GLAO science: ‘imaka and beyond

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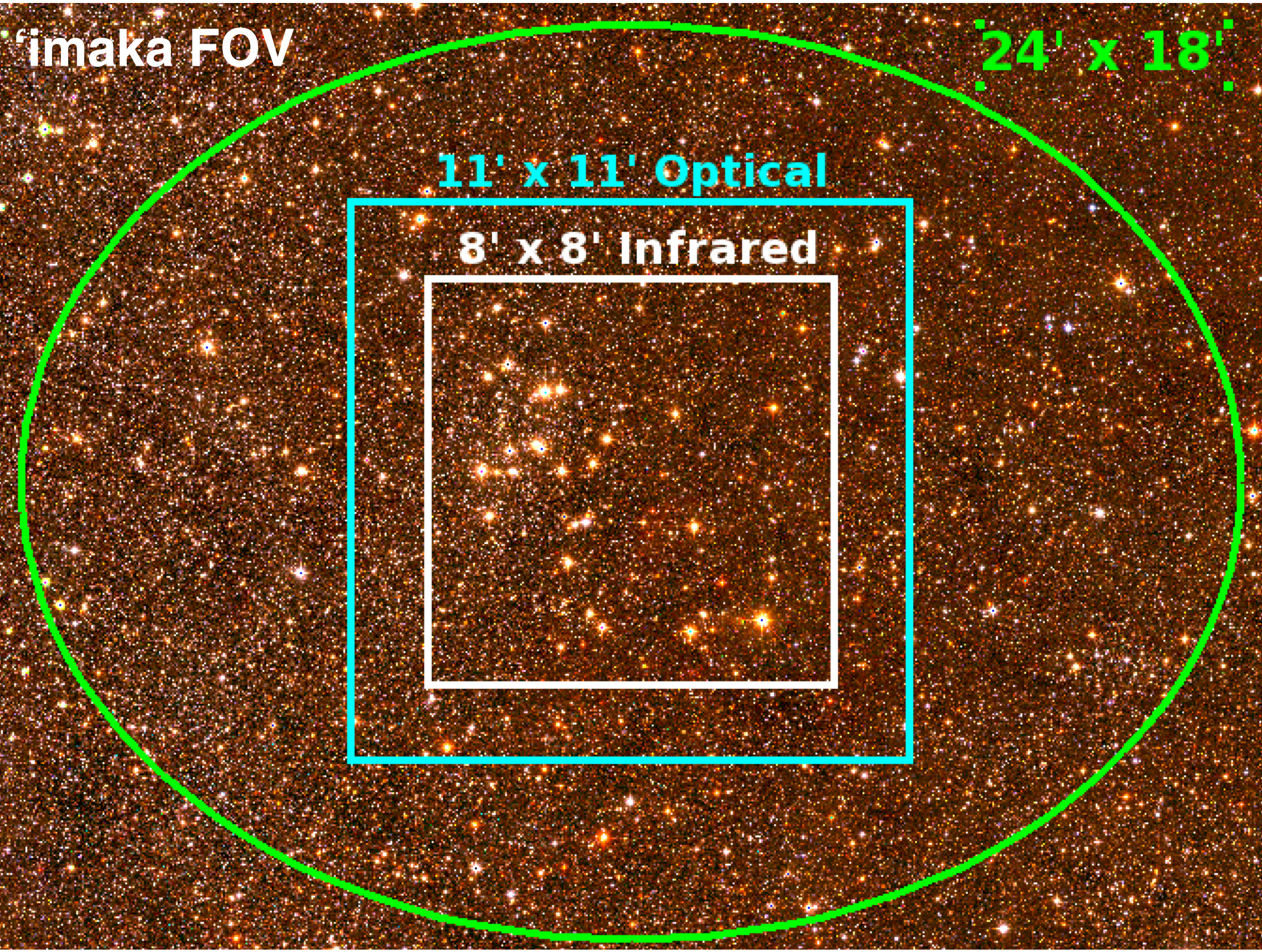
‘imaka *(scenic view)*
pathfinder for wide-field ground-layer AO

