Globular Clusters as Age Probes

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(Pontificia Universidad Catolica de Chile & The Milky Way Millenium Nucleus)
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Peter Pessev
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UNIVERSIDAD
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Fifty Years of Wide Field Studies in the Southern Hemisphere, La Serena, Chile, May 06-09, 2013

Globular Clusters as ~~Age~~ Stellar Population Probes

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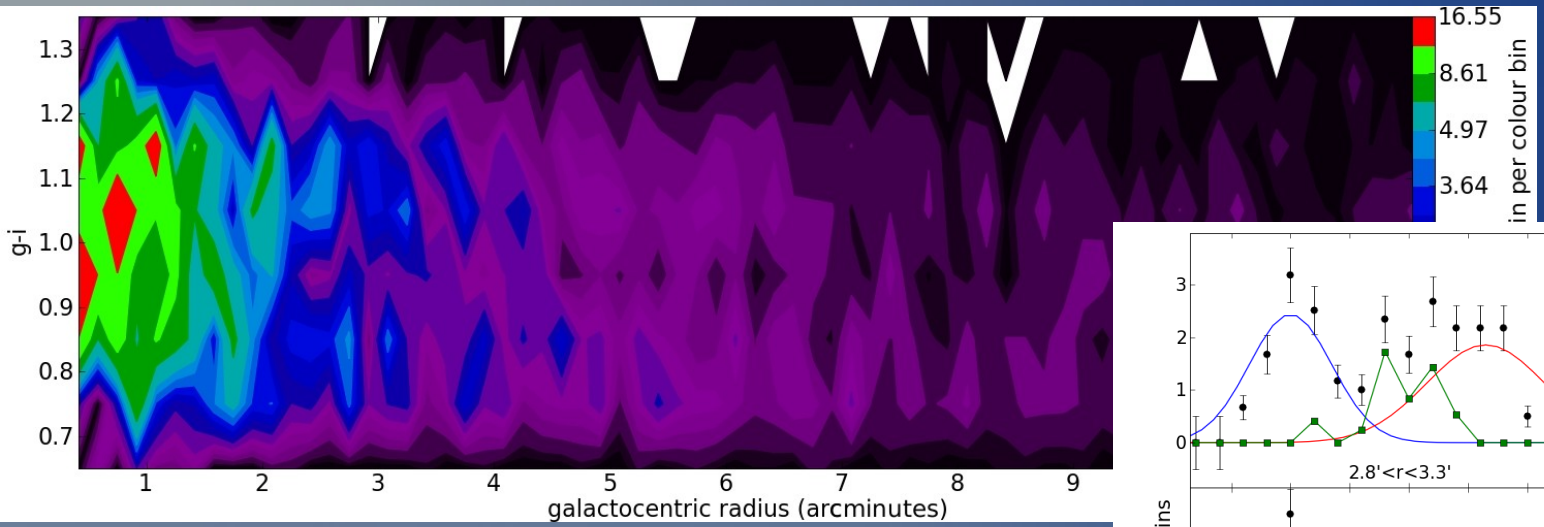
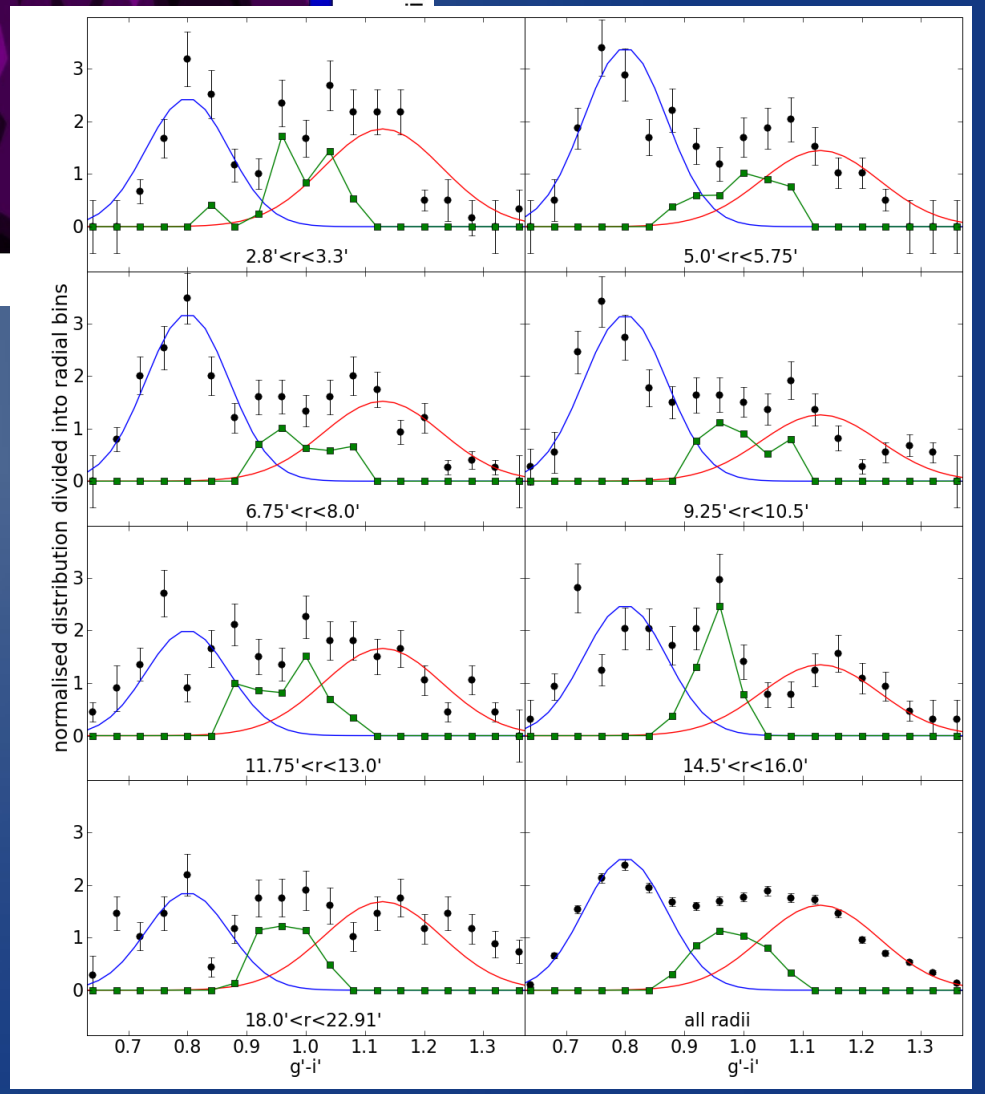
Radial Effects in the Globular Cluster Color Distribution



NGC 4365 (Blom et al. 2012)



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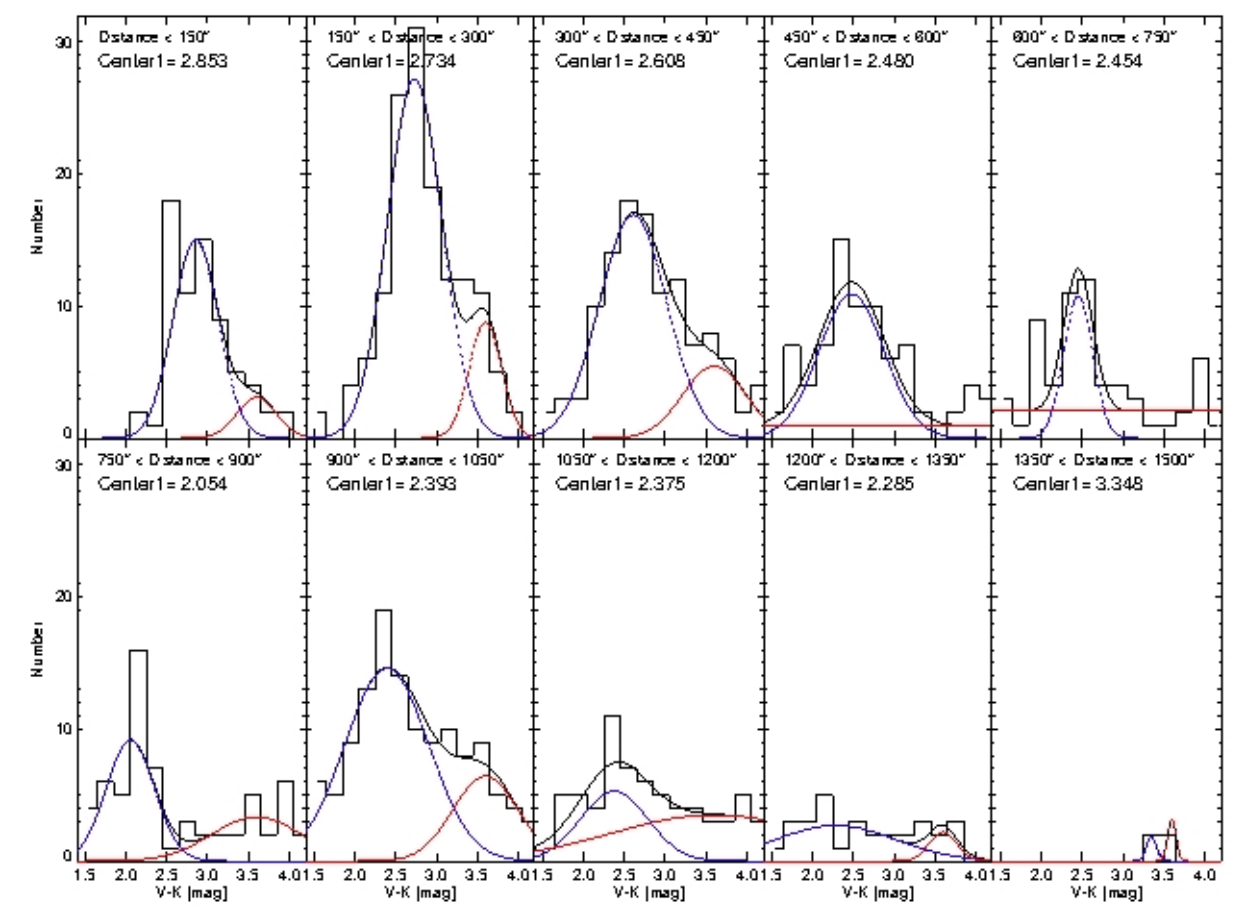
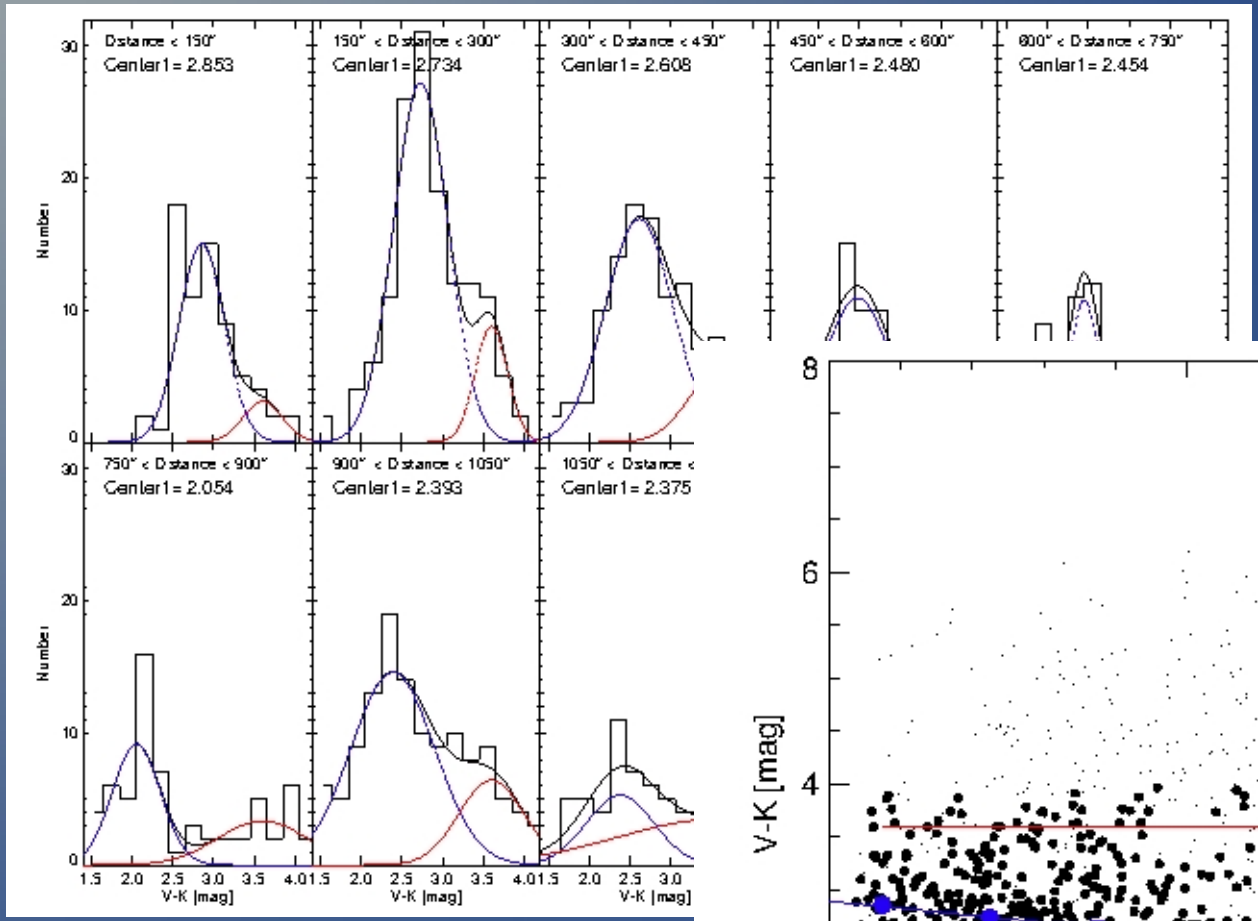
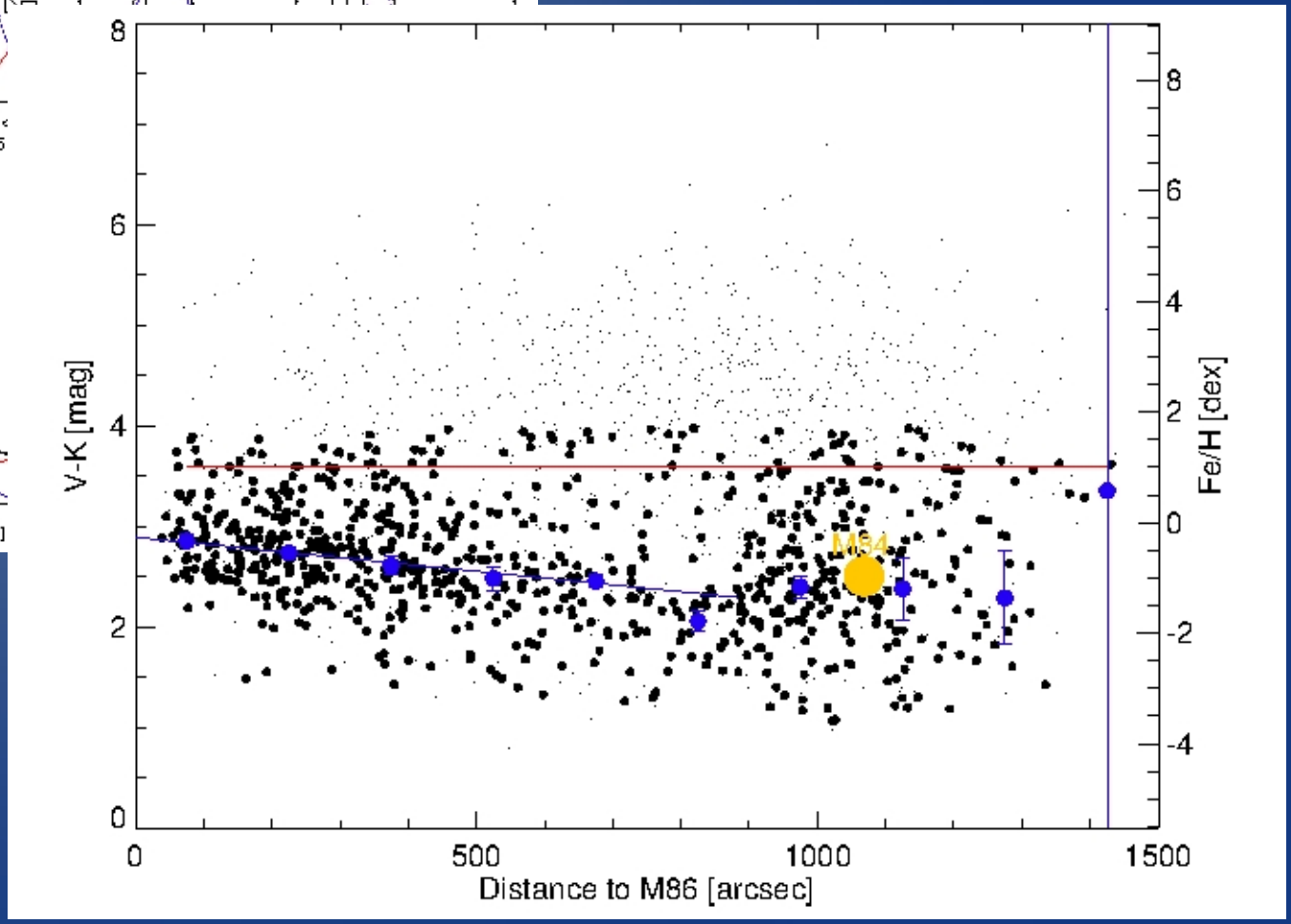


