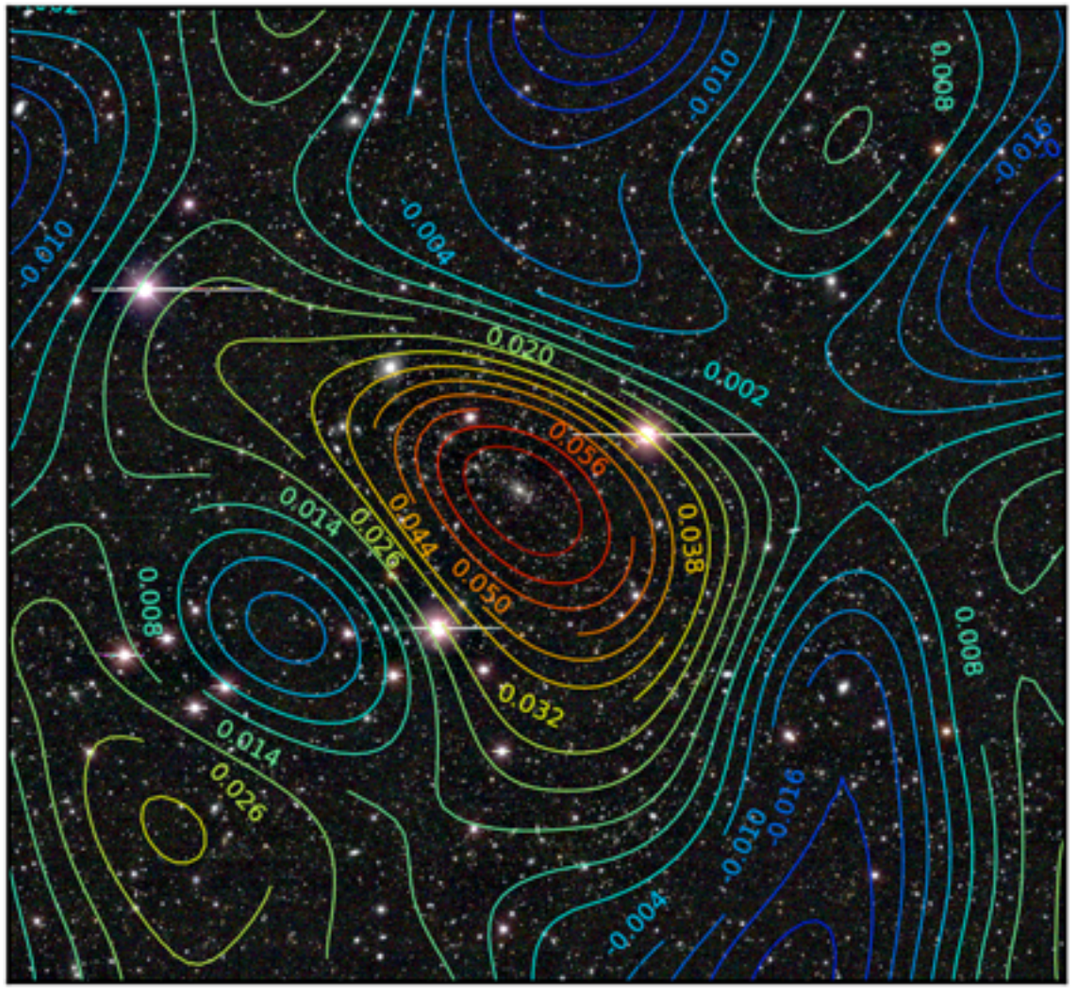
The BIGGER picture

Mass & light maps of massive galaxy clusters from early DECam data



Peter Melchior

THE OHIO STATE UNIVERSITY

CCAPP

Bob Armstrong
David Bacon
Keith Bechtol
Sarah Bridle
Fabrice Brimioulle
Joseph Clampitt
Daniel Gruen
Michael Hirsch
Klaus Honscheid
Eric Huff
Bhuv Jain
Mike Jarvis
Stephanie Jouvel
Tomasz Kacprzak
Elisabeth Krause
Huan Lin
Niall McCrann
Ken Patton
Andres Plazas
Barnaby Rowe
Eduardo Rozo
Eli Rykoff
Stella Seitz
Eric Suchyta
Rafal Szepietowski
Vinu Vikram
Julia Young
... and the DES SV squad