PI: Mark Chun
PS: Jessica Lu

Institutions:
UH IfA, MKIR, Subaru, Gemini, Laval, UH Hilo

Funded: NSF-ATI

Schedule: First-Light by end of 2015


ʻimaka FOV
24' x 18'
11' x 11' Optical
8' x 8' Infrared

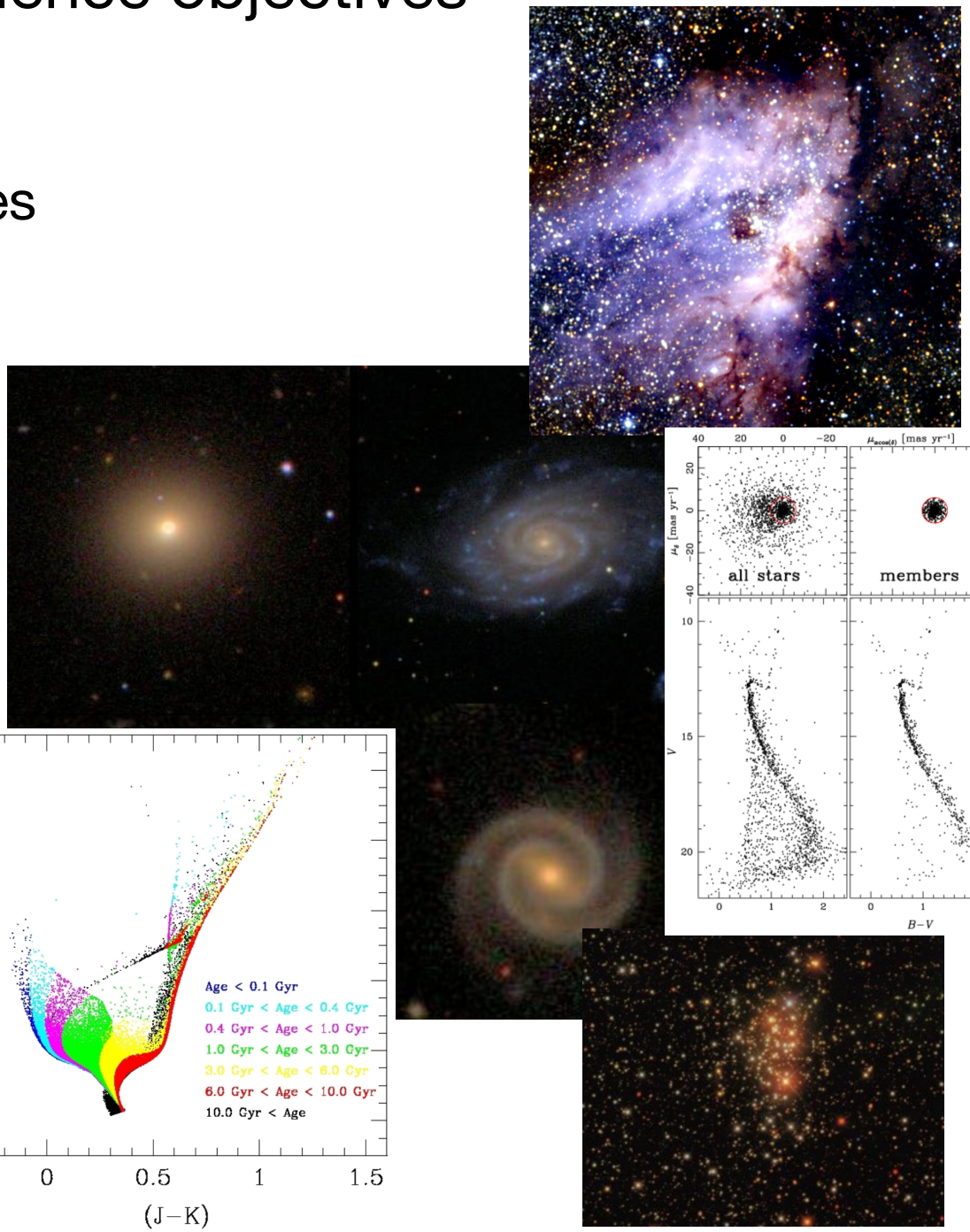
‘imaka science objectives

Deep Galaxy Morphology Studies

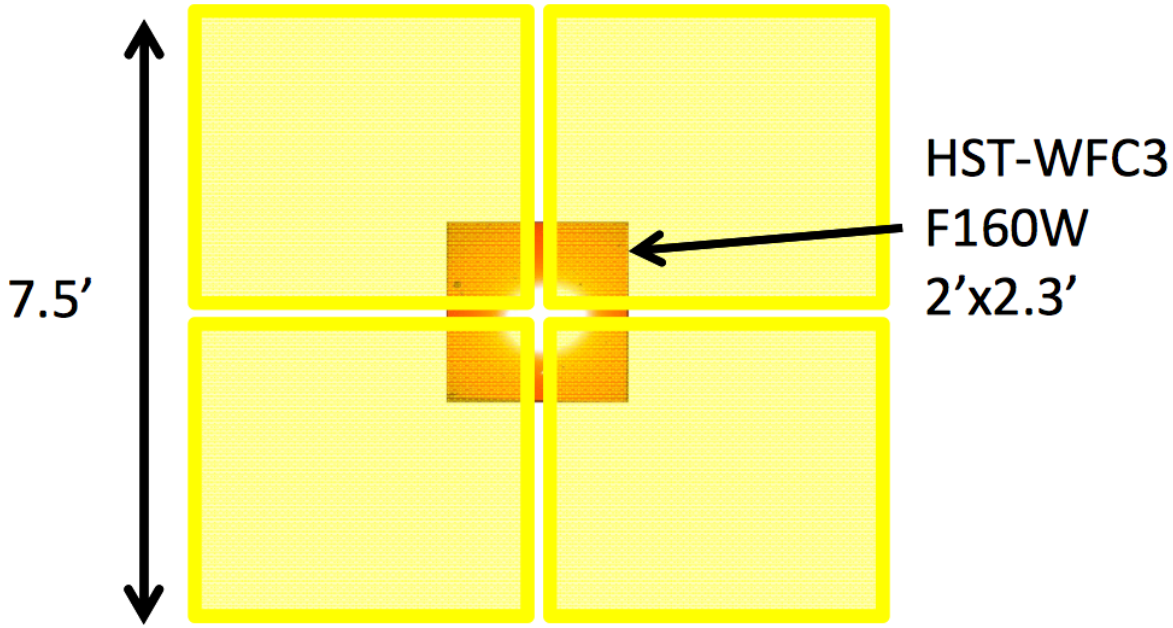
Crowded Stellar Photometry

Crowded Stellar Astrometry

Sparse Stellar Astrometry



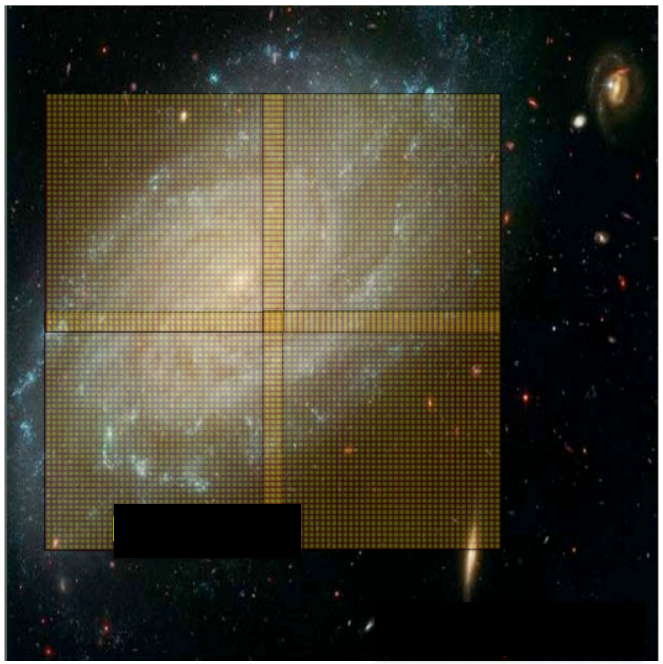
Deep Galaxy Survey: ‘imaka efficiency will be nearly comparable to Hubble.

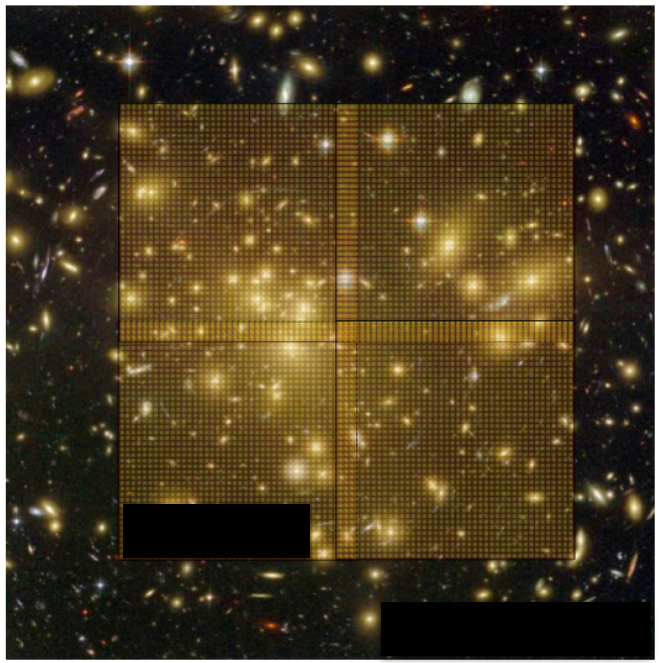


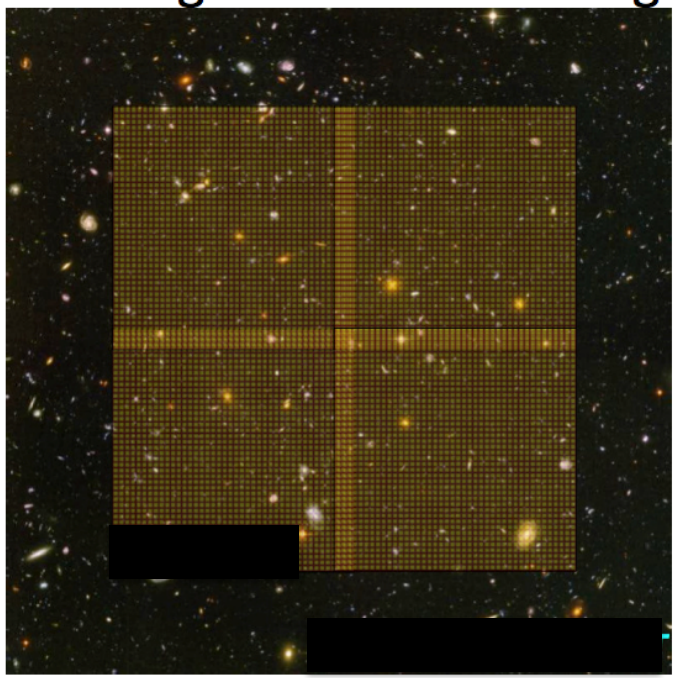
Slide Borrowed from Hubin Talk and MUSE consortium

