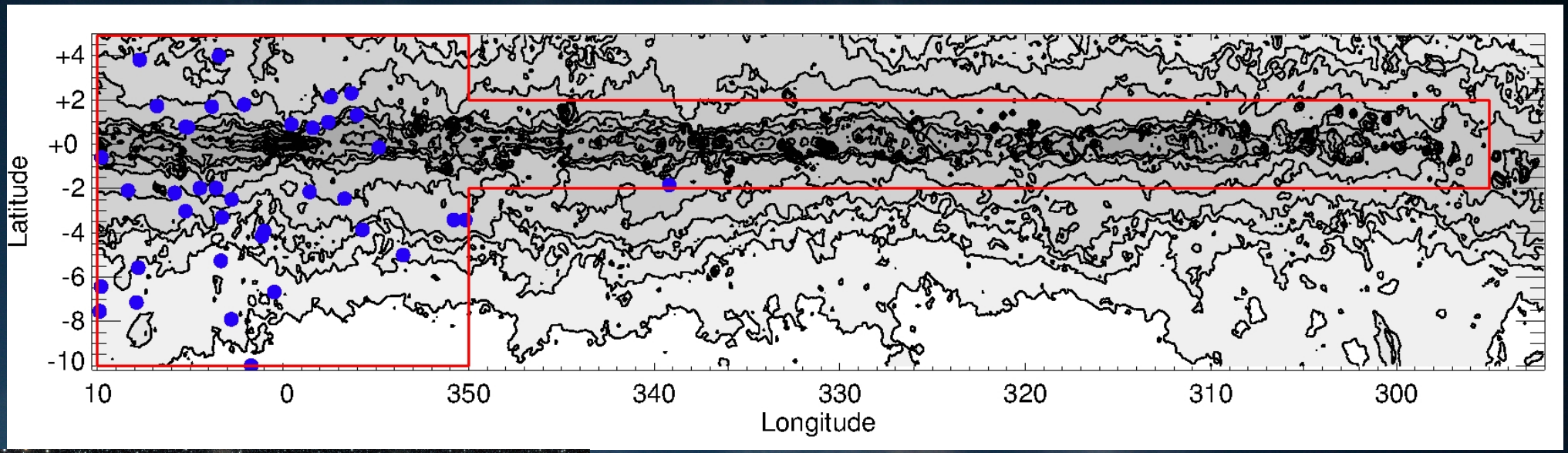
Can we use the integrated photometry to resolve age populations?

Or

How suitable is combined optical and near-IR photometry to detect age sub-populations in Globular Cluster Systems?



Globular Clusters in the VISTA Variables in the Vía Láctea Survey



- 0.339” pixel resolution
- ~ 4 mag deeper in K_s than 2MASS
- Y,Z,J,H and K_s -band photometry

NGC 6656 *(0.36^0 x 0.28^o)*

Pro's

-resolved

- well studied (Marín-Franch et al. 2009, Harris 1993,2010, ...)

- ages are known from independent studies

- optical colors are known (but ...)

Con's

- *general*

- resolved

- contaminated (field, background)

- reddening effects

- *VVV specific*

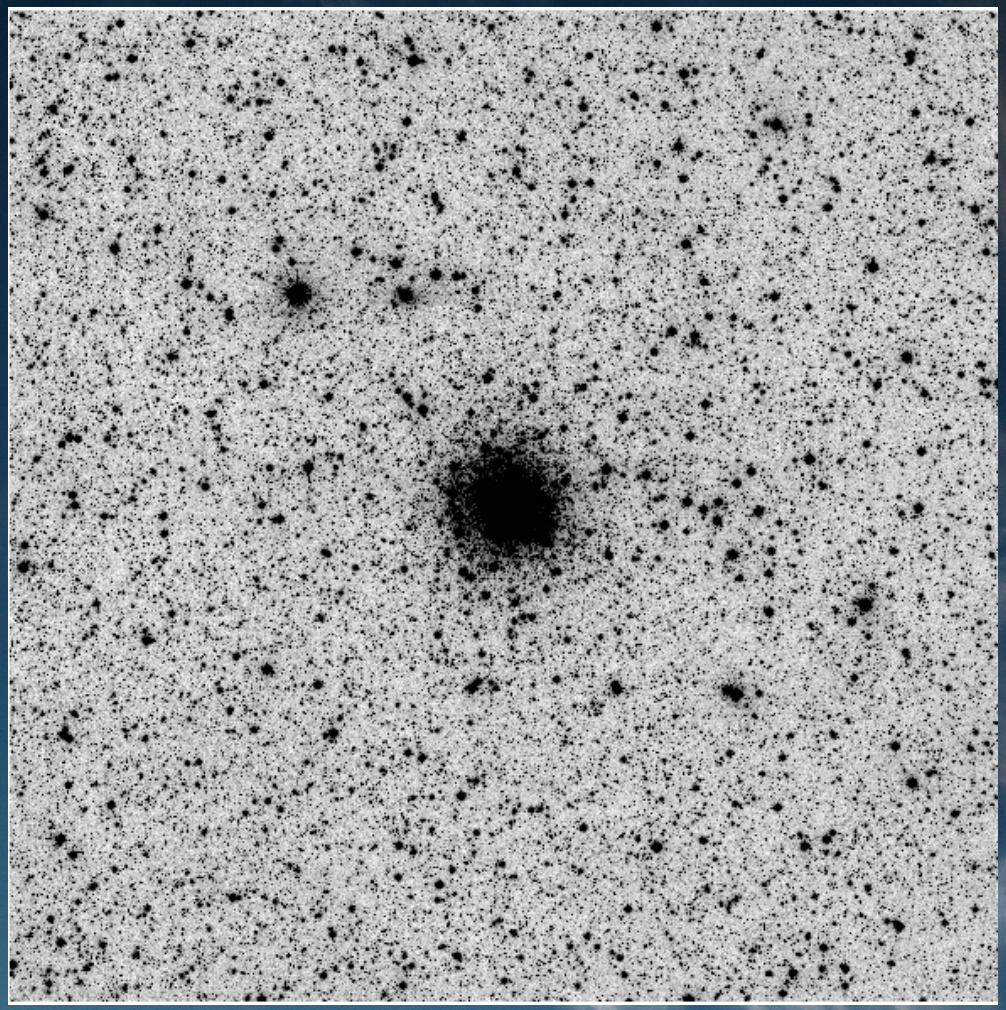
- combination of very faint (2MASS) and very bright (VVV) stars

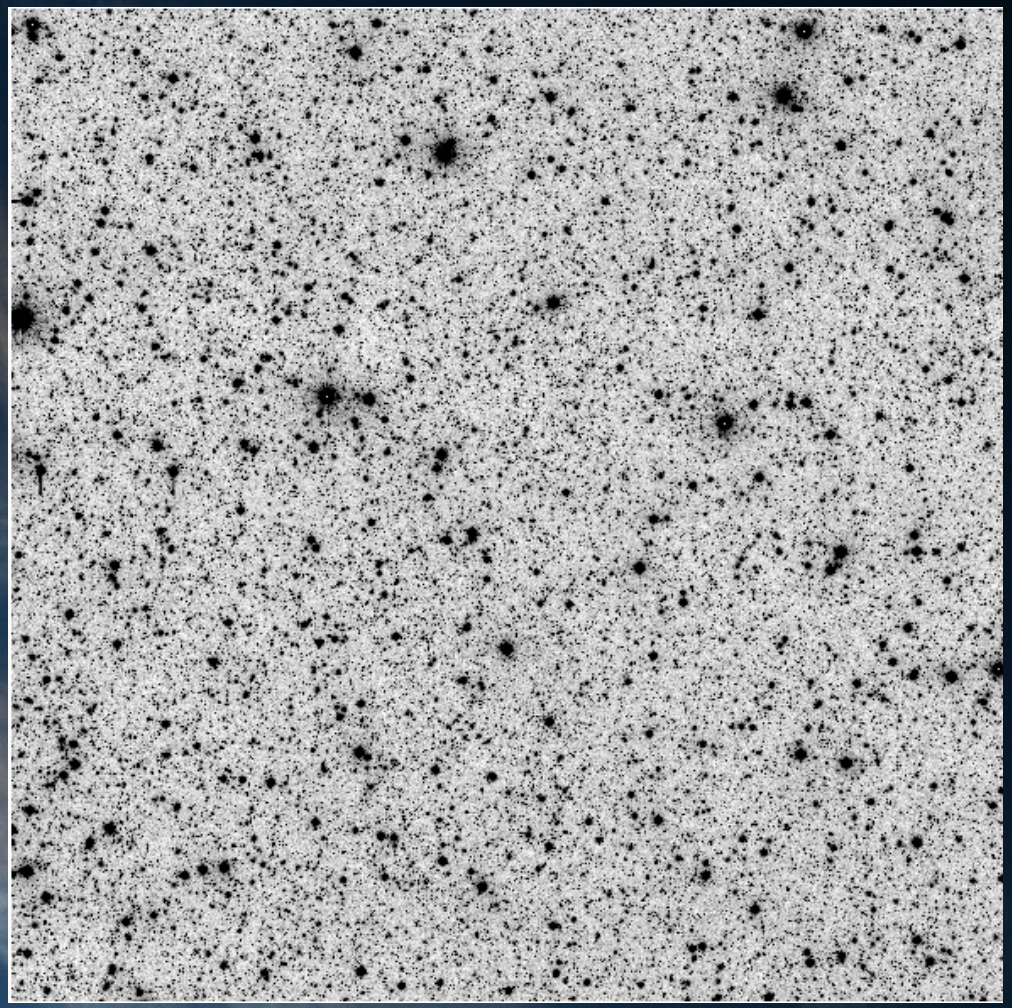
- position (tiles vs. chip)

- reddening effects (differential)