NGC 4406
(Hempel et al. 2013)

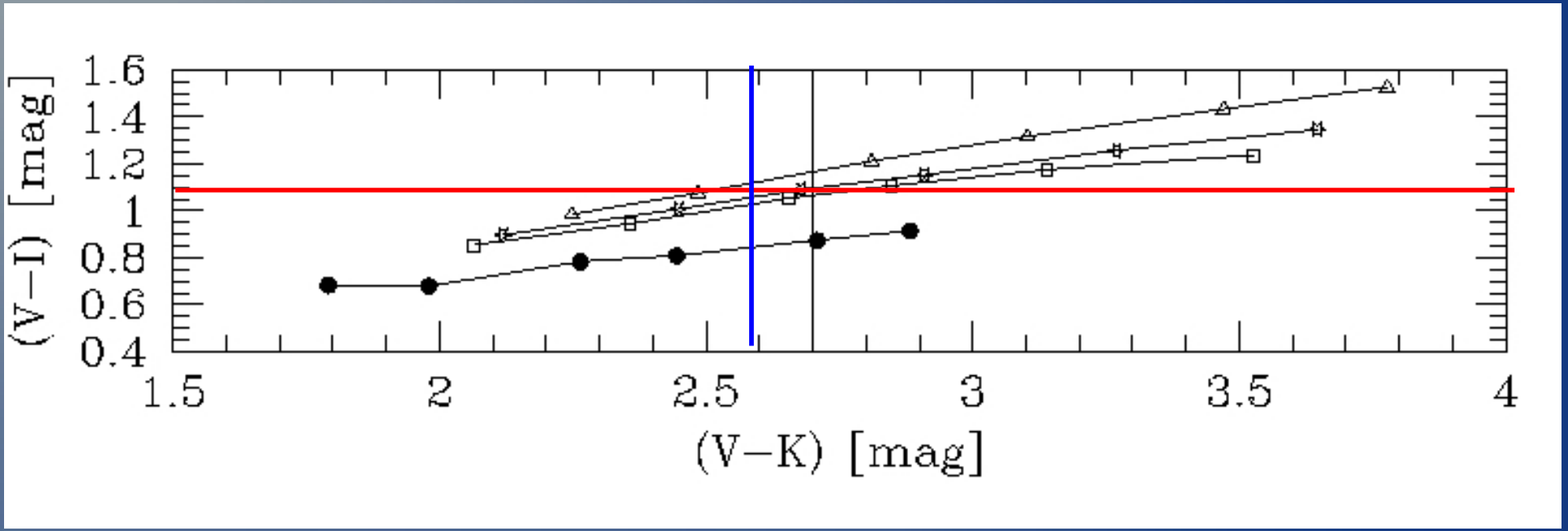
Radial Effects in the Globular Cluster Color Distribution



NGC 4408
(Hempel et al. 2013)



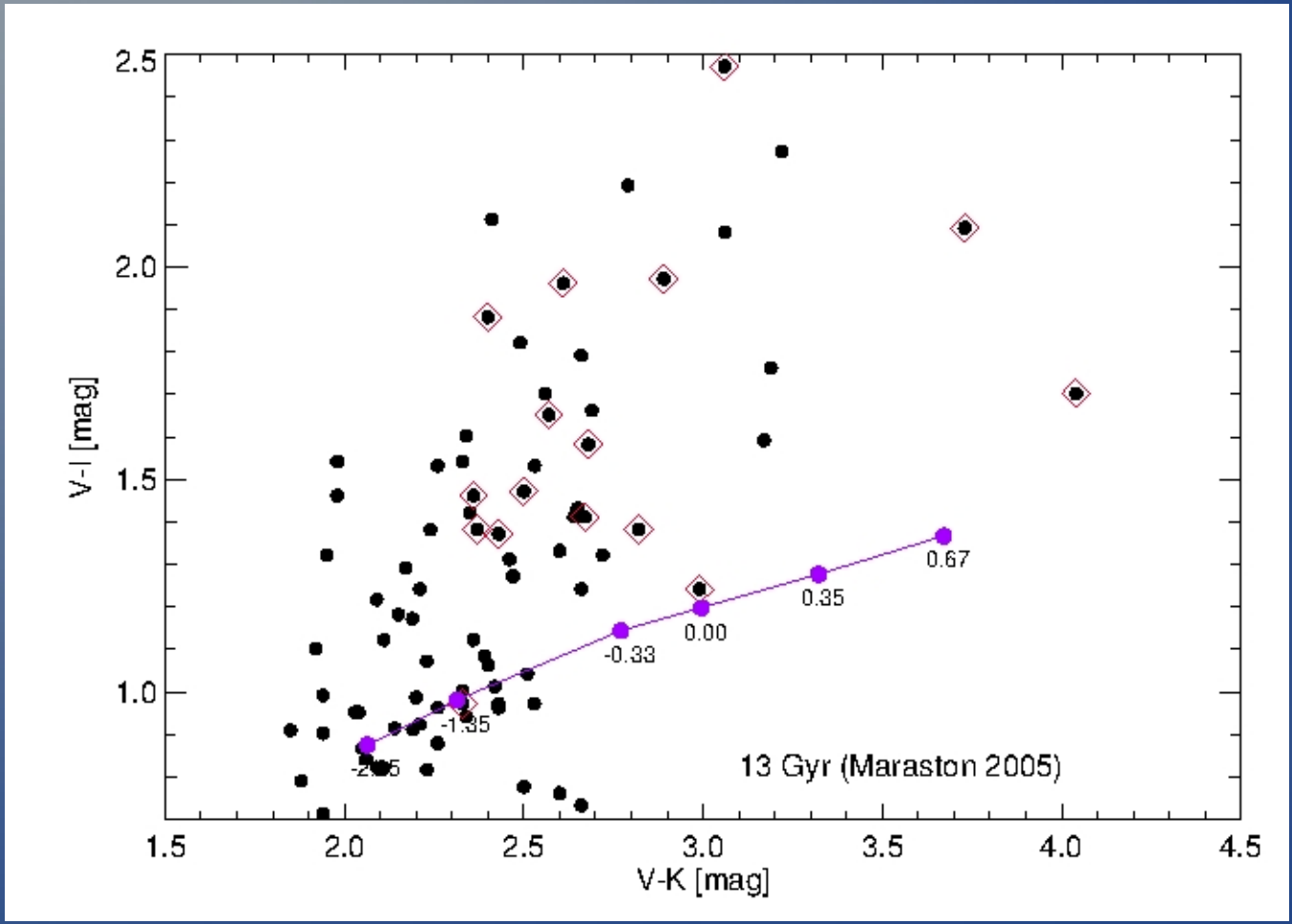
Integrated Light of Globular Clusters



- Age/ Metallicity degeneracy of optical broad band colors (Worthey 1994)

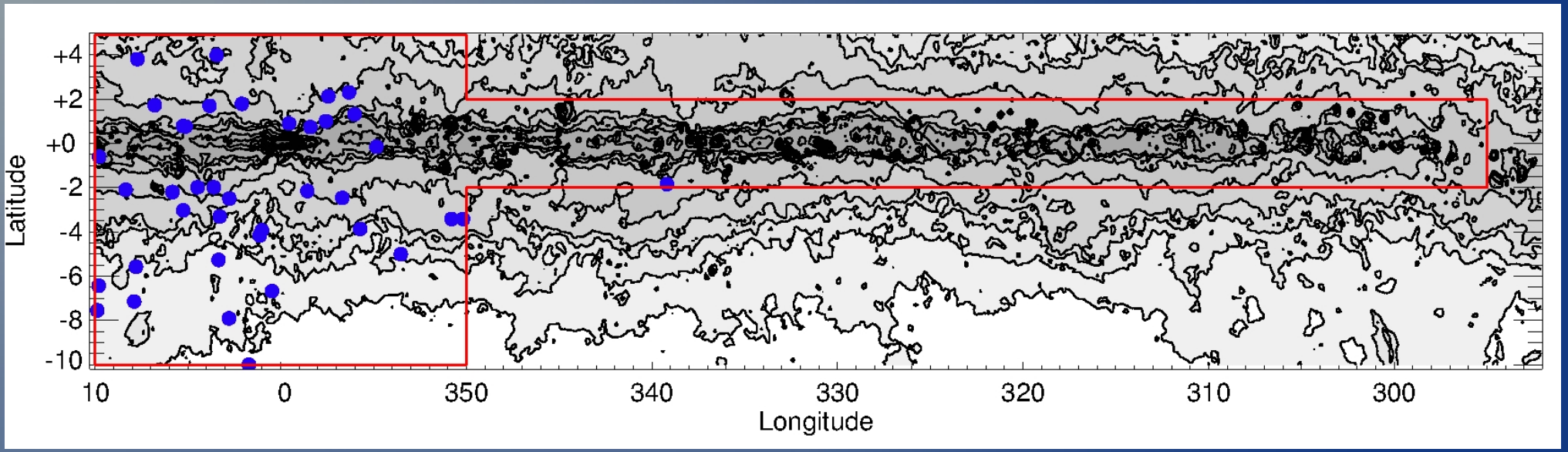
young & metal-rich or old & metal poor ??????

Combined optical & Near-Infrared Photometry (2MASS) for Milky Way Globular Clusters



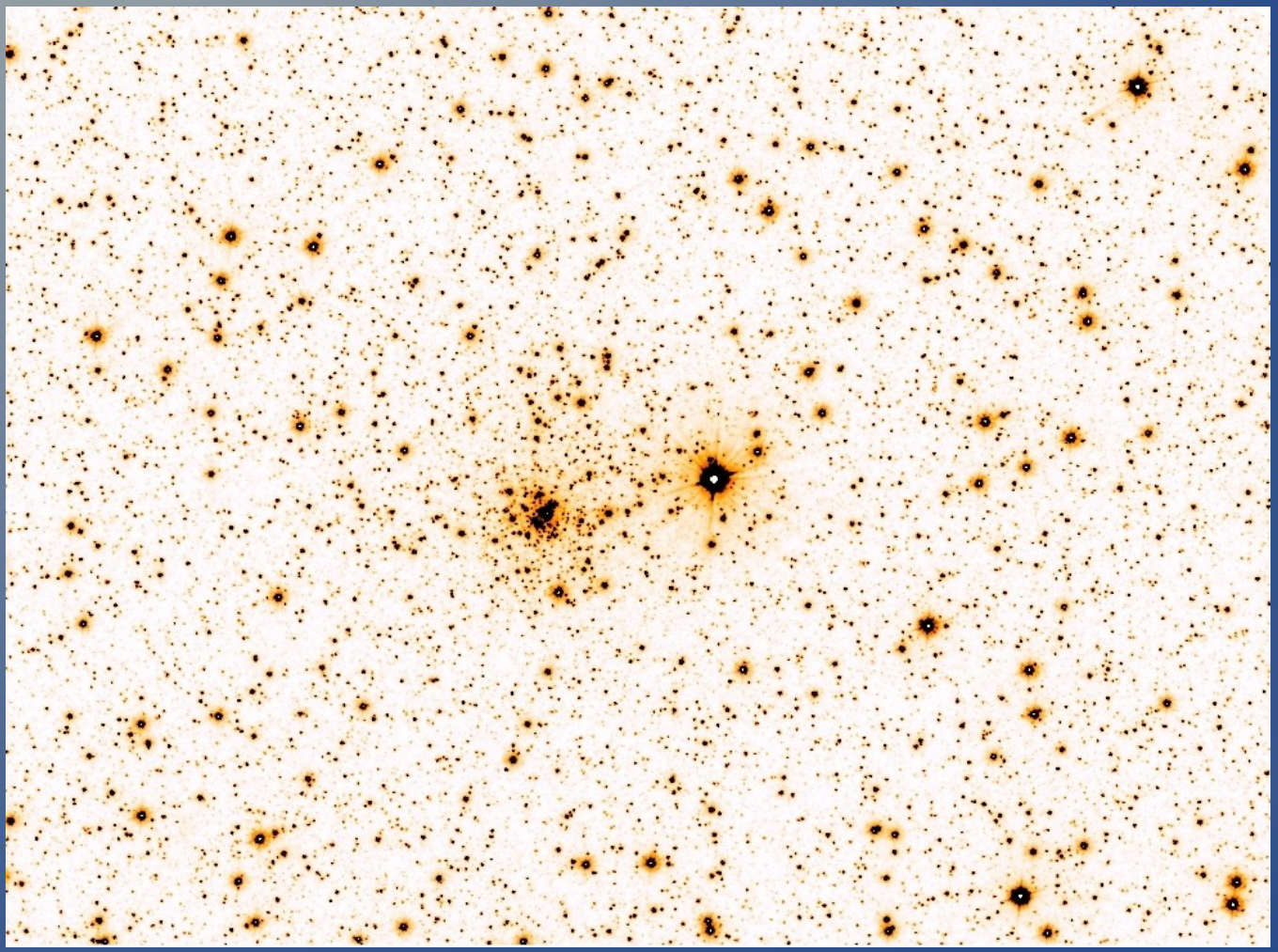
Optical: Harris 2010, NIR: Cohen et al. 2006

How can VVV do better than 2MASS?