Lyman α emission from high-z galaxies

Ultra deep field combined with gravitational lensing

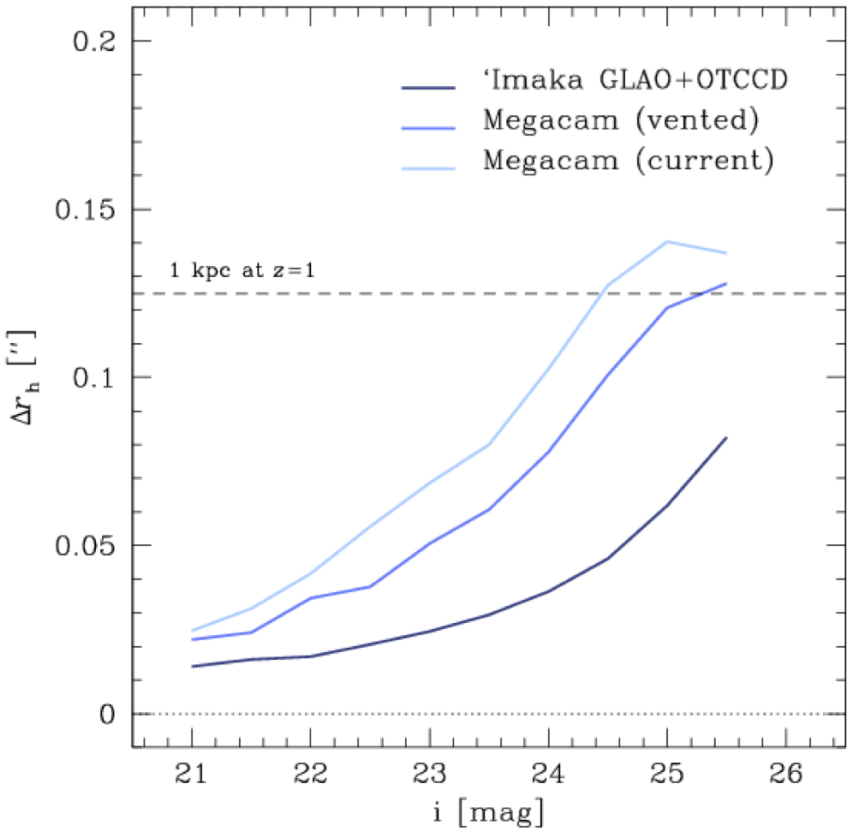




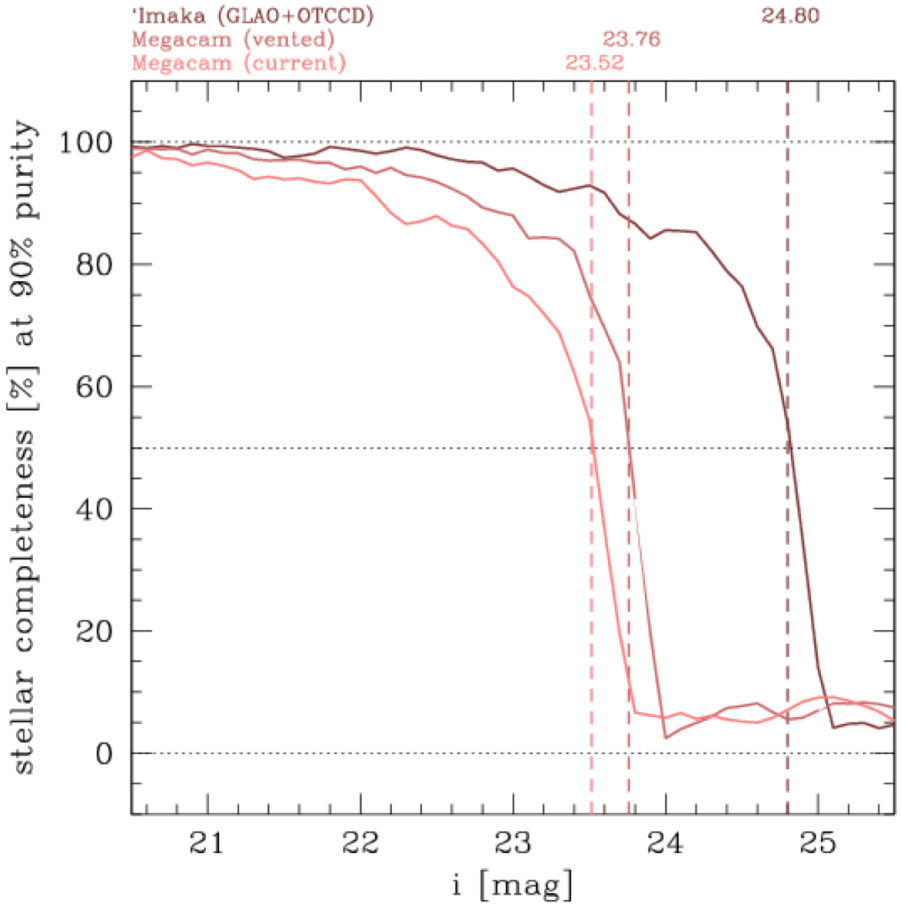


Deep Galaxy Survey - Morphologies

Uncertainty on Disk Size



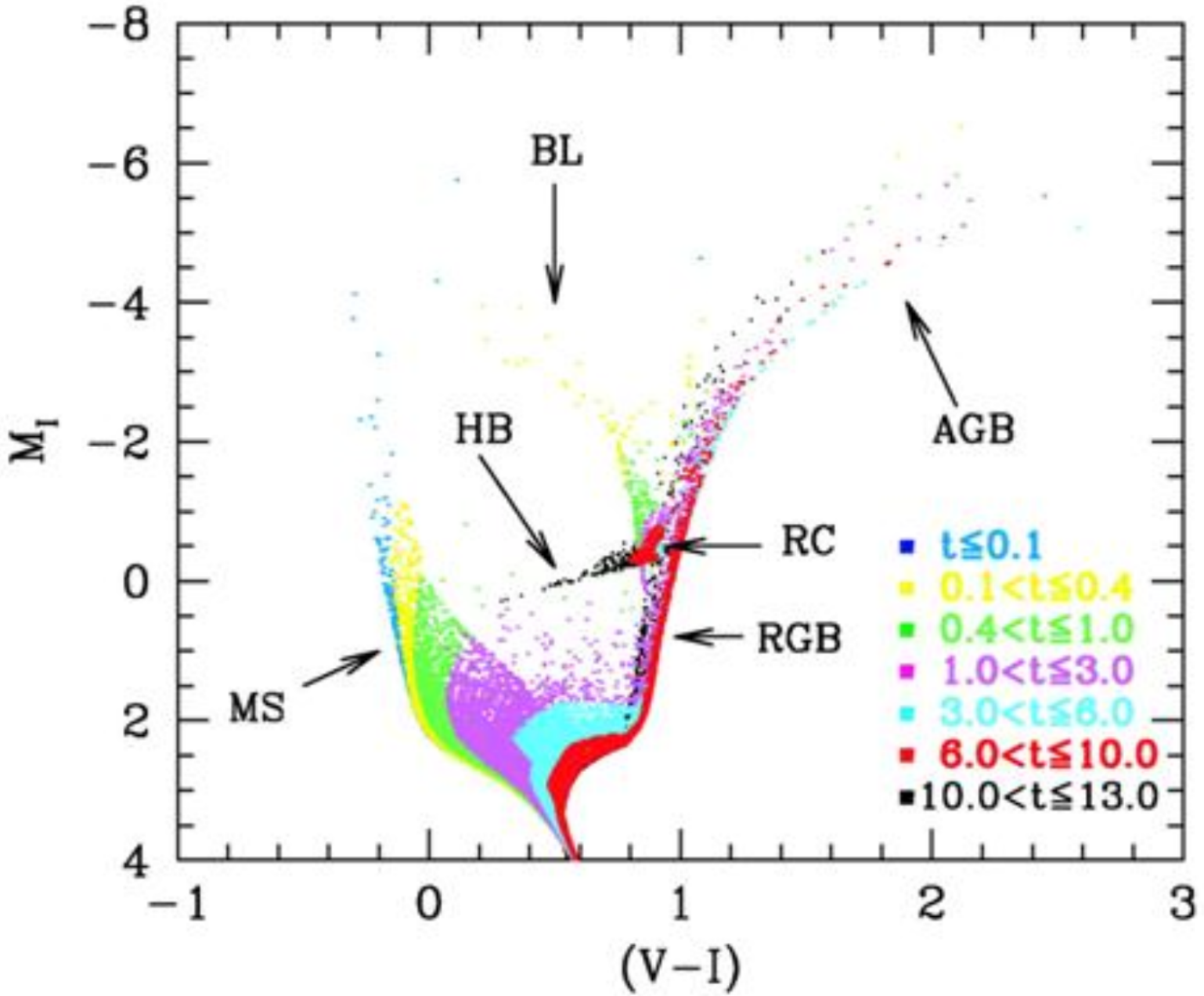
Separating Stars from Galaxies



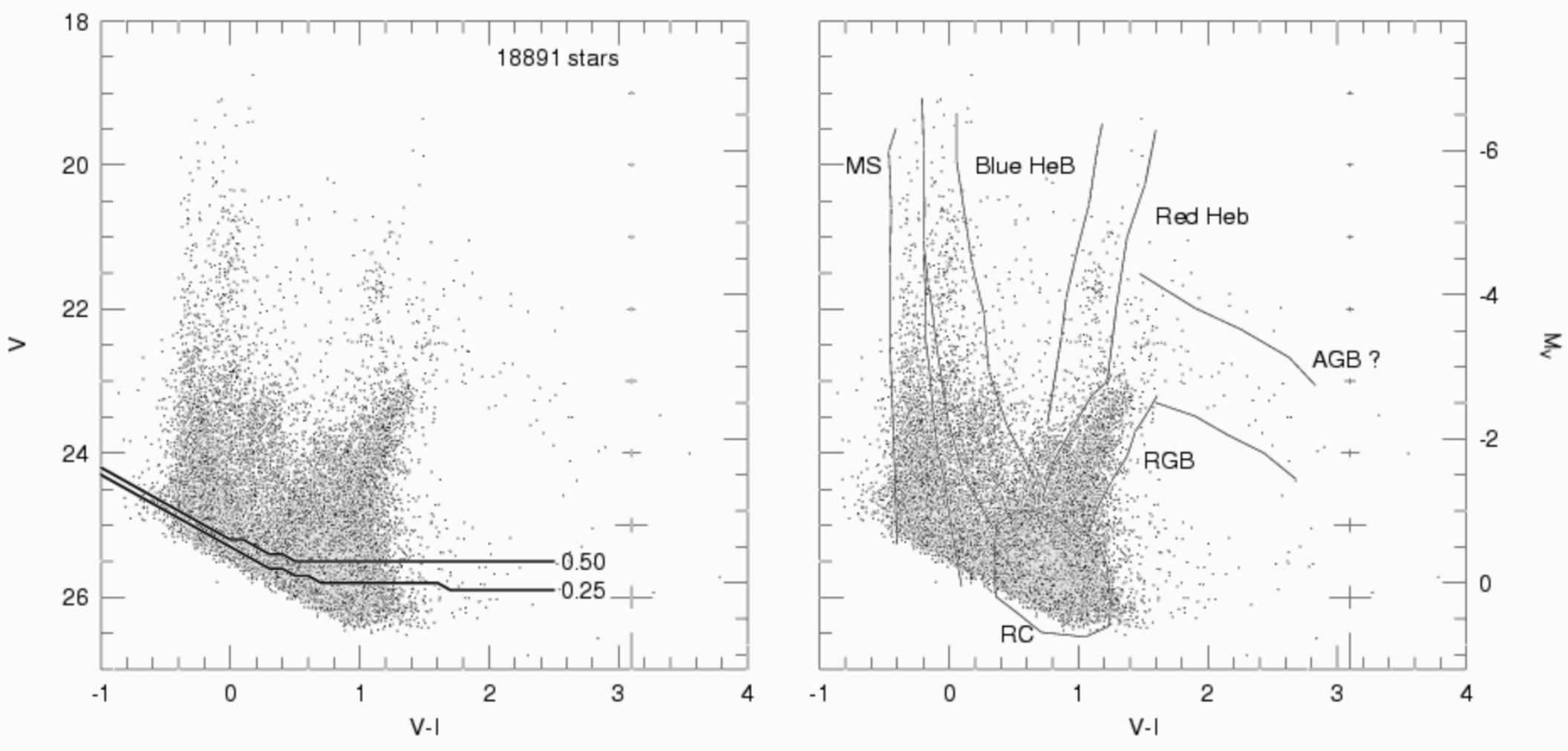
CFHT Simulations:
Δi = -1.1 for UH 2.2 m

Simulations from Emmanuel Bertin

Resolved stellar populations in nearby galaxies give metallicity distributions, star formation histories, distances.

