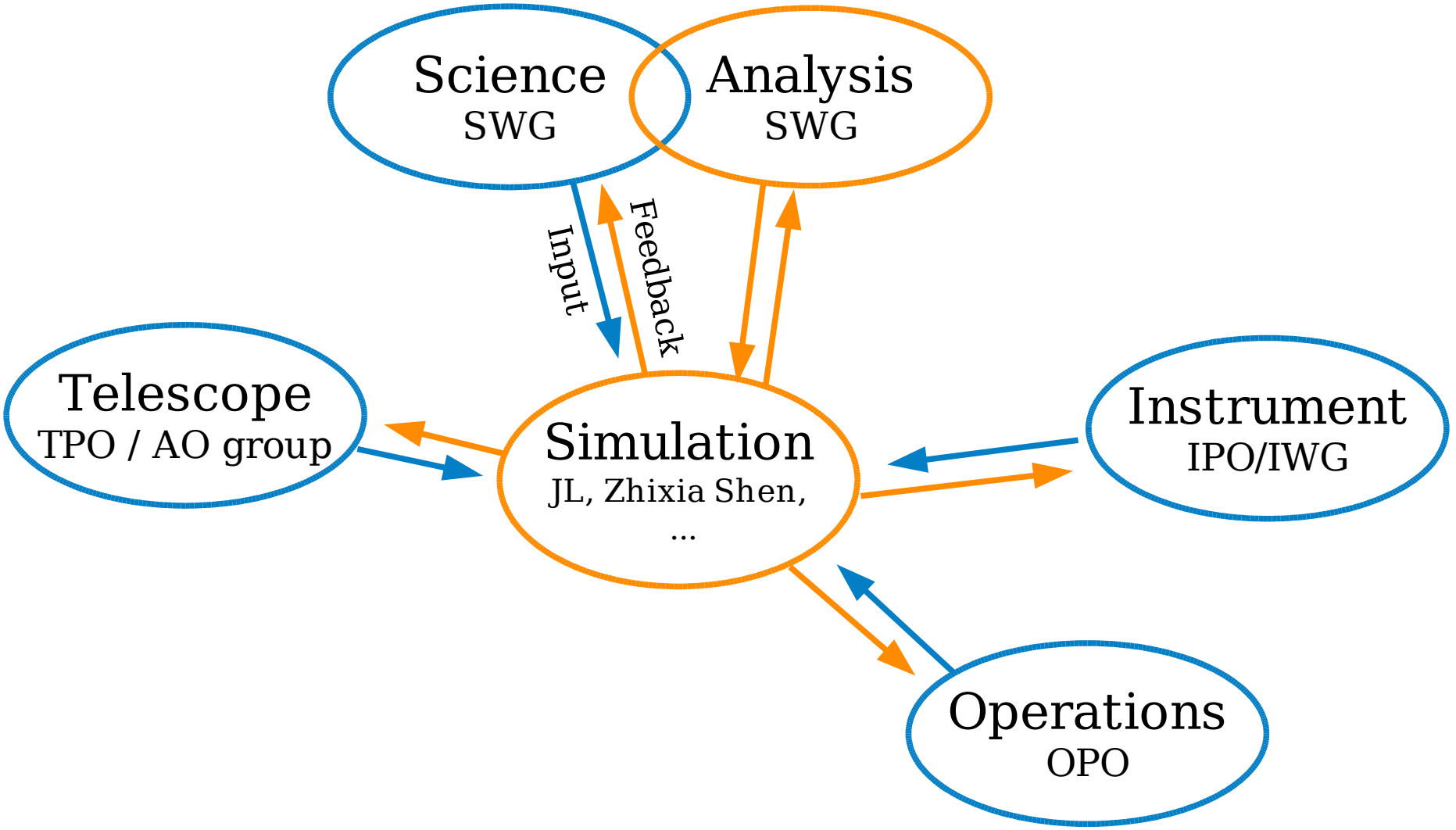
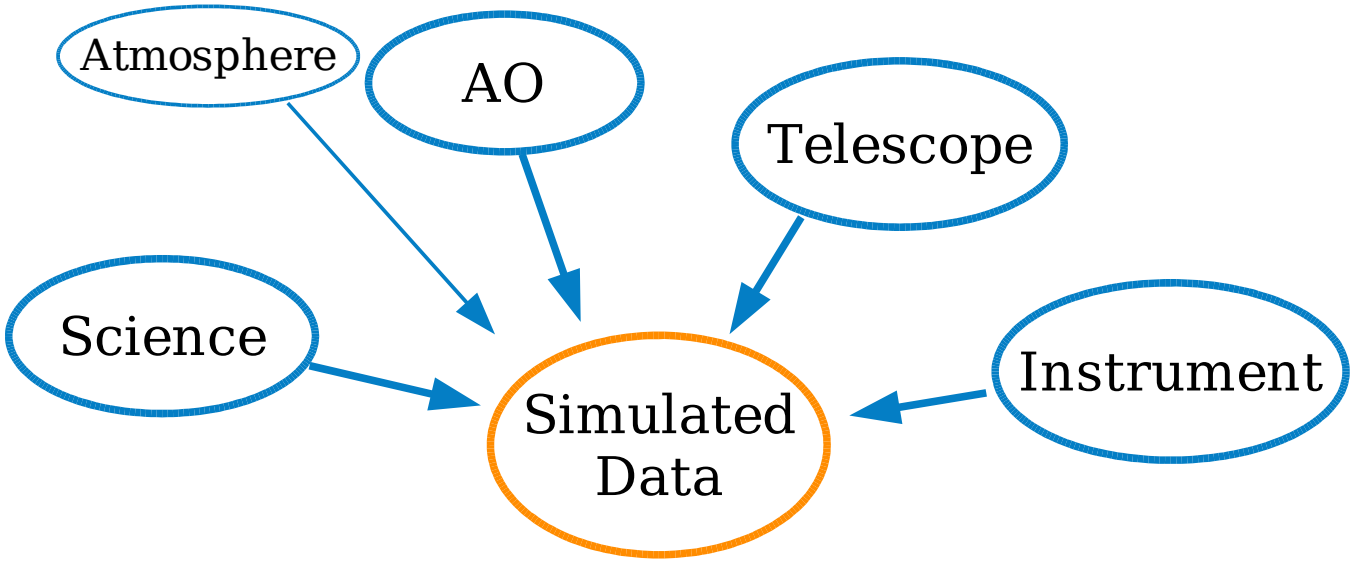
DRM Update

Joe Liske

Structure


Science
SWG
Analysis
SWG
Input
Feedback
Telescope
TPO / AO group
Simulation
JL, Zhixia Shen,
...
Instrument
IPO/IWG
Operations
OPO

Modular Simulation



- Modular approach reflects structure of DRM
- Ensures flexibility to increase the complexity of each aspect individually as the project evolves
- Allows use of diverse existing software

Science Input

= Number of photons and their distribution in (x,y,λ)-space at top of atmosphere, i.e.:

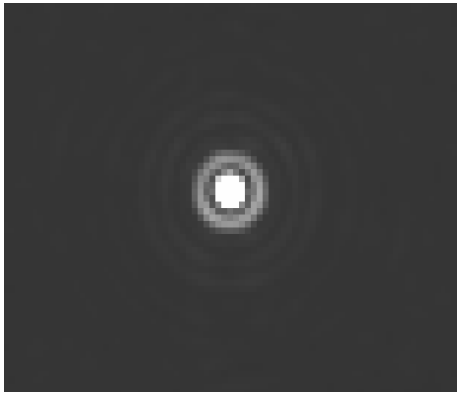
- Number counts of sources
- Luminosity functions + radial distributions of sources
- Distributions on sky of sources
- Profiles of sources / distribution of flux within sources
- Spectral characteristics

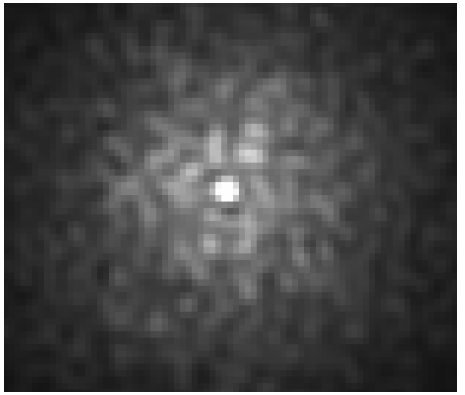
Atmosphere

- Transmission
- Emission
- Thermal background from warm components

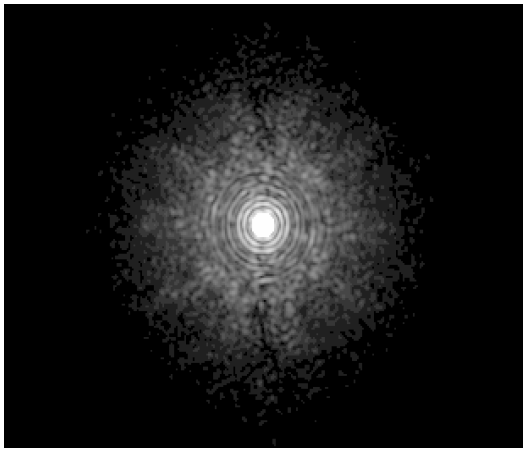
AO

- AO group supplies simulated PSFs as a function of:
  - Type of AO
  - Band
  - Seeing
  - FoV
  - Position within FoV





  but for a fixed telescope (diamater, no of actuators, …)
- Two problems:
  - Short integrations (4 s) --> Does not account for longer scale variation of atmosphere
  - Short integrations (4 s) --> Speckle noise
- Solutions:
  - Use measured 'atmosphere time series' to build weighted averages of individual PSFs
  - Fitting of final PSFs and/or multiple realisations of individual PSFs



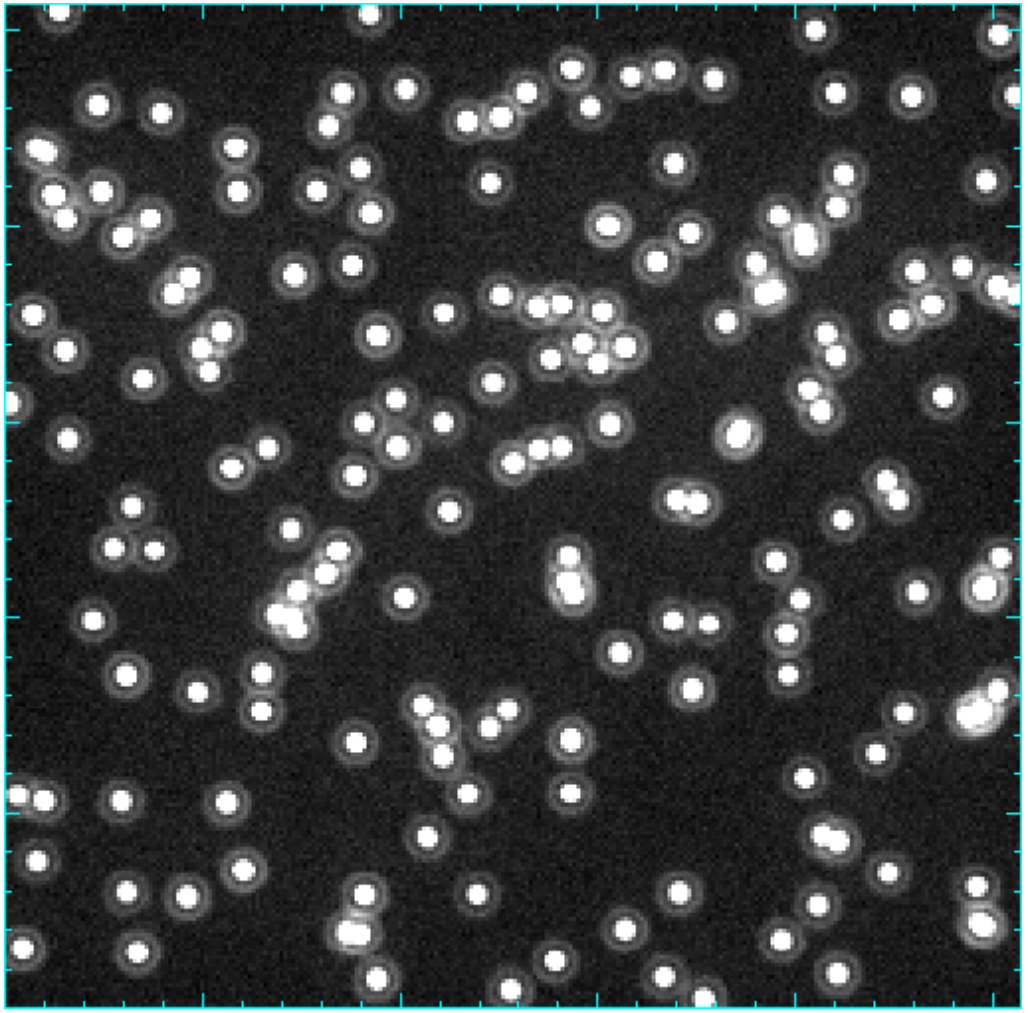
Telescope / Instrument

- Size of collecting area
- Throughput
- Filters / spectral resolution
- FoV
- Detector characteristics: pixel size, RO noise

- Distortions
- Scattered light
- Fringing
- Illumination
- Pixel-to-pixel sensitivity variation
- ...