NGC 6380

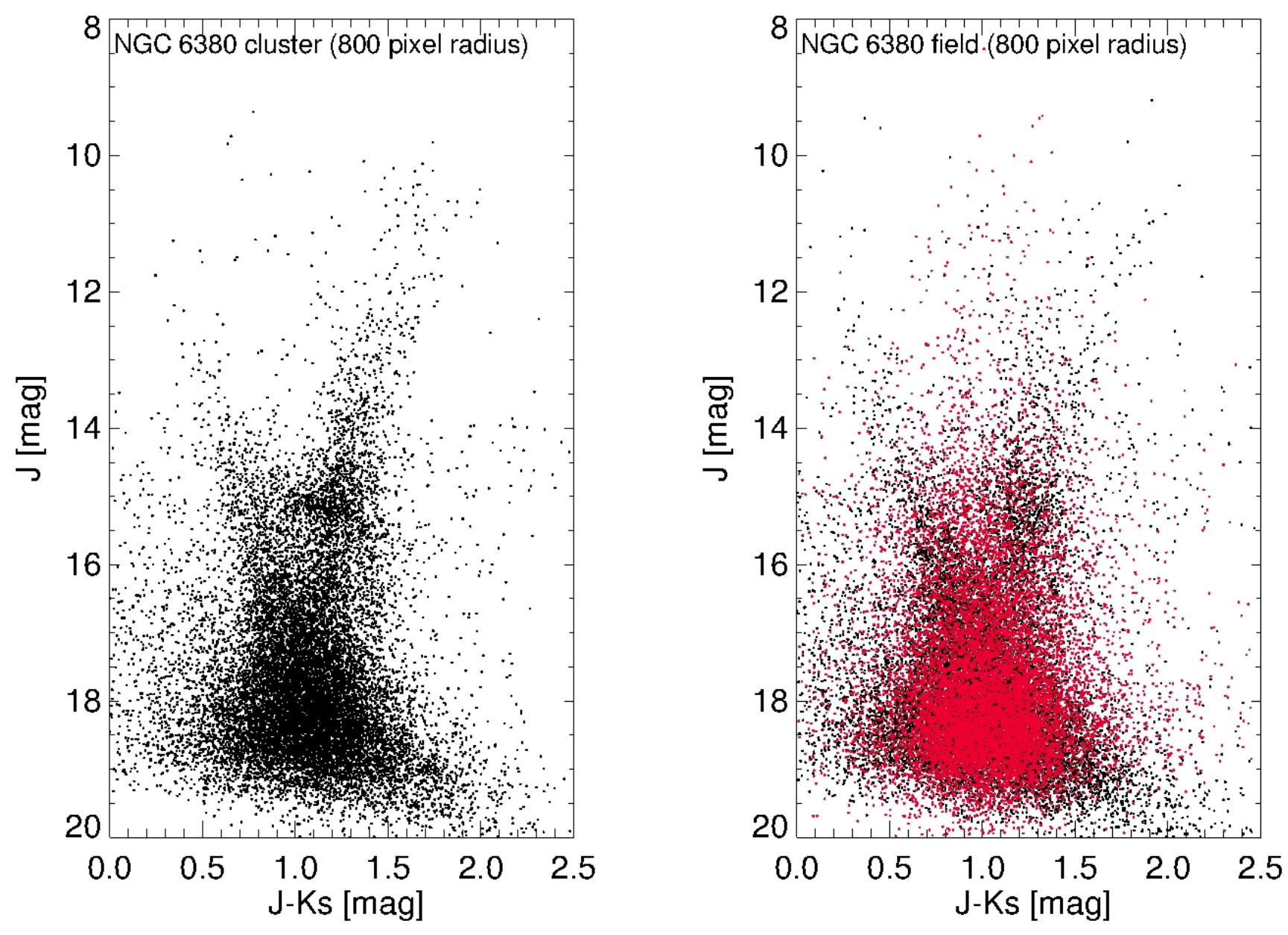
Field

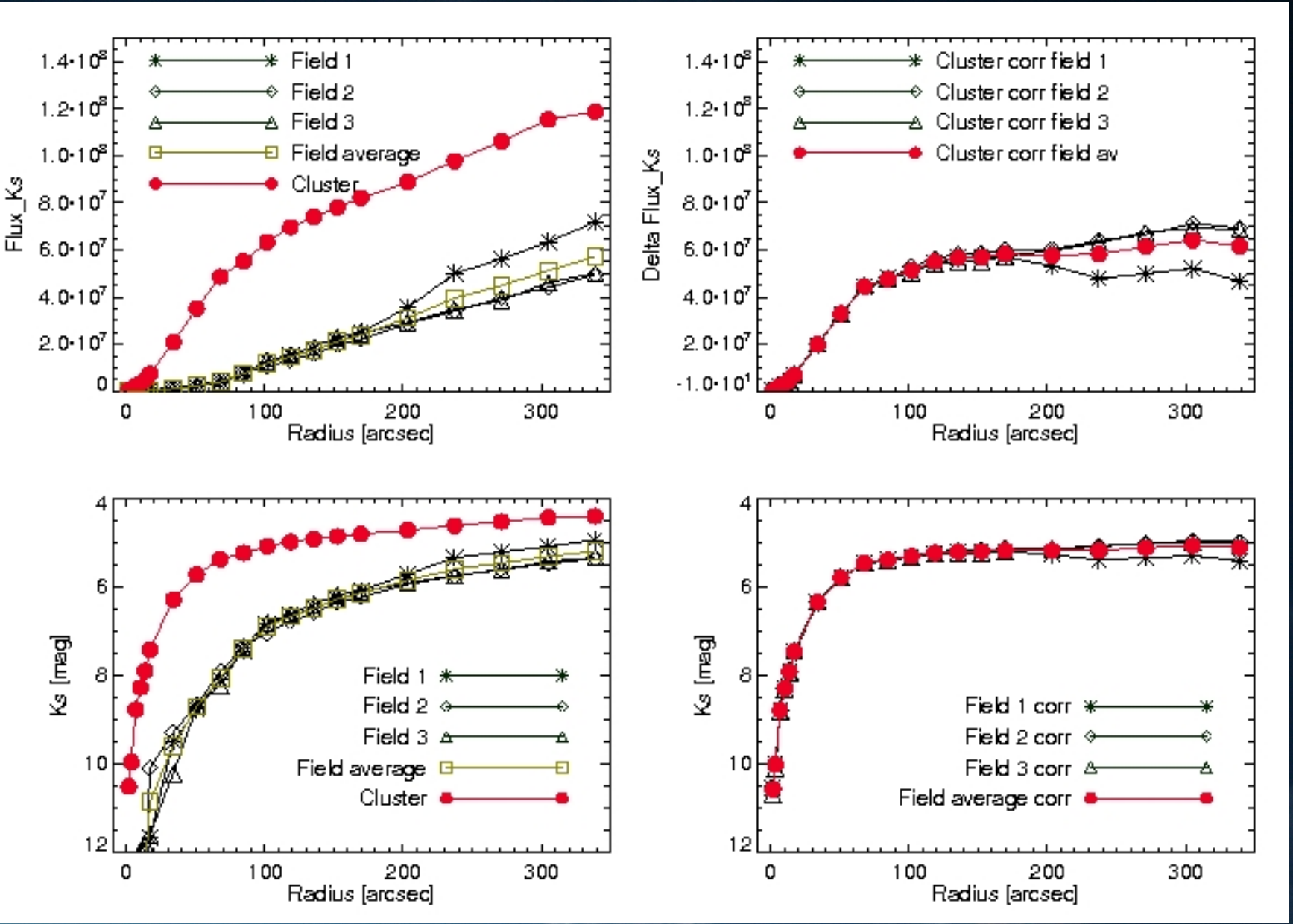


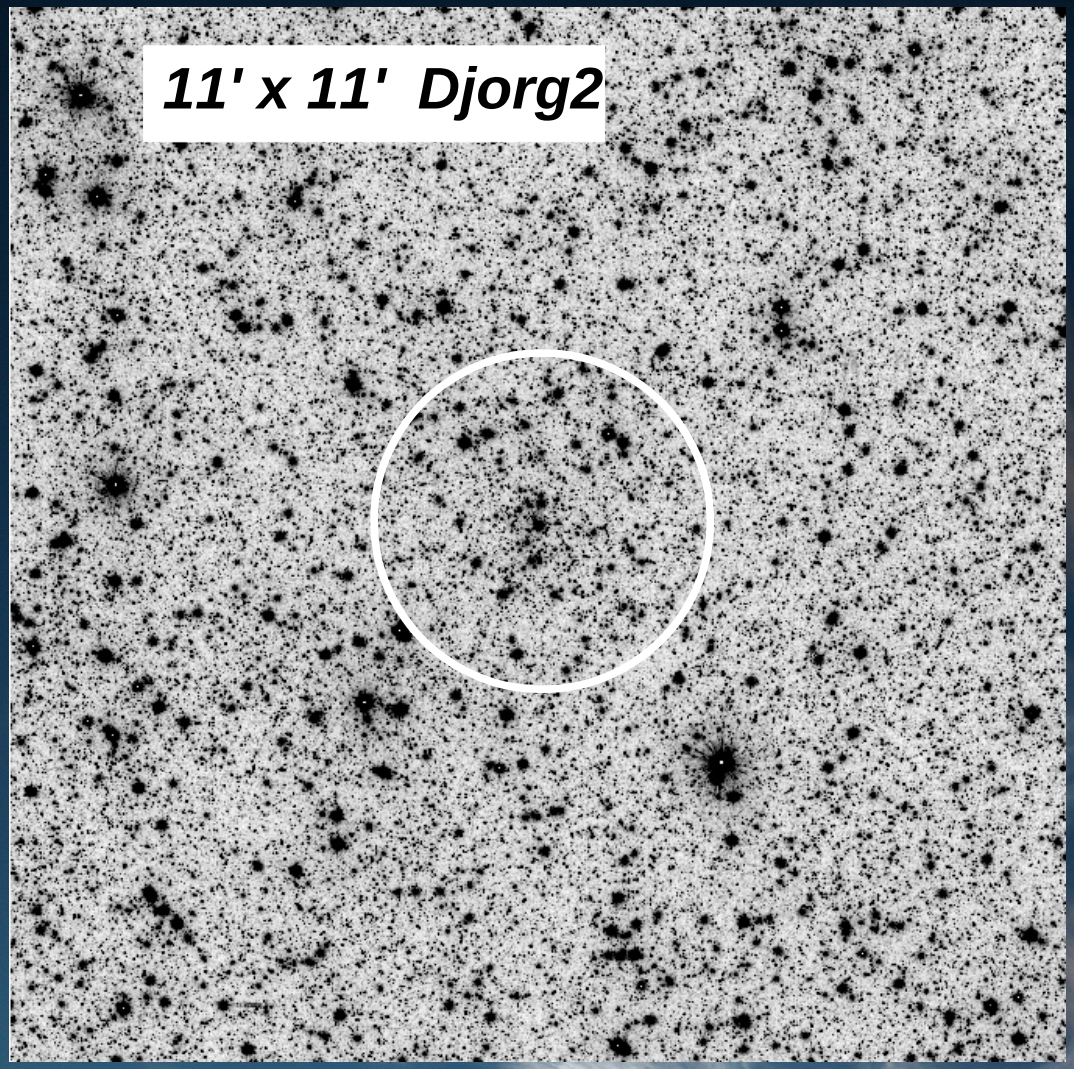


K_s - band, 17' x 17'