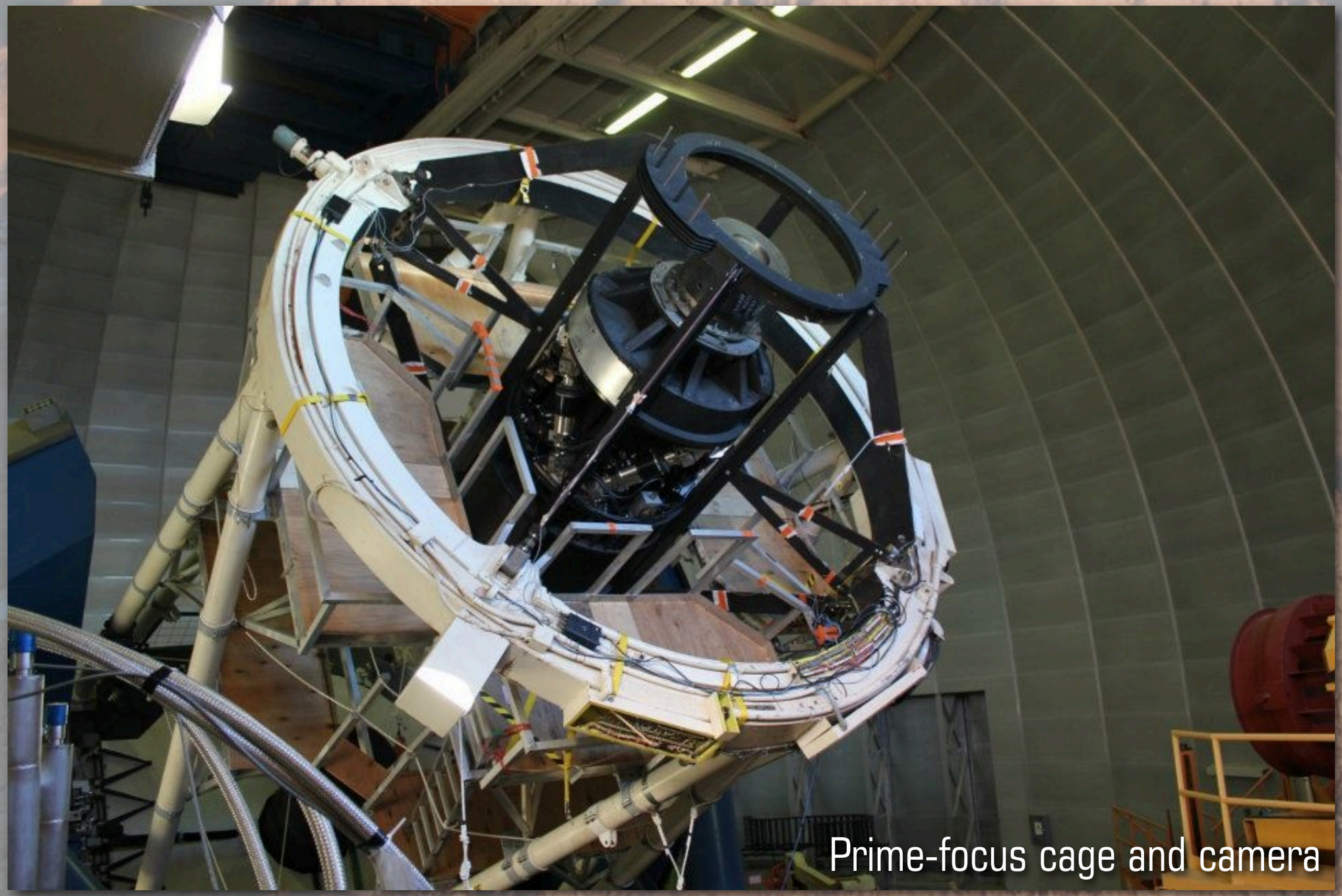
DARK ENERGY SURVEY

Dark Energy Survey

Cerro Tololo Inter-American Observatory

Dark Energy Survey

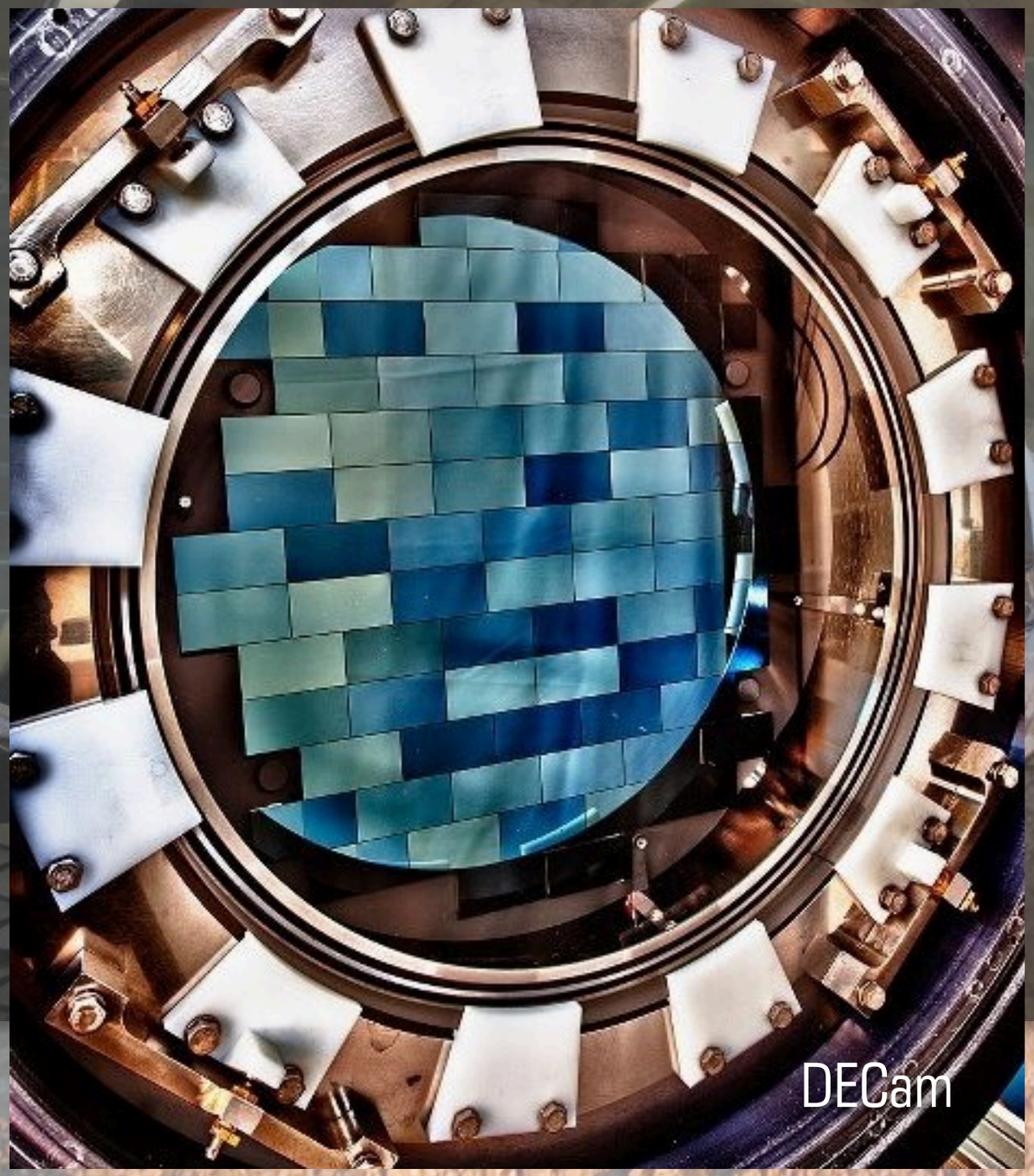
DARK ENERGY SURVEY



Prime-focus cage and camera

Dark Energy Survey

DARK ENERGY SURVEY

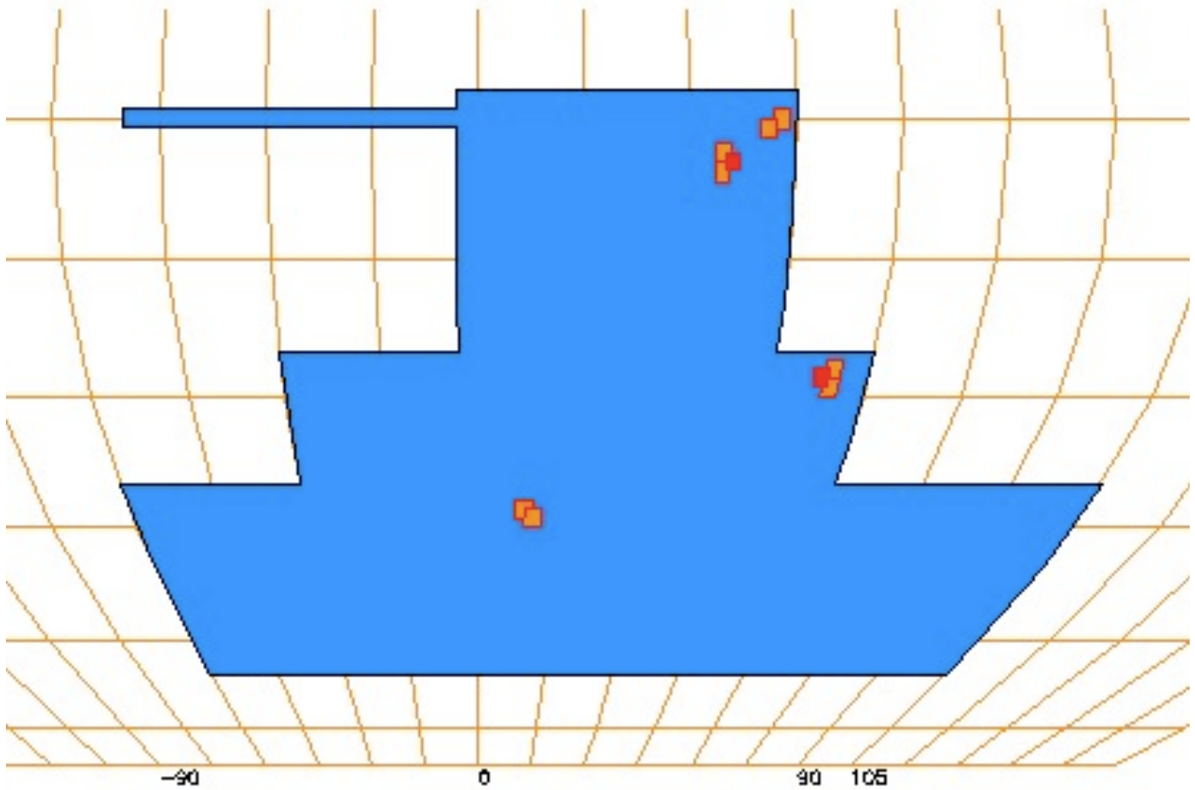


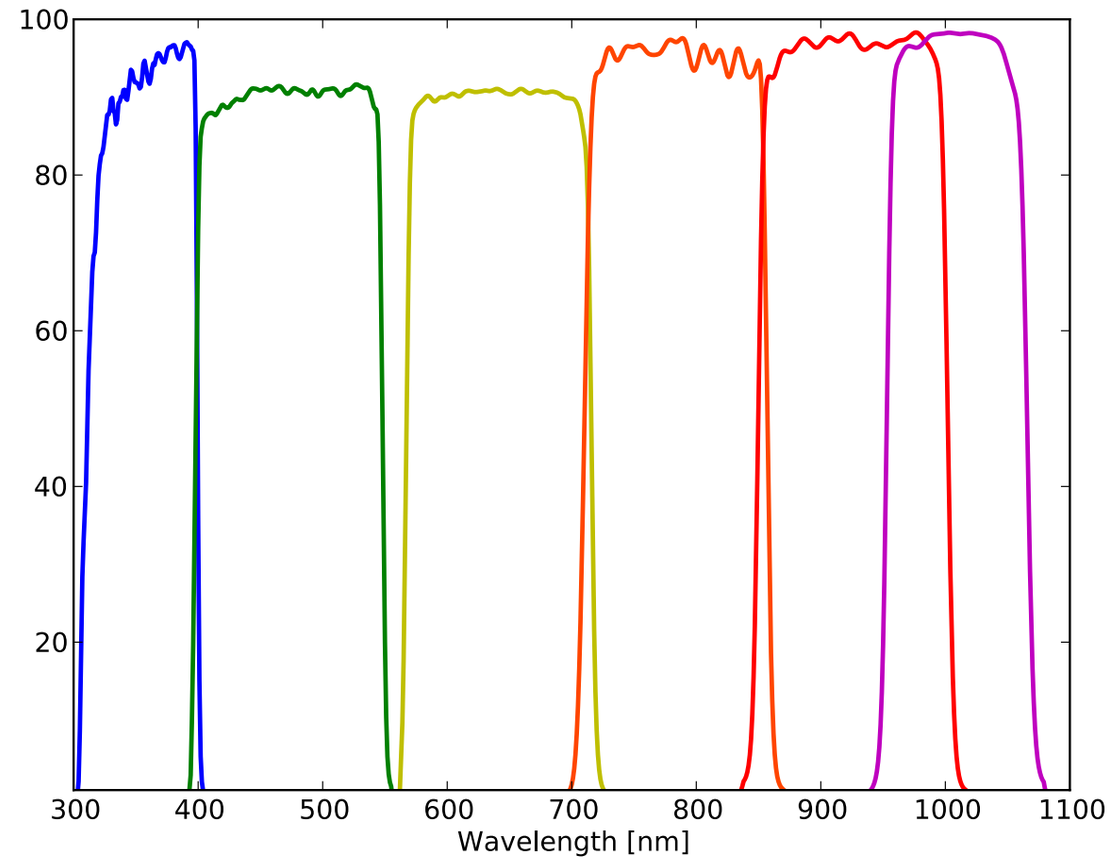
Dark Energy Survey

DARK ENERGY SURVEY

g-filter installation

Survey characteristics





5000 sq. degrees
filters: grizY + U
10 x 90 seconds
limiting magnitudes: 25.2 (g) .. 23.4 (z)

Clusters in Science Verification

DARK ENERGY SURVEY

1. validate the data quality delivered by DECam for the purpose of galaxy cluster and lensing studies

2. utilize the large FoV of DECam to create light and mass maps over more than 2 square degrees around these clusters.

Clusters in Science Verification

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1. validate the data quality delivered by DECam for the purpose of galaxy cluster and lensing studies