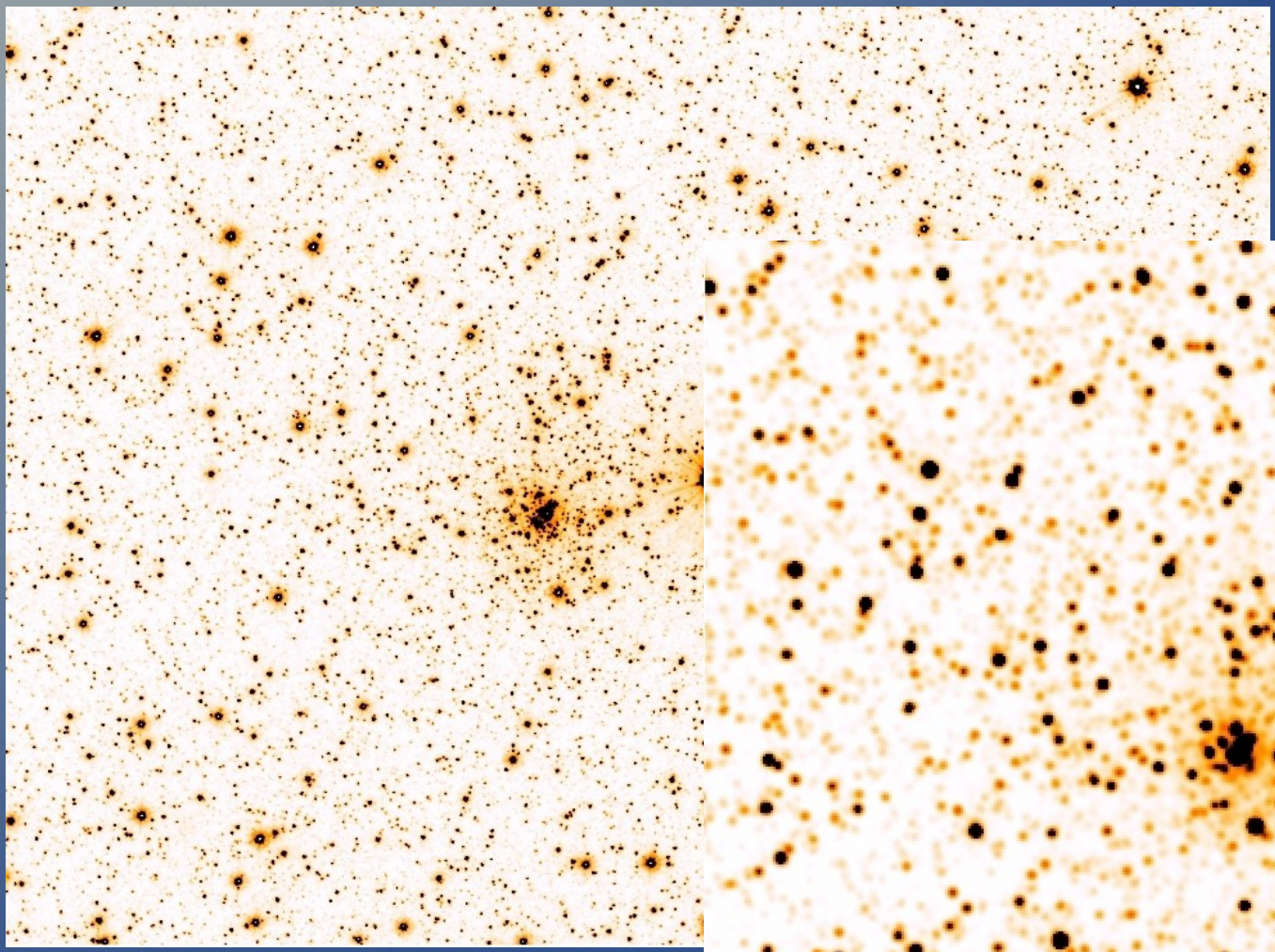


- 39 Milky Way Globular Clusters covered by VVV
- final data (in Ks) will be ~5 mag deeper than 2MASS