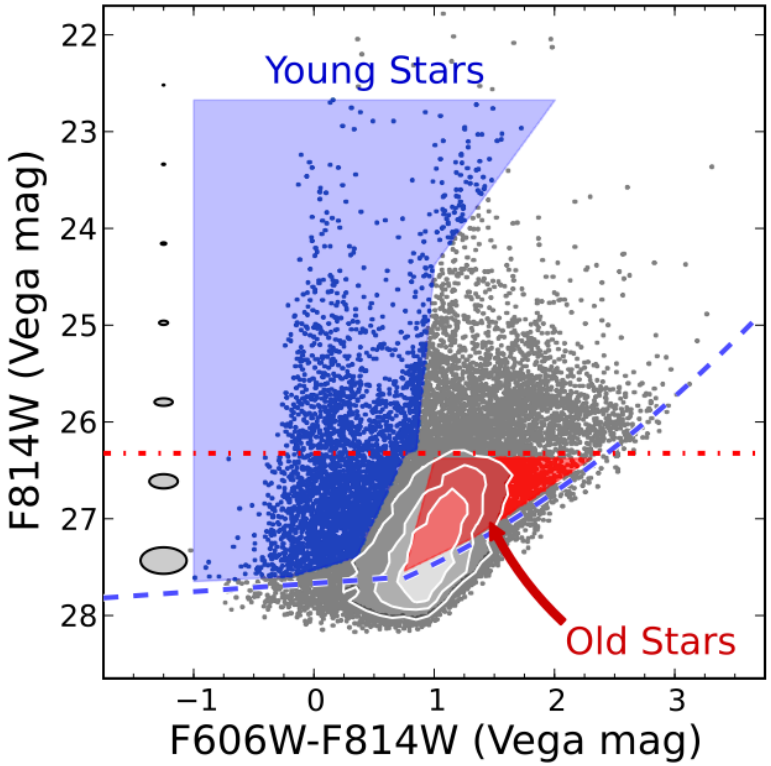


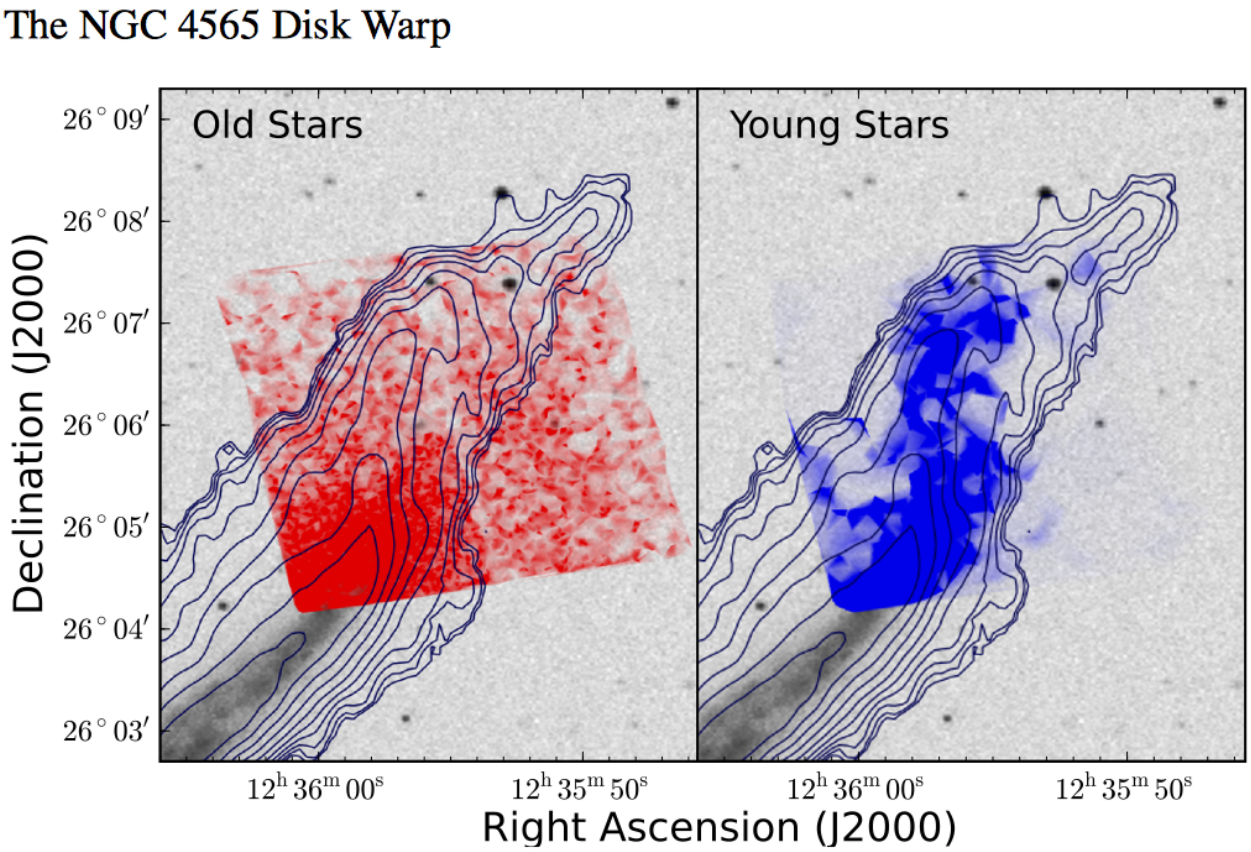
‘imaka sensitivity can get at least 1 mag below the tip of the RGB for nearby galaxies.



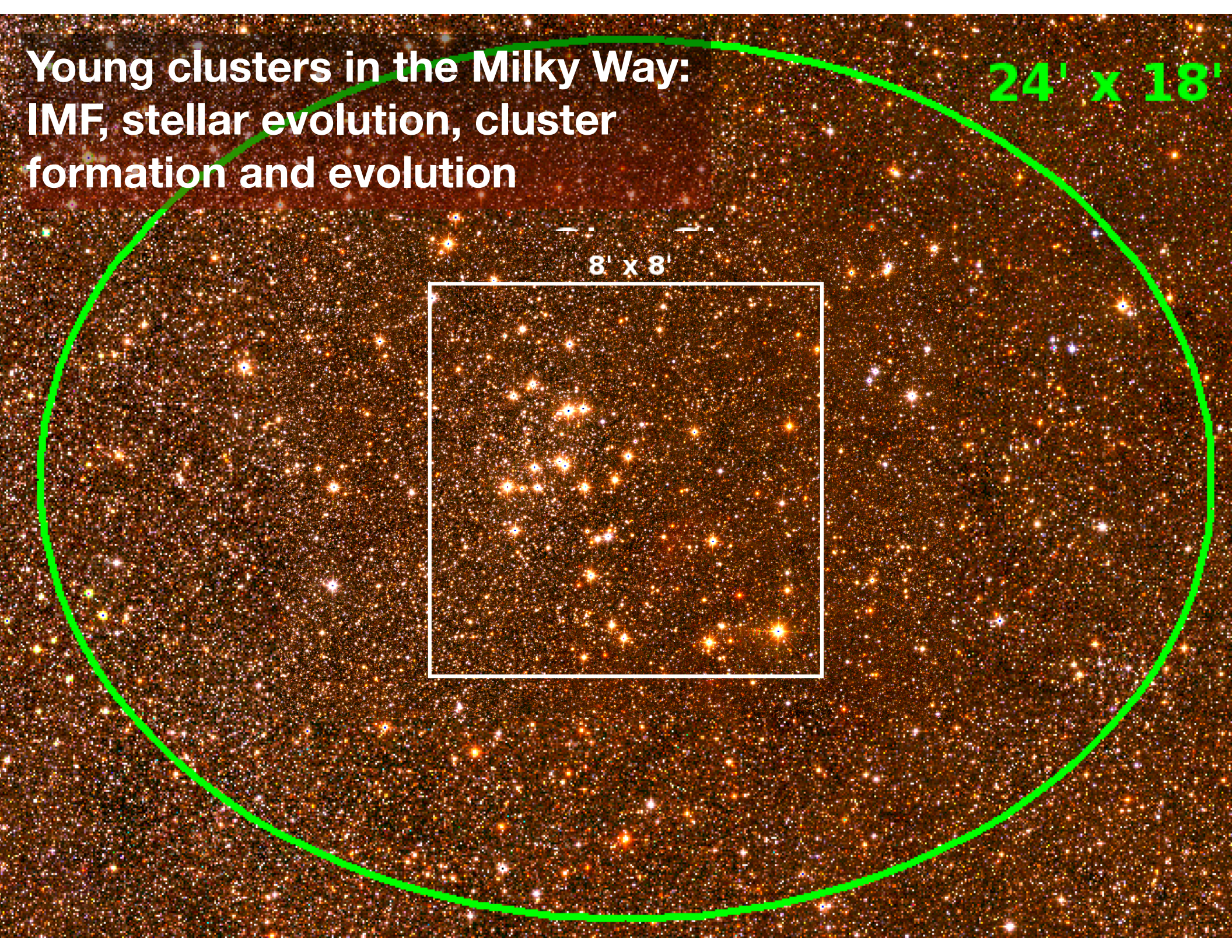
Skillman et al. 1998
Sextans A Dwarf Irregular

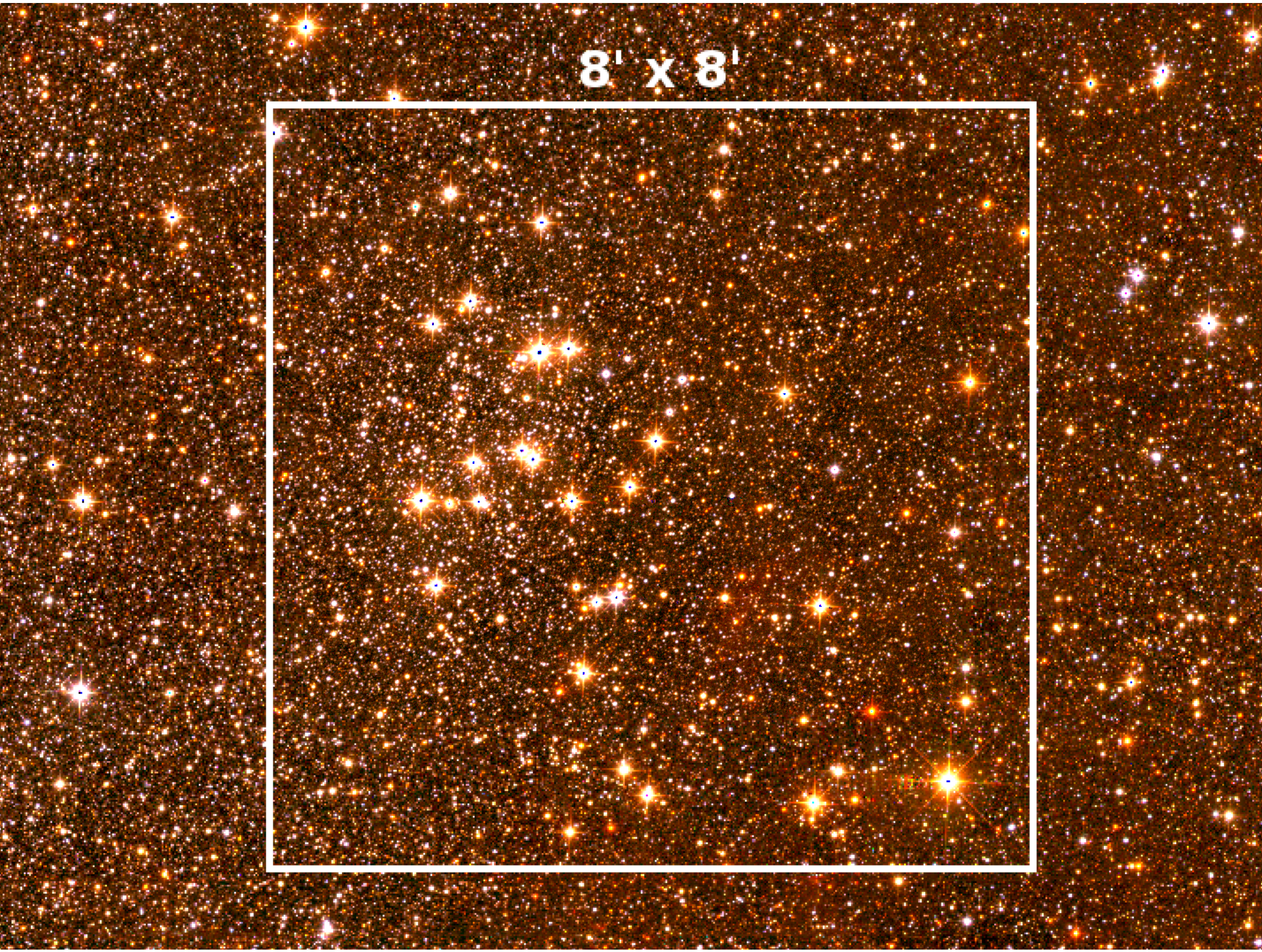
Resolved stellar populations in nearby galaxies give metallicity distributions, star formation histories, distances.