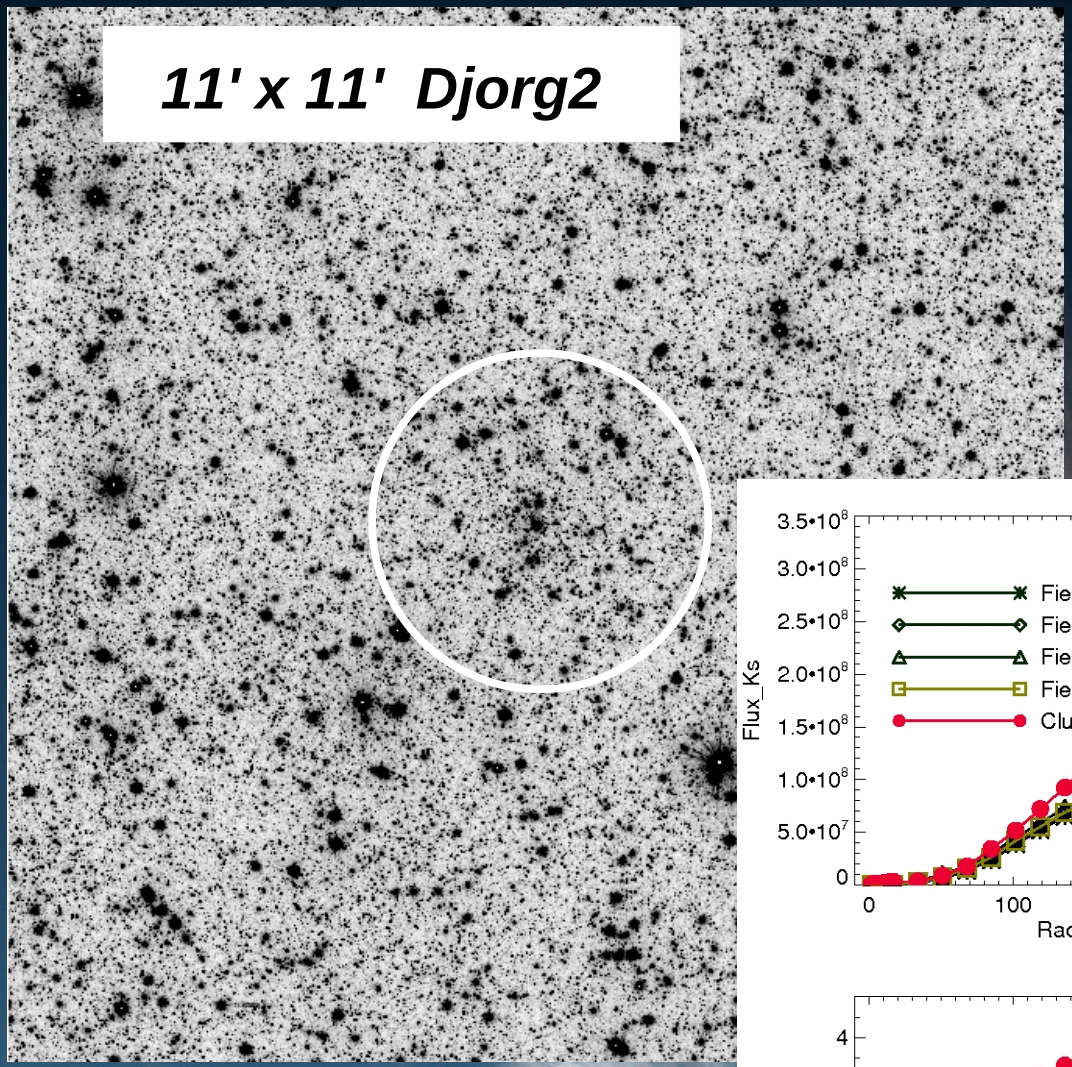
The Quick & Dirty Way

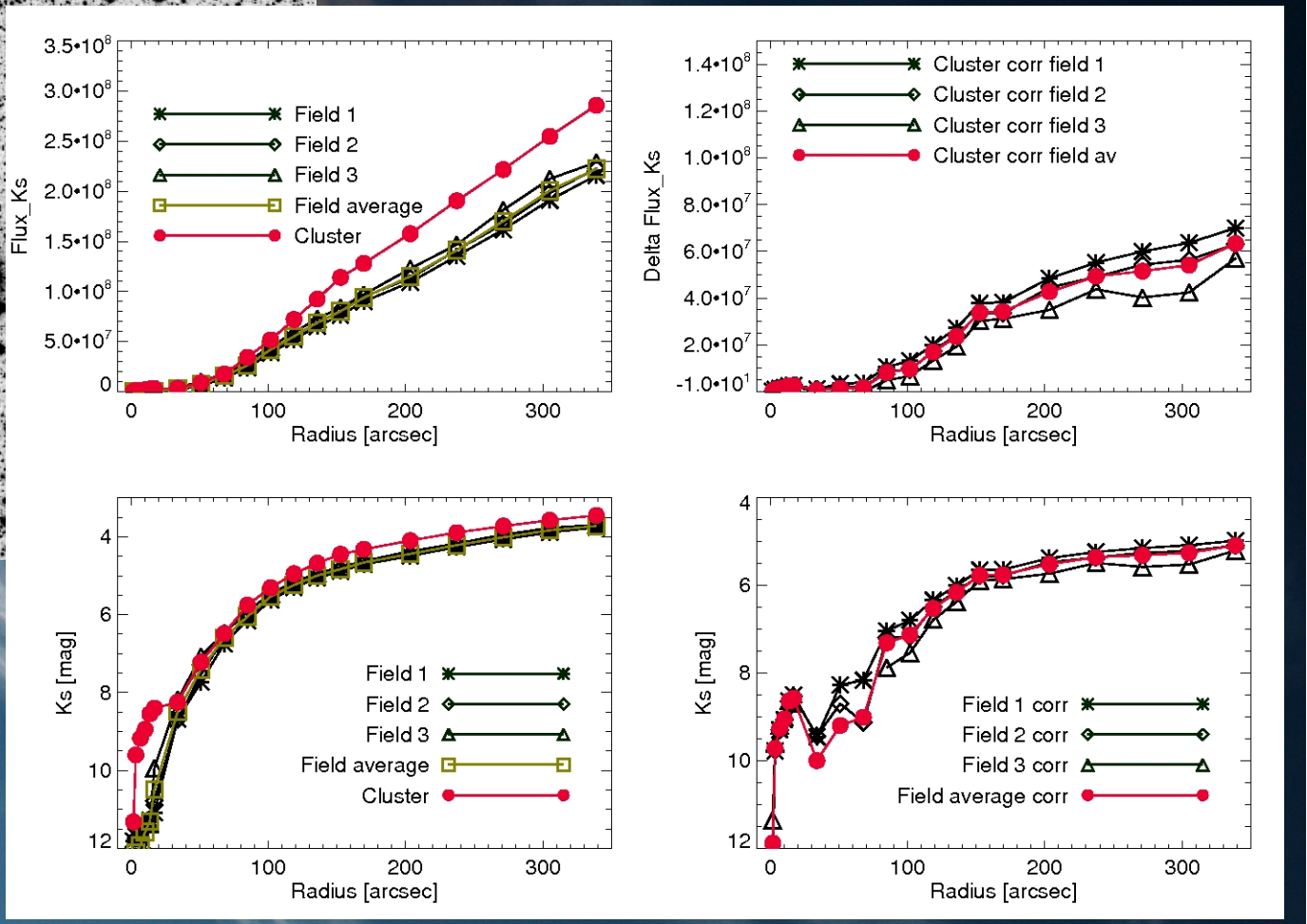



Flux_Ks
Field 1
Field 2
Field 3
Field average
Cluster
Radius [arcsec]
Delta Flux_Ks
Cluster corr field 1
Cluster corr field 2
Cluster corr field 3
Cluster corr field av
Radius [arcsec]
Ks [mag]
Field 1
Field 2
Field 3
Field average
Cluster
Radius [arcsec]
Ks [mag]
Field 1 corr
Field 2 corr
Field 3 corr
Field average corr
Radius [arcsec]