Resolved stellar populations

K-band image
10 h
stars to K < 25 mag
(tip of RGB @ Virgo)



0.9 arcsec

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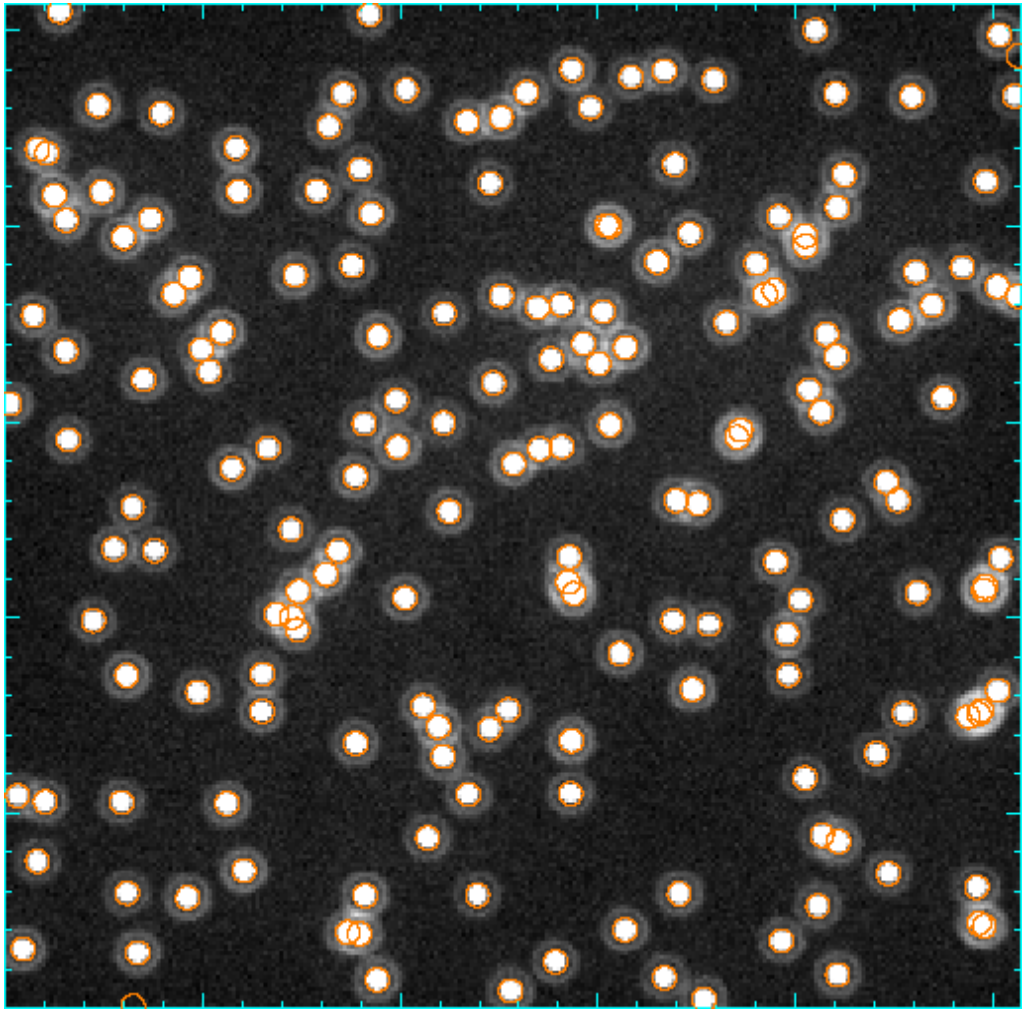
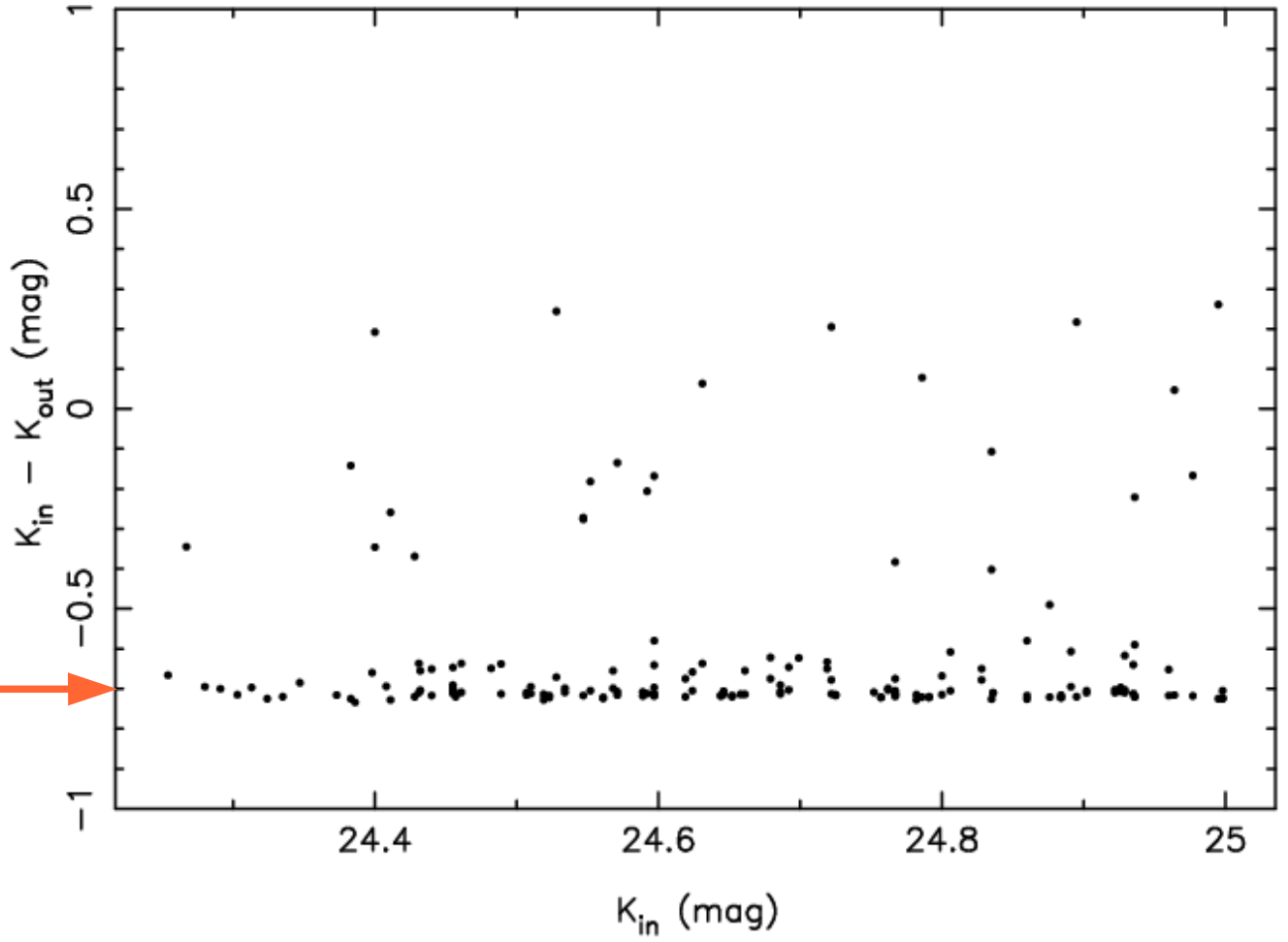