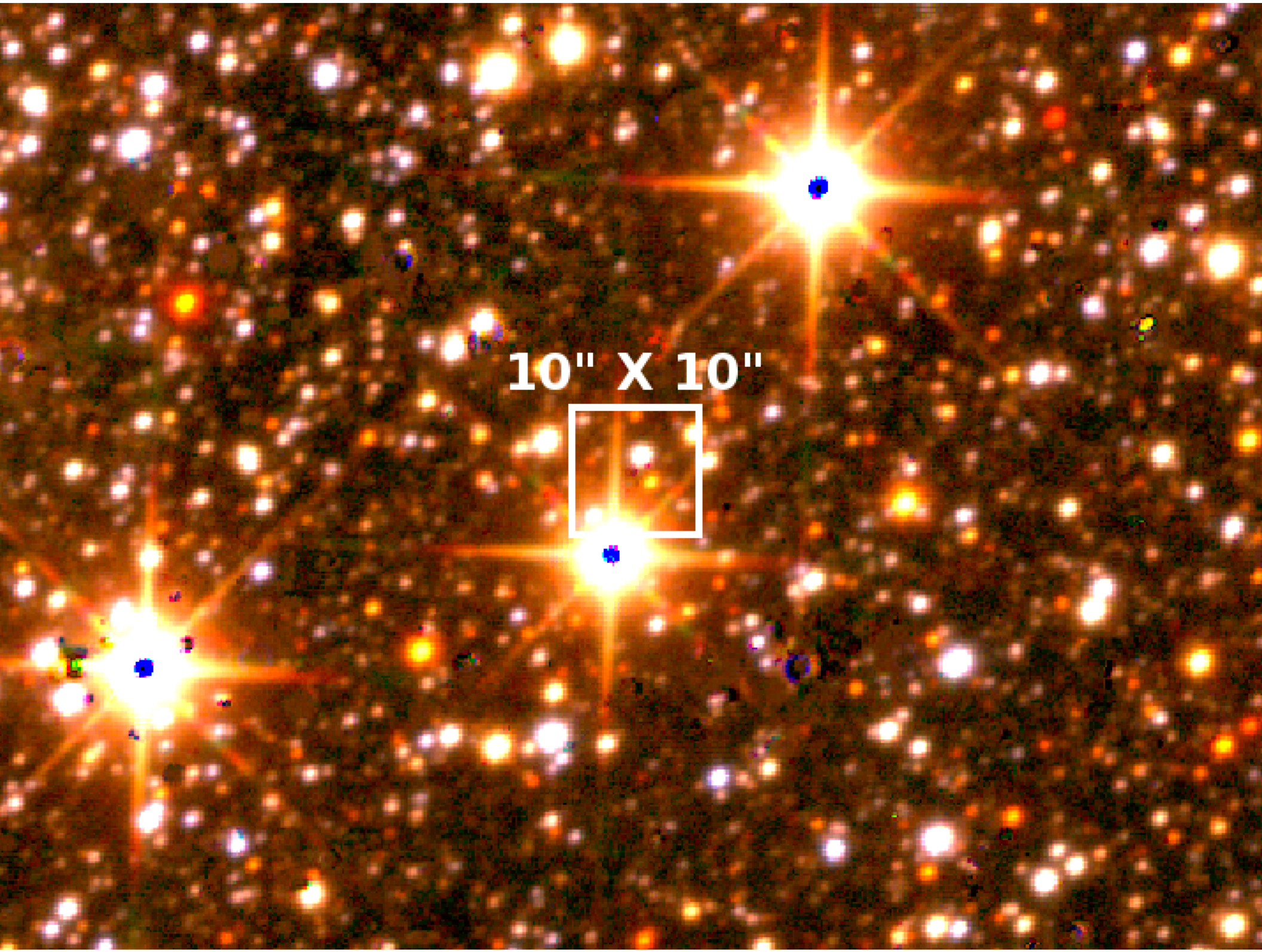


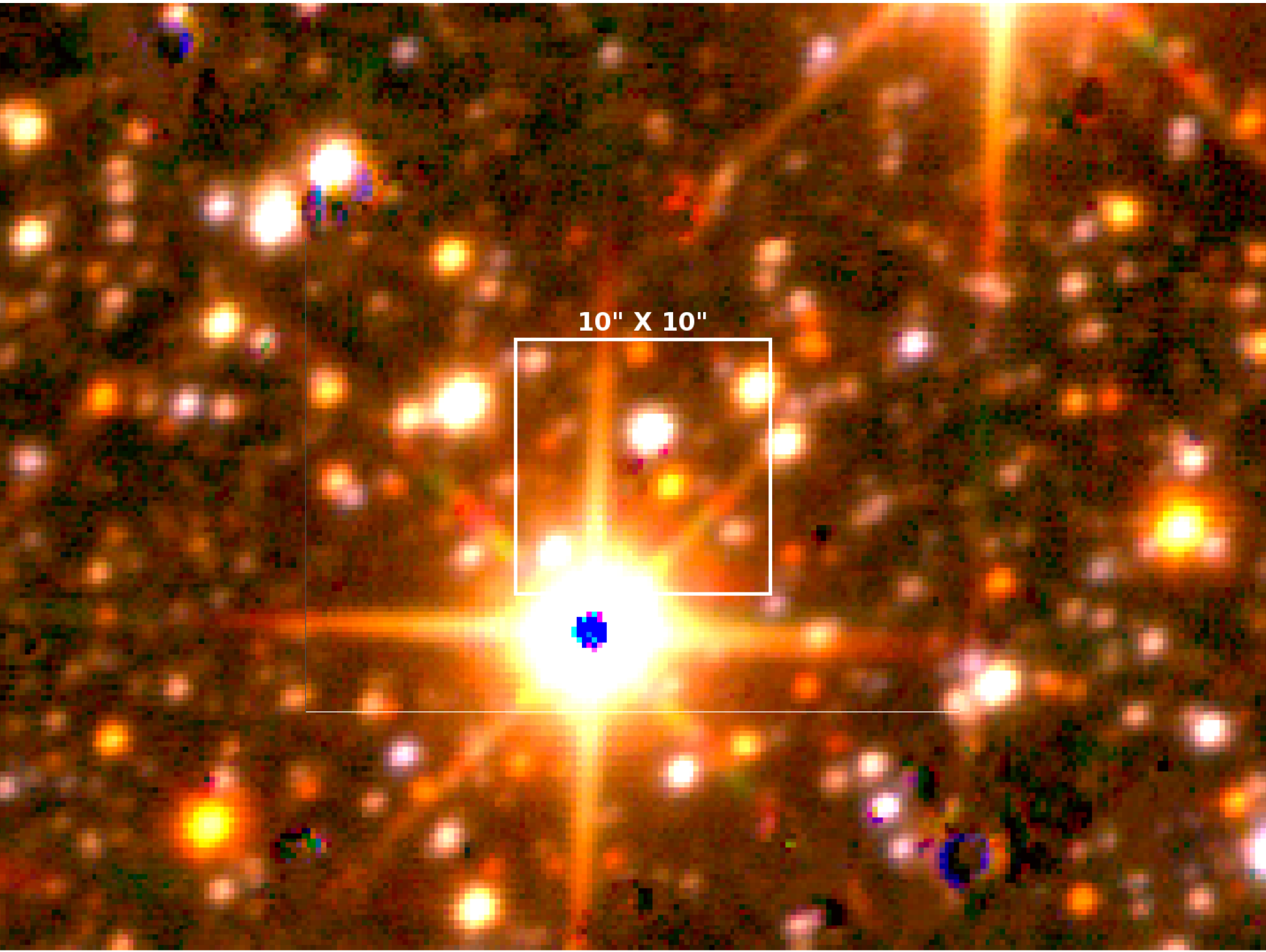


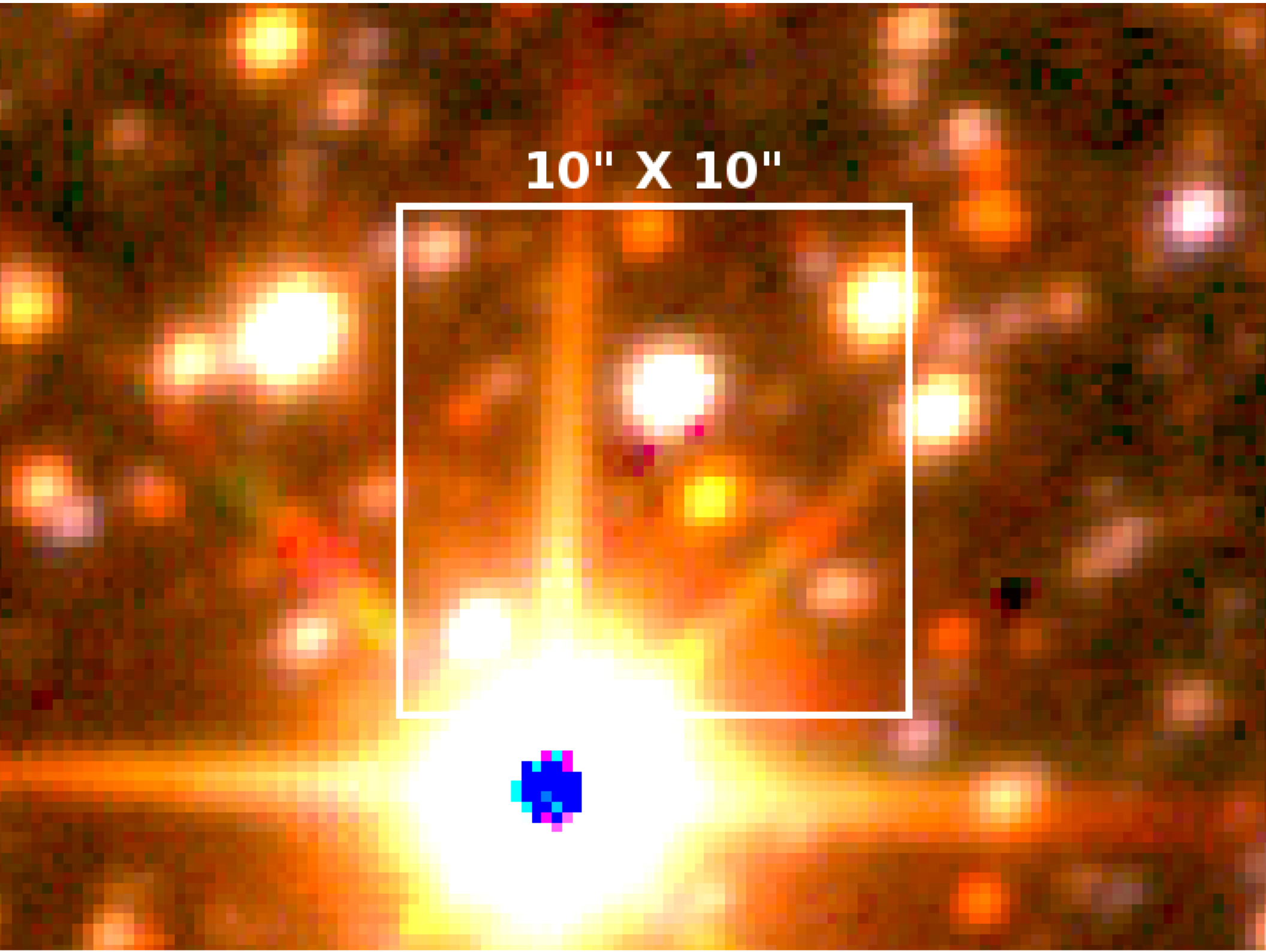
Radburn-Smith et al. 2014


Young clusters in the Milky Way:
IMF, stellar evolution, cluster
formation and evolution