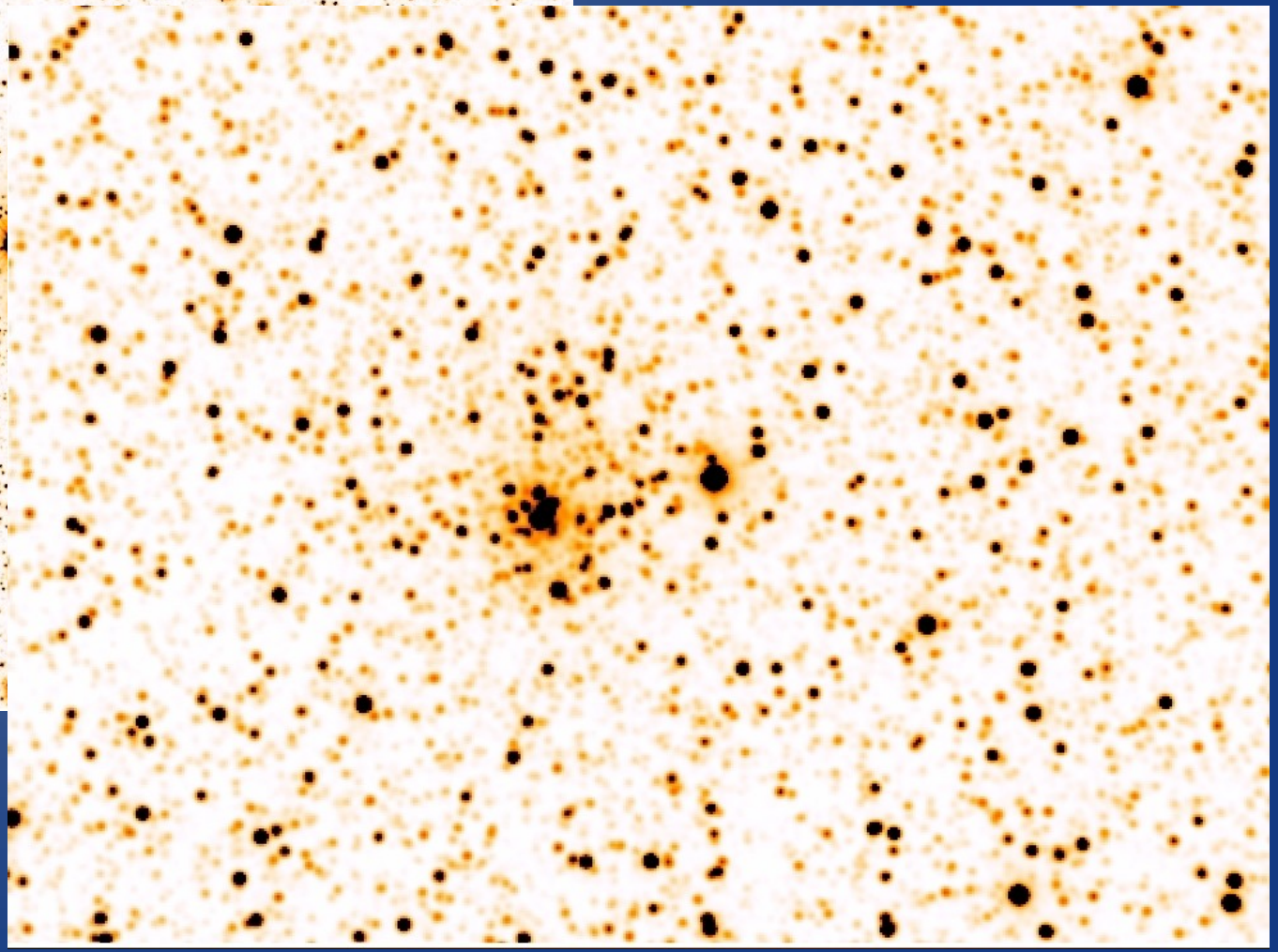
Terzan 2 in VVV



Terzan 2 in VVV

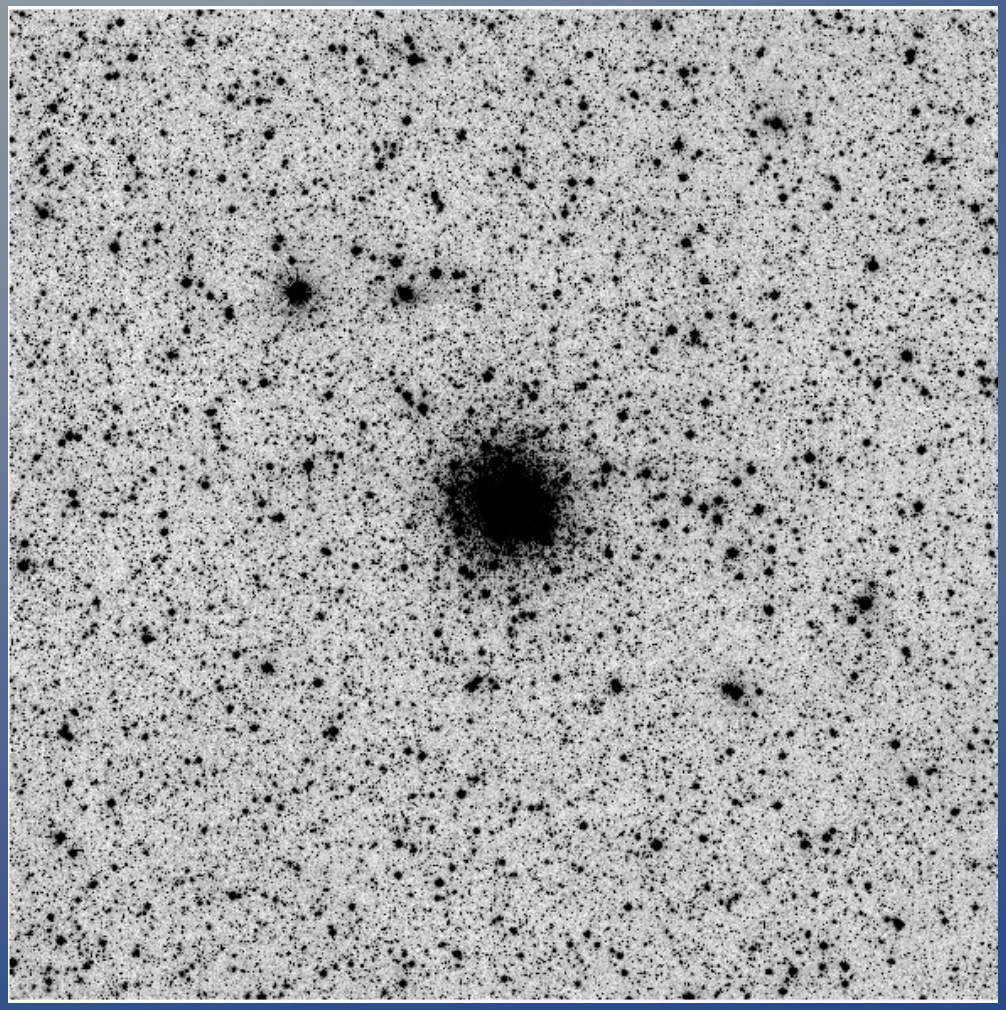


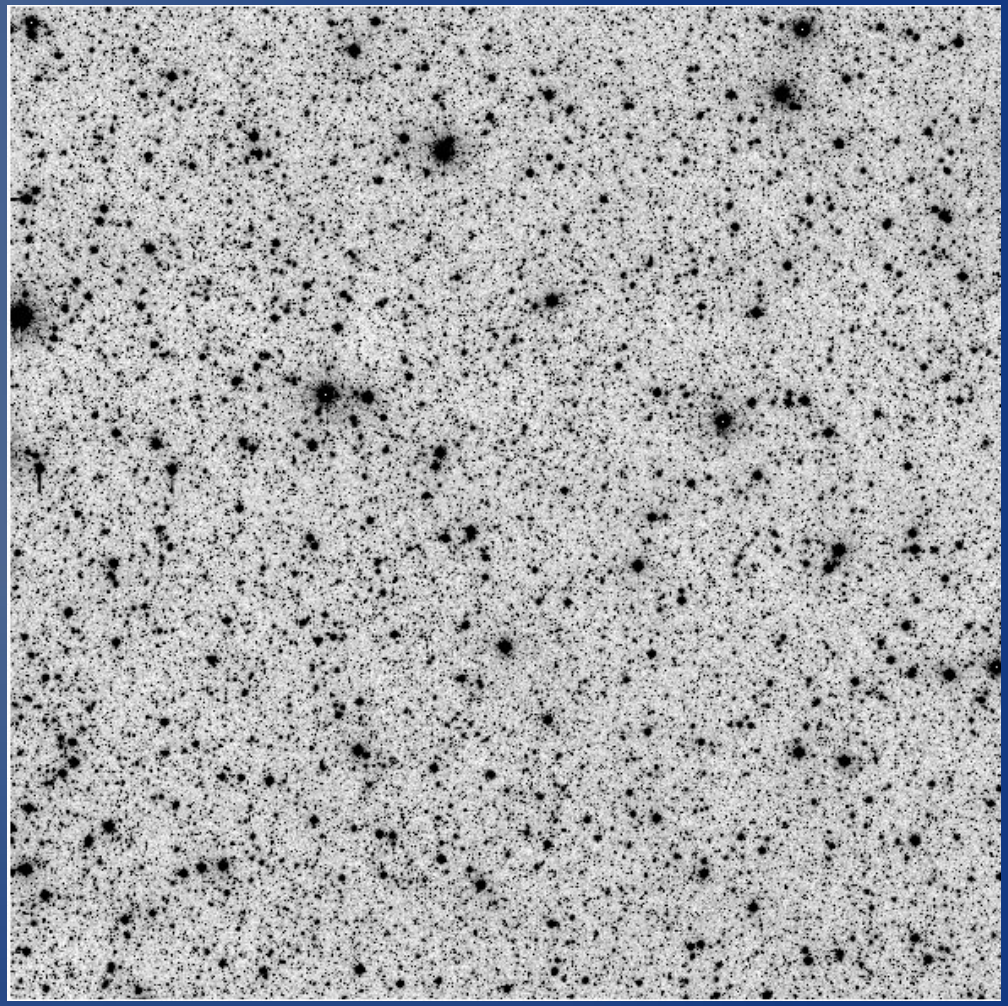
in 2MASS



NGC 6380

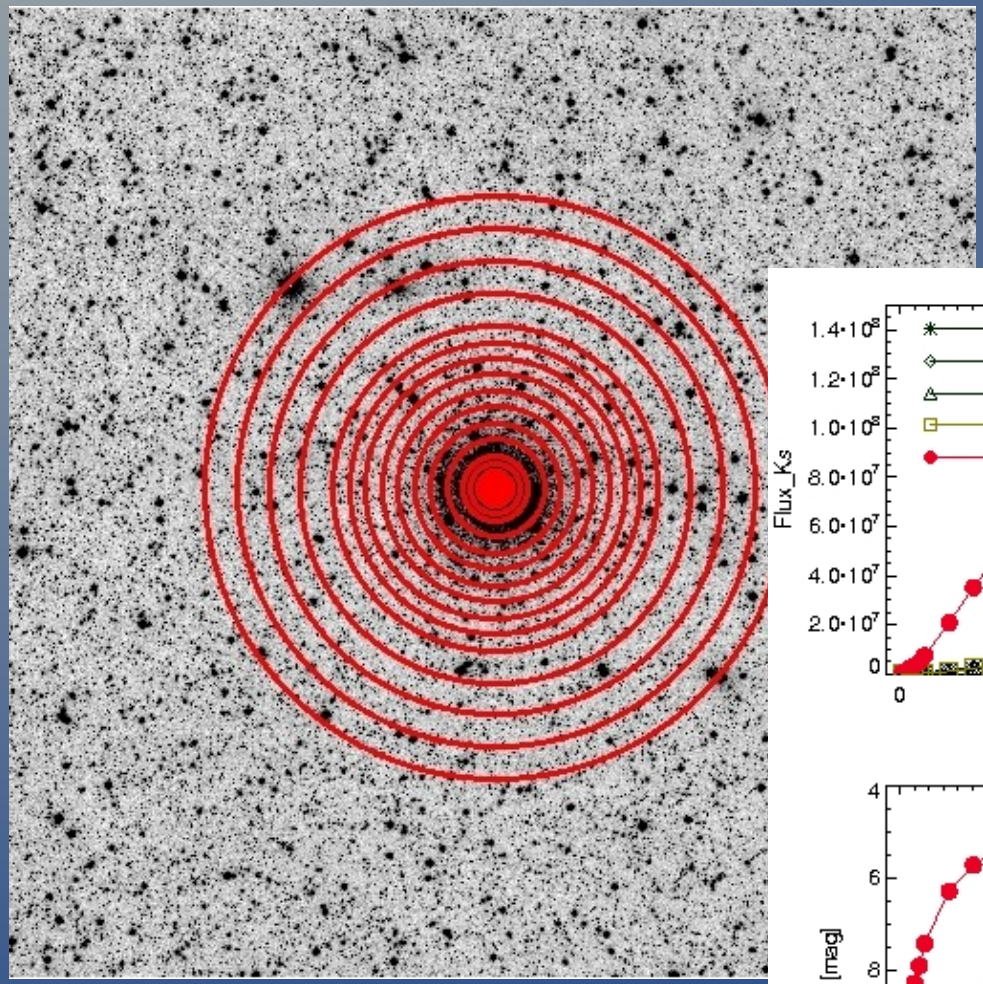
Cluster *Field*

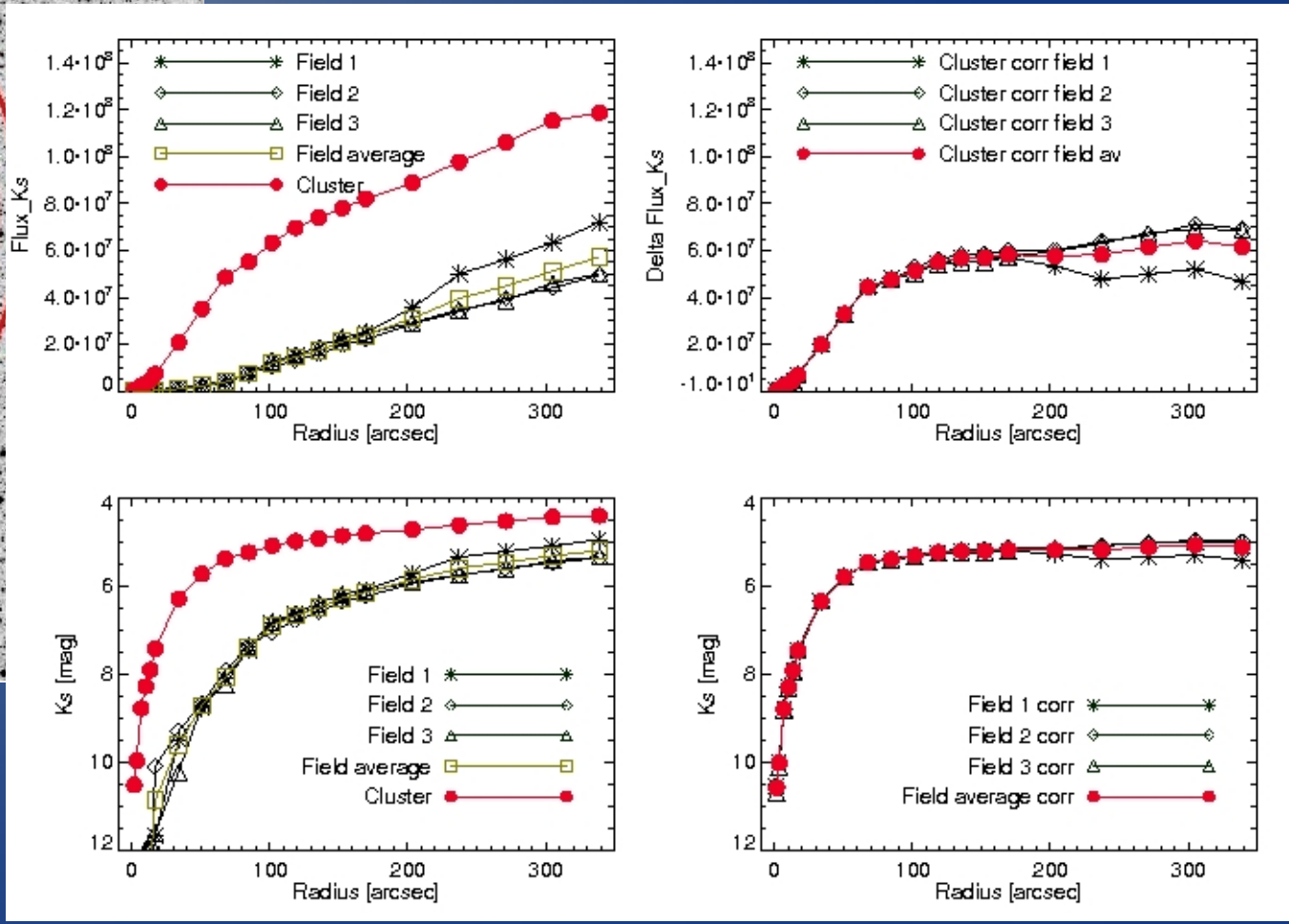




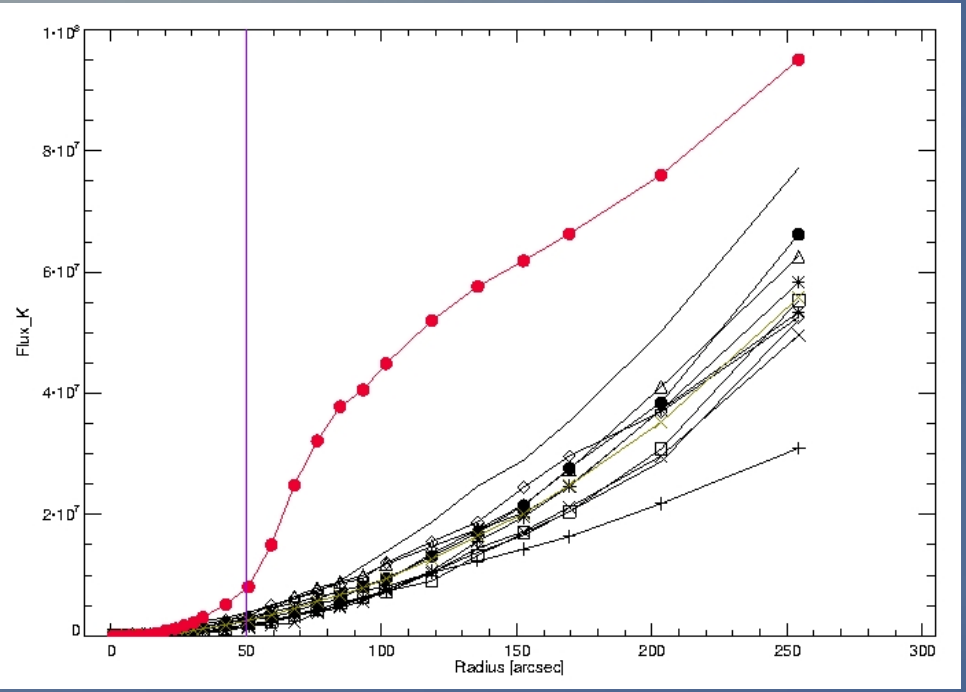
K_s - band, 17' x 17'