Resolved stellar populations

0.7 mag offset due to simple aperture photometry



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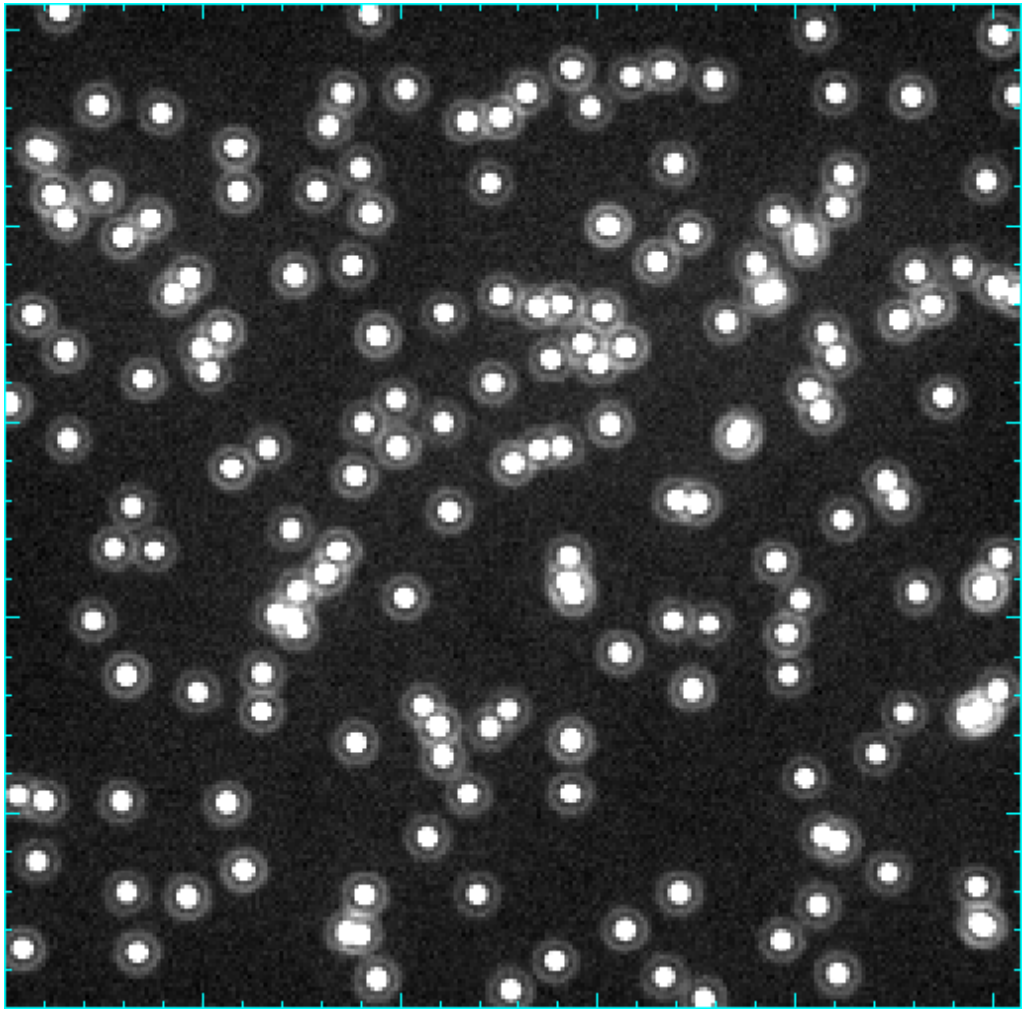
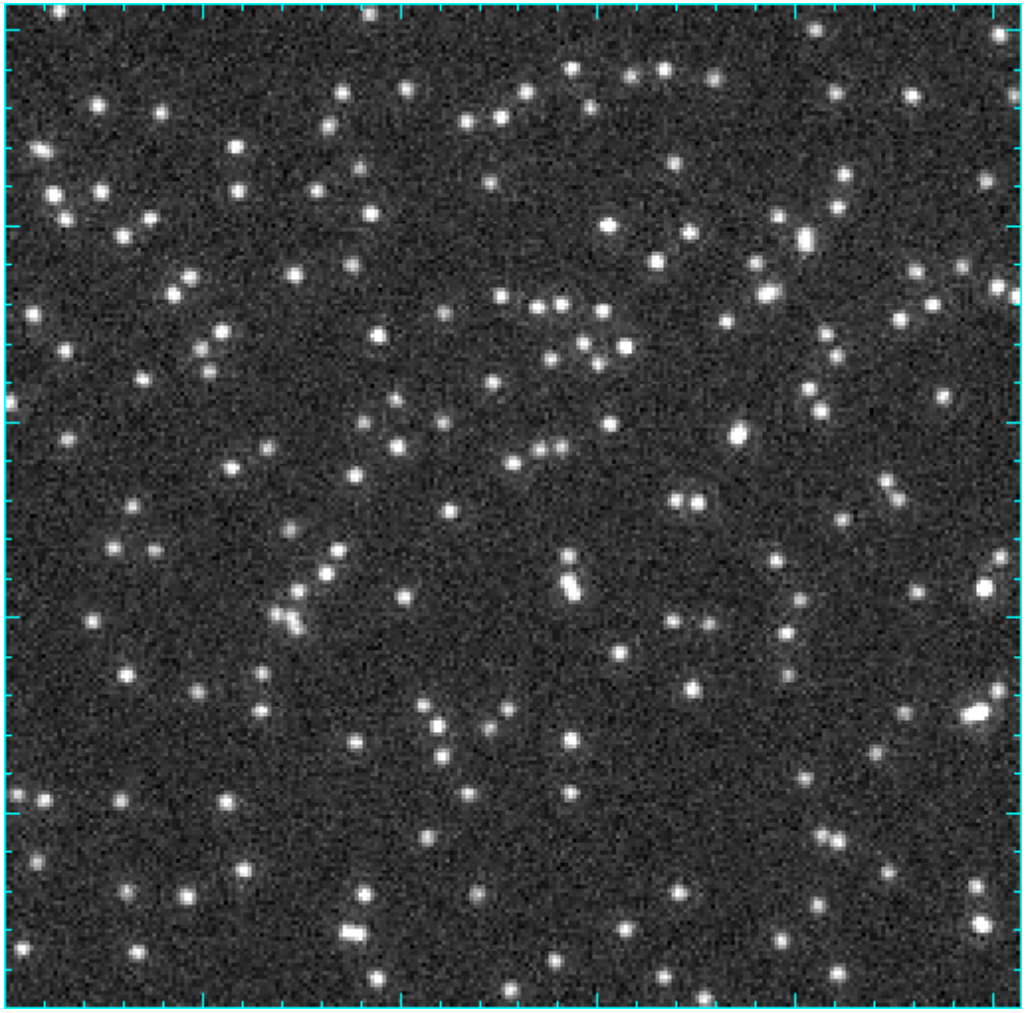
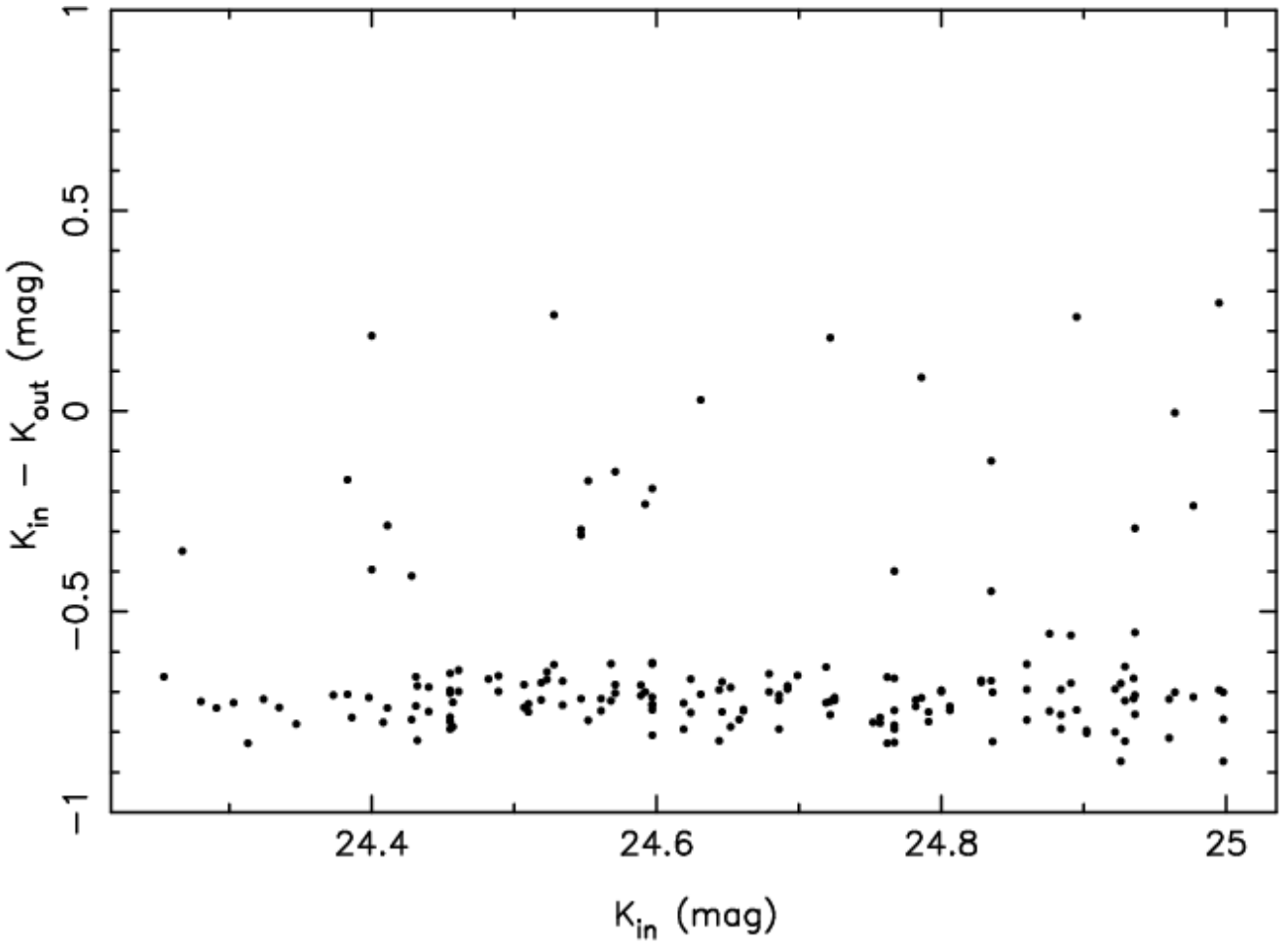


Resolved stellar populations

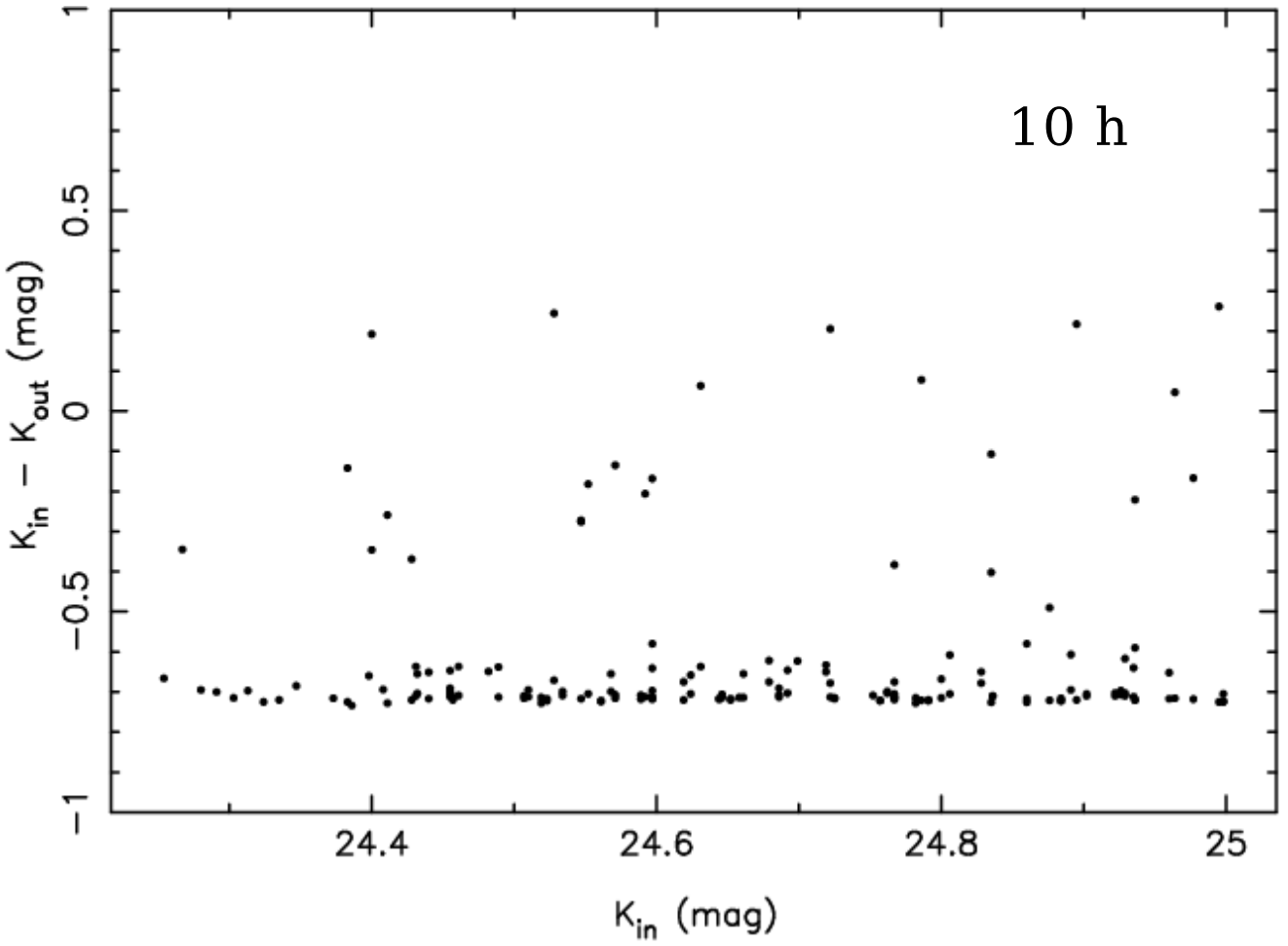
K-band image
0.1 h
stars to K < 25 mag
(tip of RGB @ Virgo)