24' x 18'
8' x 8'


8' x 8'

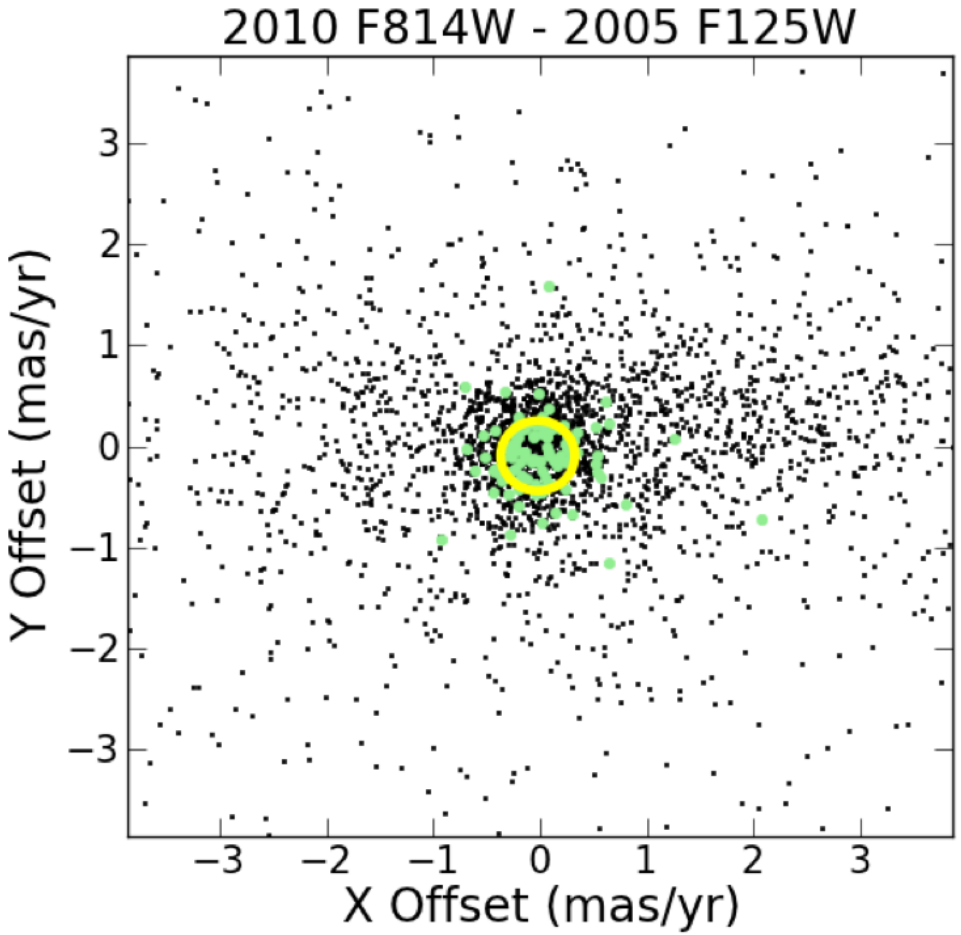

10" X 10"

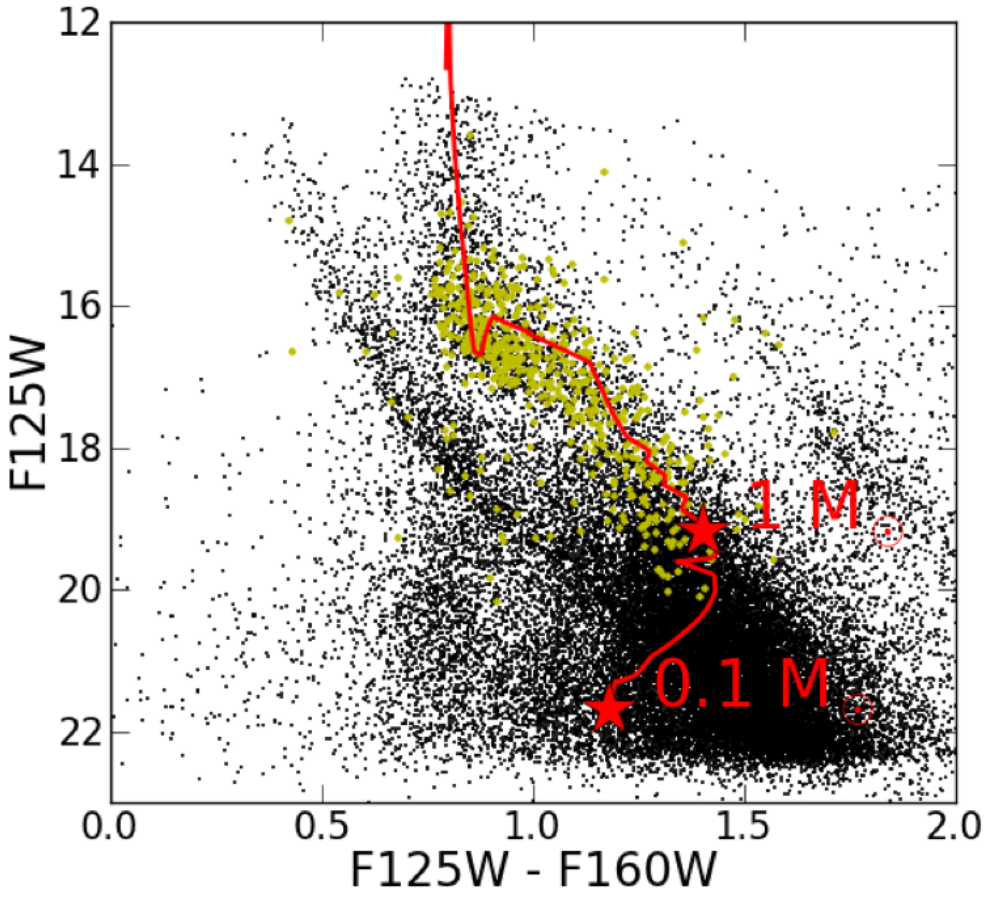

10" X 10"


10" X 10"

Astrometry and photometry enable detailed and complete studies of young massive clusters.