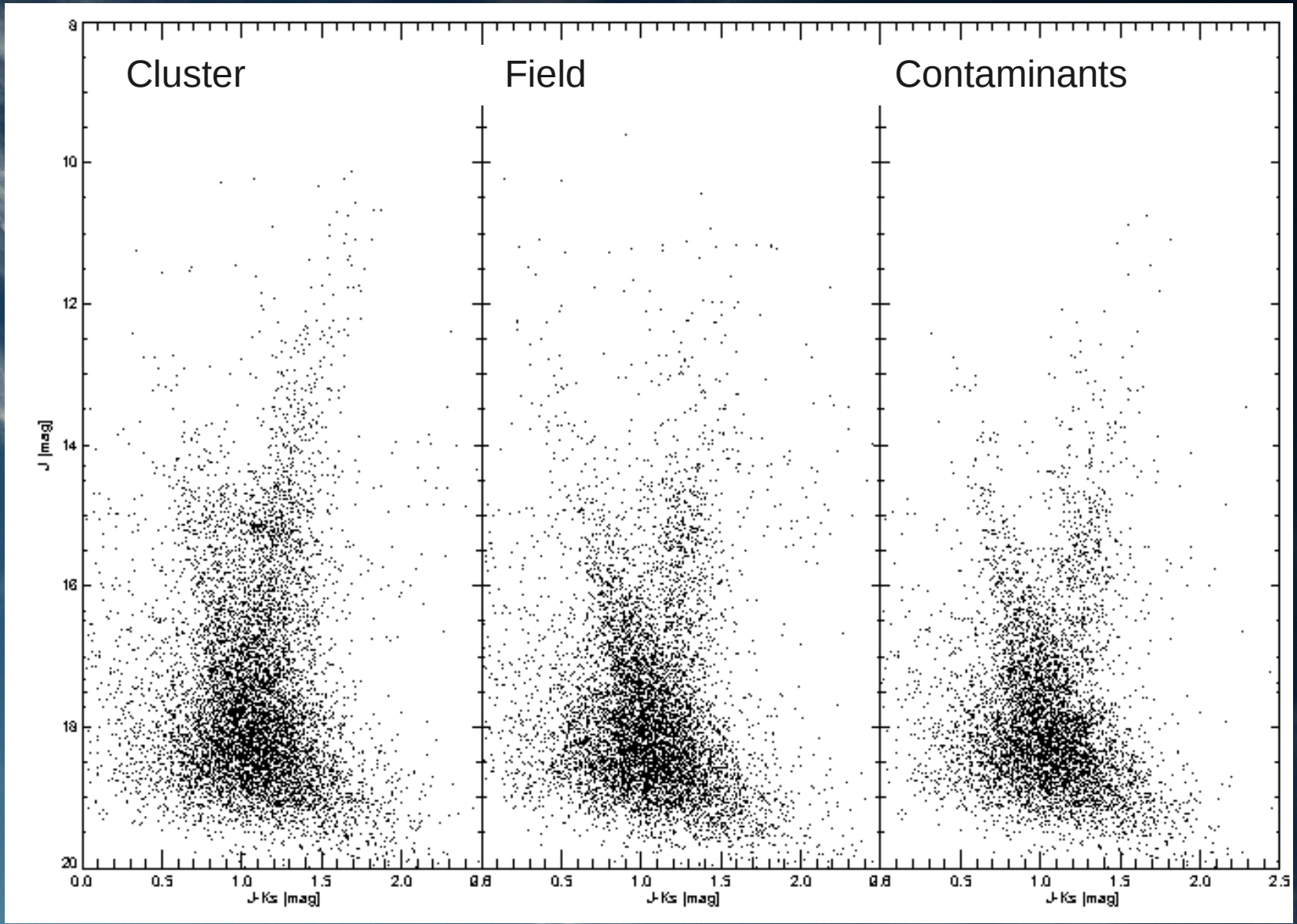

11' x 11' Djorg2

11' x 11' Djorg2

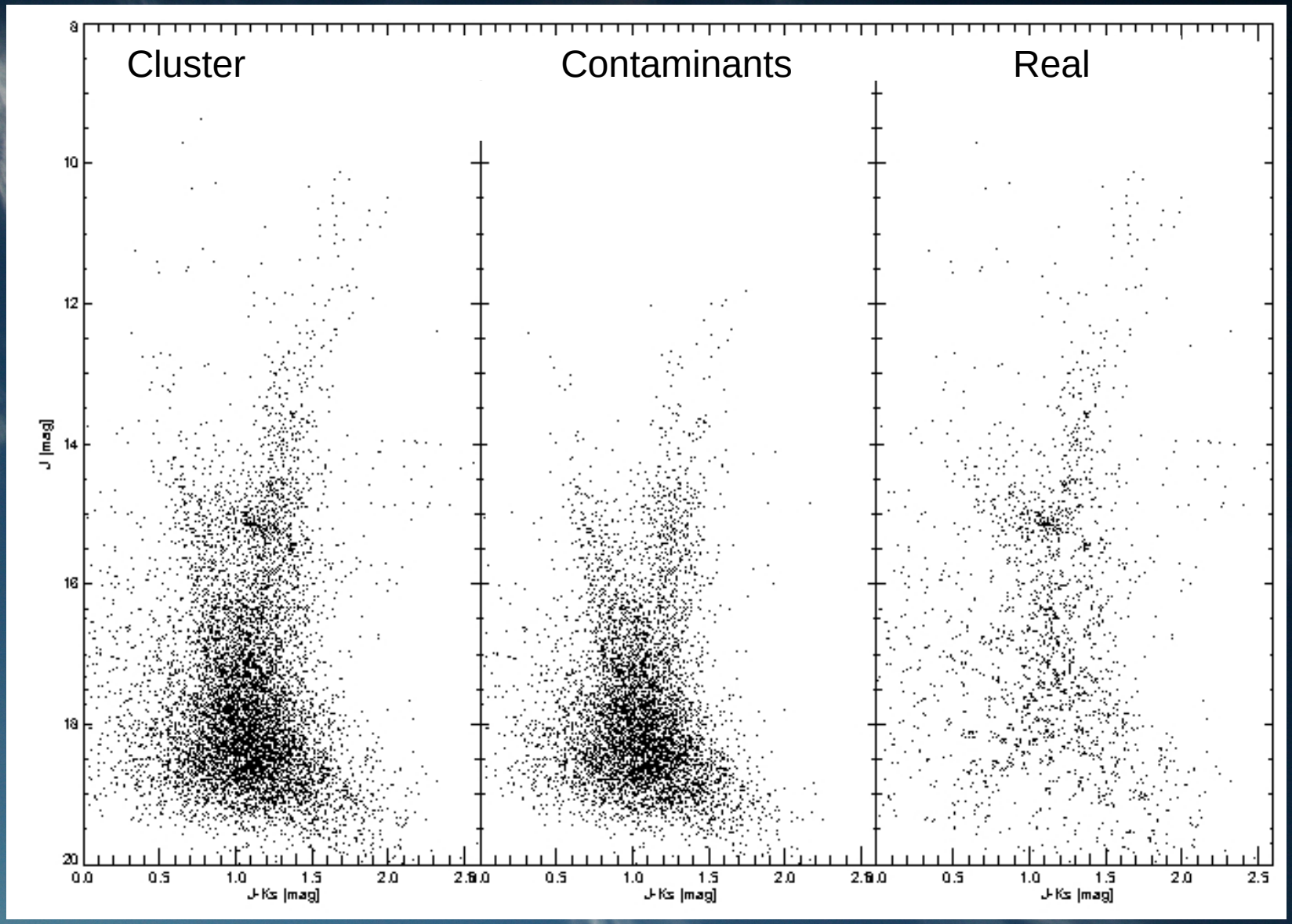




Decontamination : Star by Star
NGC 6360



Decontamination : Star by Star