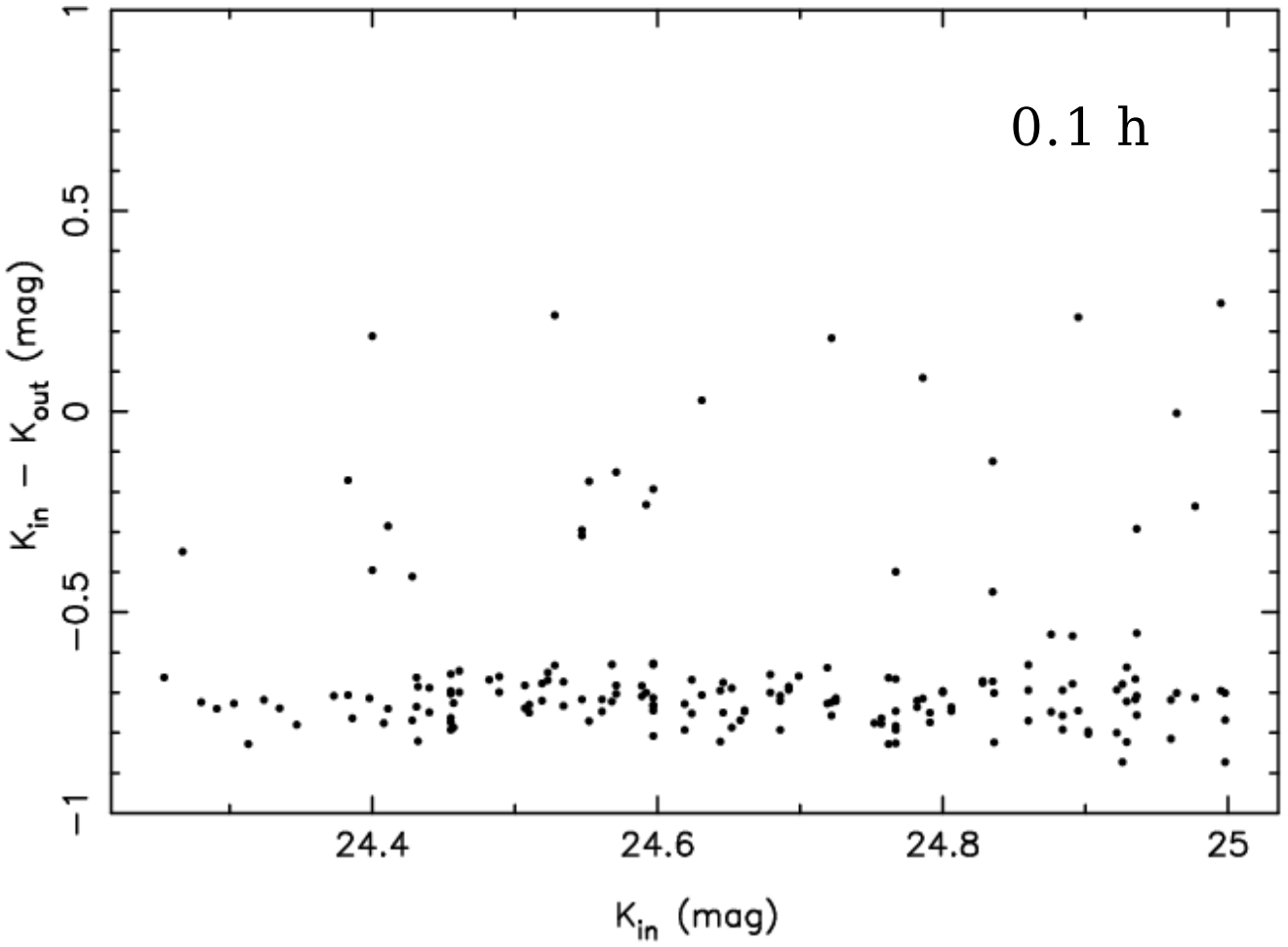
Resolved stellar populations



Resolved stellar populations



Resolved stellar populations



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10 h
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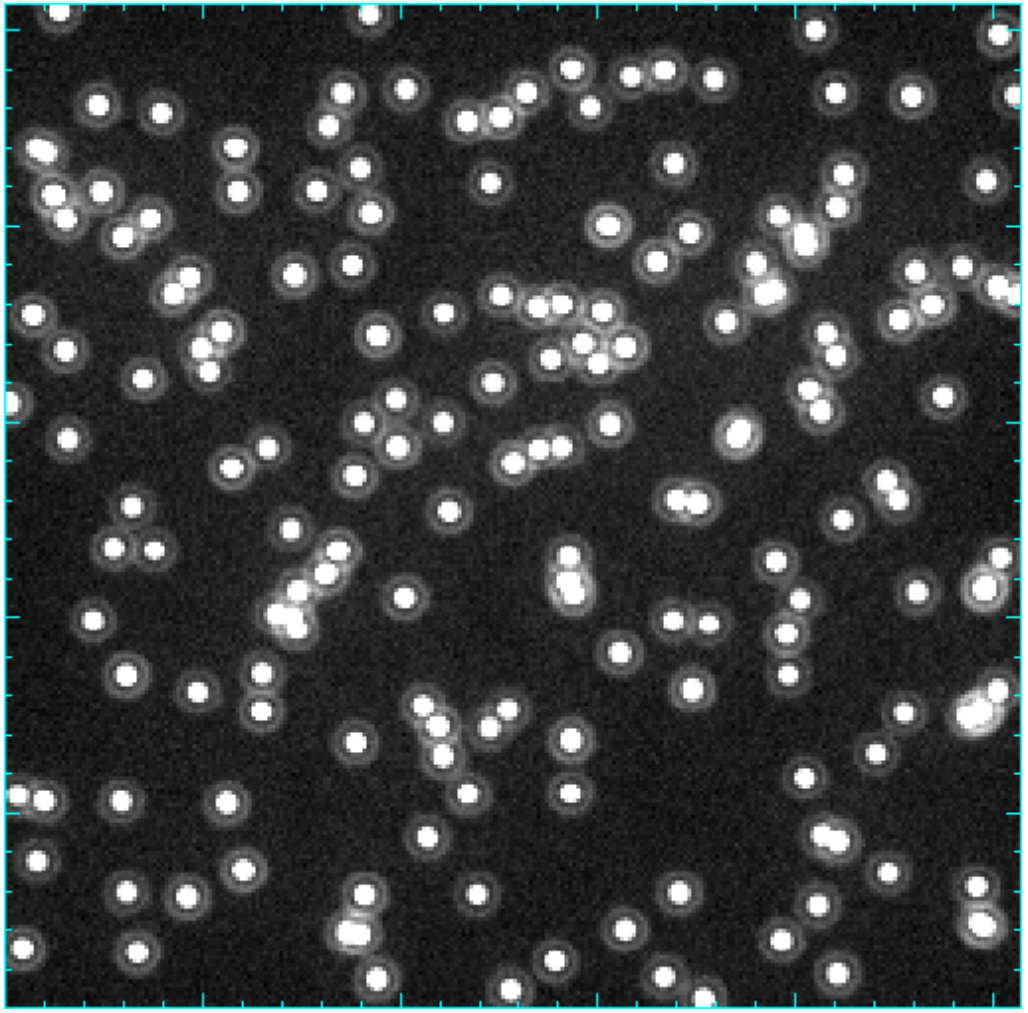

Resolved stellar populations

K-band image
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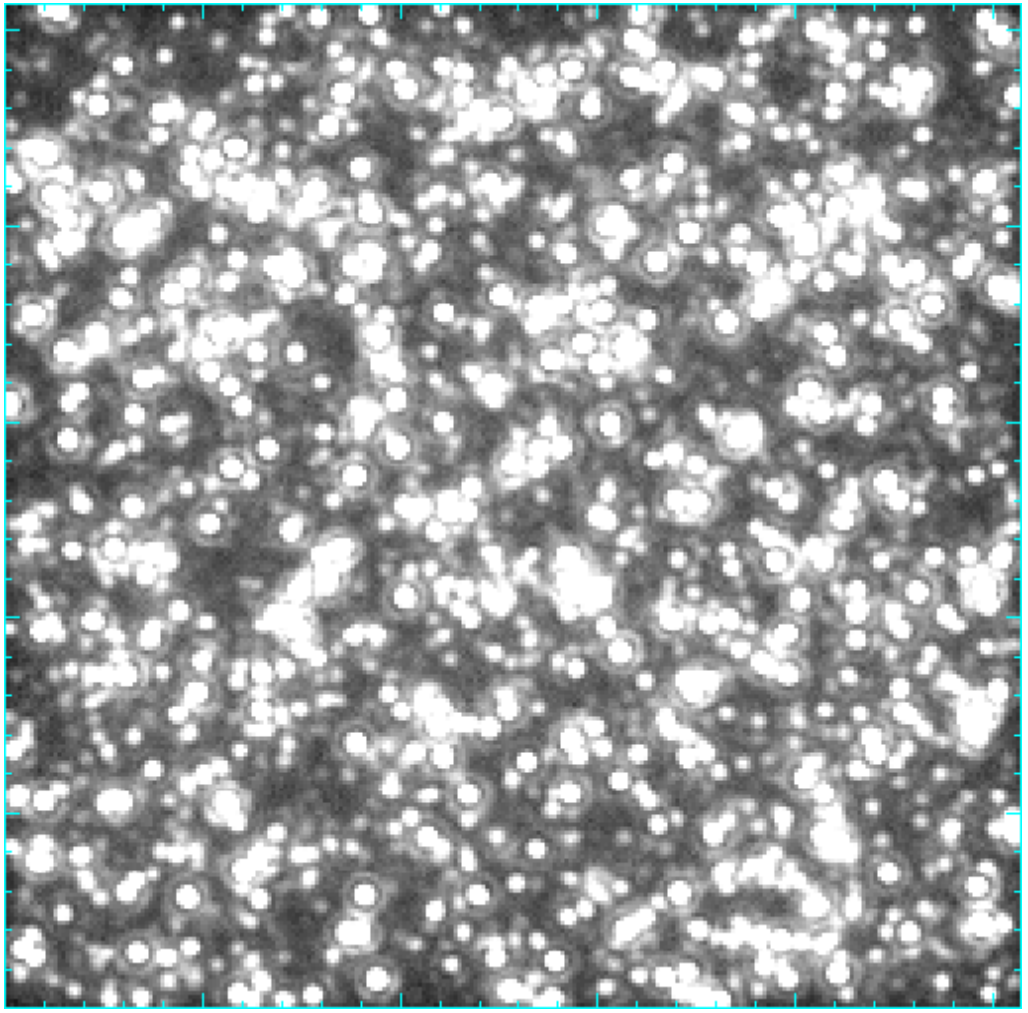

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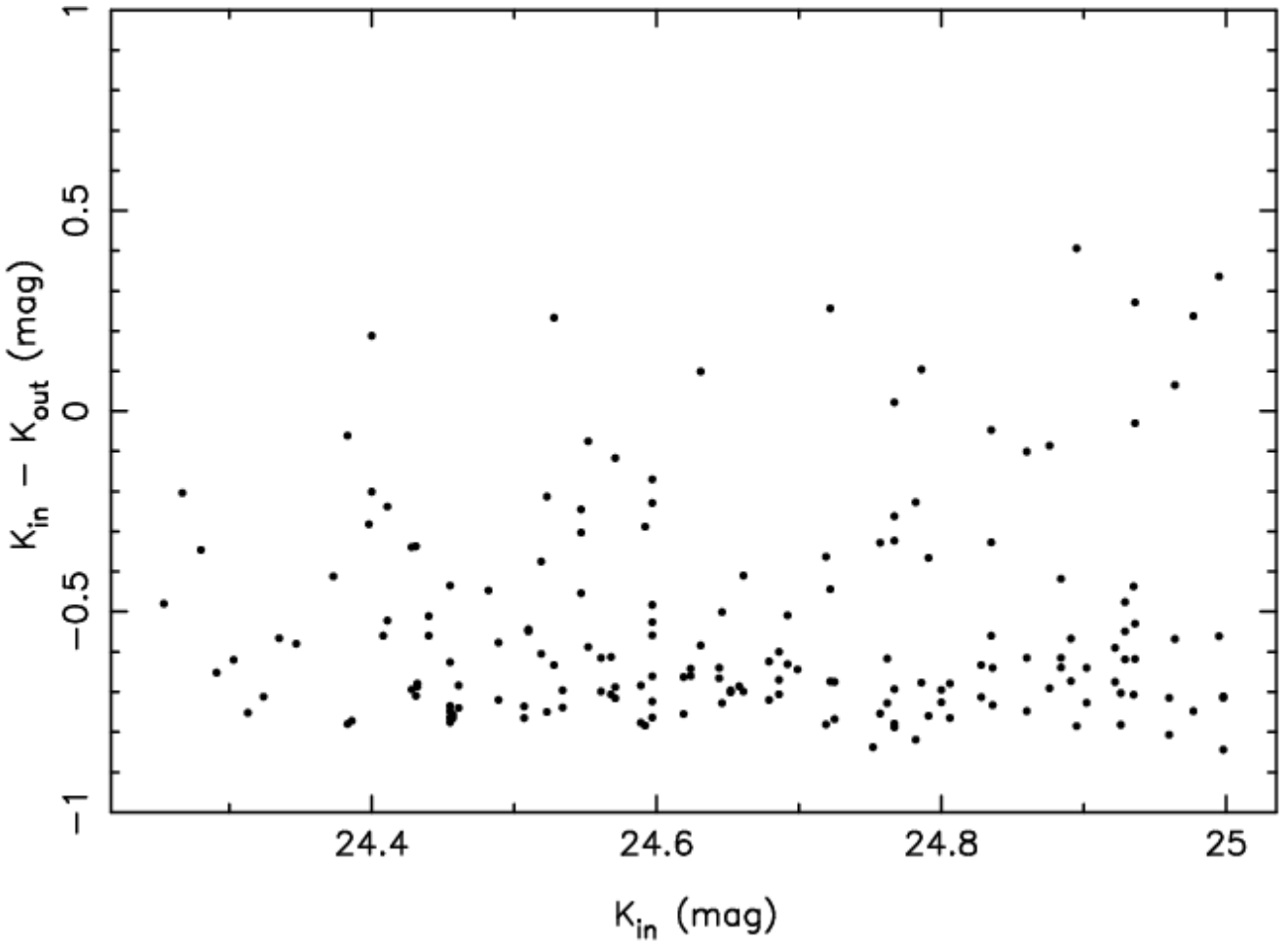