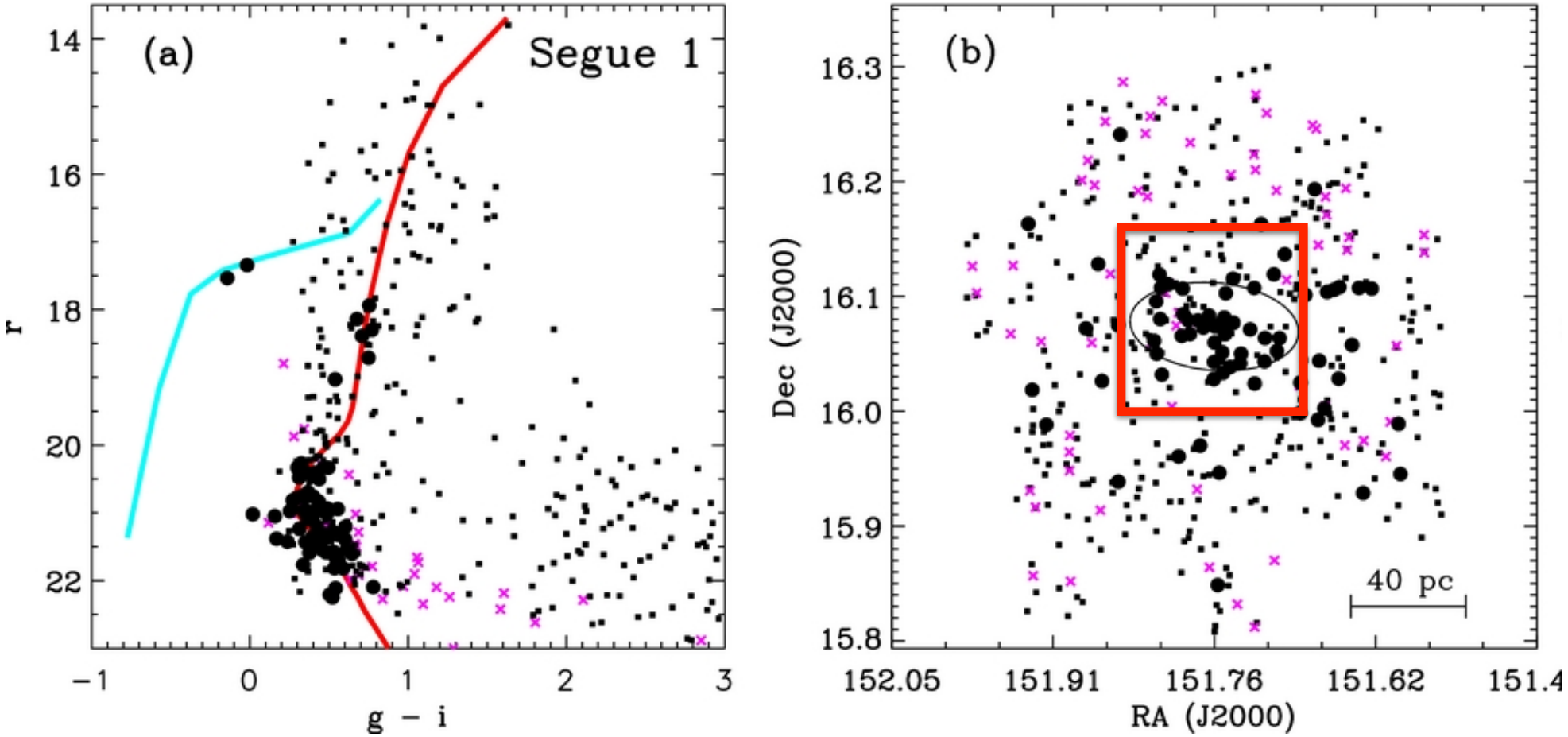
Plots: Westerlund 1 Cluster (5 Myr, 10^4 M_{sun})
'imaka will do similar work for older, nearer, or lower mass clusters





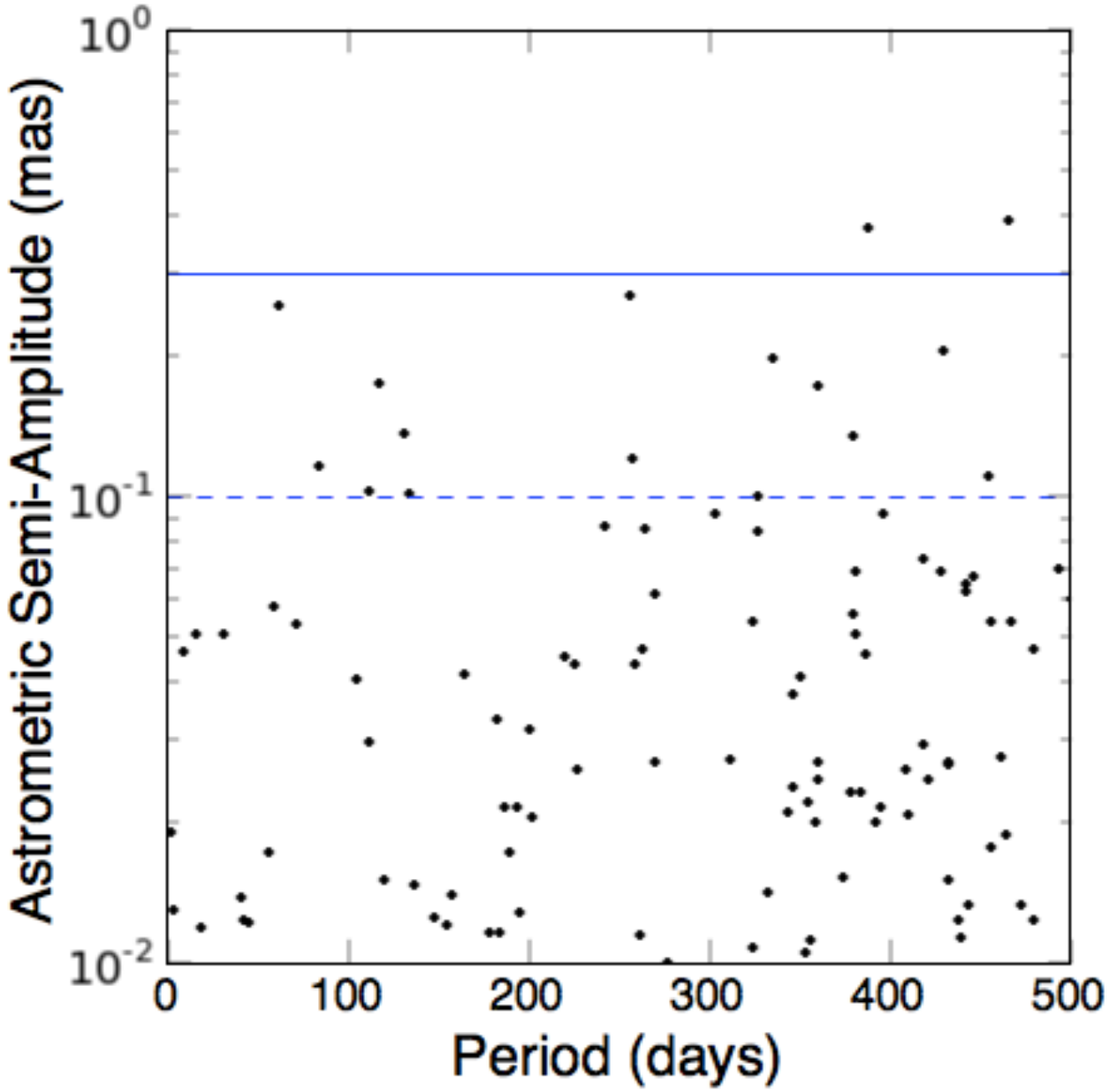
Lu et al. in prep.

Proper motions of dwarf galaxies gives their orbit around the Milky Way.



Simon et al. 2011

Sparse field astrometry — astrometric planet-hunting for *known* planets.



Selected known RV planets with detectable astrometric signals.