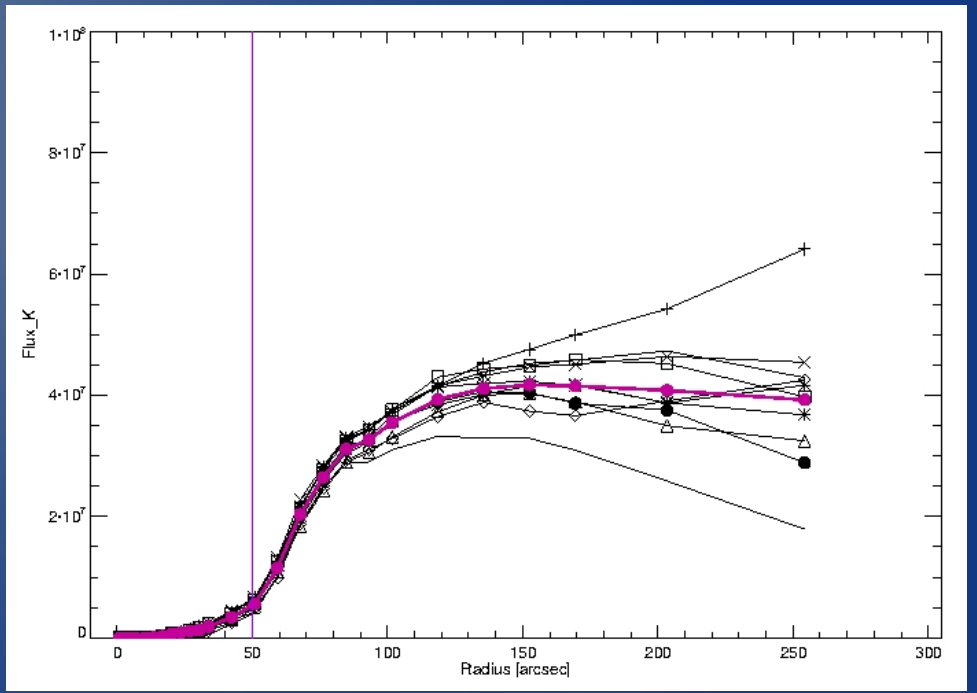
NGC 6380



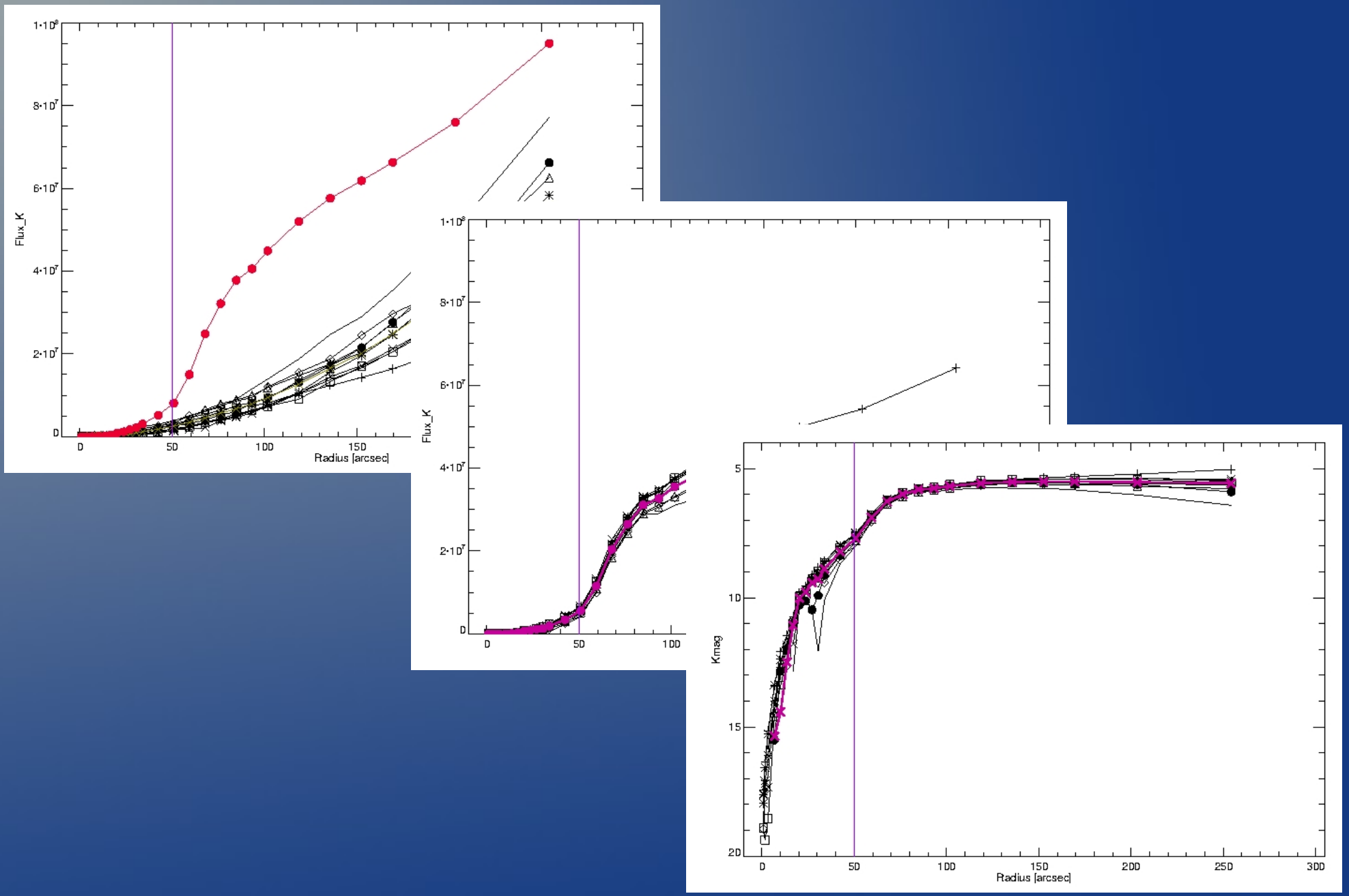

Flux_Ks
Field 1
Field 2
Field 3
Field average
Cluster
Radius [arcsec]
Delta Flux_Ks
Cluster corr field 1
Cluster corr field 2
Cluster corr field 3
Cluster corr field av
Radius [arcsec]
Ks [mag]
Field 1
Field 2
Field 3
Field average
Cluster
Radius [arcsec]
Ks [mag]
Field 1 corr
Field 2 corr
Field 3 corr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

NGC 6624


1·10⁸
8·10⁷
6·10⁷
4·10⁷
2·10⁷
0
Flux_K
0
50
100
150
200
250
300
Radius [arcsec]

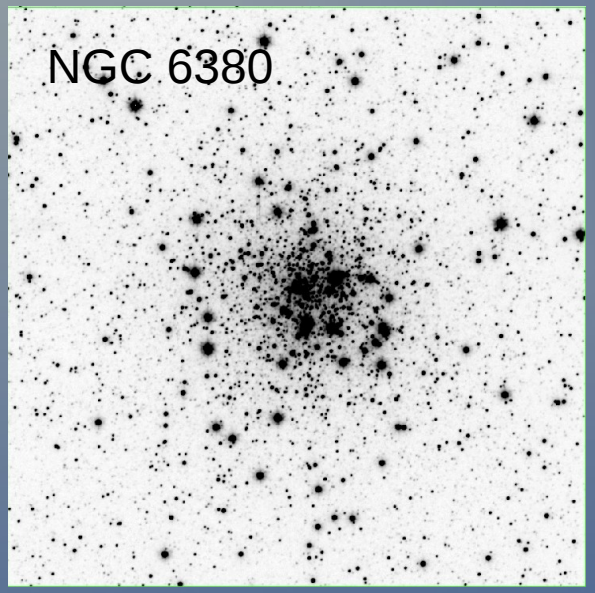

1·10⁸
8·10⁷
6·10⁷
4·10⁷
2·10⁷
0
Flux_K
0
50
100
150
200
250
300
Radius [arcsec]

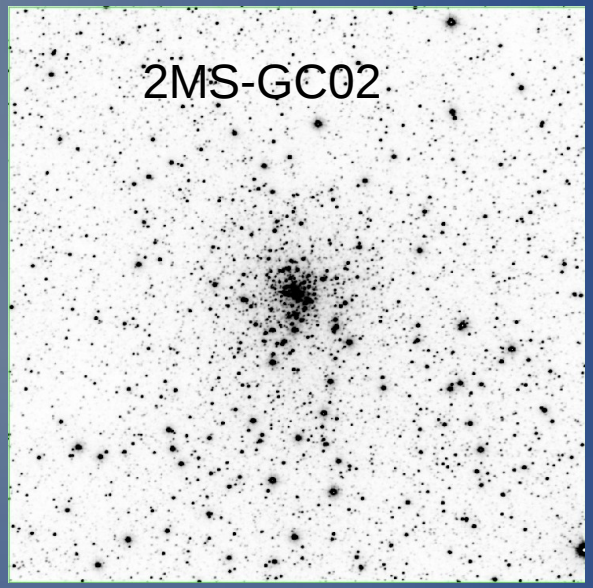
NGC 6624

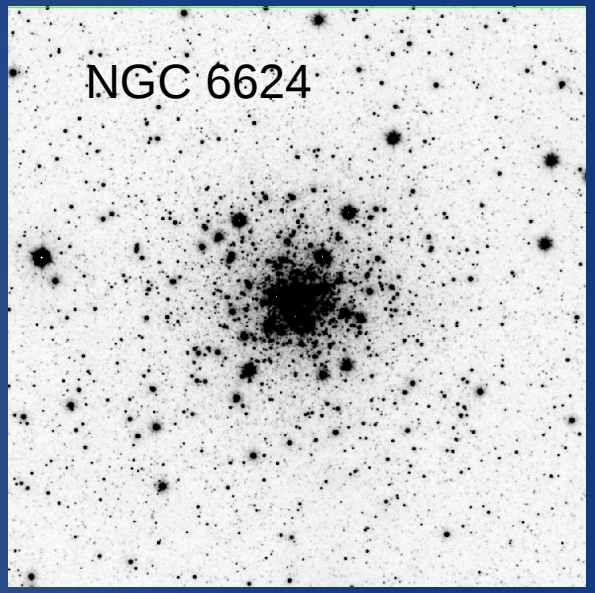


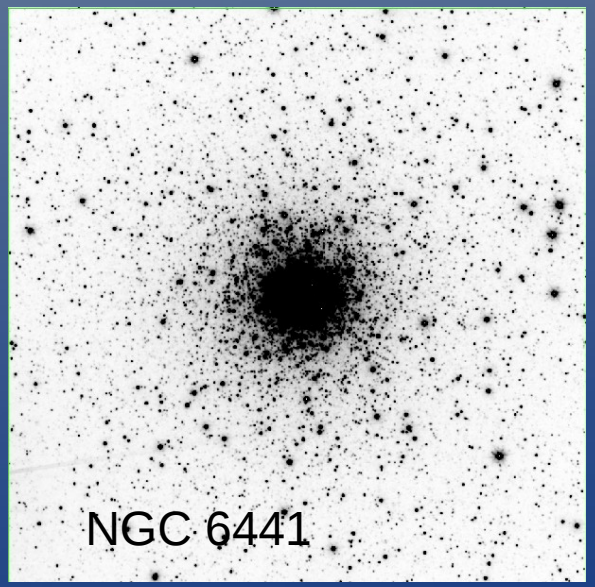
Every Cluster for ITSELF!