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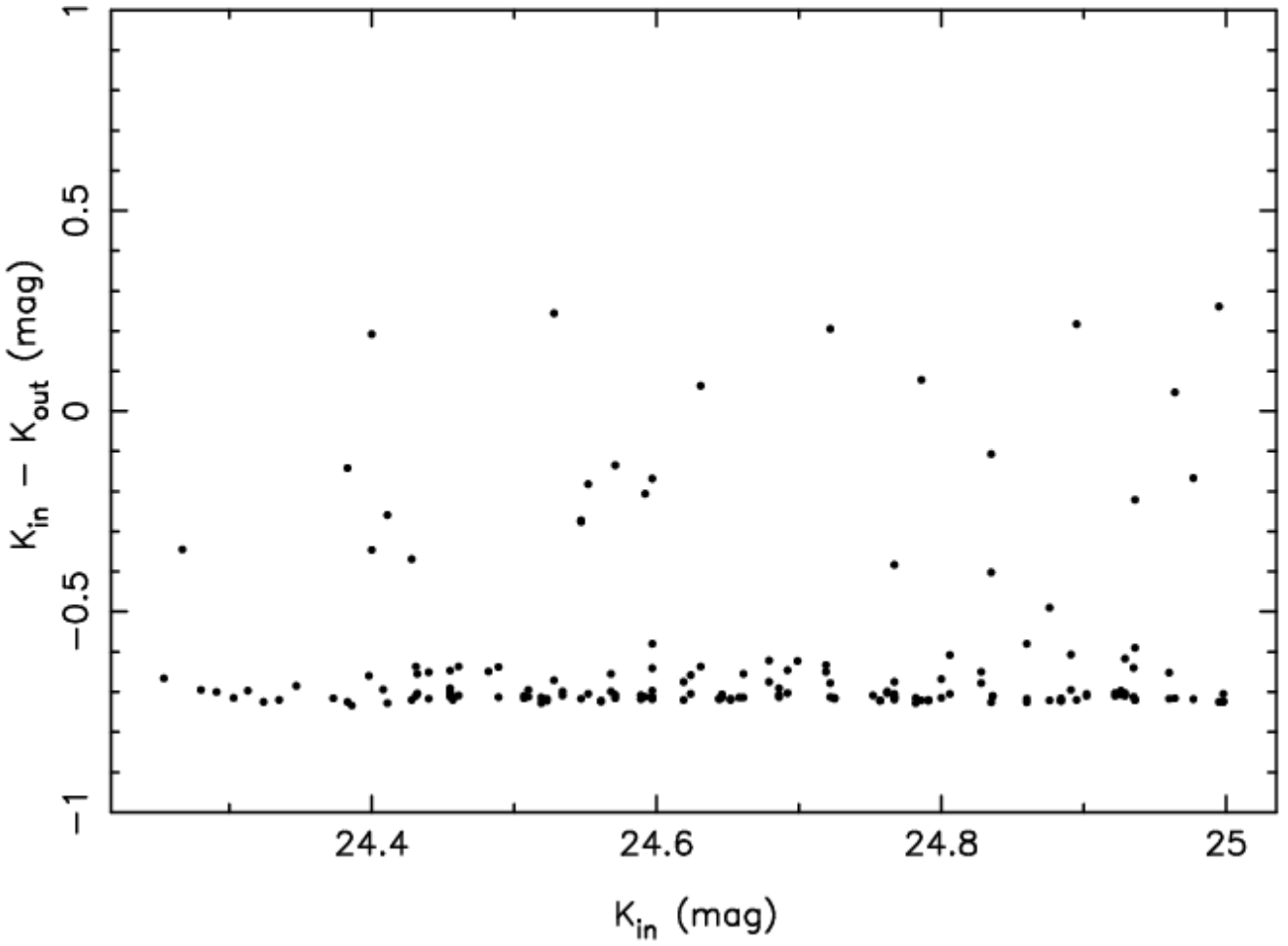
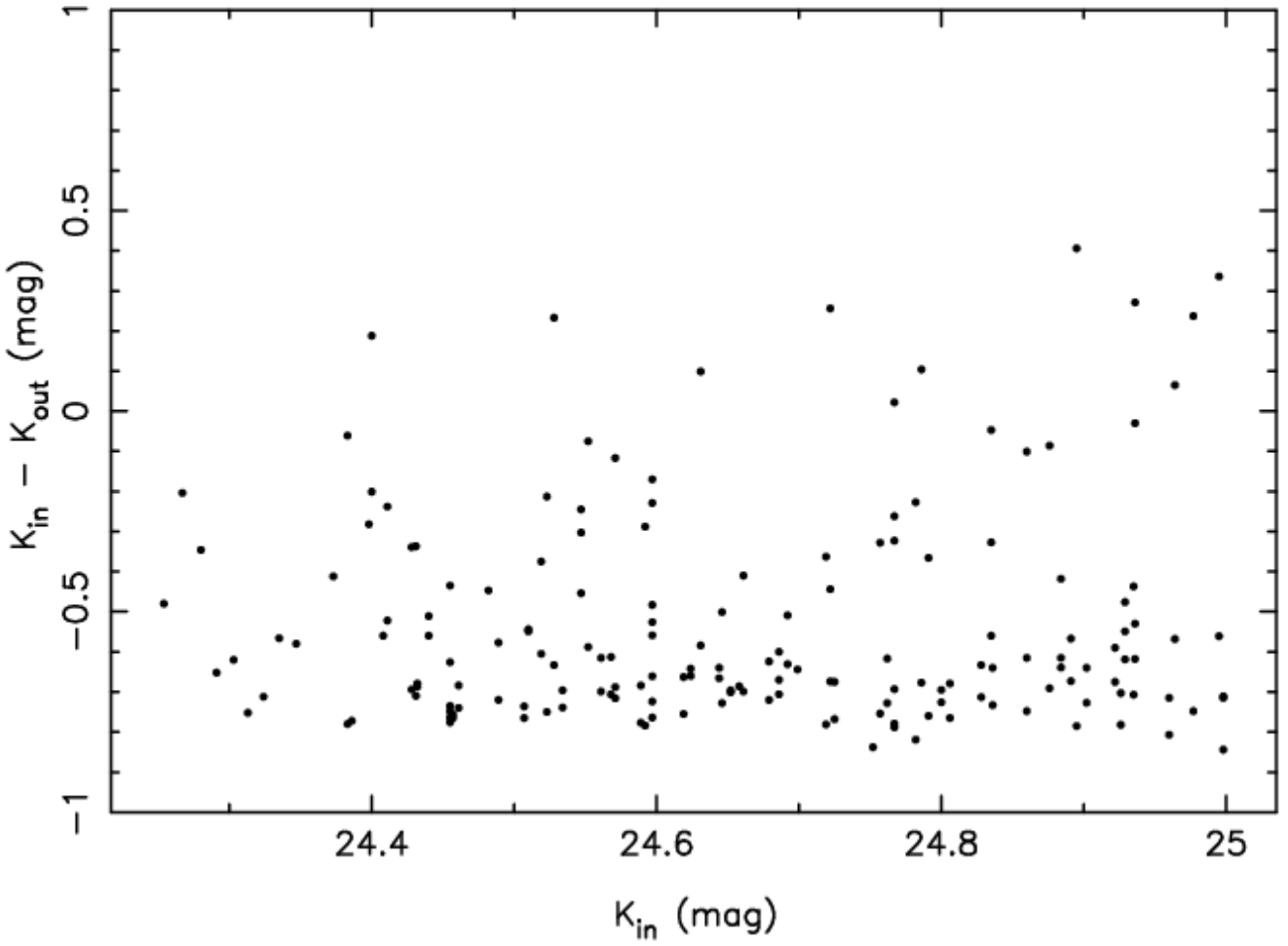