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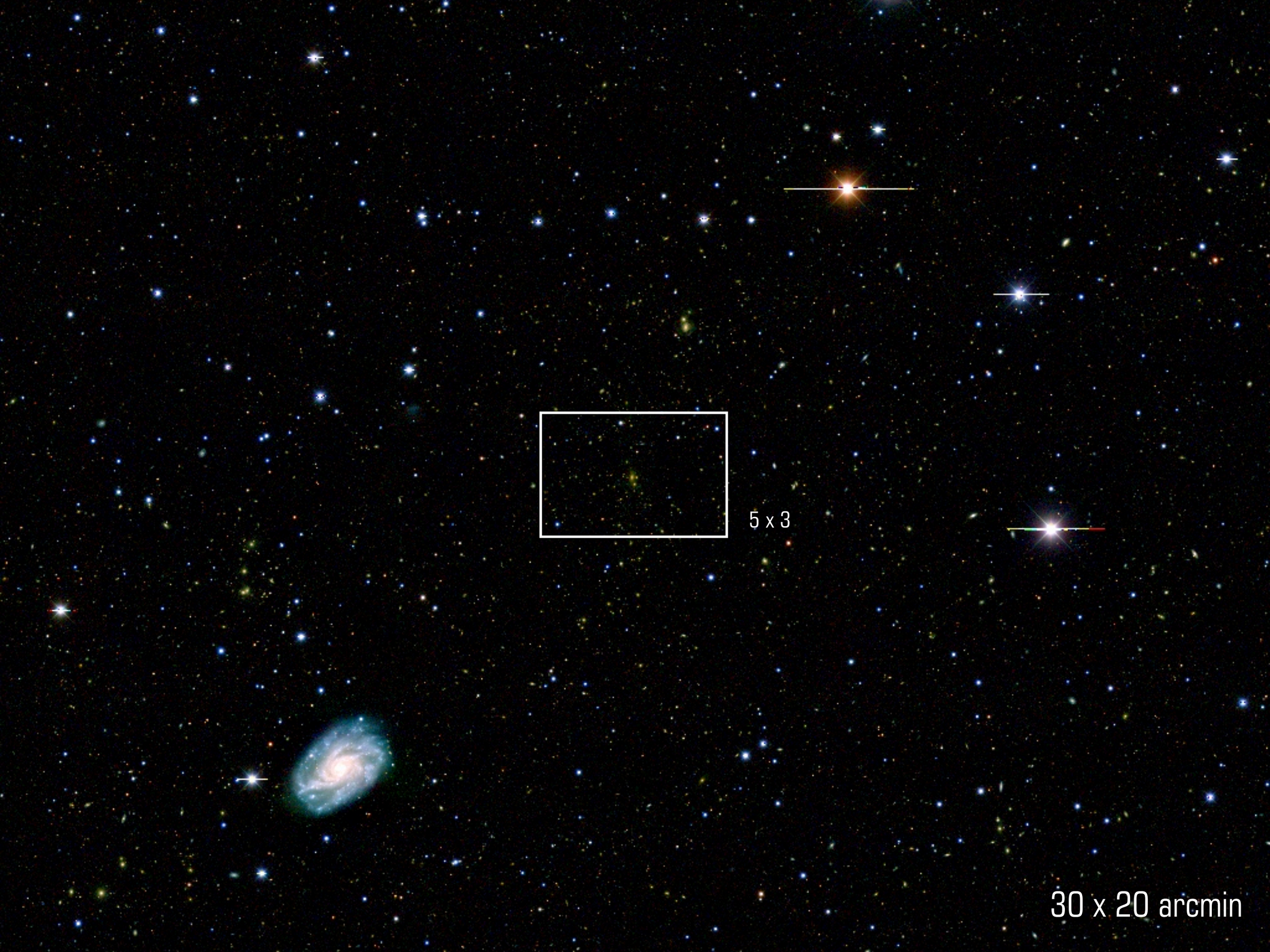
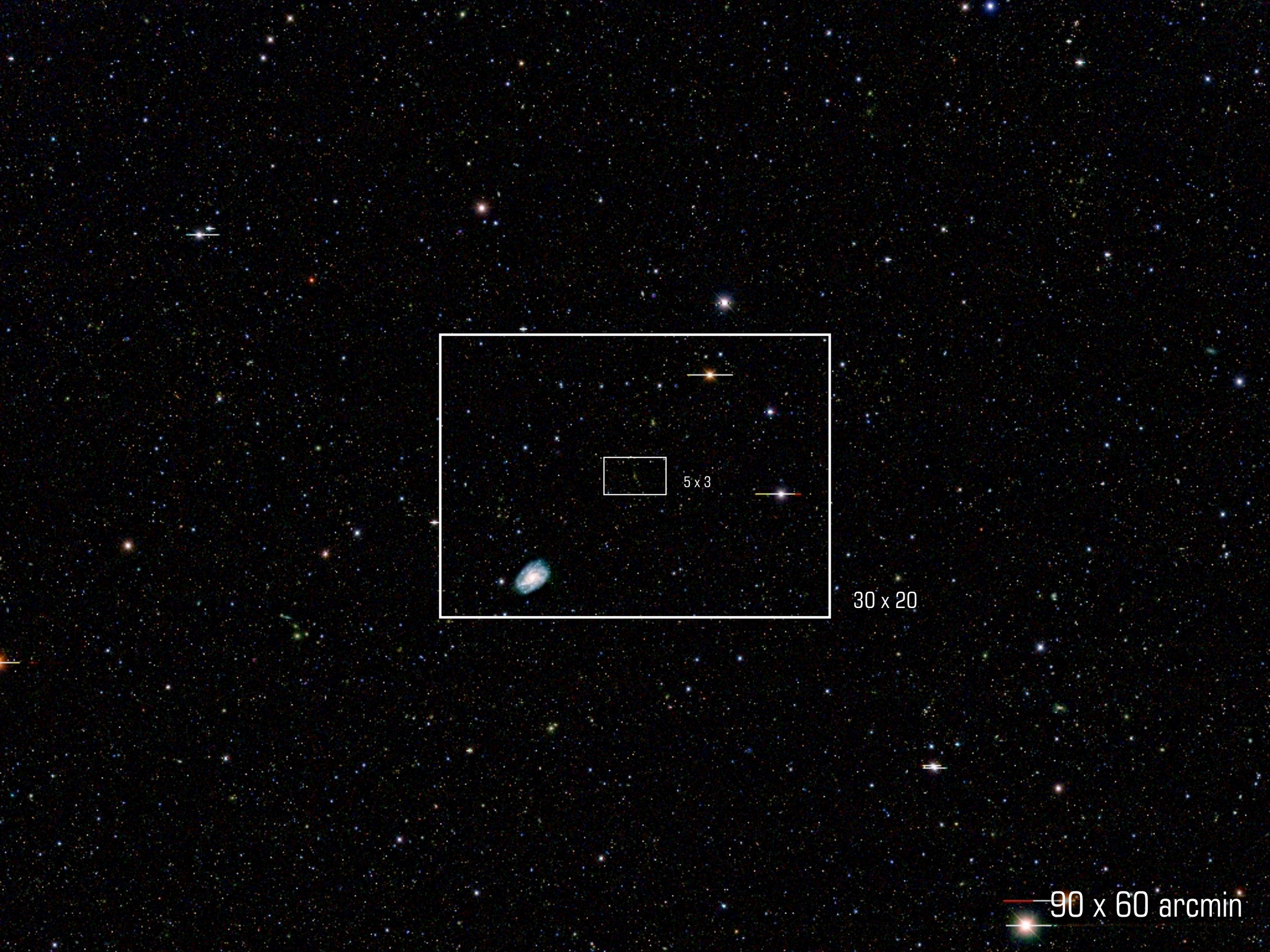
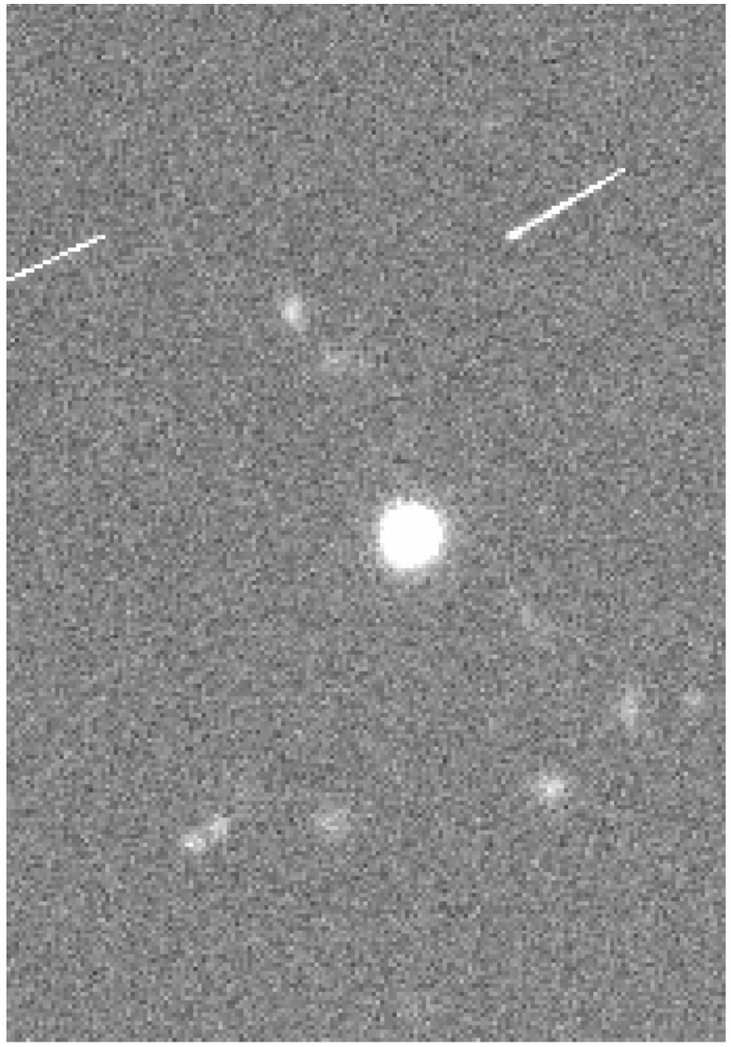
5 x 3 arcmin