NGC 6360



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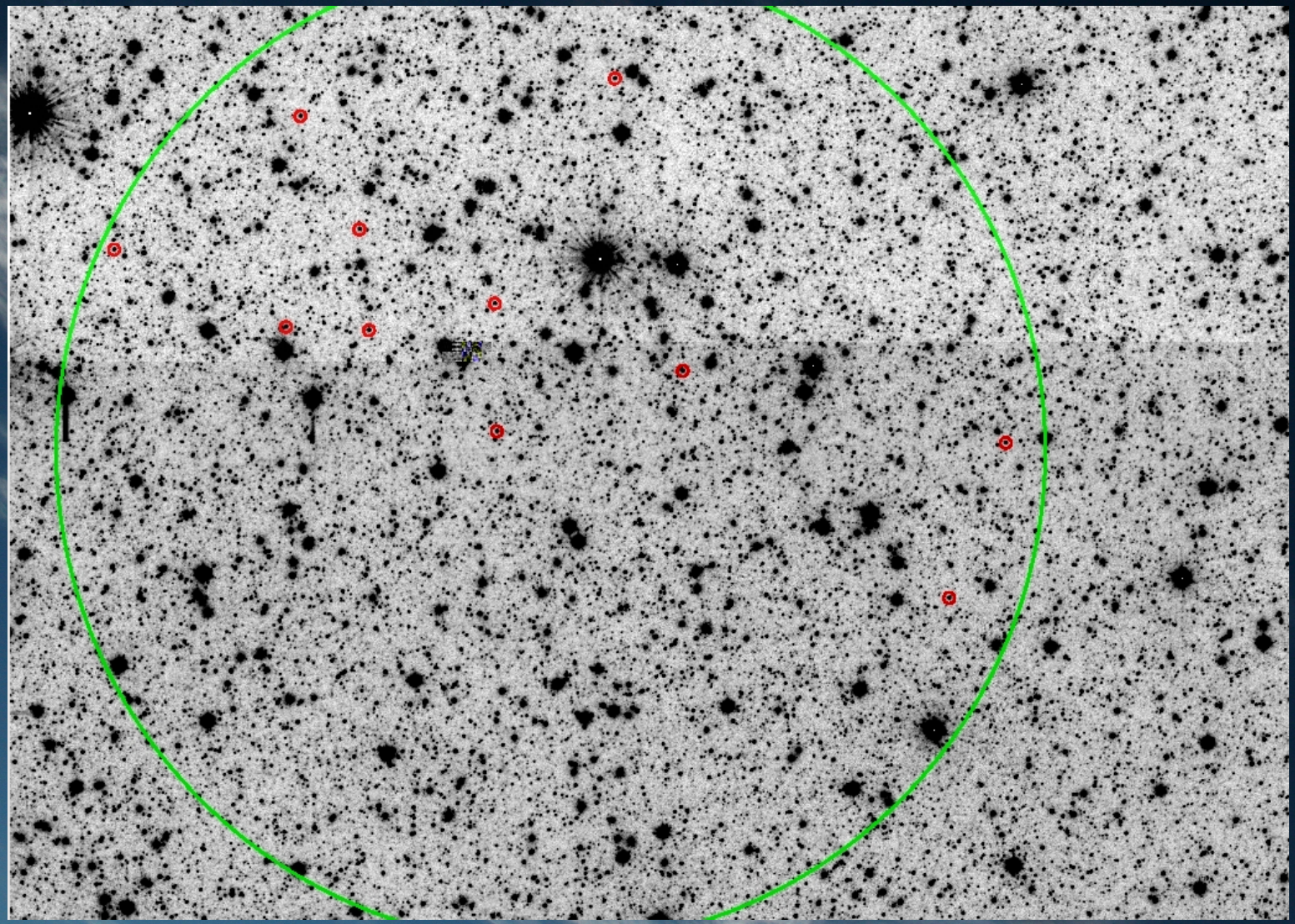
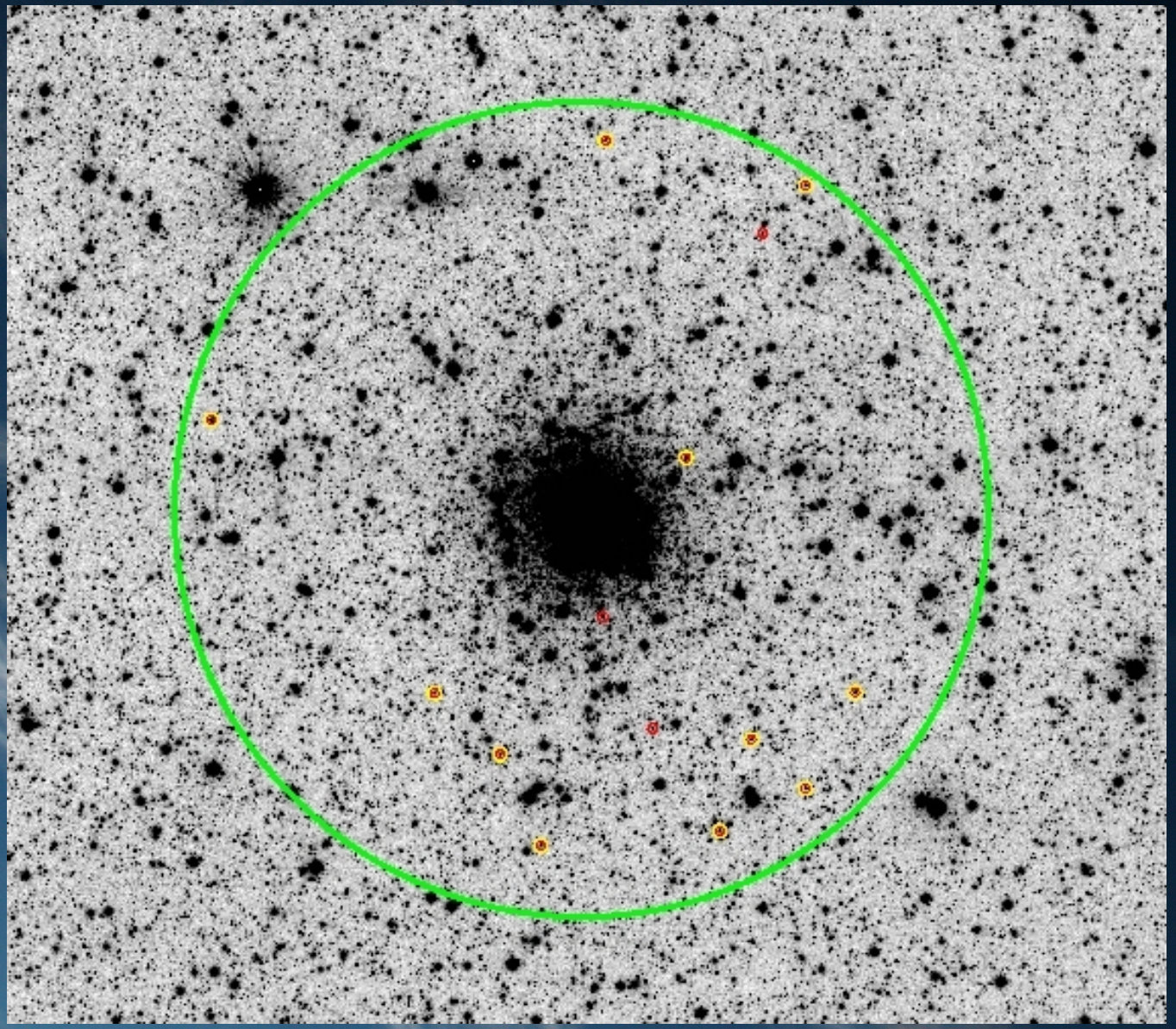
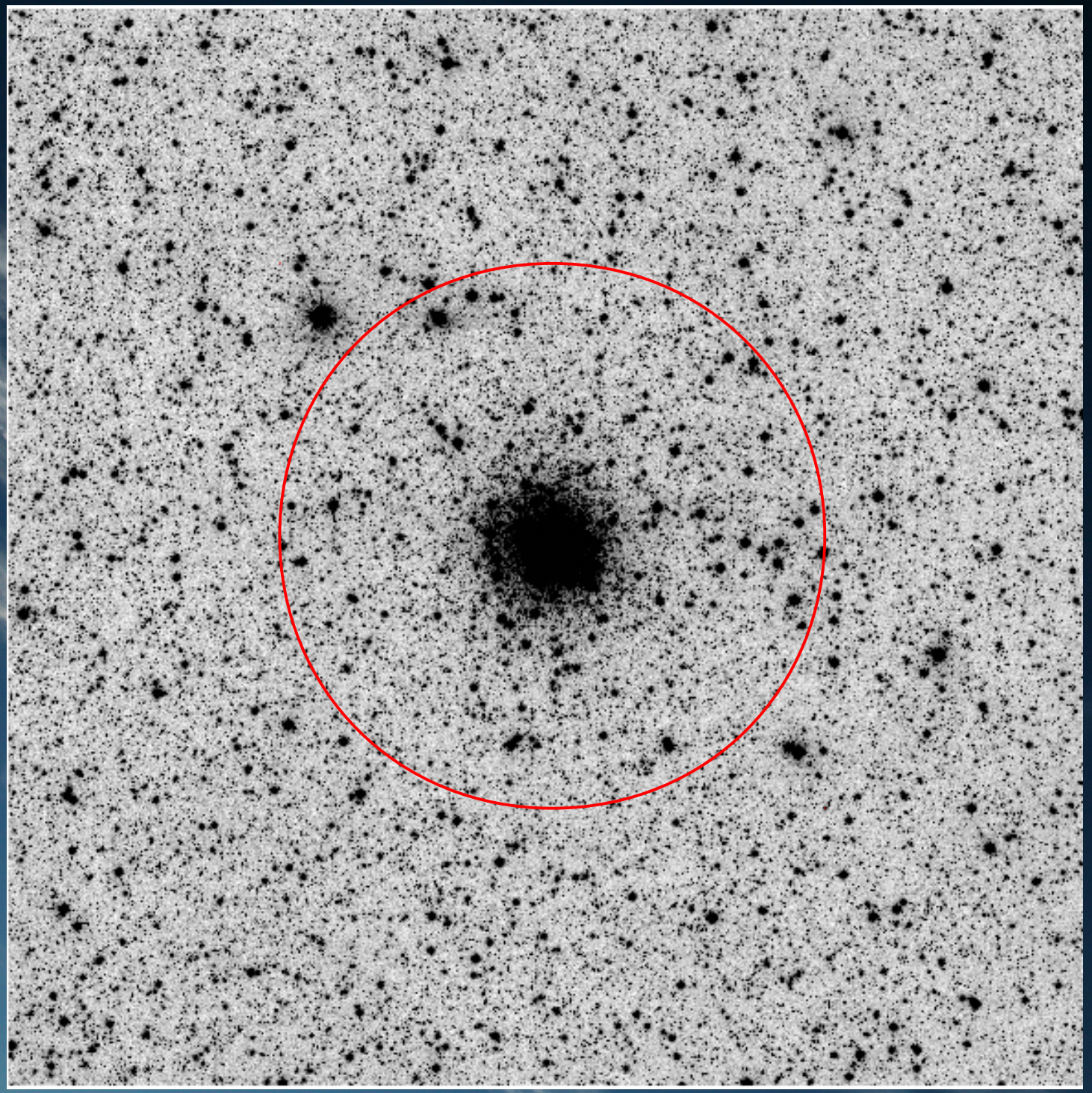