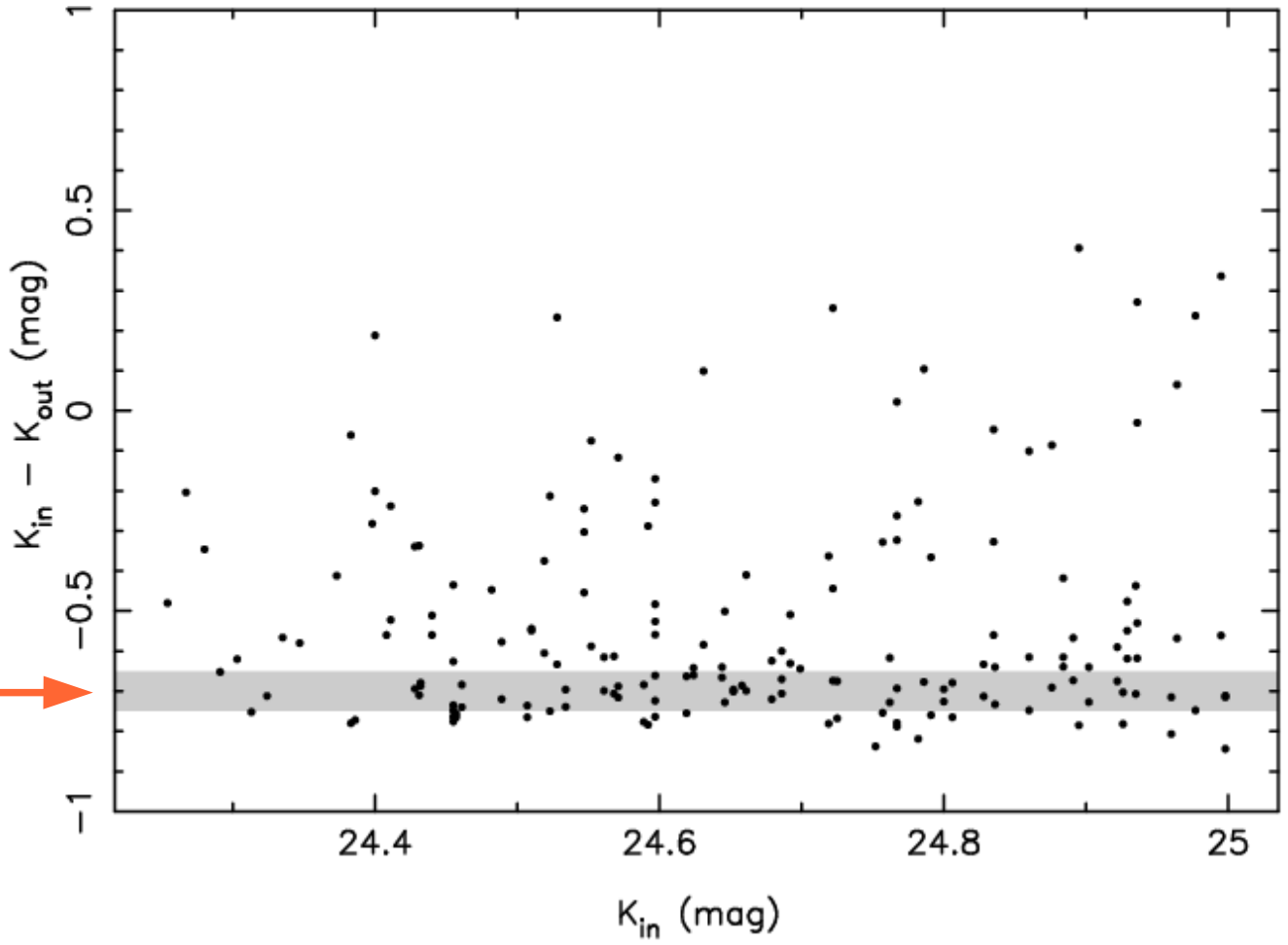
Including stars to K < 25 mag

Resolved stellar populations



Including stars to K < 32 mag

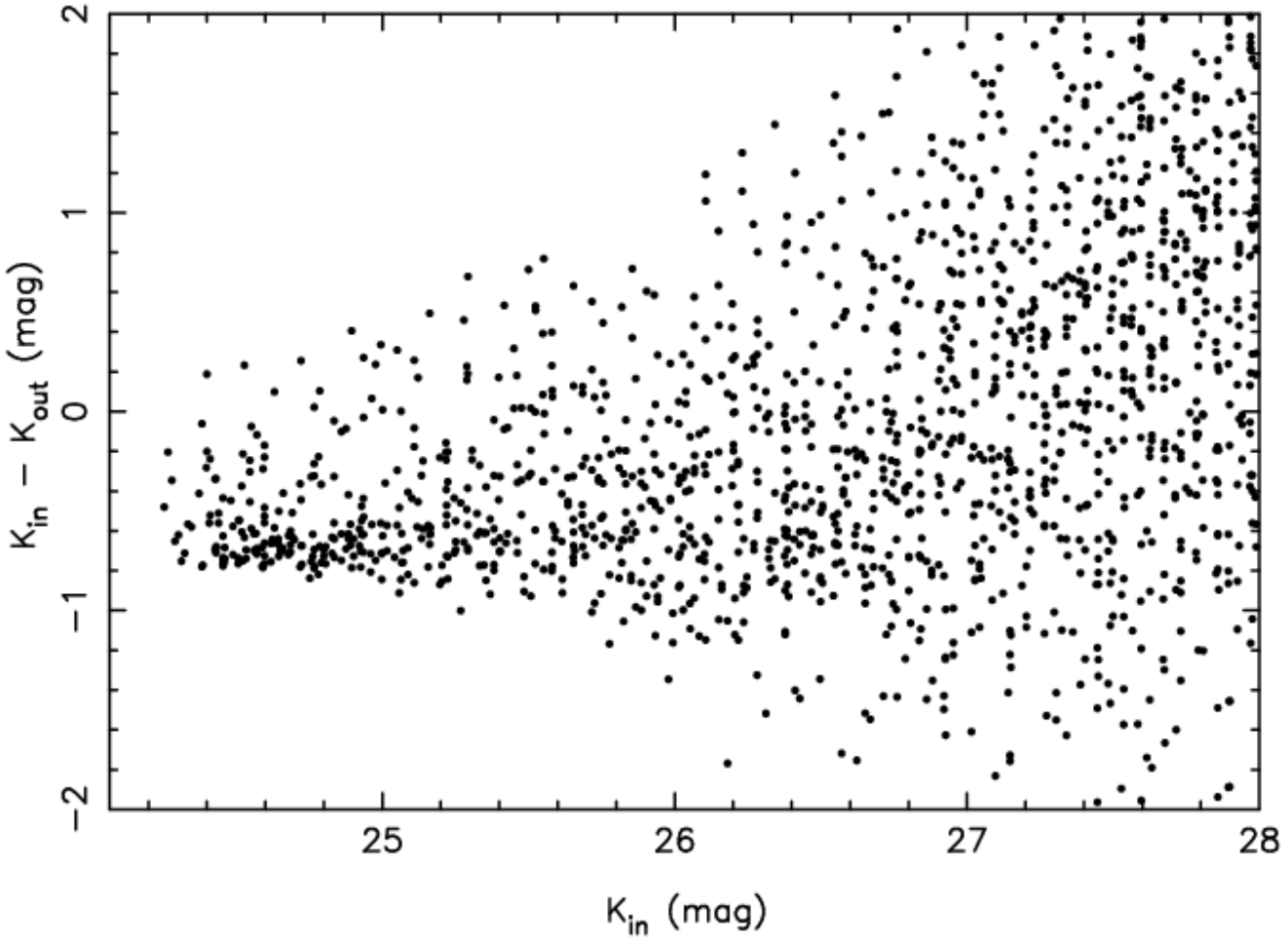
Resolved stellar populations



0.1 mag

Including stars to K < 32 mag

Resolved stellar populations



Resolved stellar populations

K-band image
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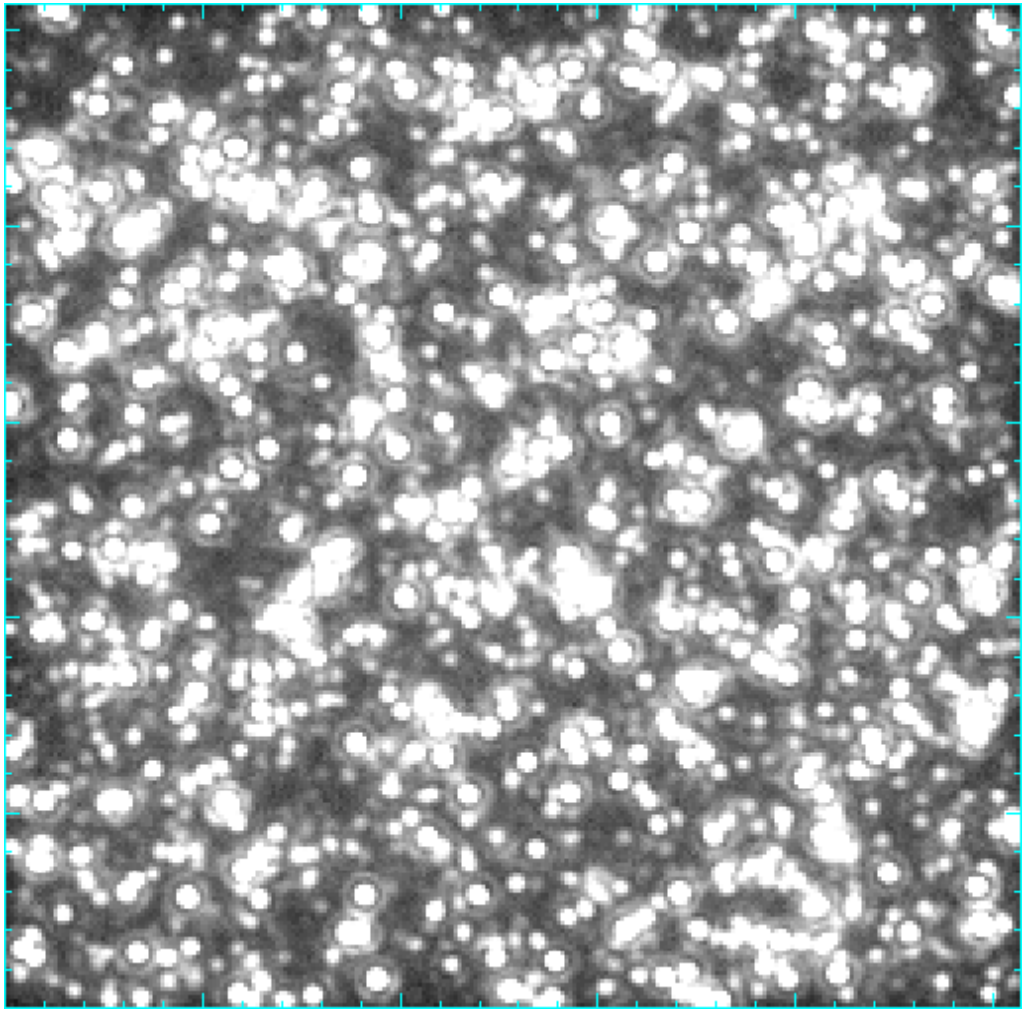
(HB @ Virgo)
$\langle \mu_V \rangle$ = 29 mag/arcsec^2



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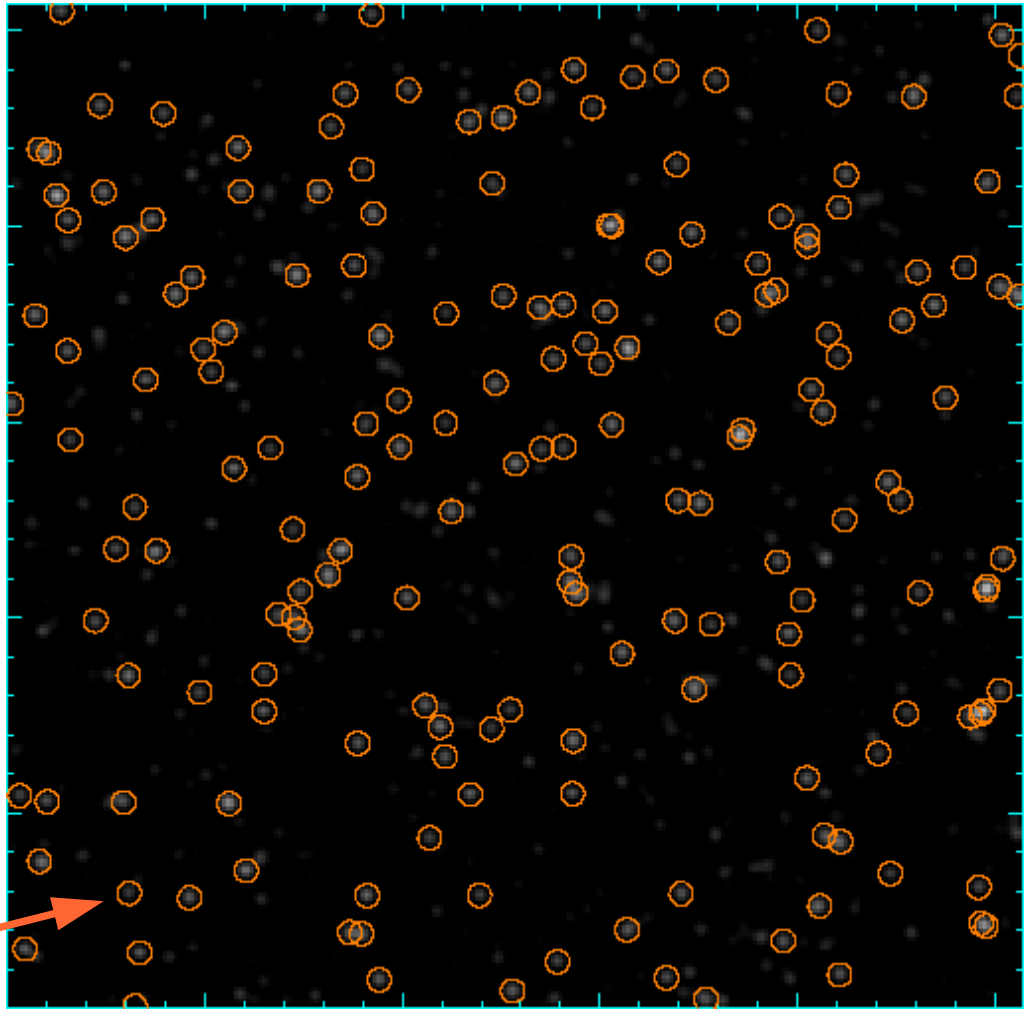

K < 25 mag

Resolved stellar populations

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(HB @ Virgo)
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Resolved stellar populations

K-band image
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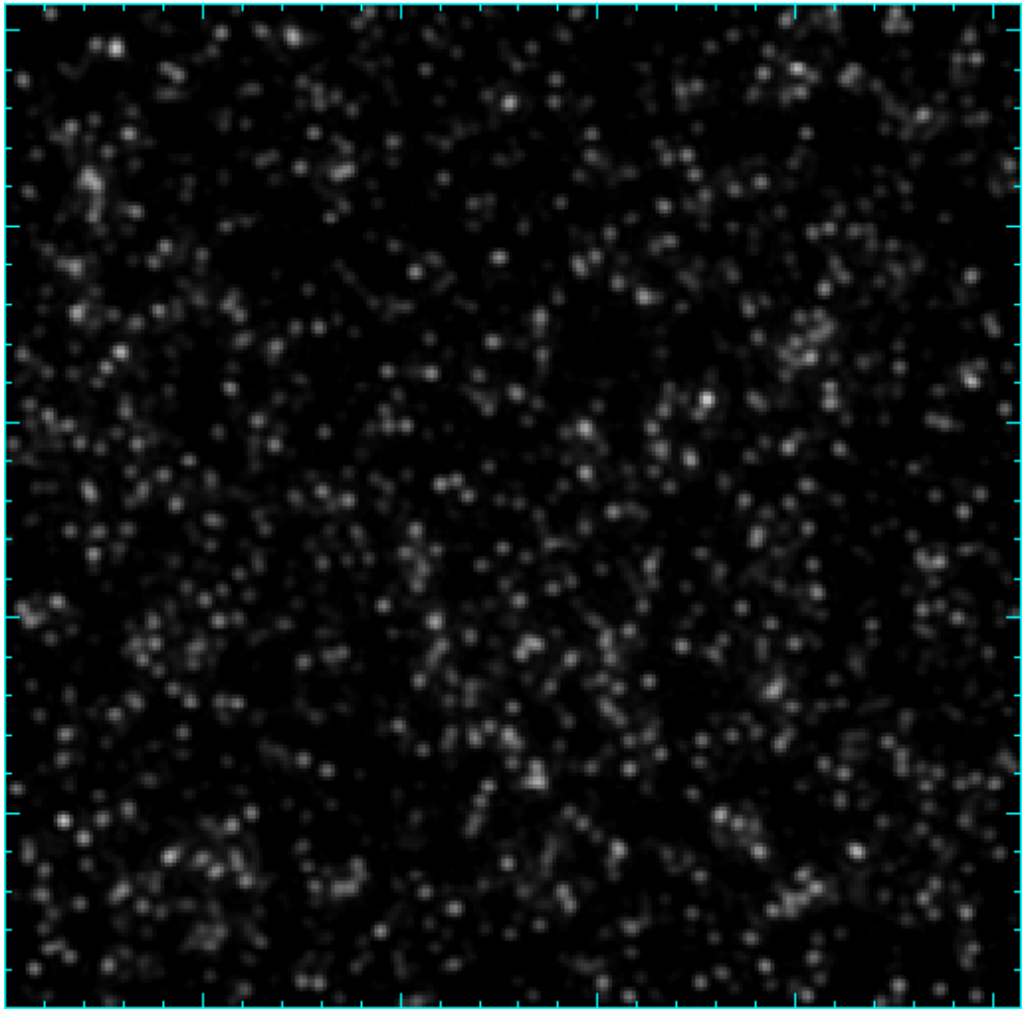
stars to K < 32 mag
(HB @ Virgo)
$\langle \mu_V \rangle$ = 28 mag/arcsec^2