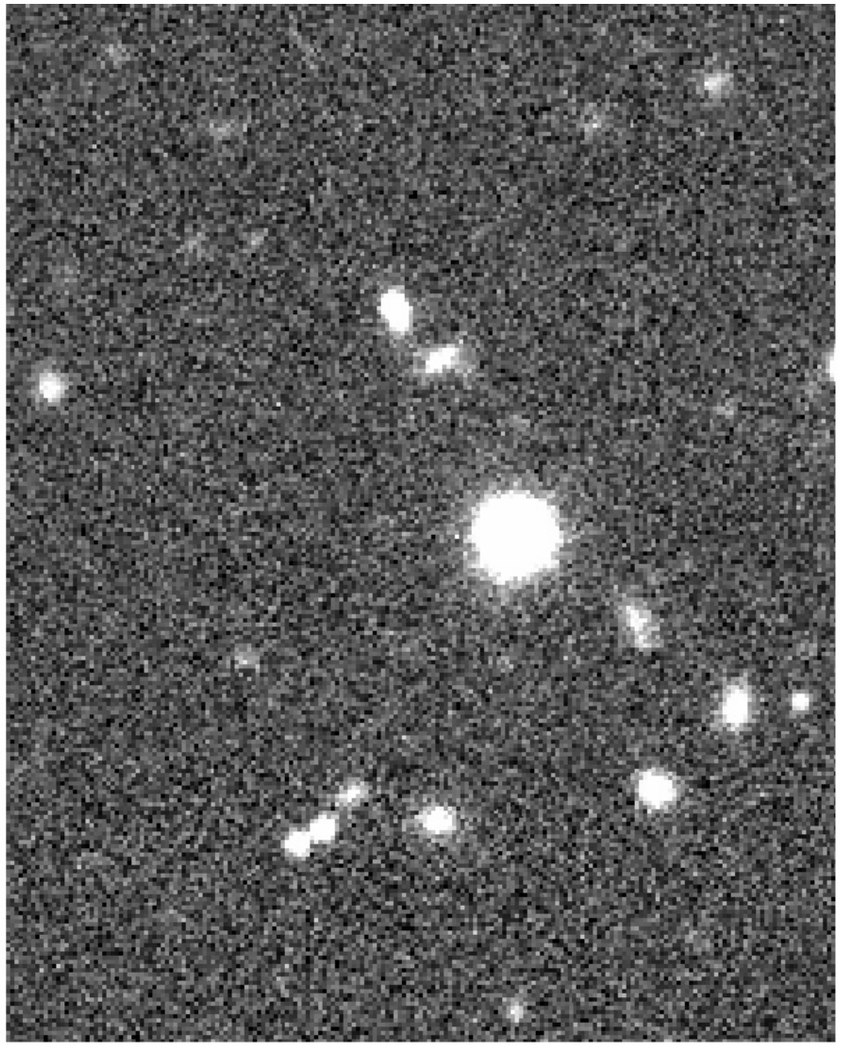

5 x 3
30 x 20 arcmin


5 x 3
30 x 20
90 x 60 arcmin

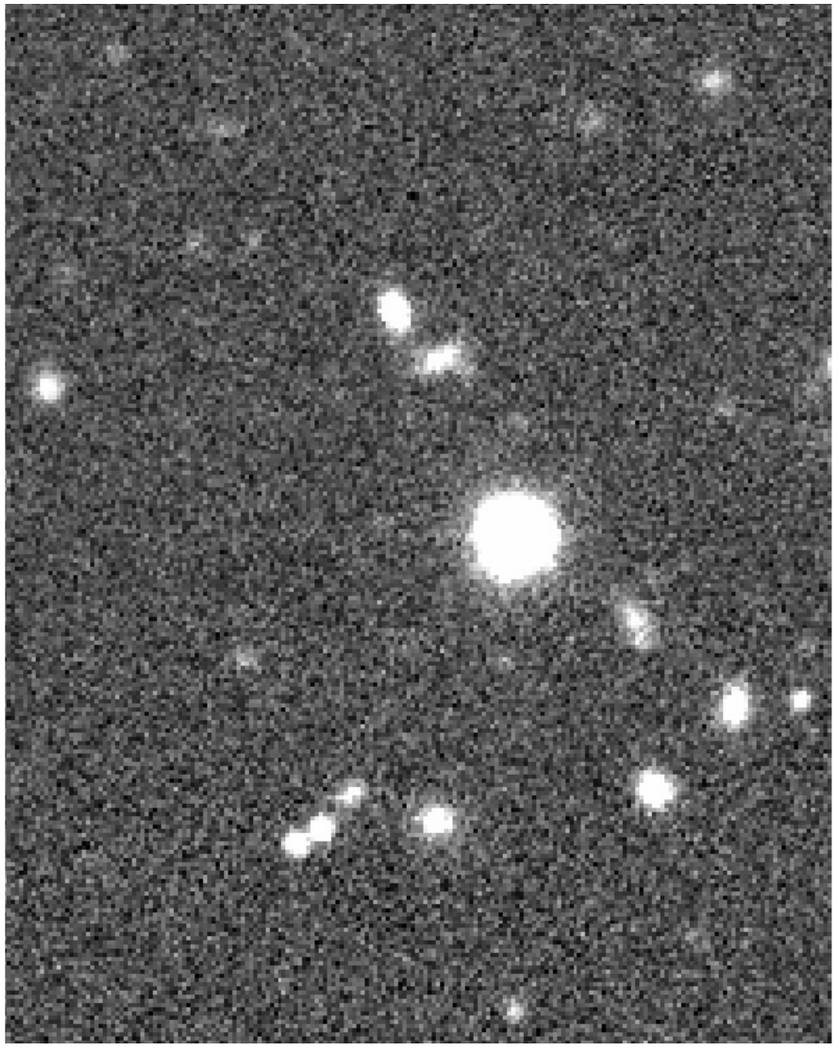
Coadds



single i-band exposure

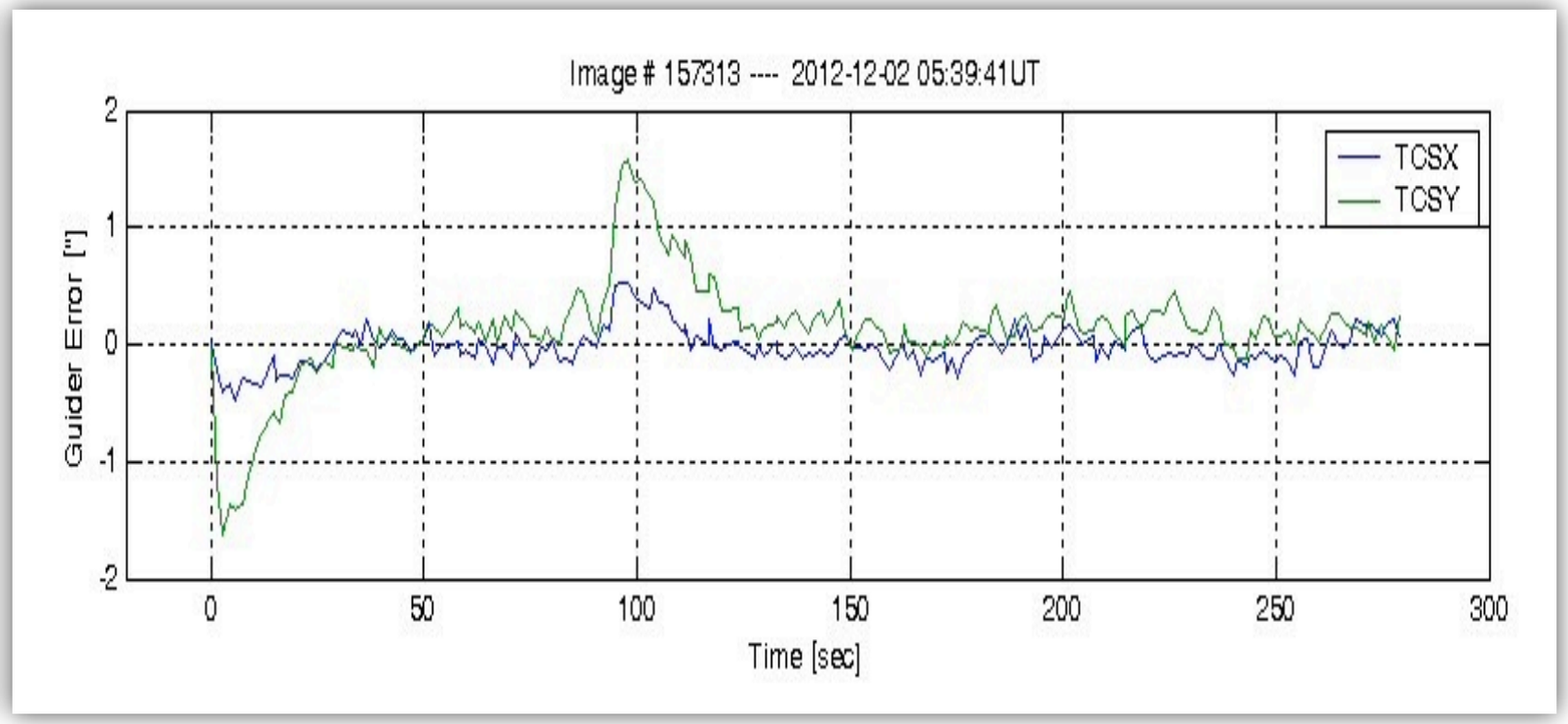


Swarp: median coadd of 10 exp.
$n_{gal} = 21$ / sq. arcmin



mean coadd+outlier rejection
$n_{gal} = 25$ / sq. arcmin

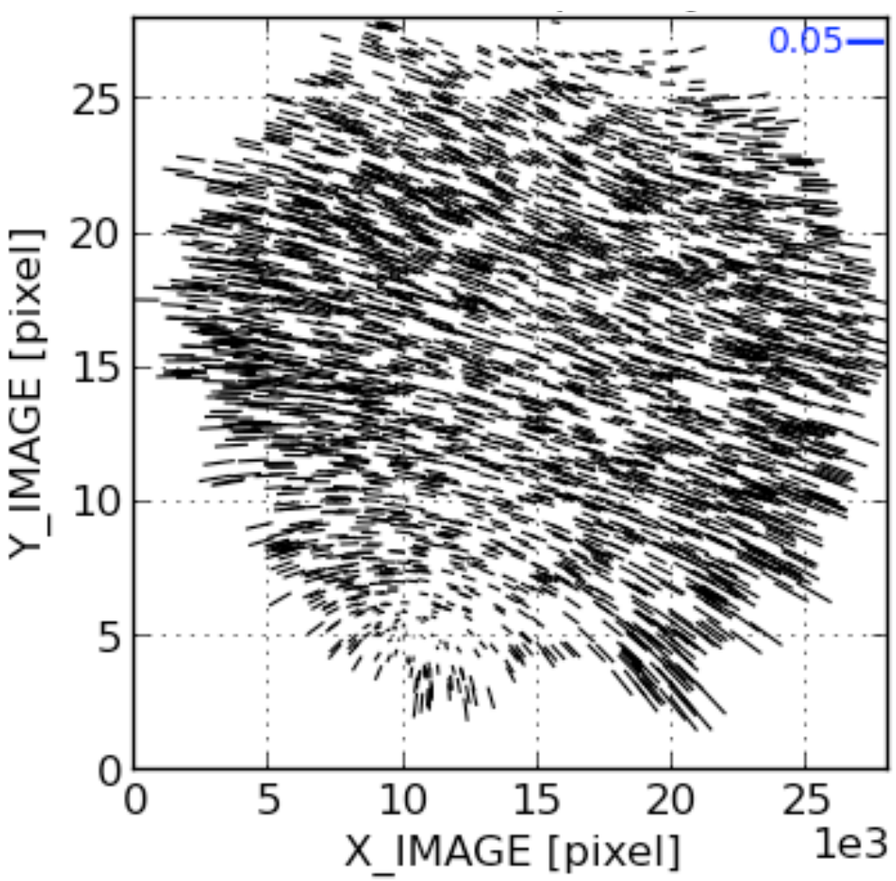
Early data issues



November 2012:

- early data affected by “guider jumps”
- tracking performance not as desired

Early data issues



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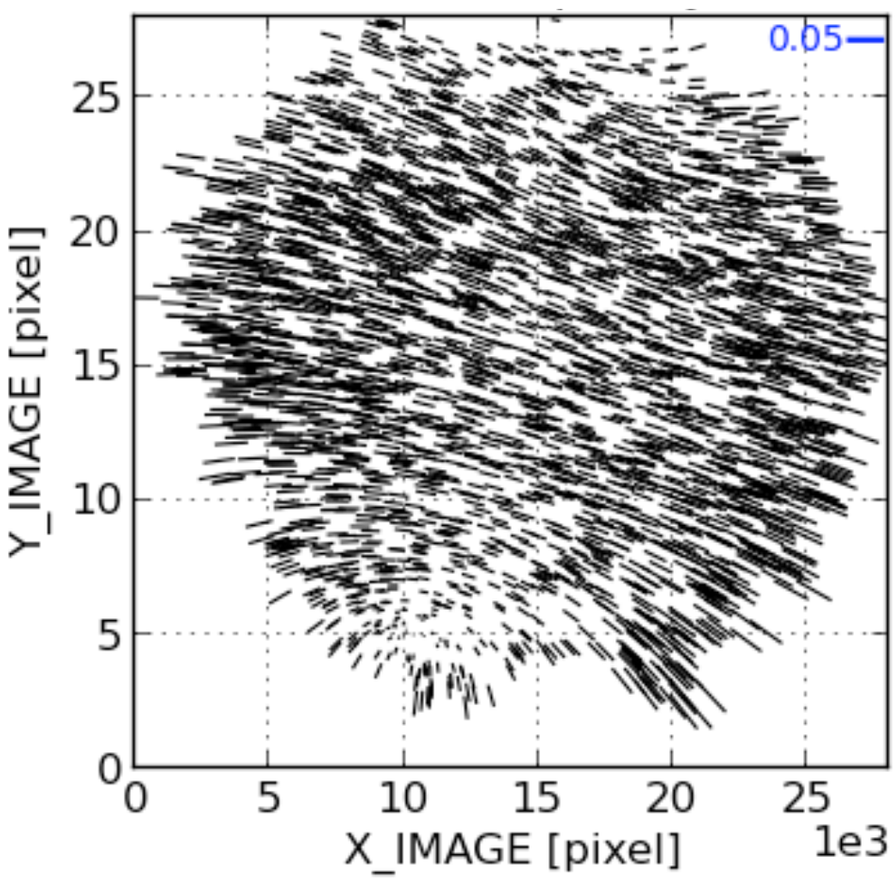
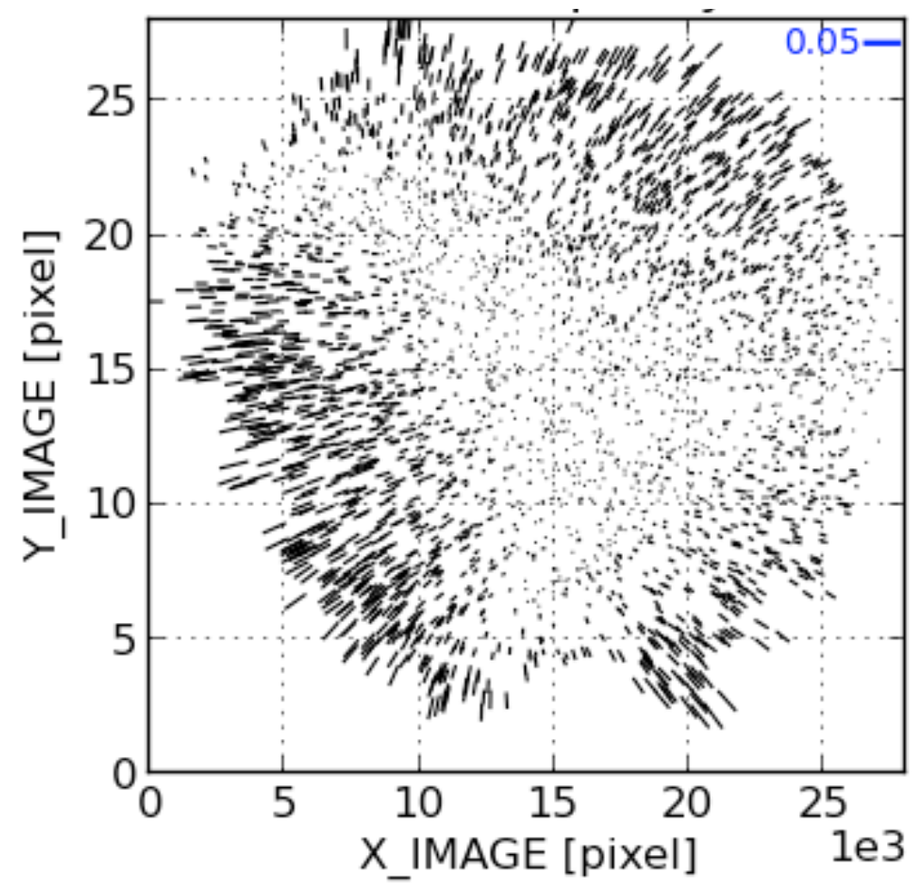
Early data issues





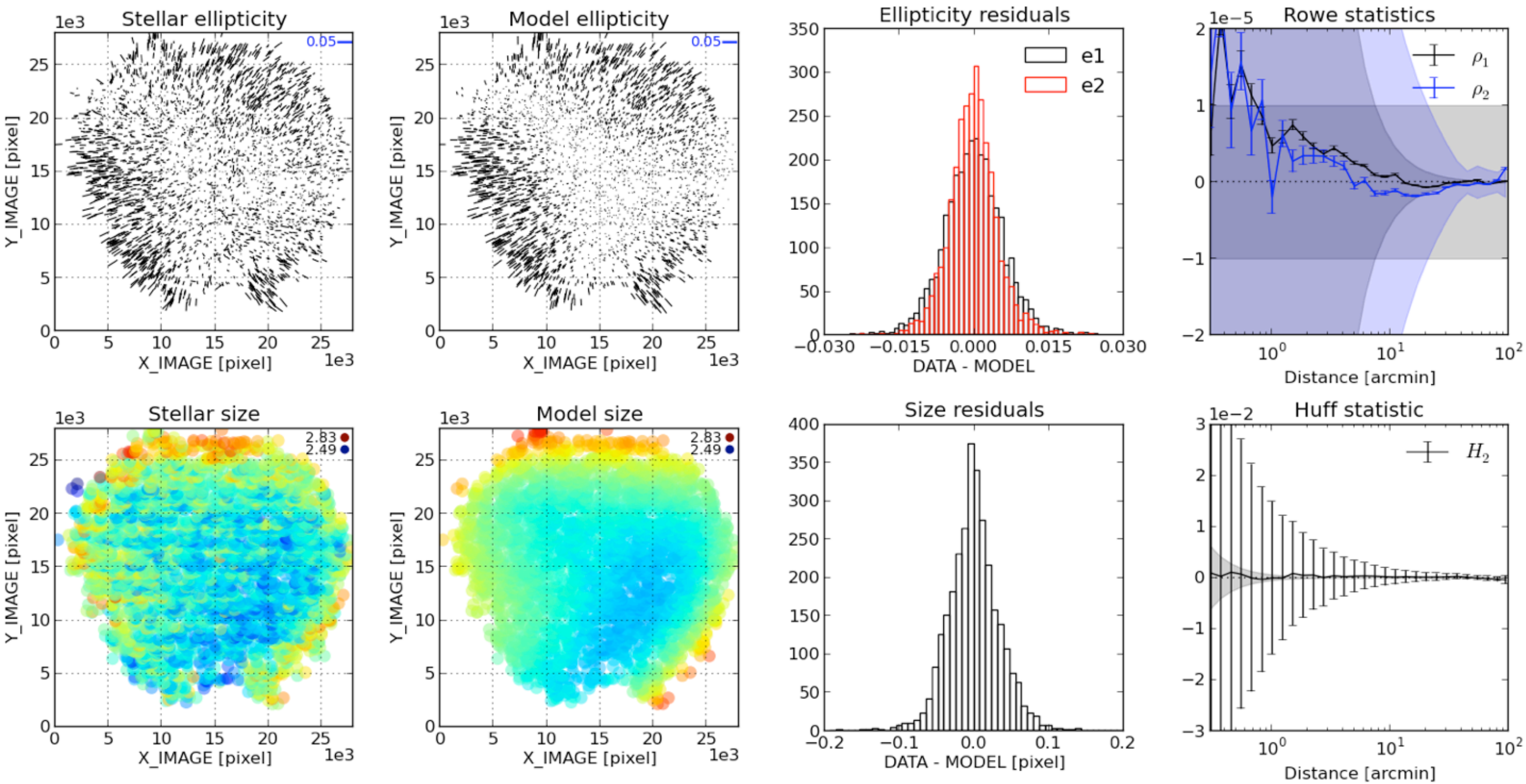
November 2012:

- early data affected by “guider jumps”
- tracking performance not as desired

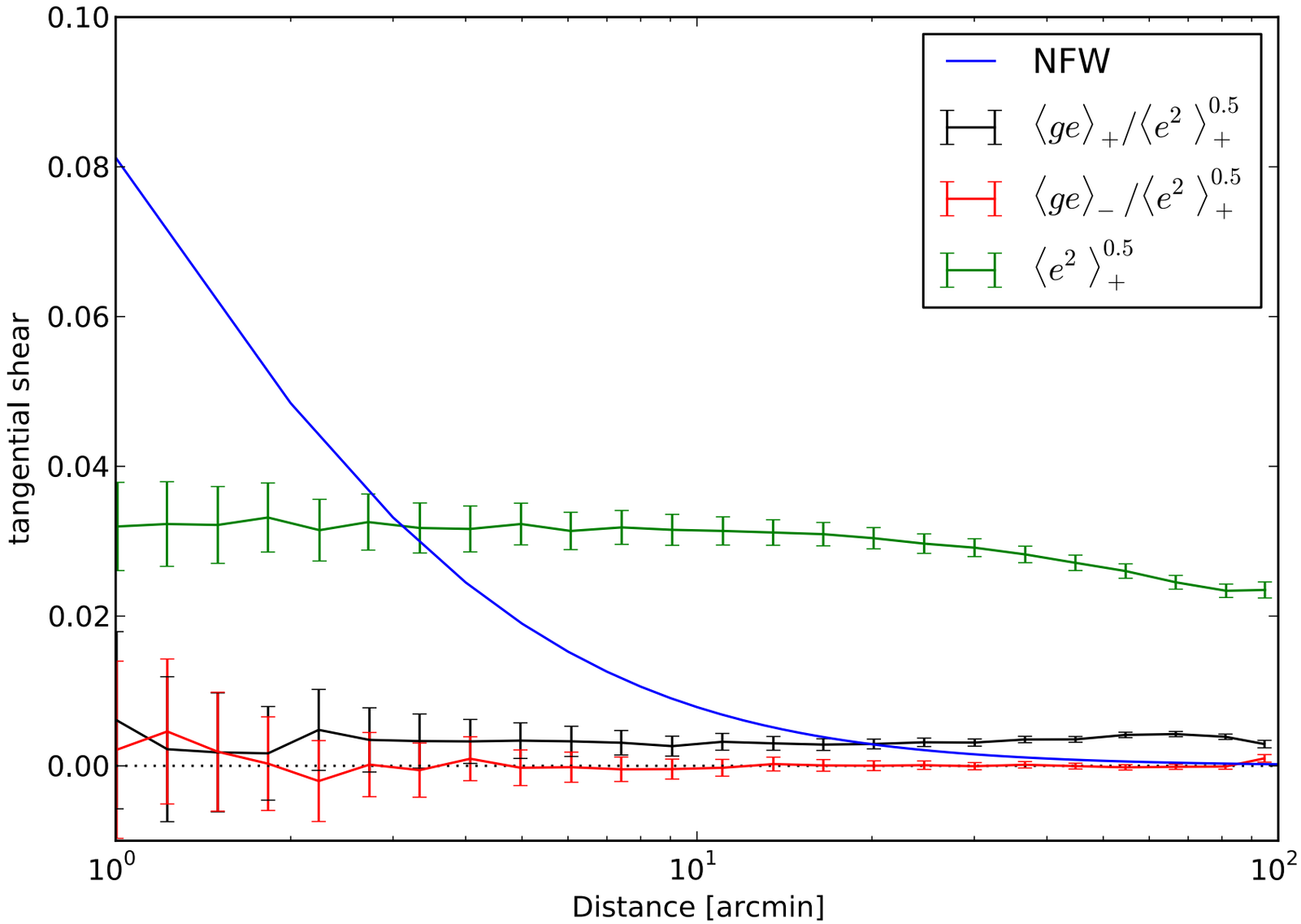
December 2012:

clearly improved image quality

PSF modeling

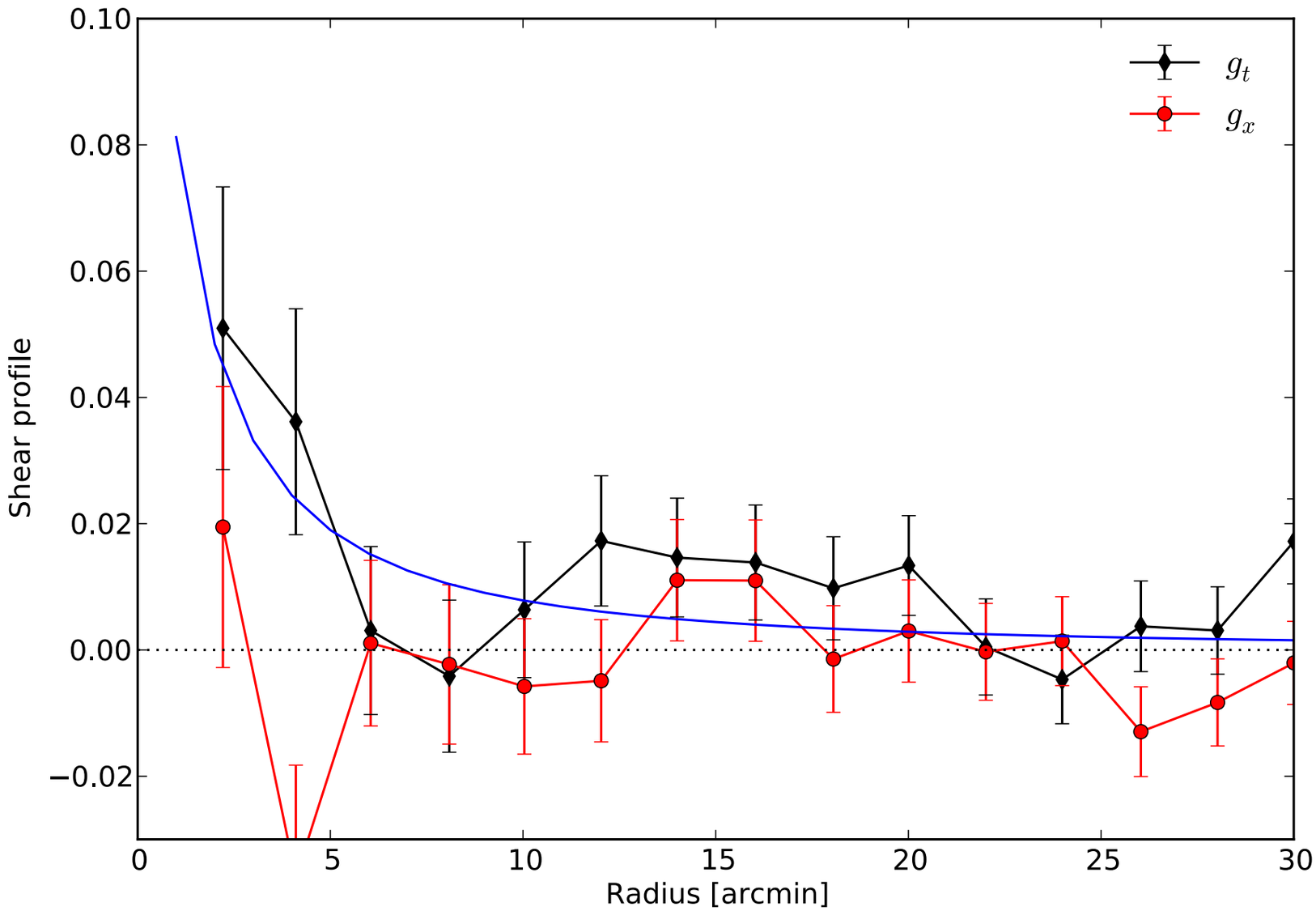


Star-galaxy correlation function



- KSB
- shapelet
- DEIMOS
- im3shape

Shape catalogs

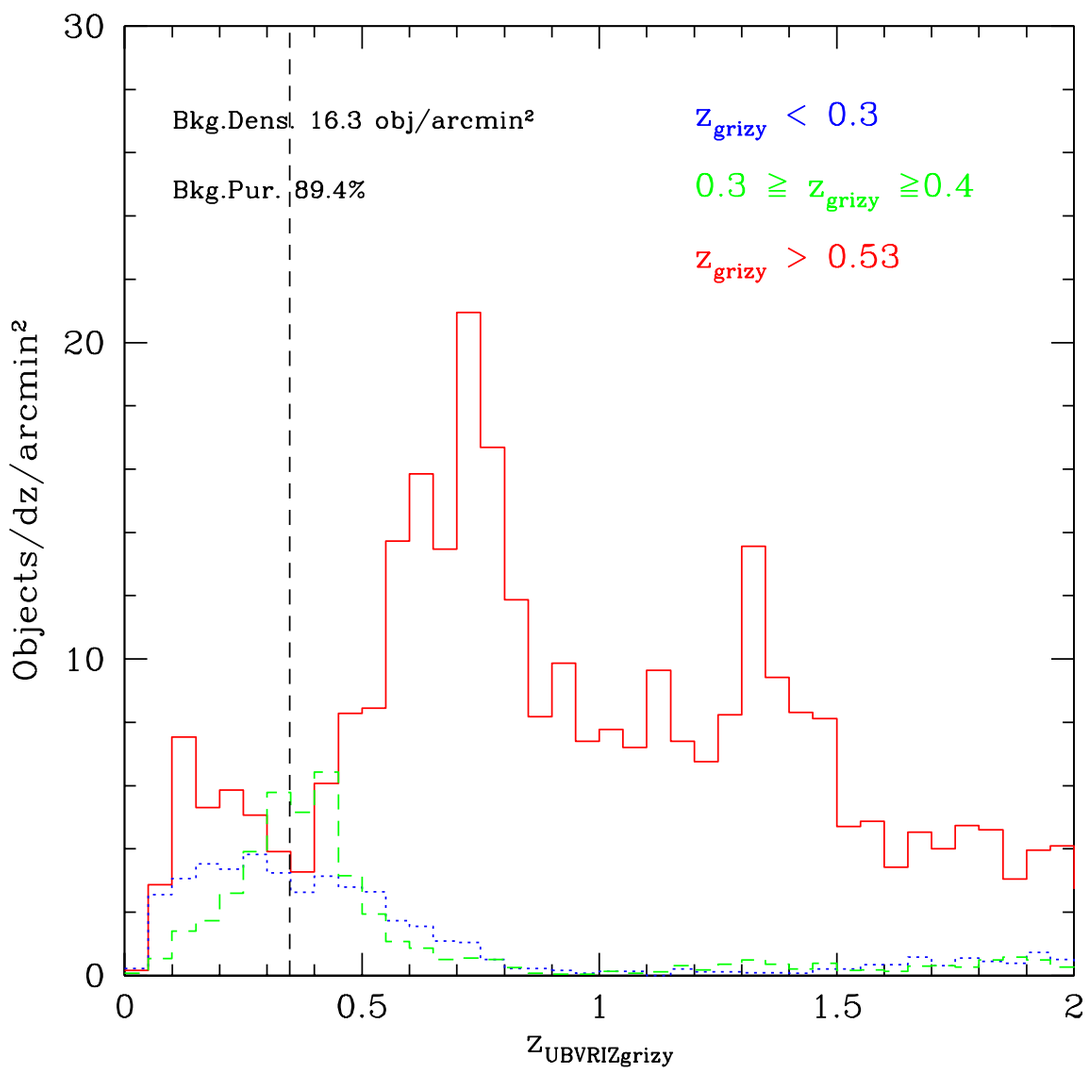


- KSB
- shapelet
- DEIMOS
- im3shape

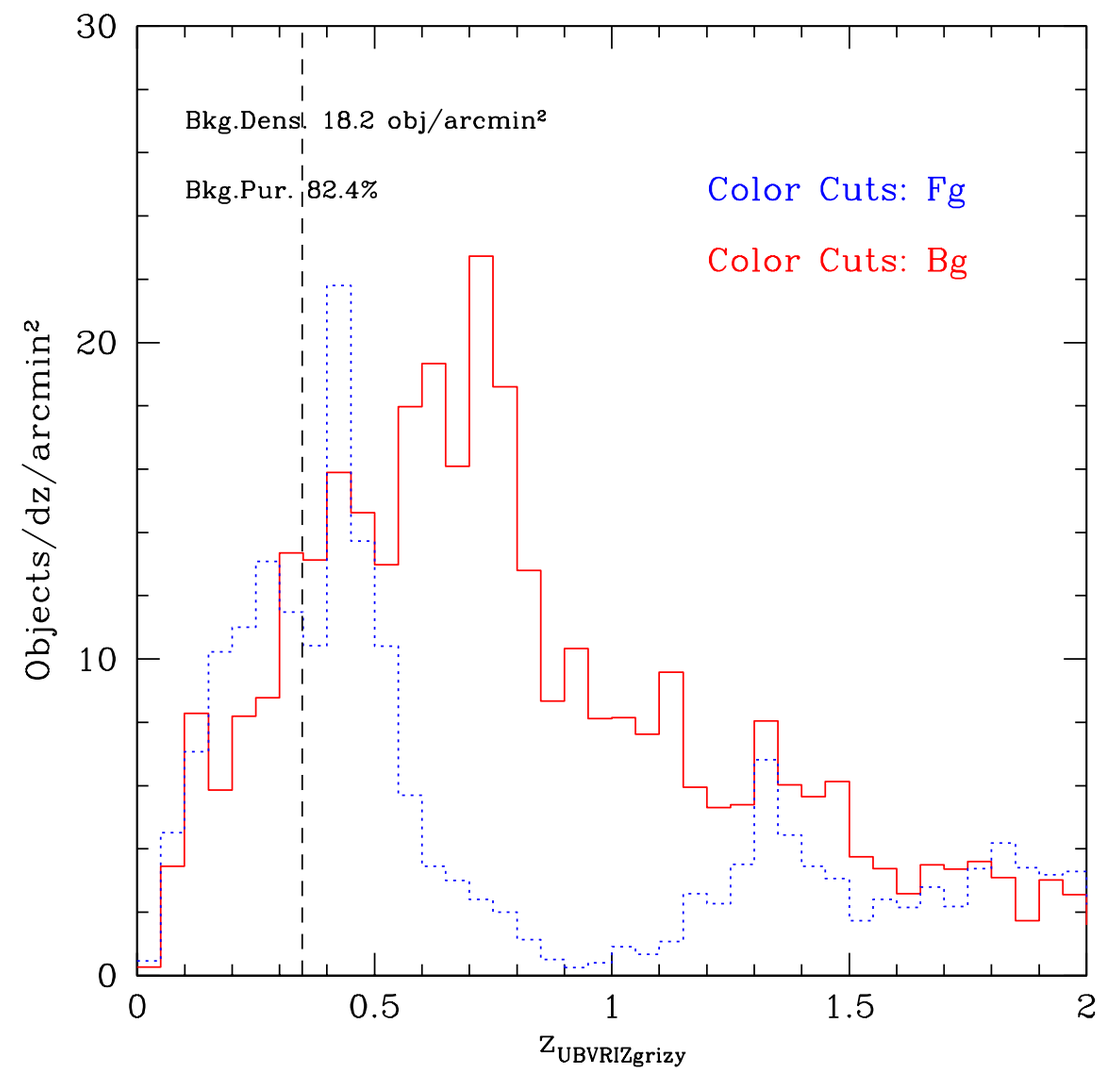
n_gal ~ 15/sq. arcmin

Photometric catalogs

Foreground / Background selection based on color cuts and photo-zs



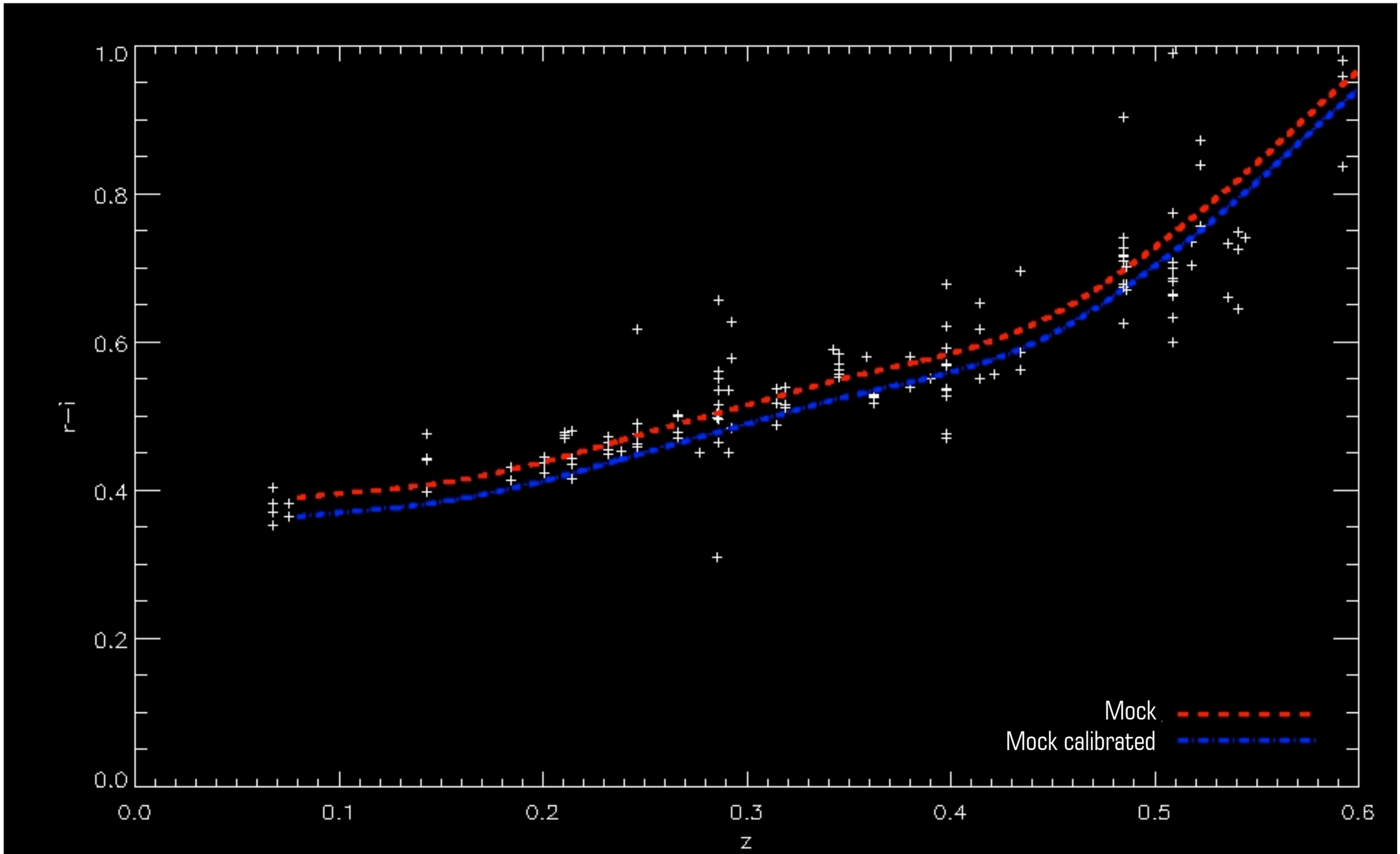
DES photo-z selection