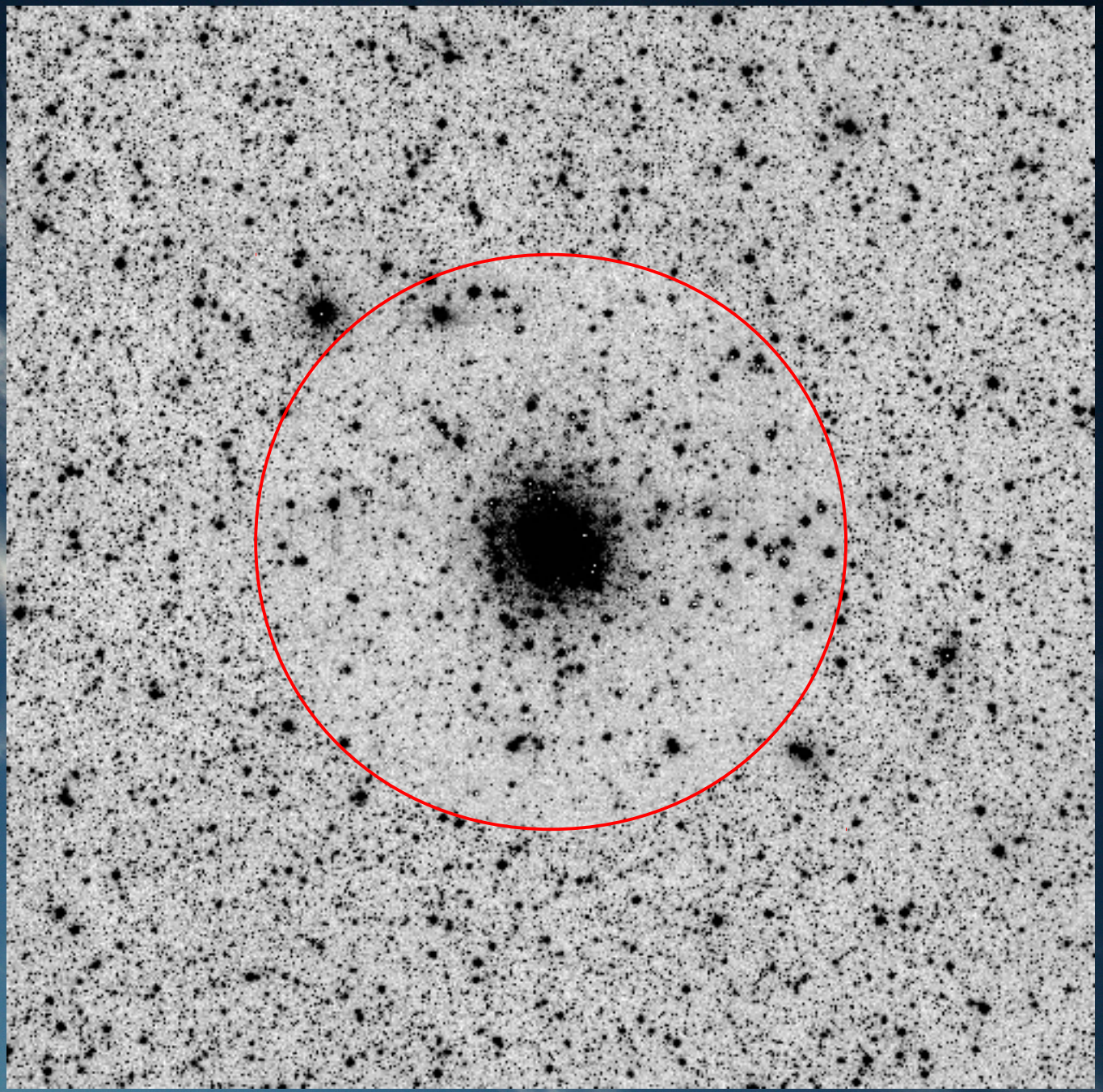
J= 15.0 mag - 15.1 mag **J-Ks= 1.2 mag- 1.25 mag** **Field: 11 stars**