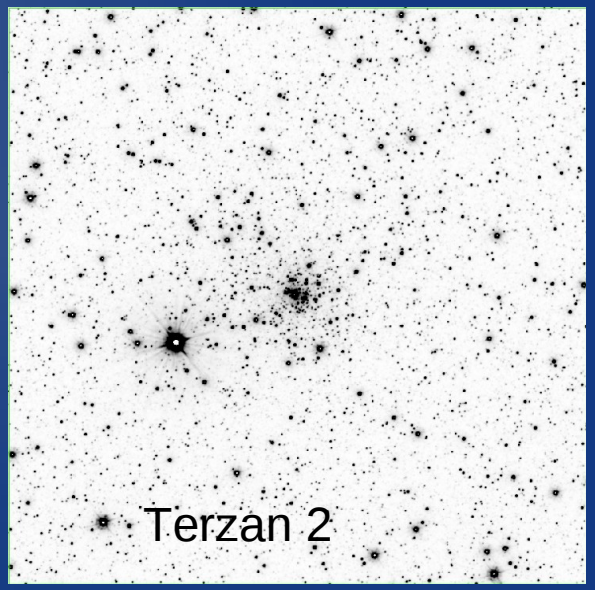
5' x 5' FOV



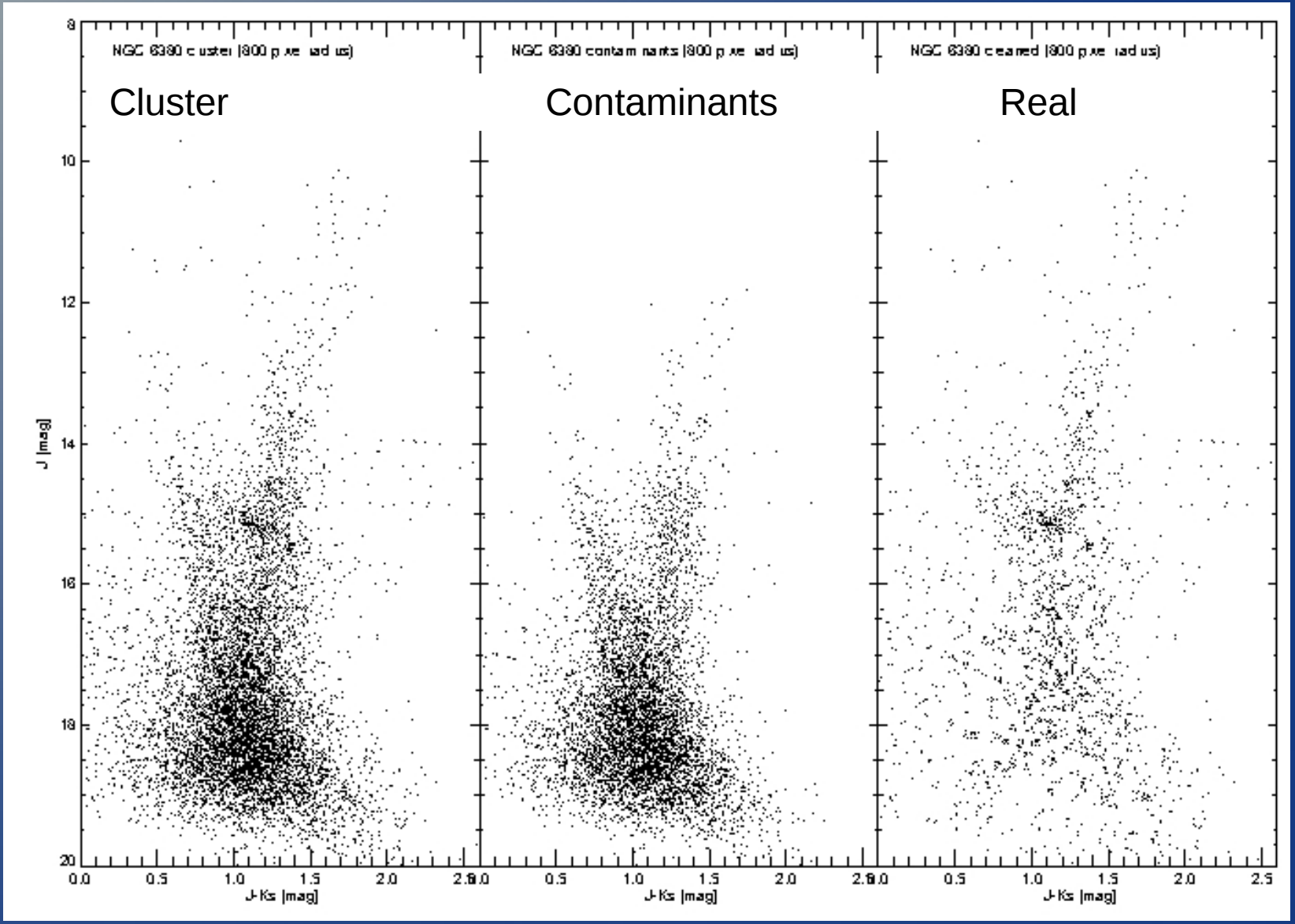




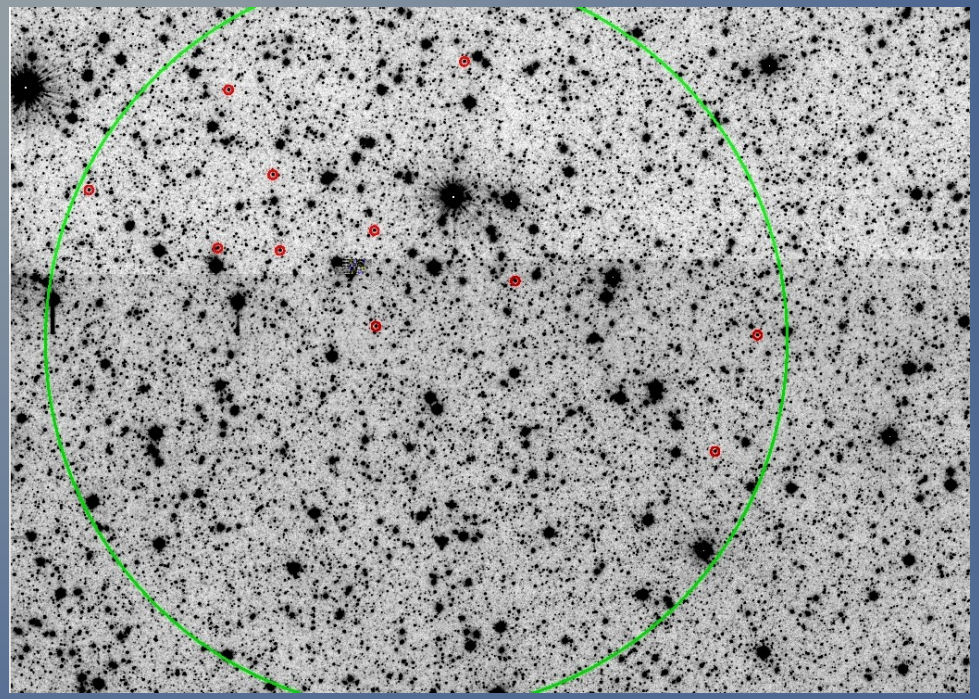


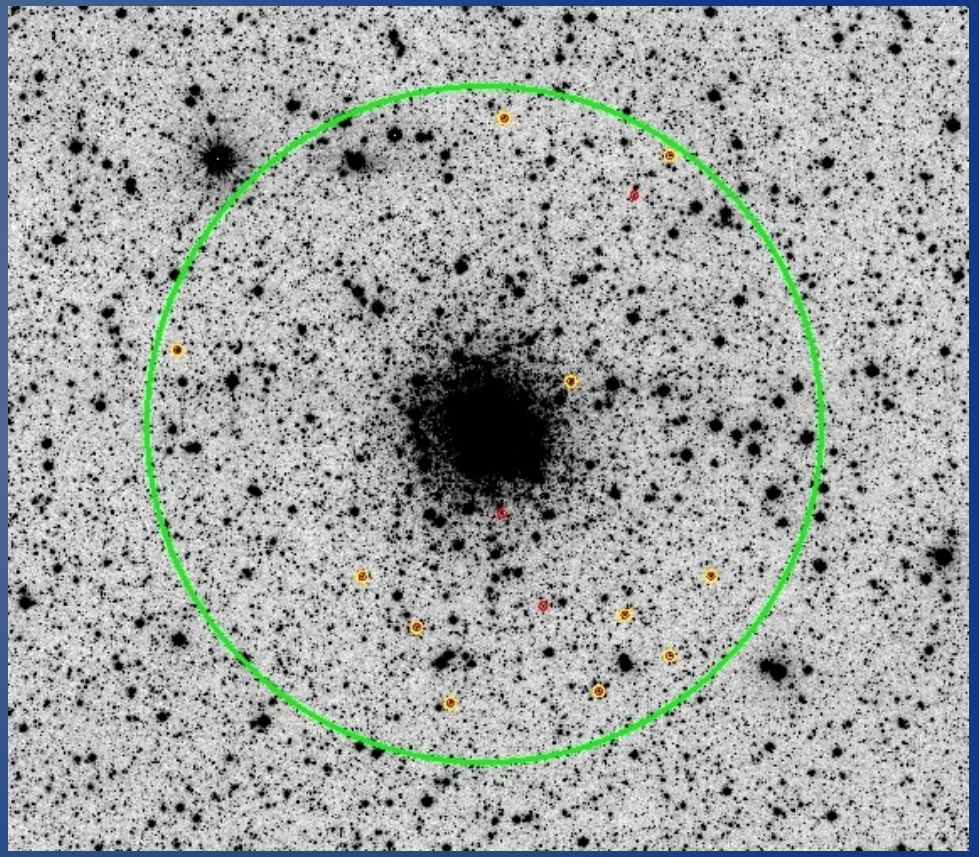


Alternative (especially for low mass globular clusters)



NGC 6380



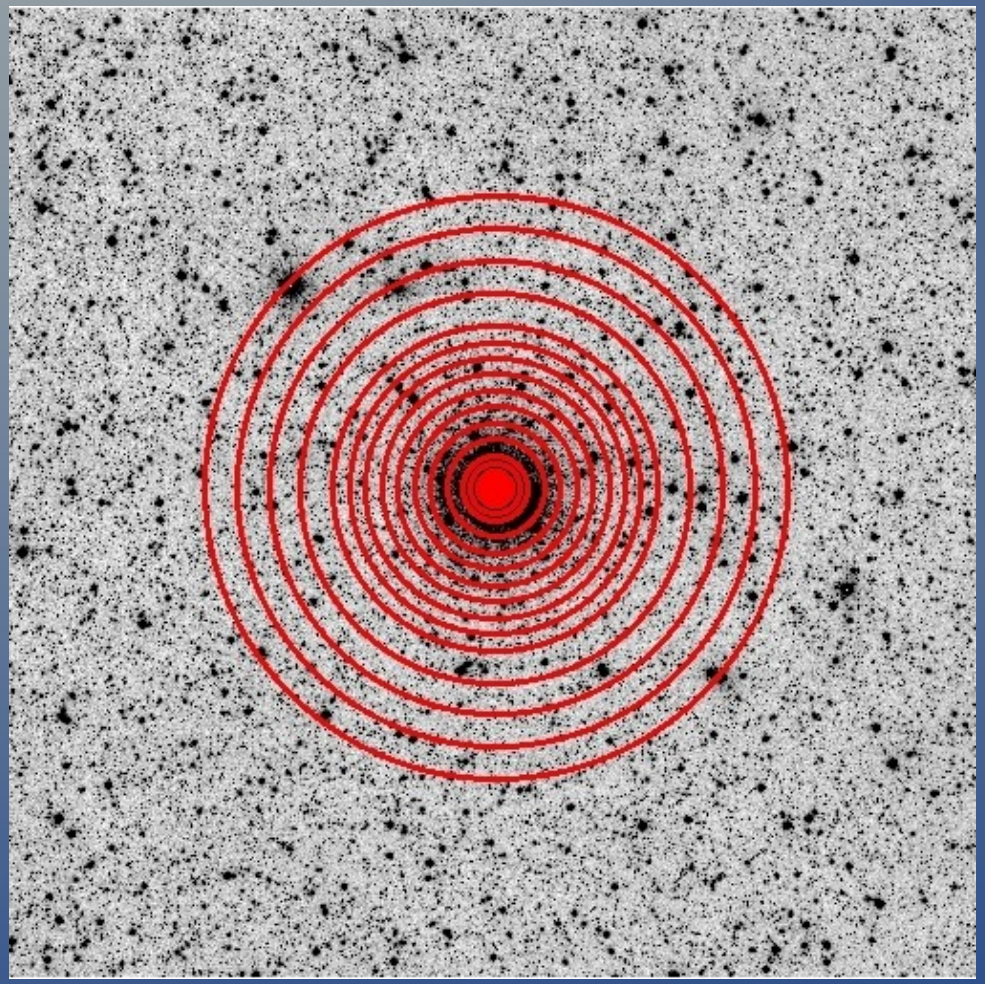


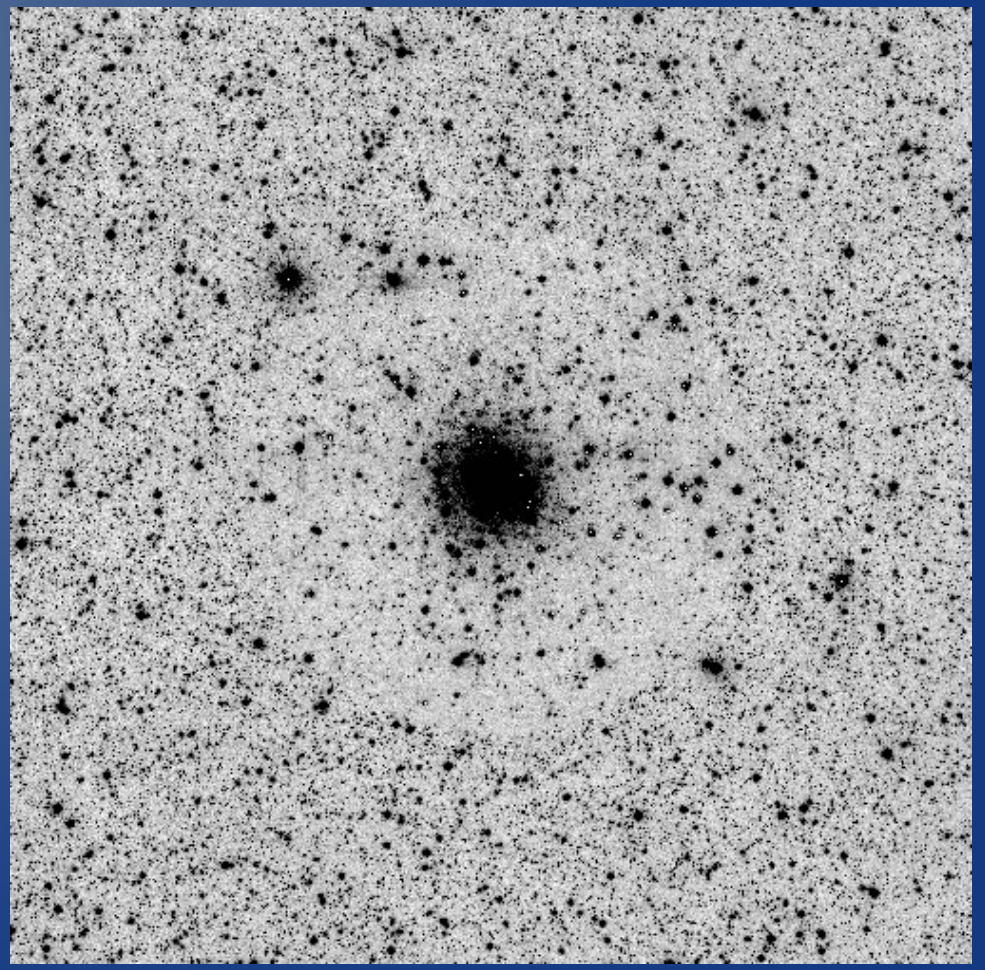
J= 15.0 mag - 15.1 mag; J-Ks= 1.2 mag- 1.25 mag