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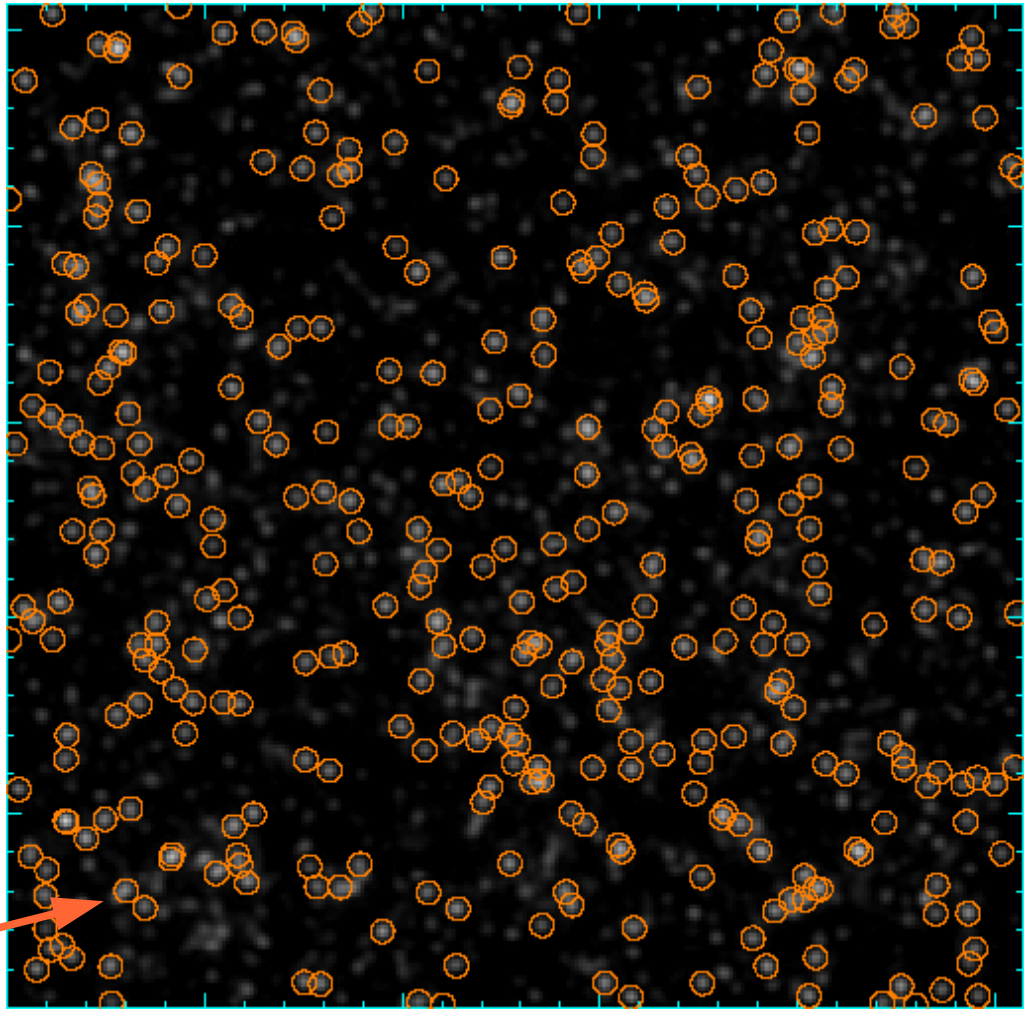

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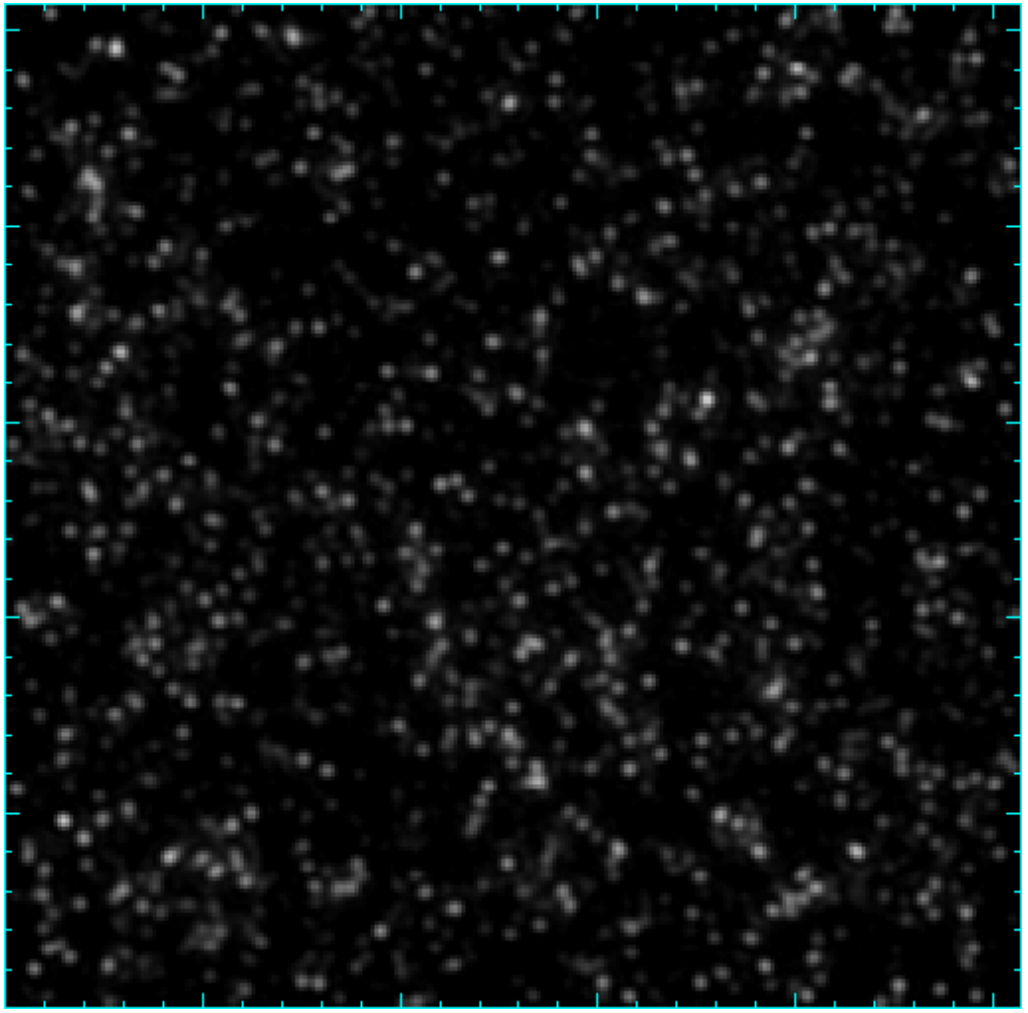

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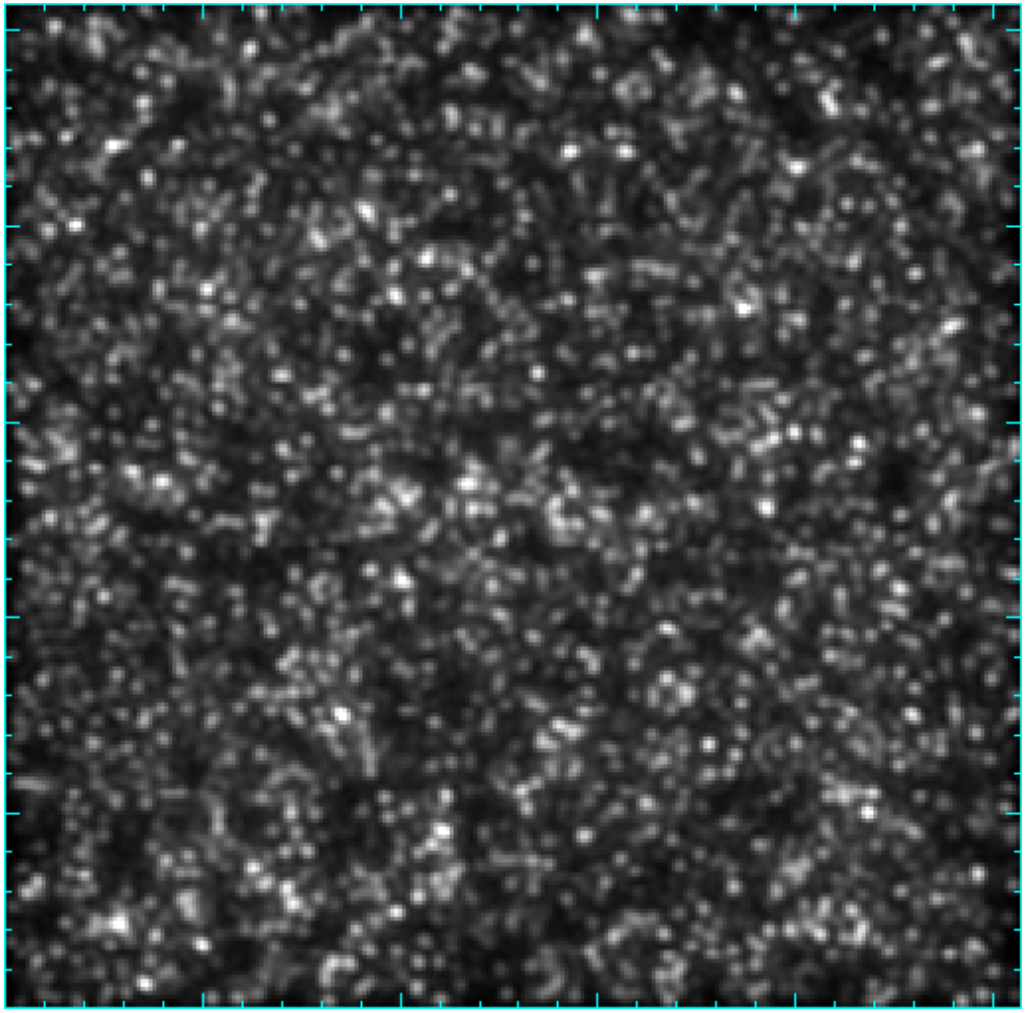

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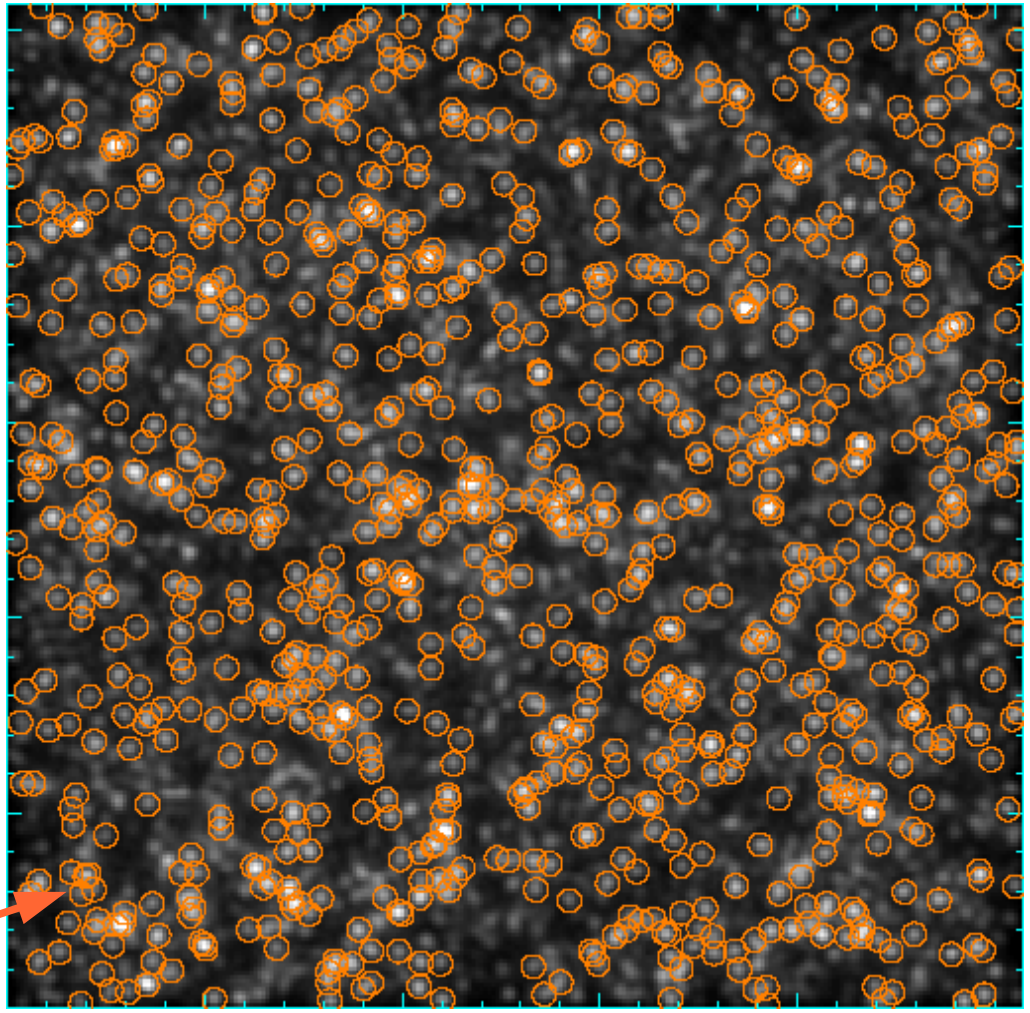