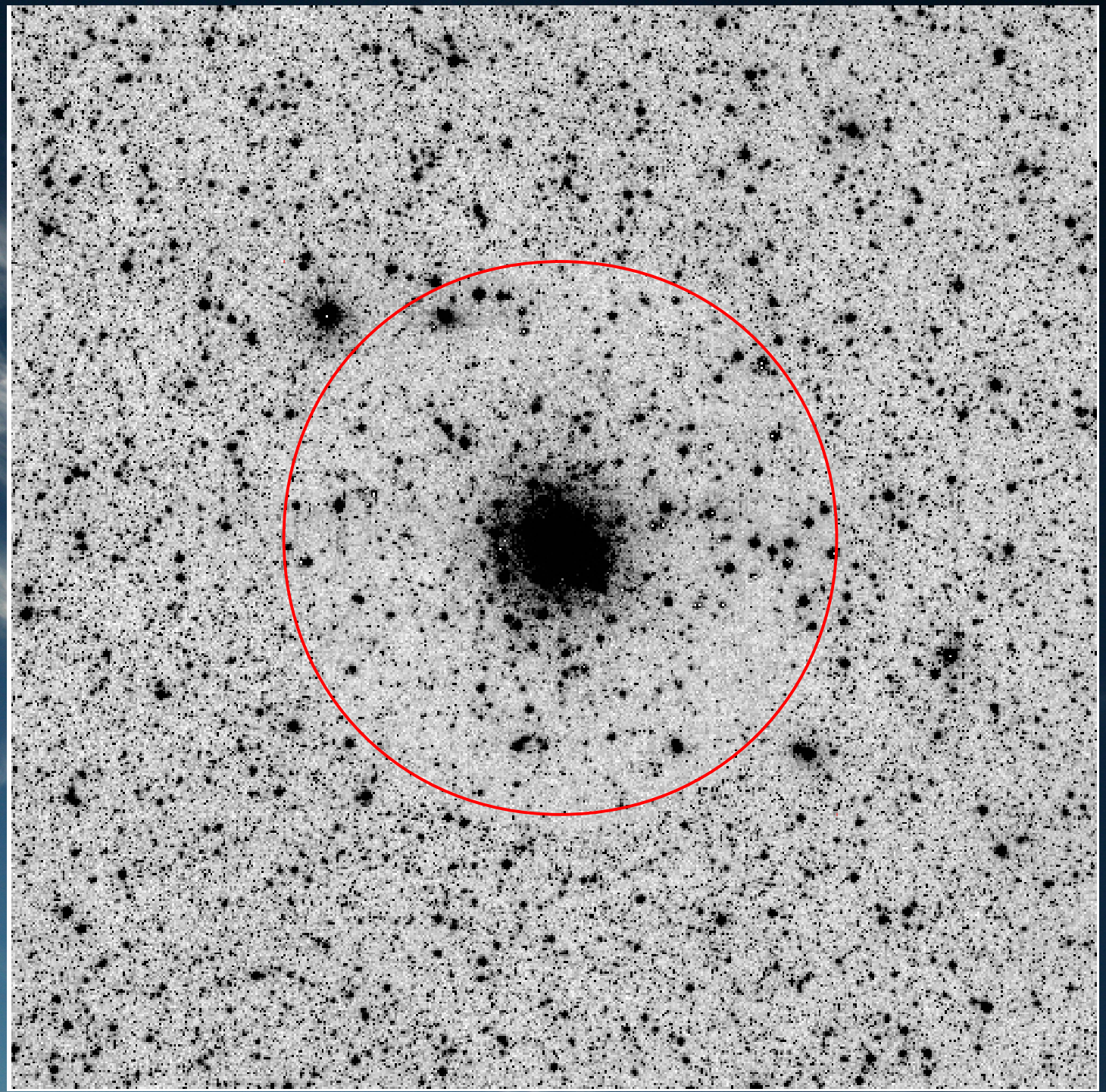
Decontamination : Star by Star
NGC 6360

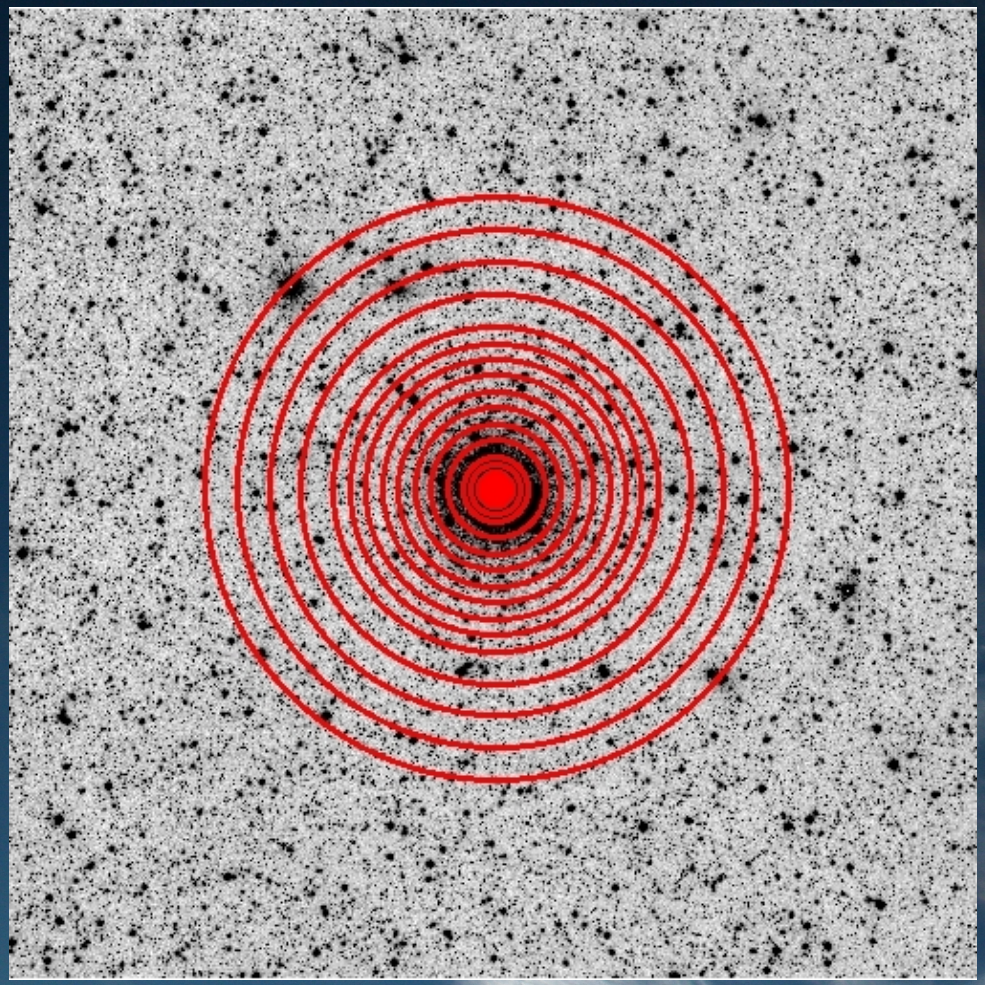


J= 15.0 mag - 15.1 mag **J-Ks= 1.2 mag - 1.25 mag** **Cluster: 14 stars**

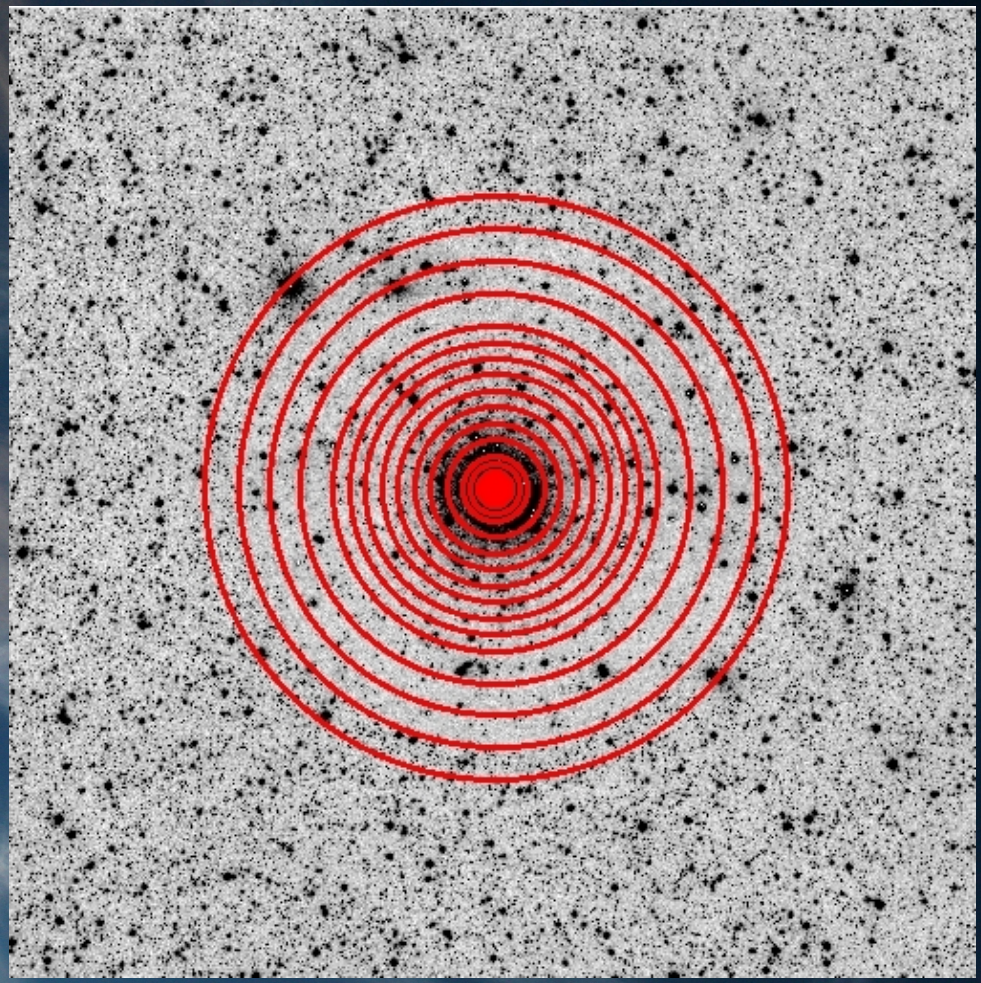






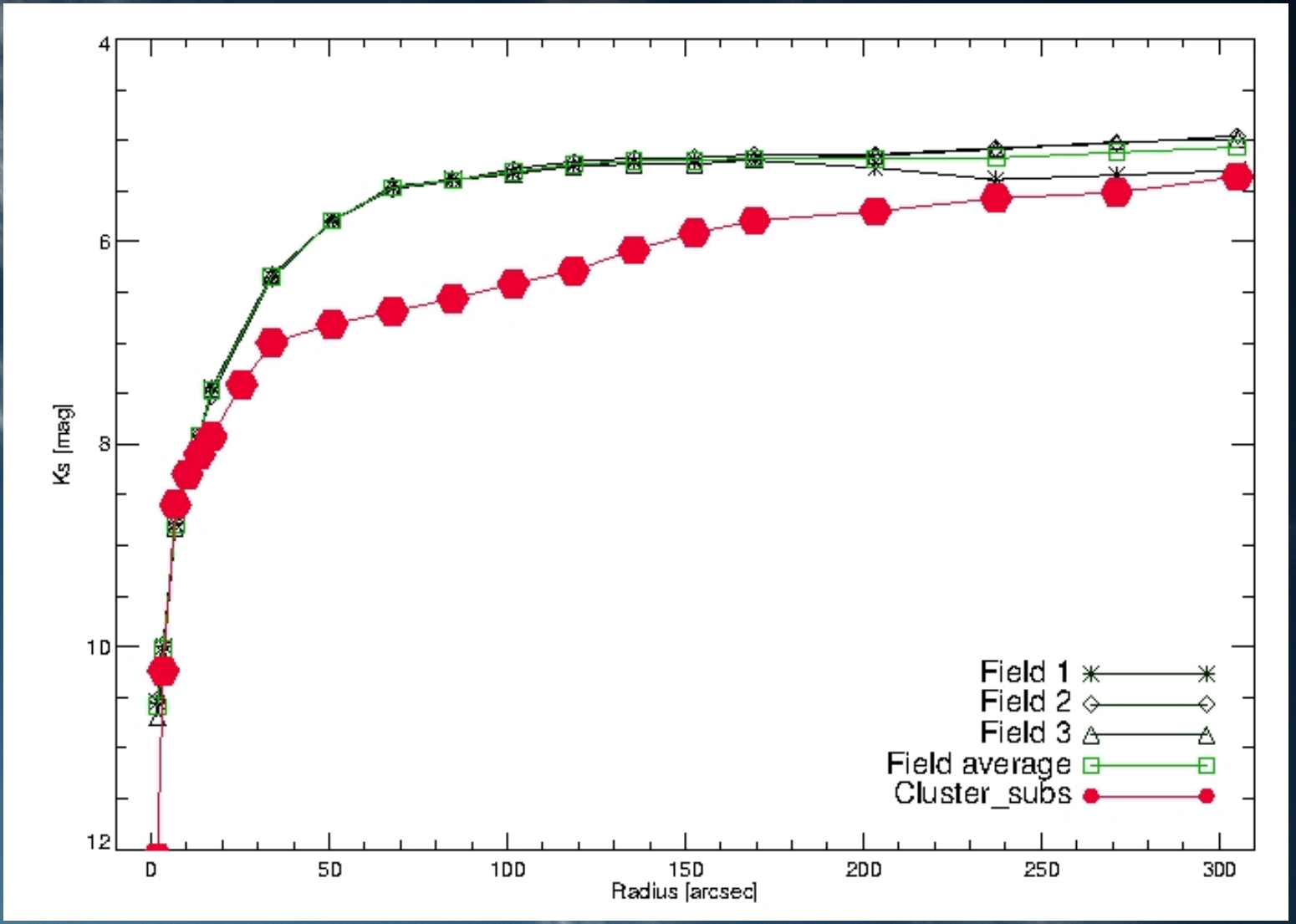


Original NGC 6380

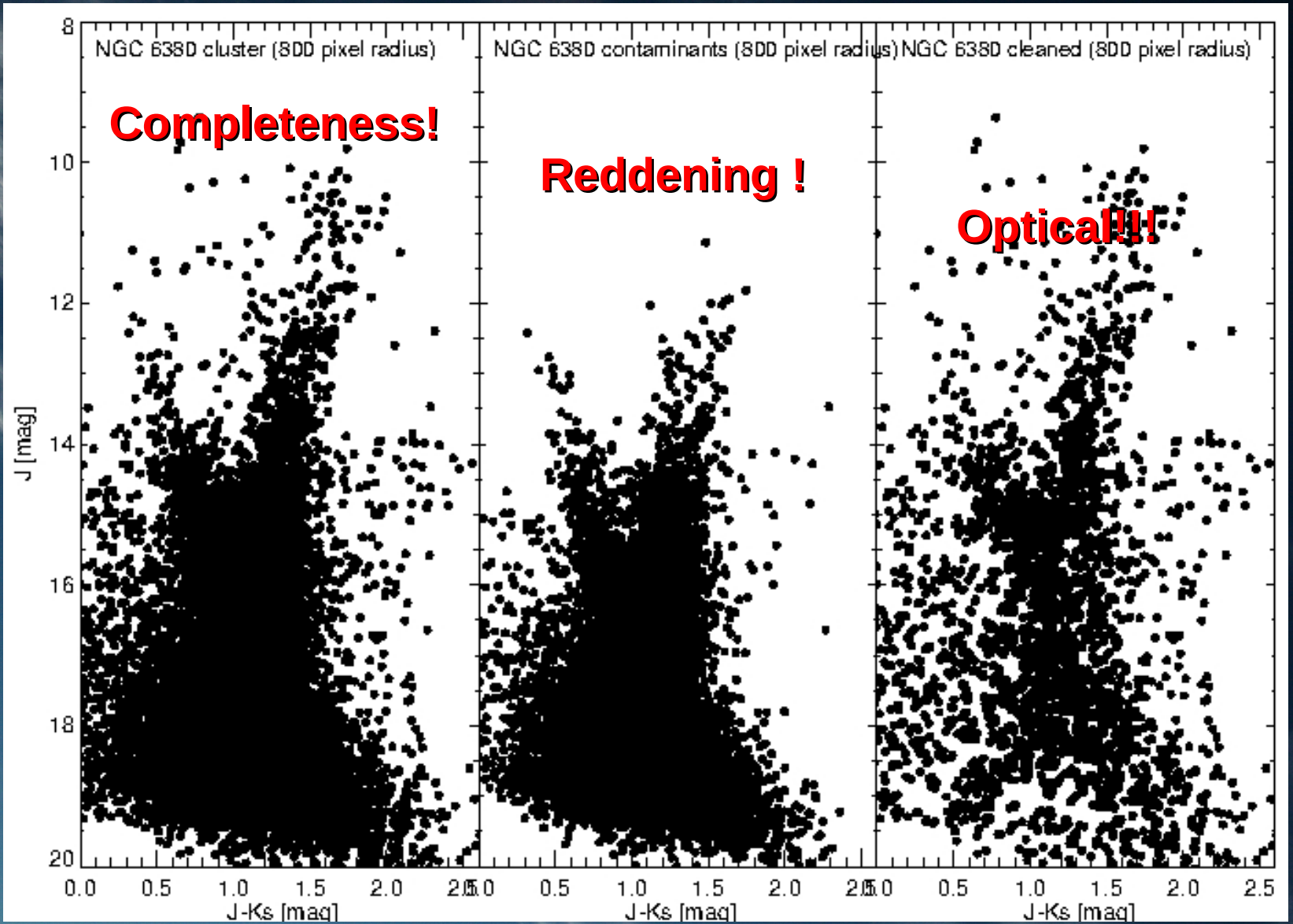


After decontamination, i.e. eliminating contaminating field stars

Comparison: 'Quick & Dirty' vs. 'Star by Star'