Field: 11 stars

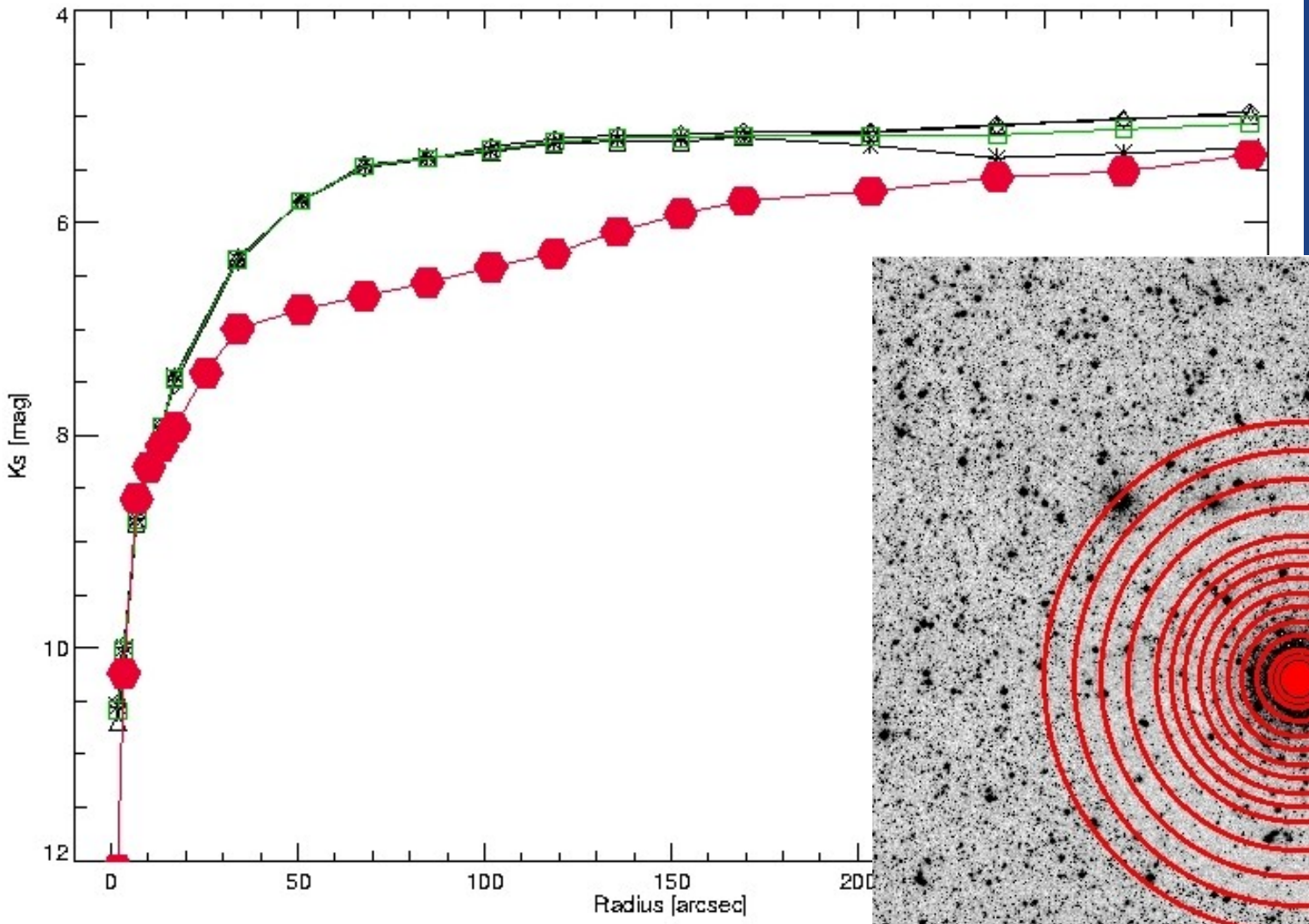
Cluster : 14 stars

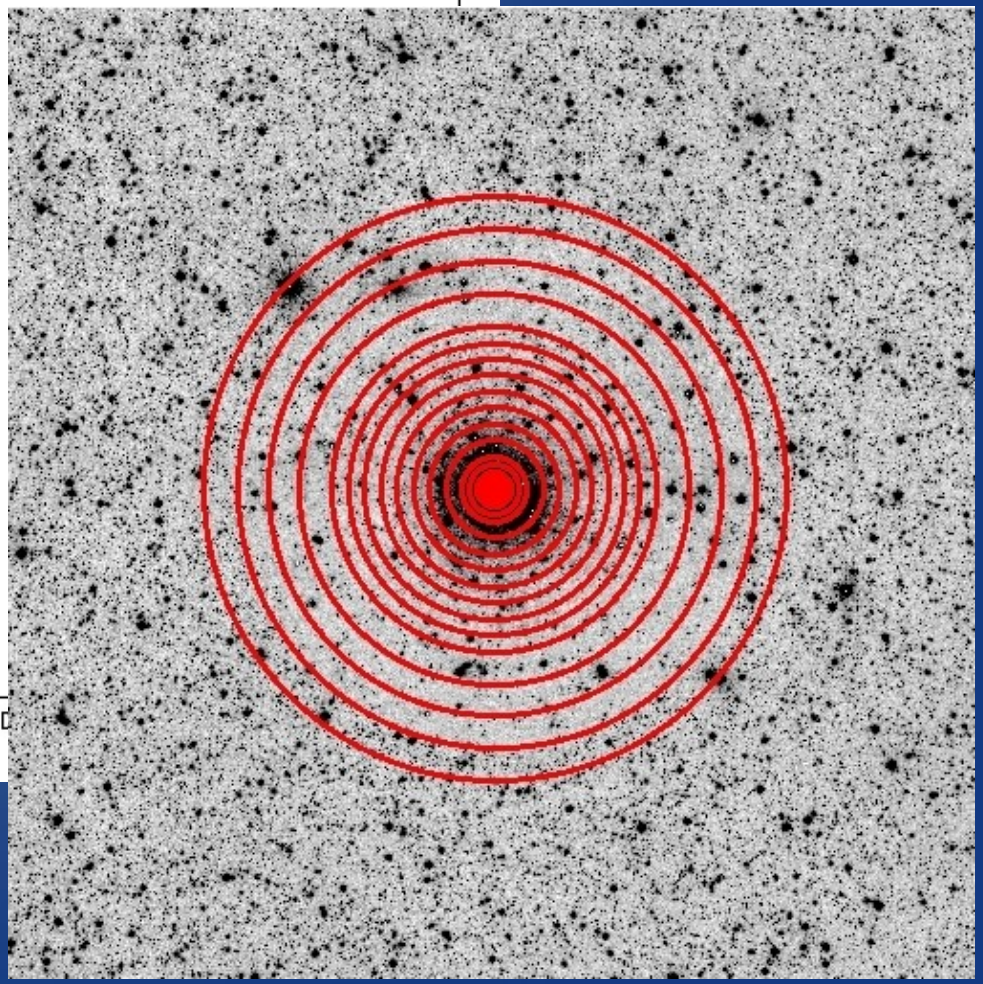
NGC 6380



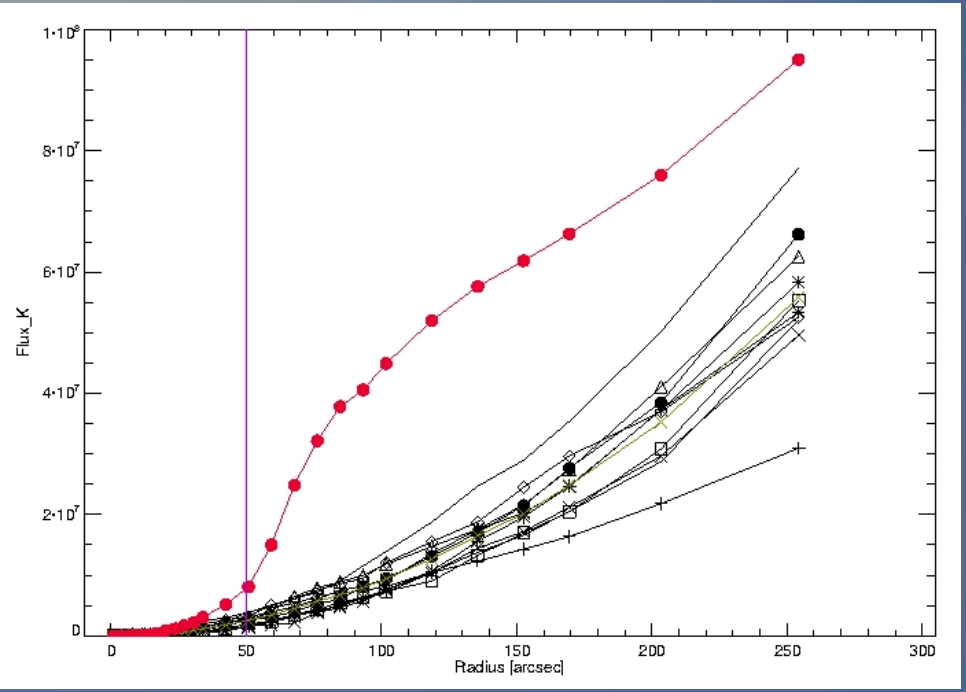


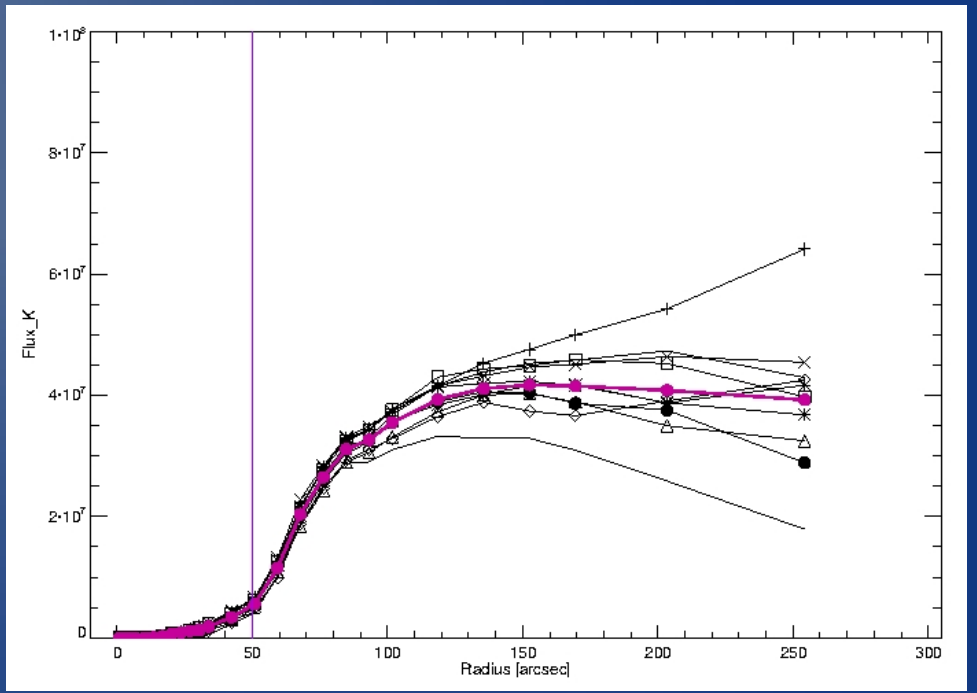
NGC 6380





NGC 6624


1·10⁸
8·10⁷
6·10⁷
4·10⁷
2·10⁷
0
Flux_K
0
50
100
150
200
250
300
Radius [arcsec]


1·10⁸
8·10⁷
6·10⁷
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Flux_K
0
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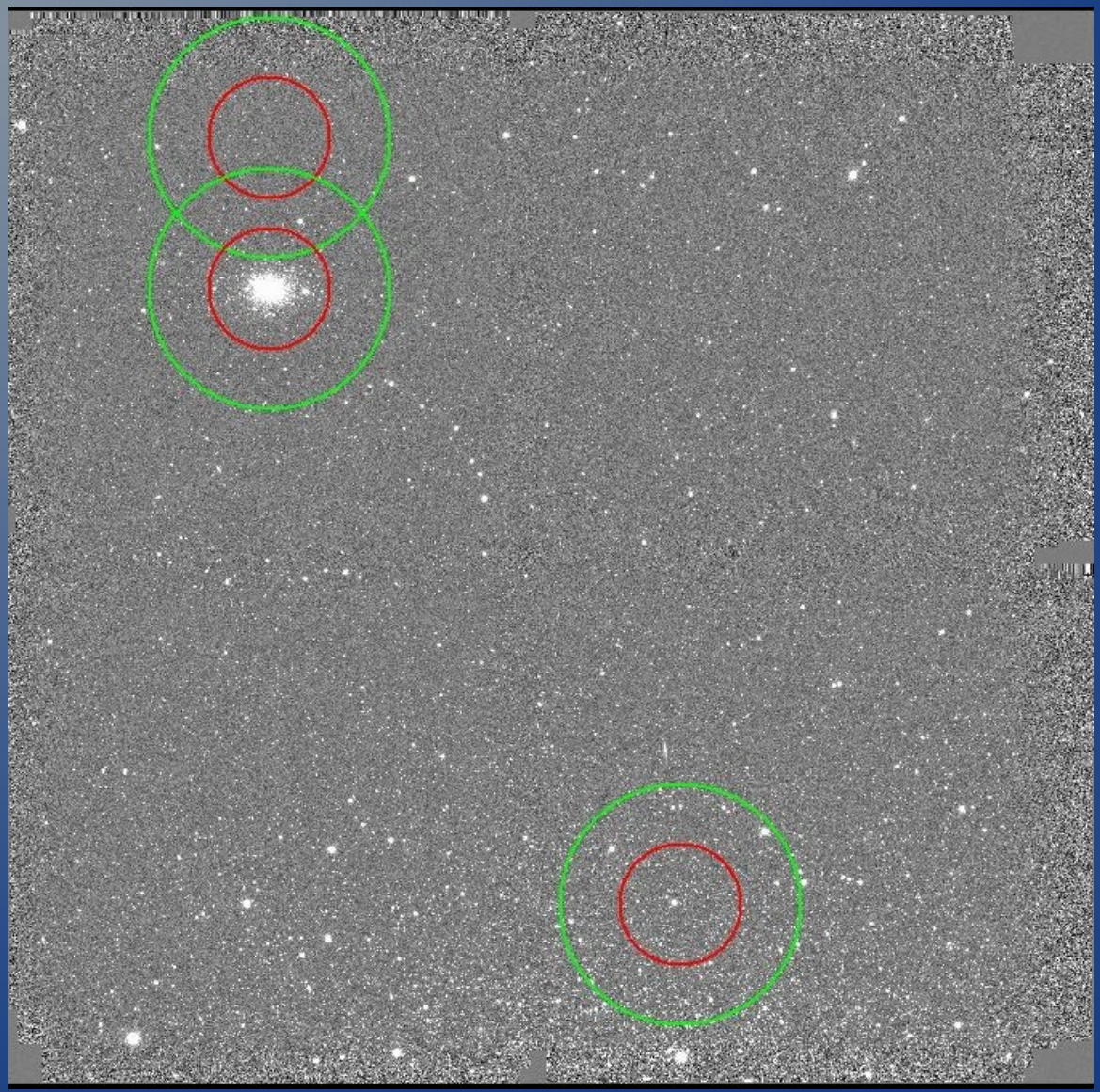
300
Radius [arcsec]

Why Wide-Field Data?

LMC/ SMC Globular Clusters

- CTIO/ NEWFIRM observations (J,K- band)



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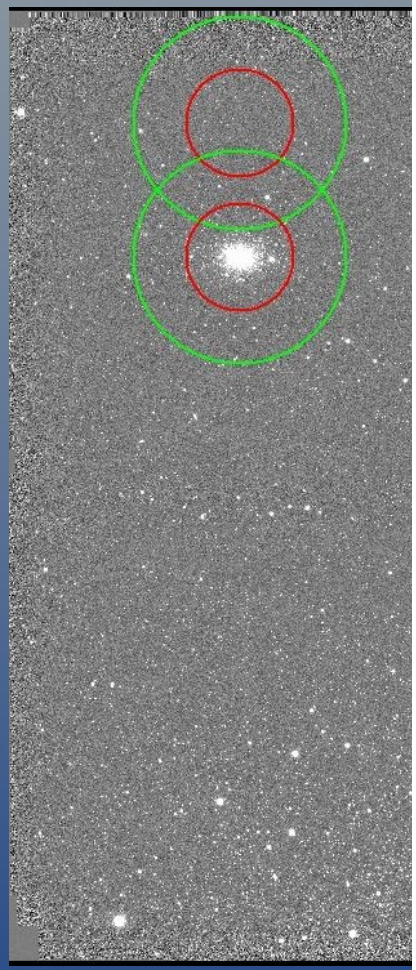