Proof of Concept

‘imaka technical objectives

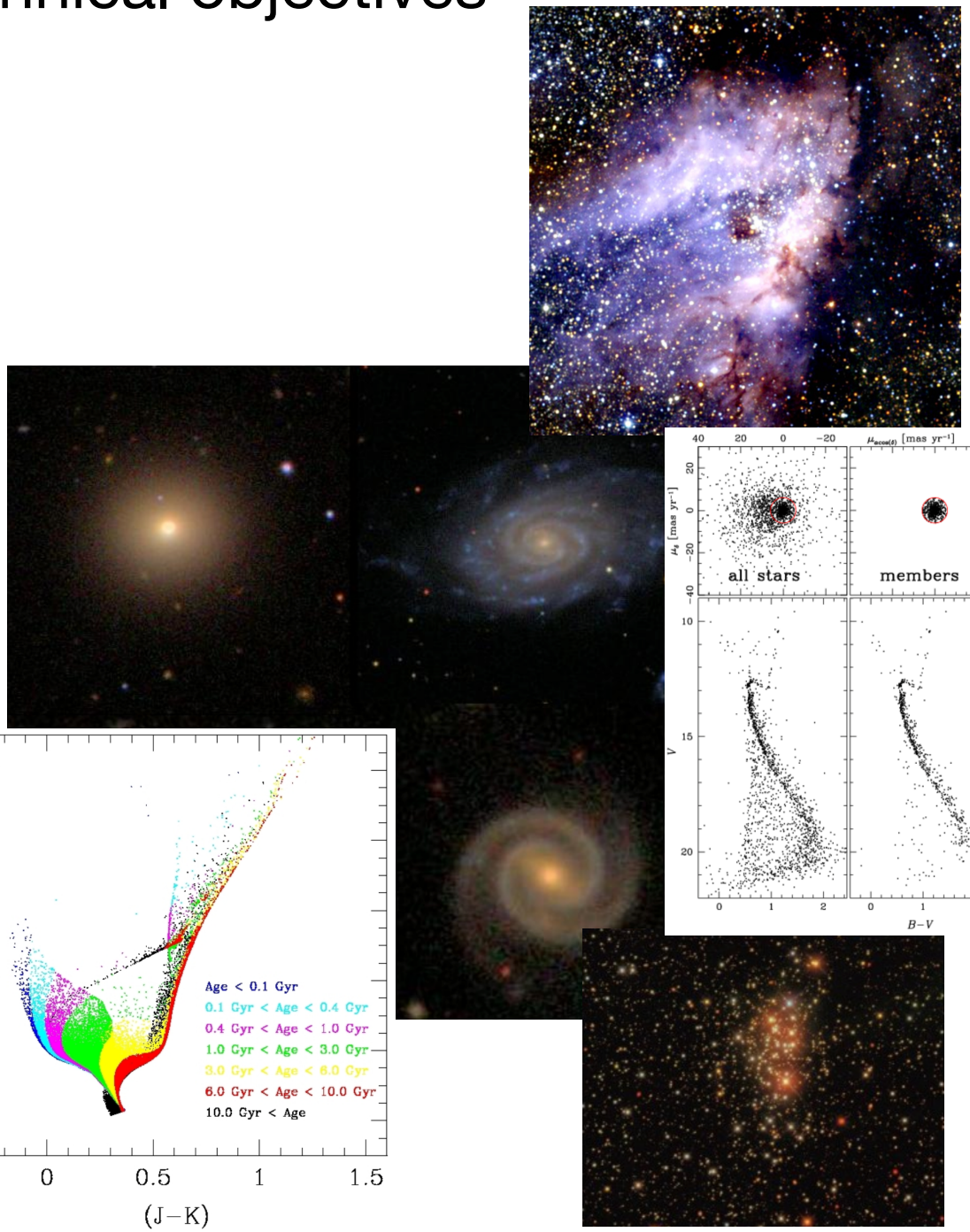
Test FOV vs. AO performance

Test sensitivity gains

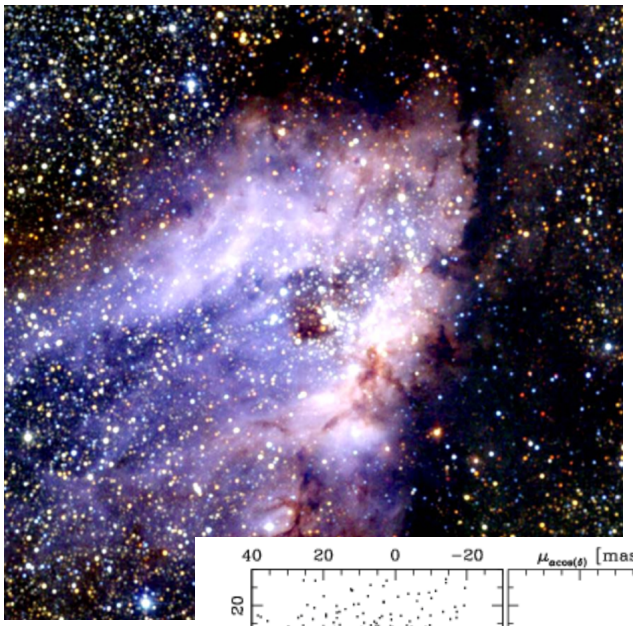
Test PSF uniformity and stability

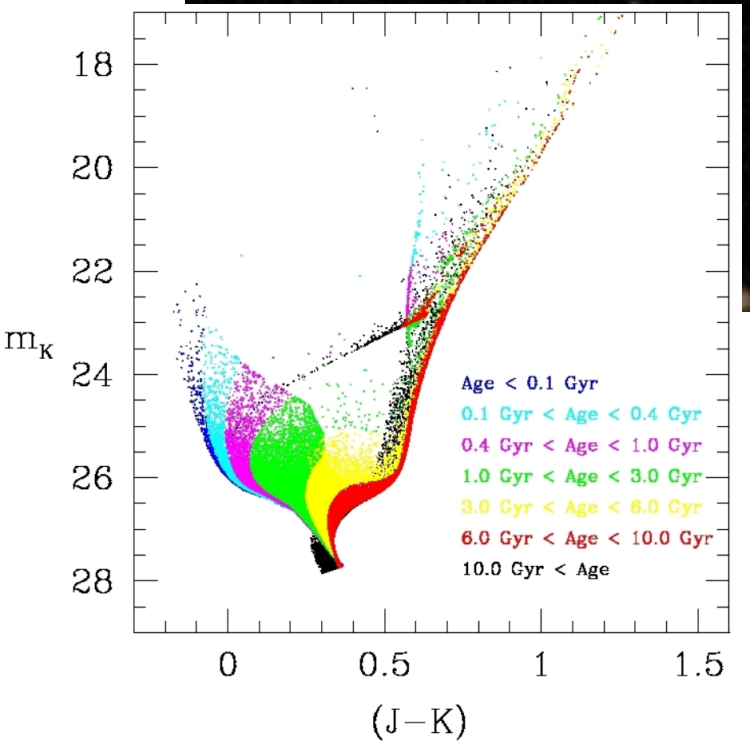
Test astrometric capability

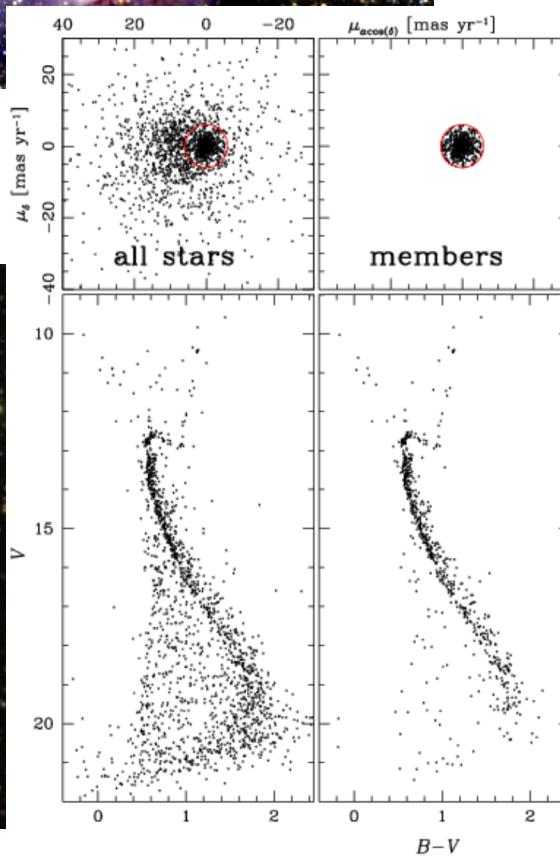
Test GLAO in a range of conditions



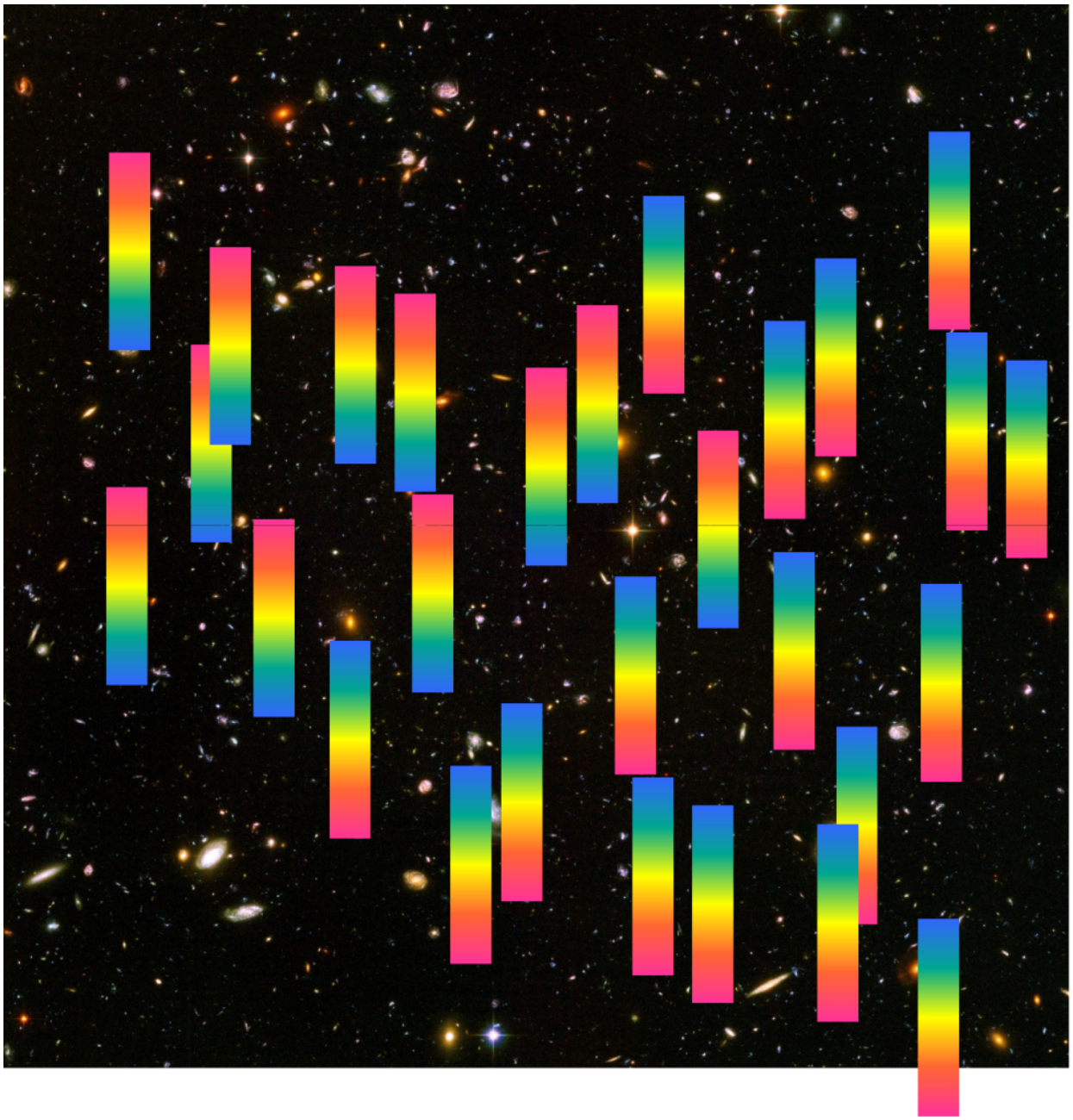
Future science with GLAO on larger telescopes







Future science with GLAO on larger telescopes - spectroscopy



Future science with GLAO on *smaller* telescopes (UH 2.2 m)

Switch to LGS for more science

Testbed for new AO instruments:
- multi-object spectroscopy (e.g. starbugs)
- new large-format detectors (e.g. Hawaii 4RG)

Testbed for new AO technologies:
- WFS and reconstructor experiments
- PSF reconstruction for GLAO

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