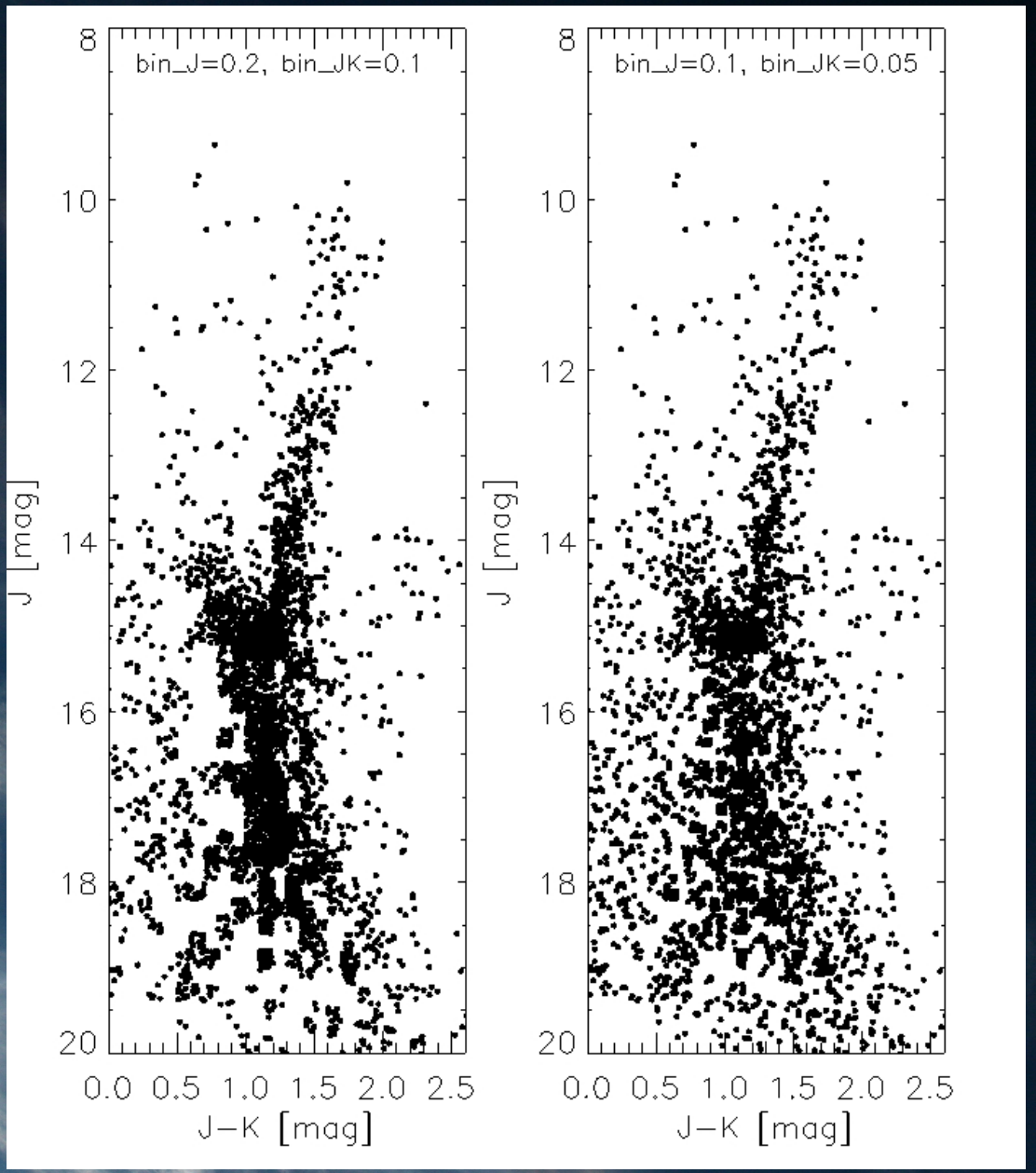


Things to deal with:



Things to deal with:

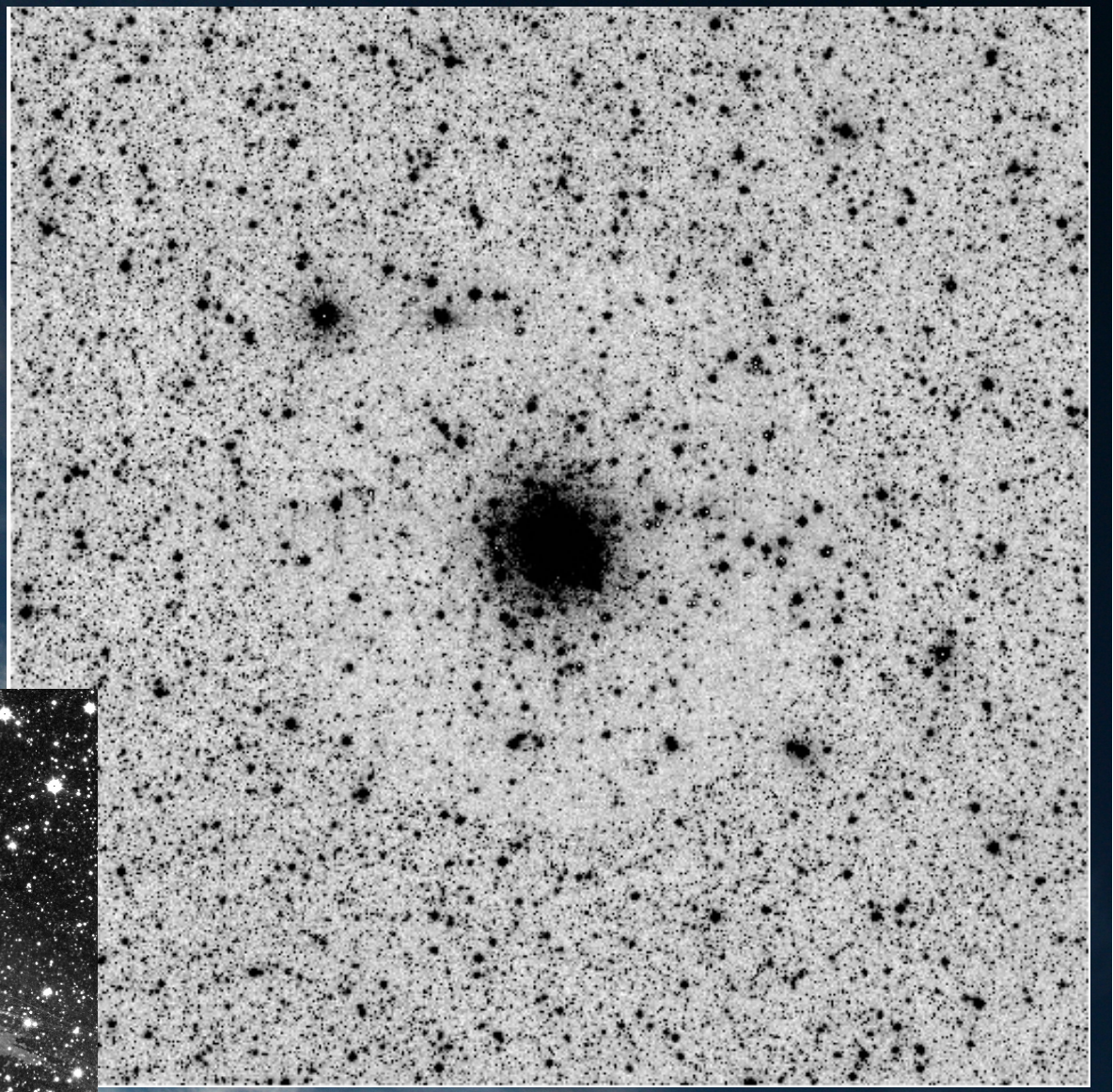
- Completeness

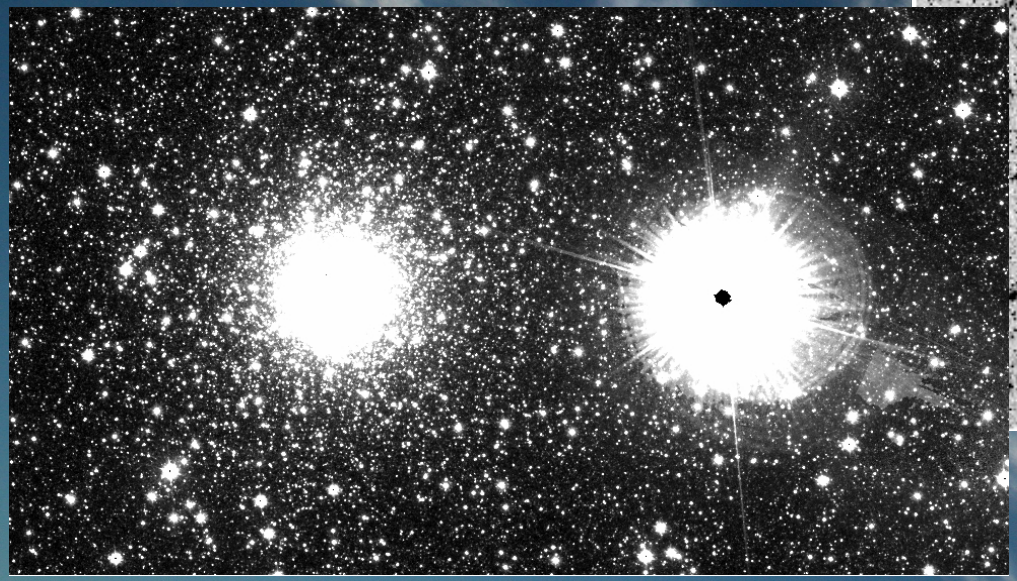


Things to deal with:

- Saturated stars
- Differential Reddening

- Variable psf





NGC 6441, Ks