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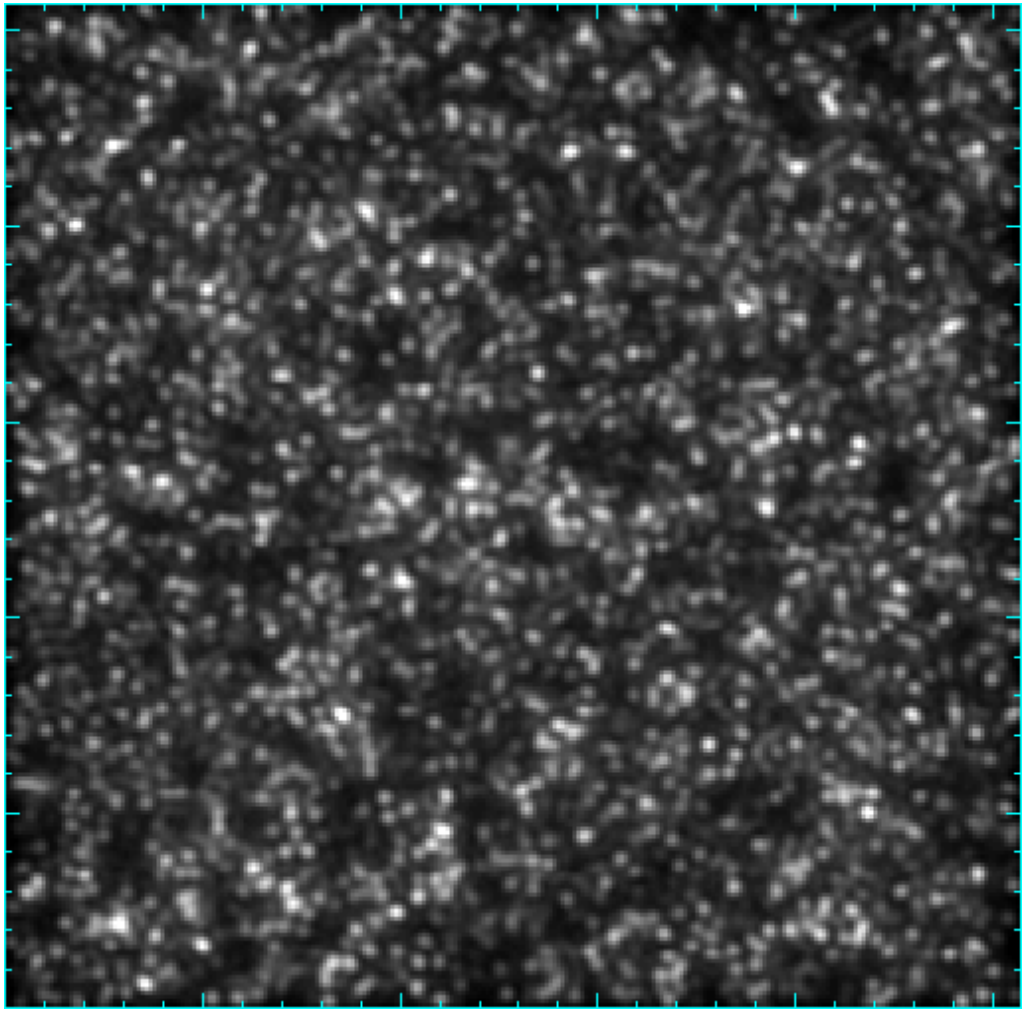

Resolved stellar populations

K-band image
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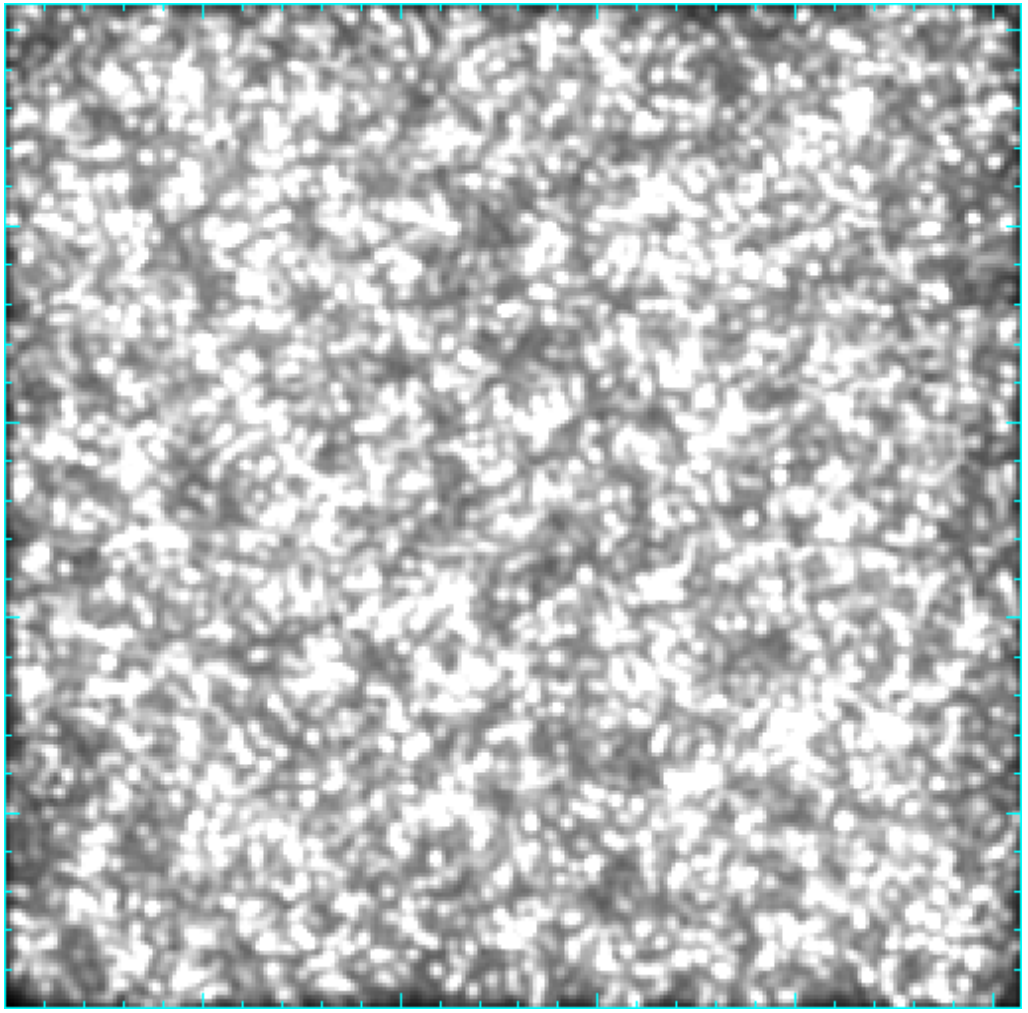
$\langle \mu_V \rangle$ = 26 mag/arcsec^2



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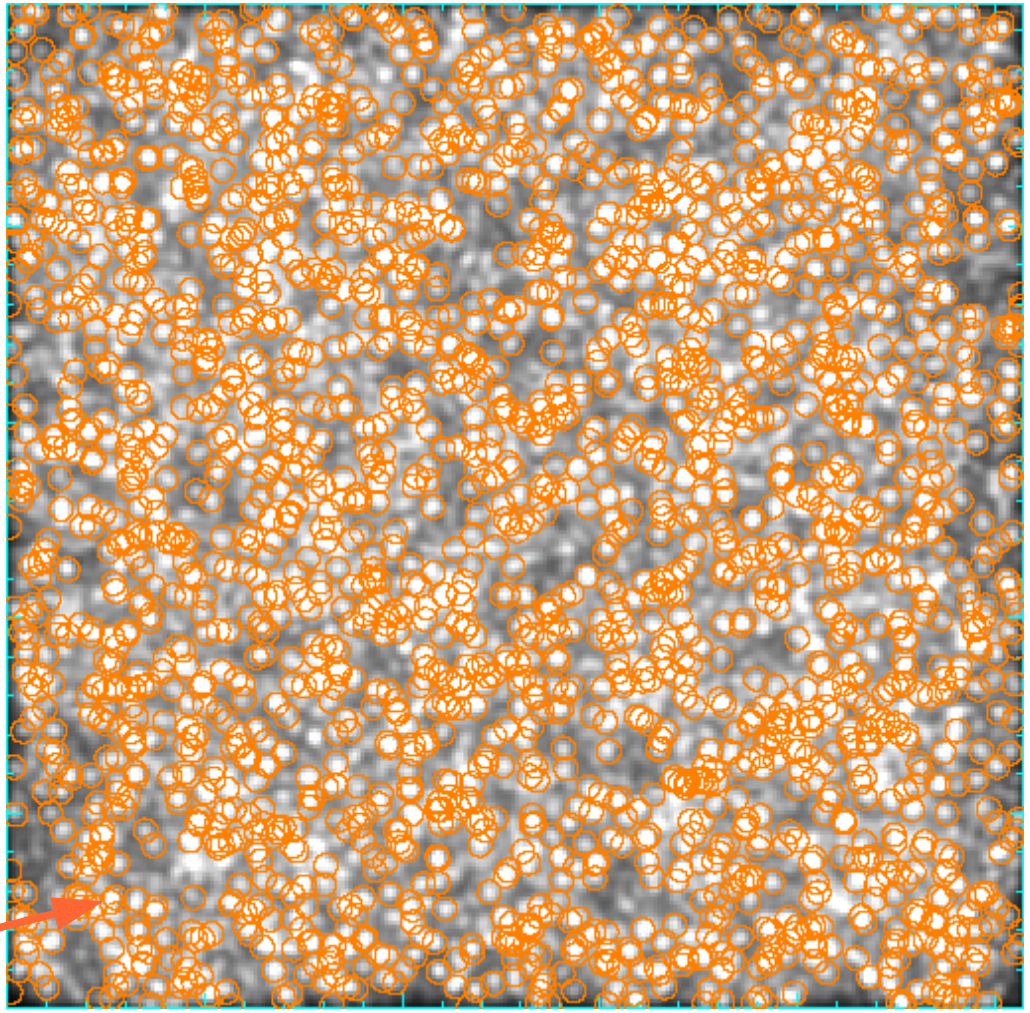

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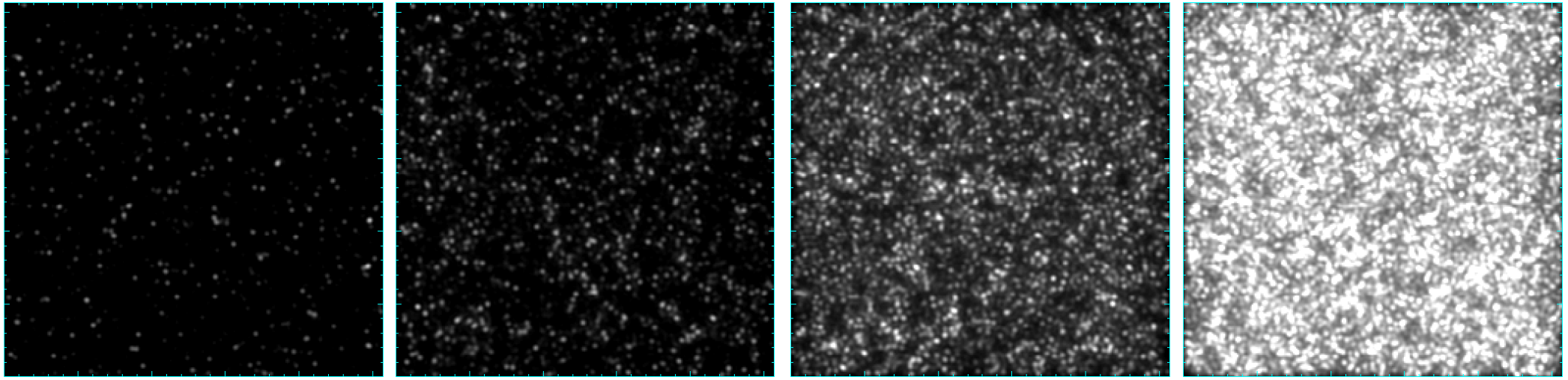

$\langle \mu_V \rangle$ = 29 28 27 26 mag/arcsec^2