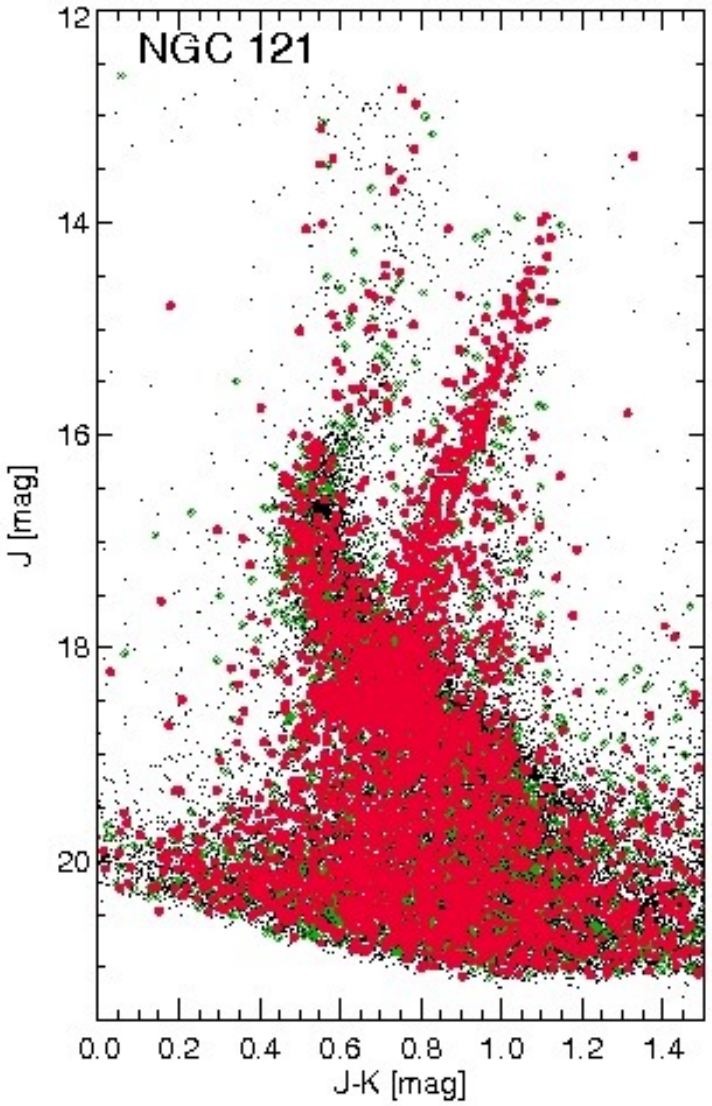

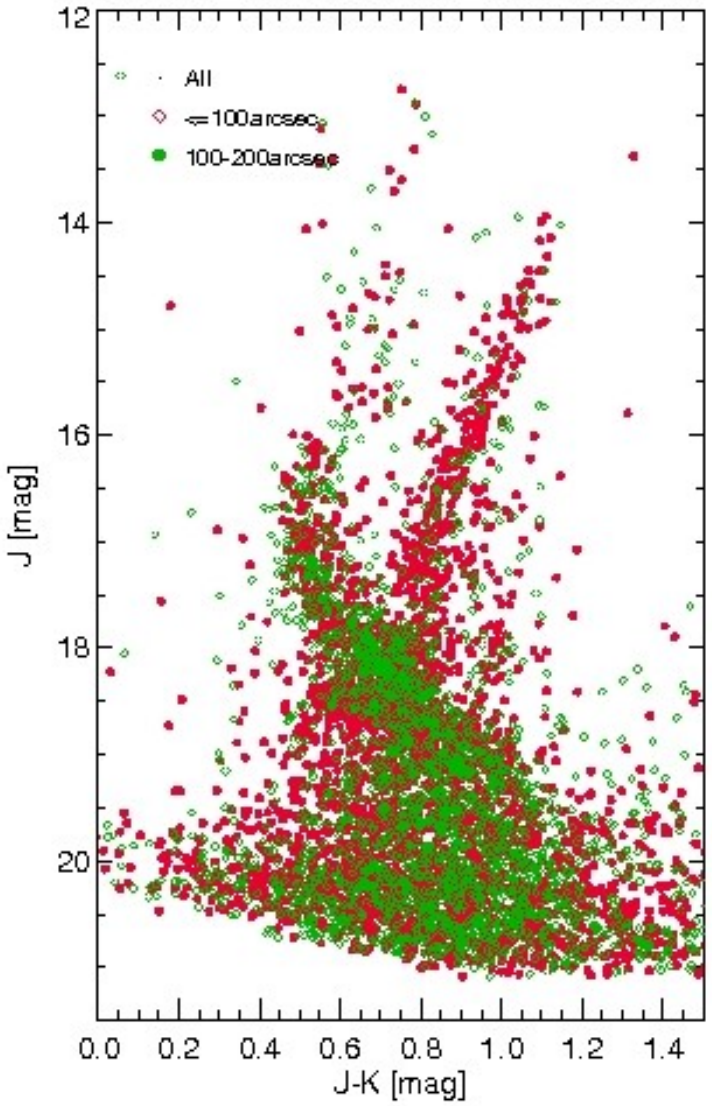

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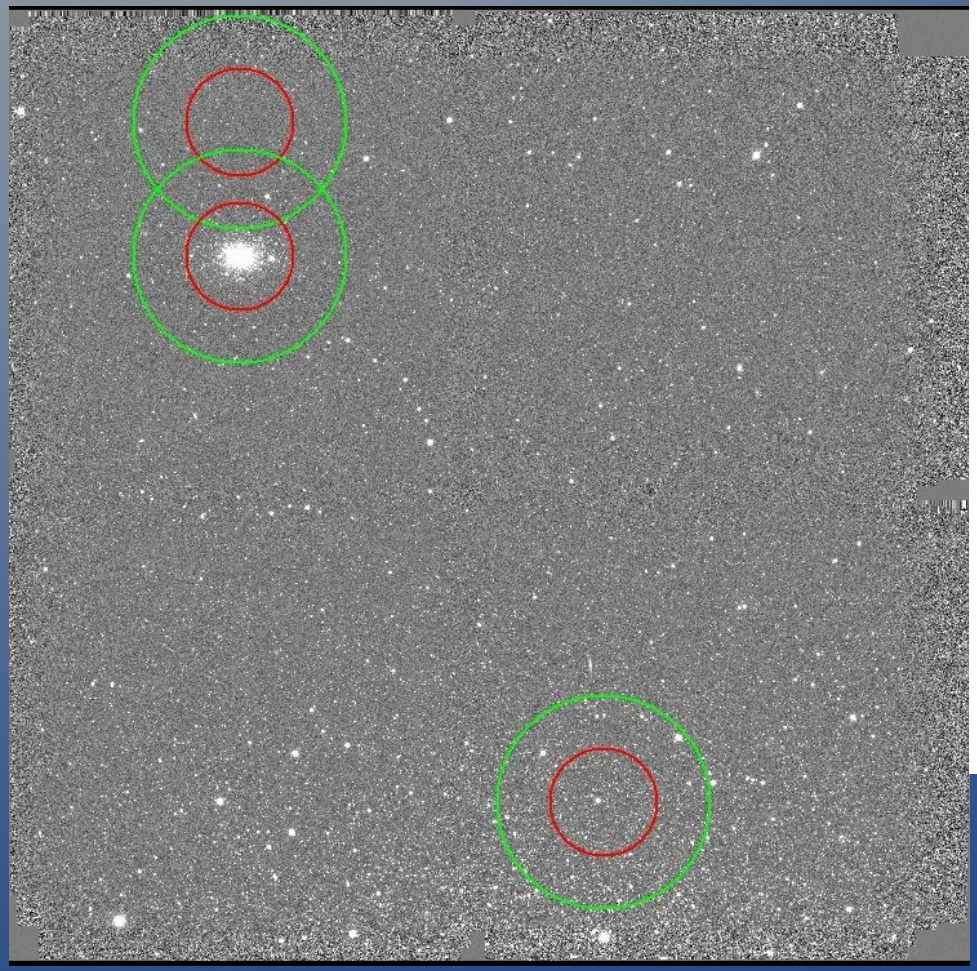

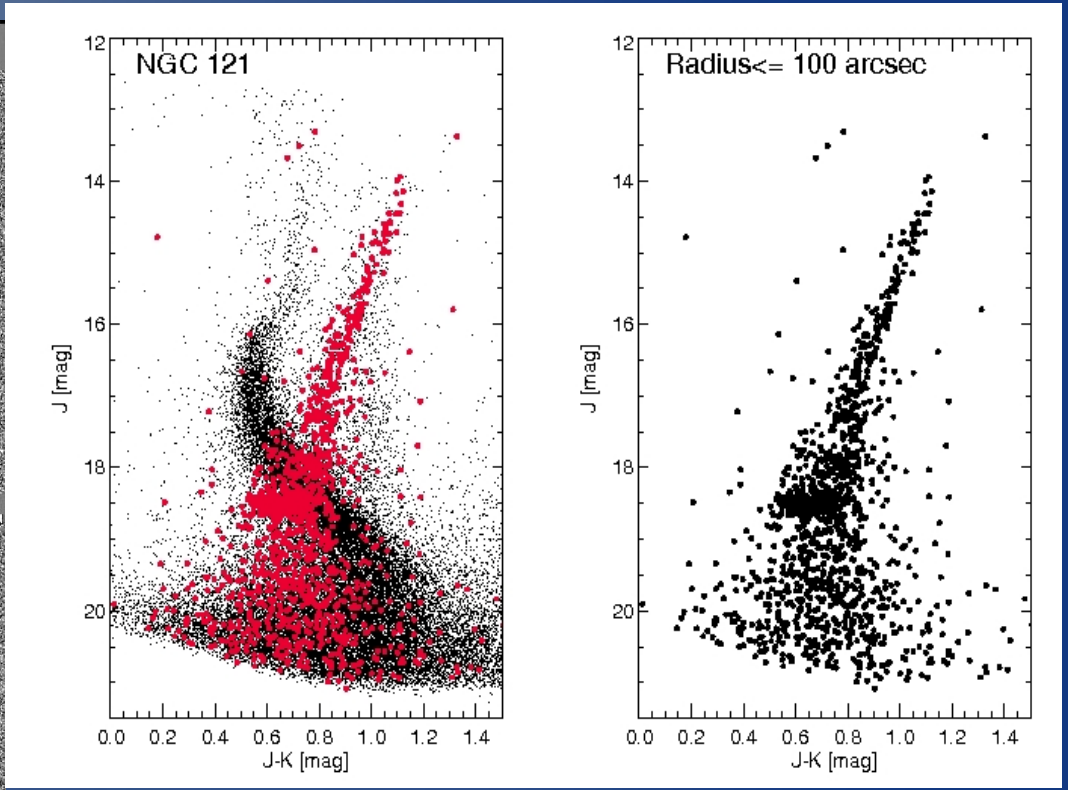

What is the contamination?

- much brighter
- more metal-rich
- detectable in the whole FOV (28 arcmin)

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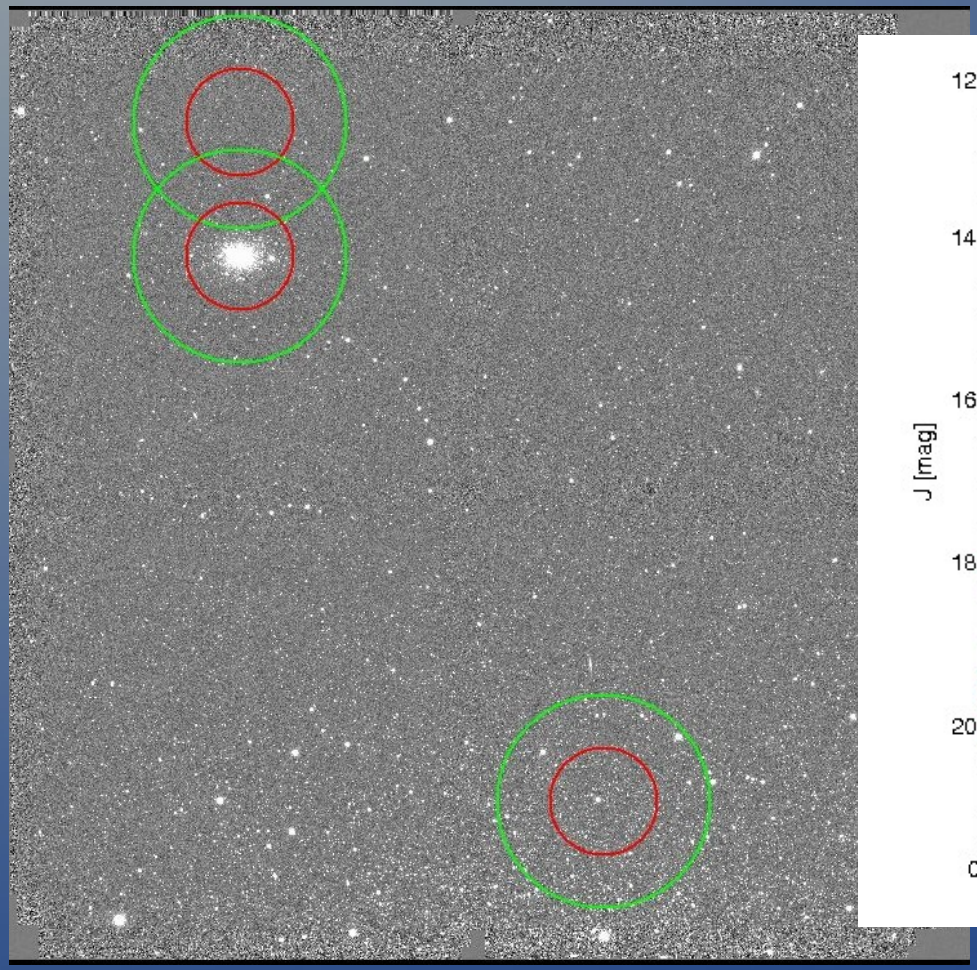

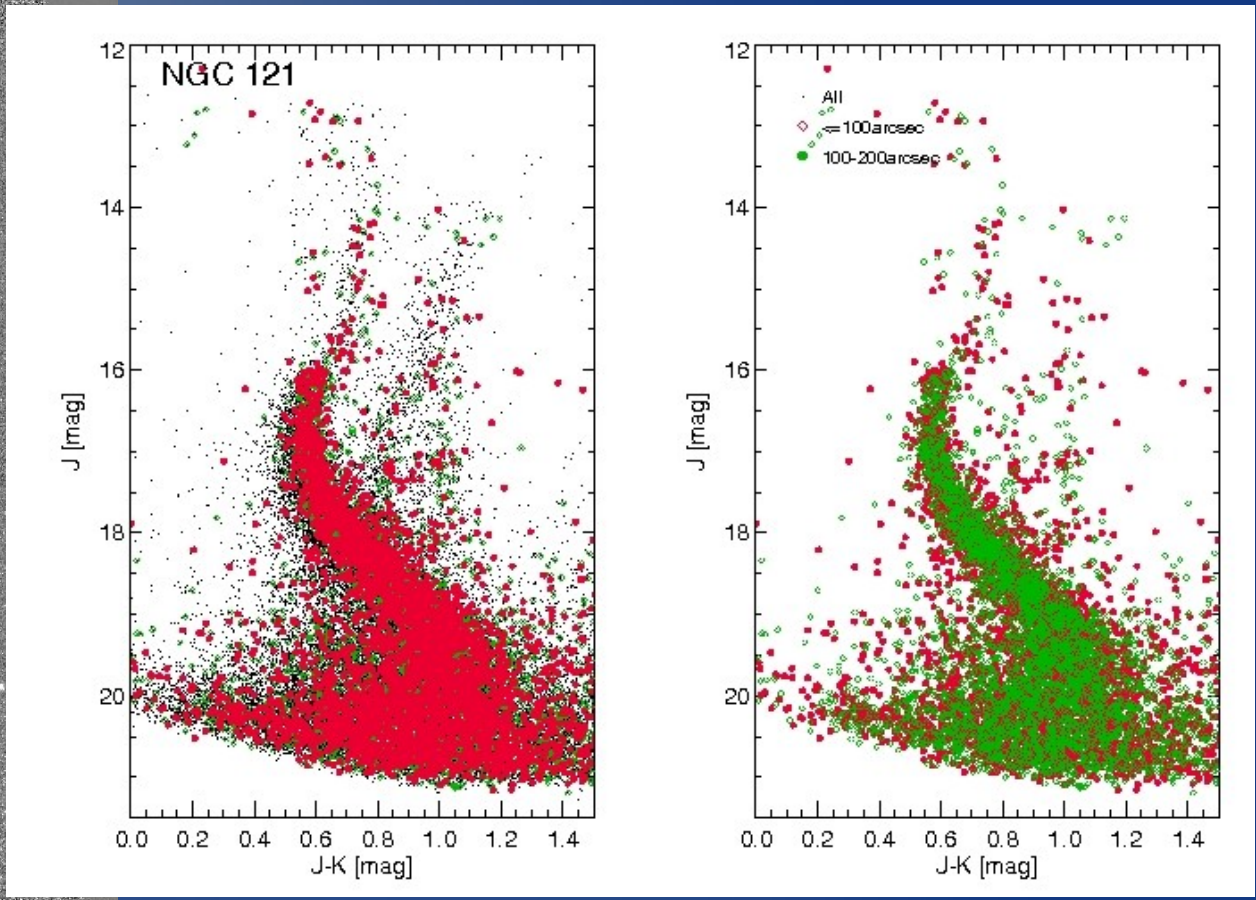

47 TUC