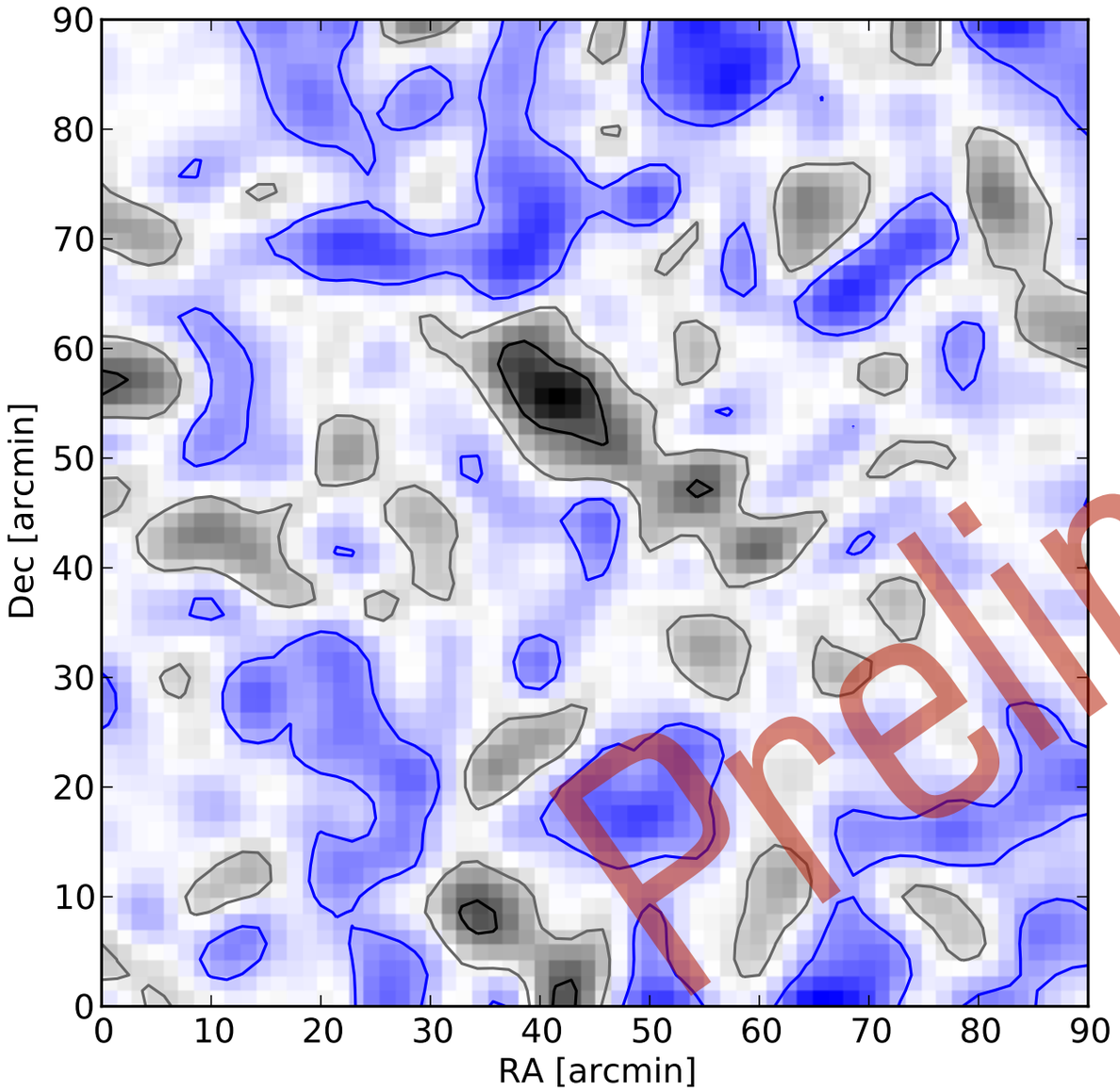
color-cut selection

Cluster member selection

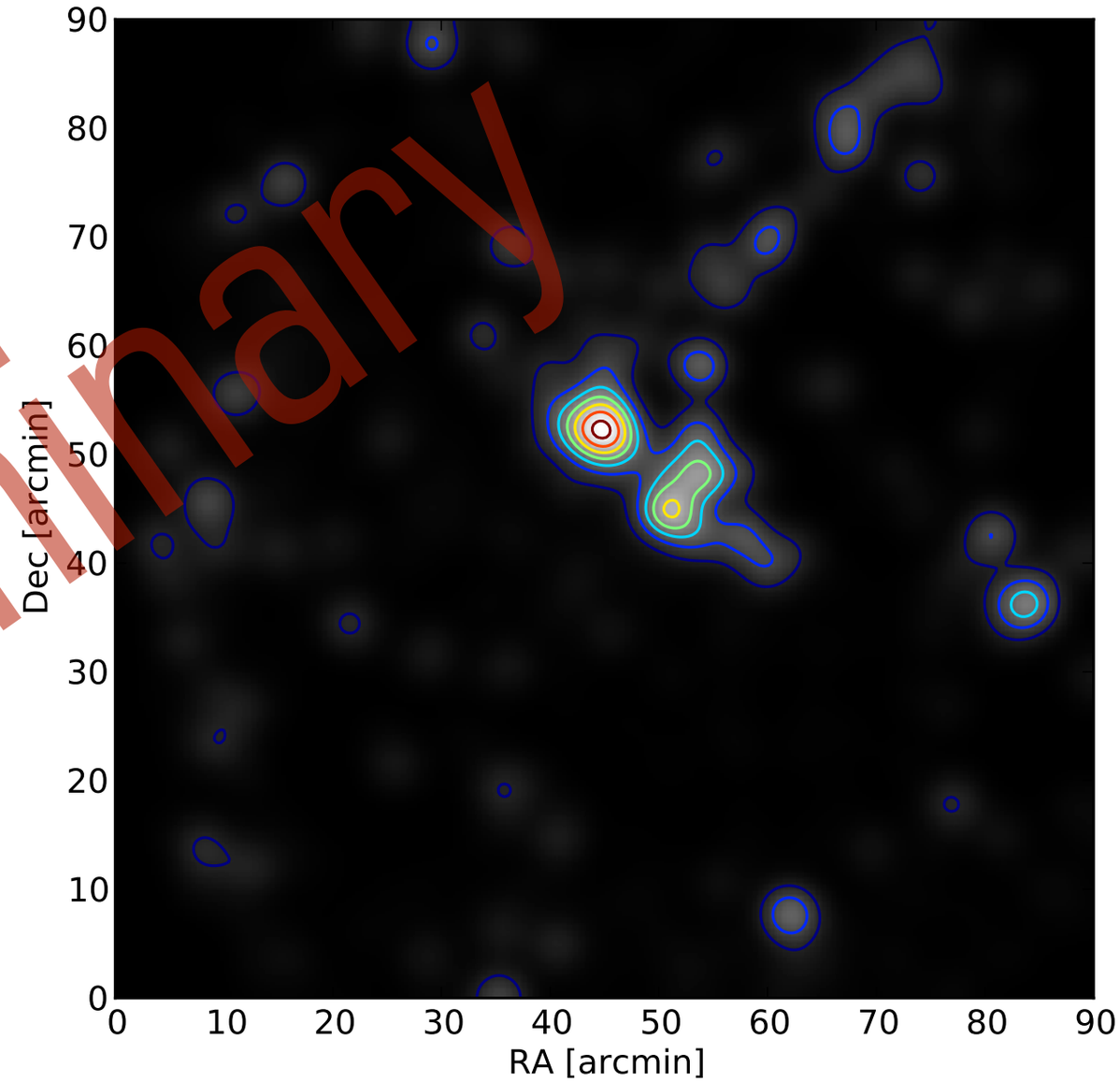
based on color cuts and redMaPPer



Mass & light maps



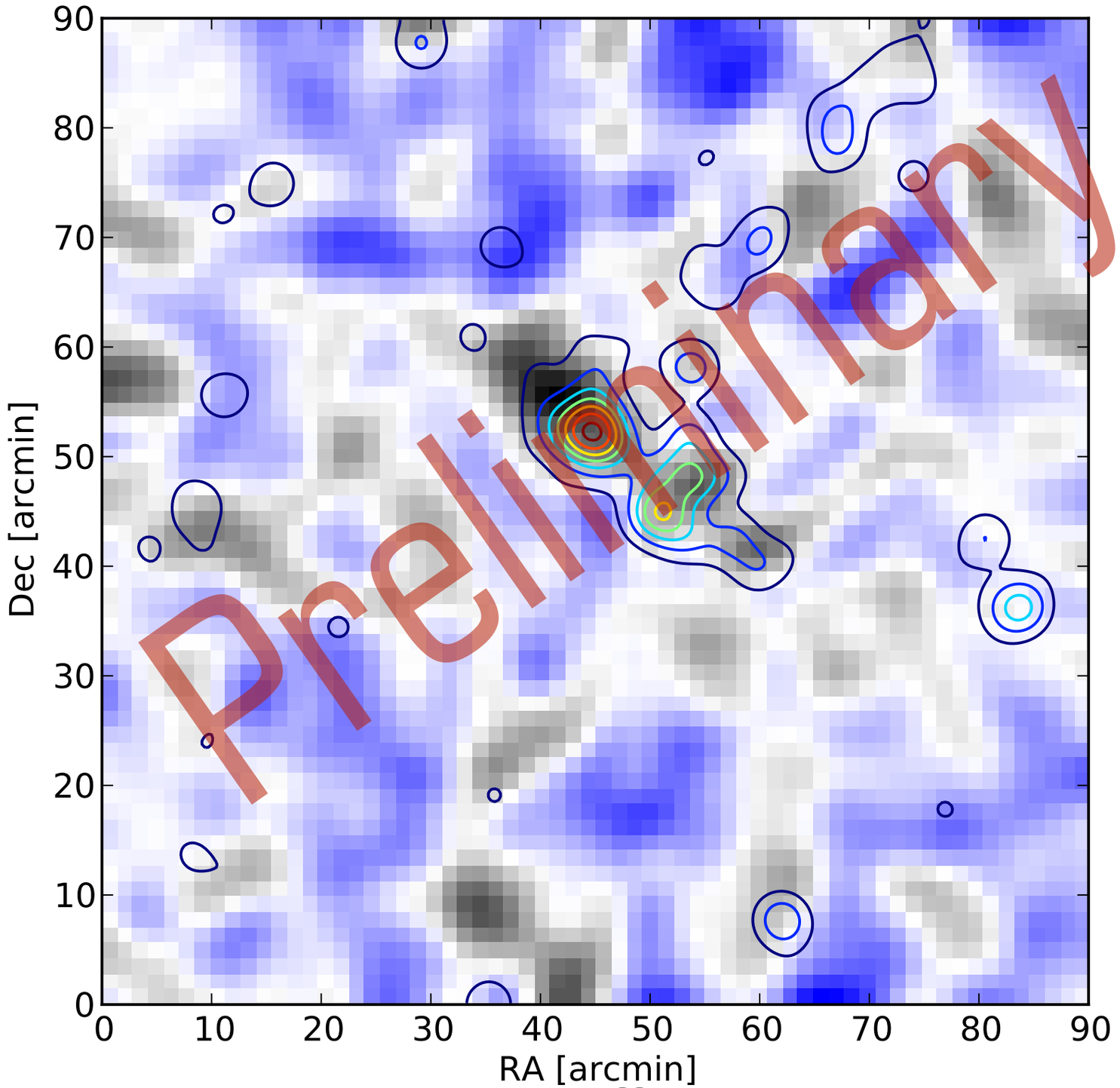
WL mass reconstruction



redMaPPer galaxy distribution at z=0.35

Preliminary

Mass & light maps



Outlook

DARK ENERGY SURVEY

- Analysis soon completed on 5 cluster fields: 2.3 sq. degrees each
  - $M_{200} = 4 \cdot 10^{14} \ldots 2 \cdot 10^{15}\ M_{solar}$
  - Redshifts $z = 0.3 \ldots 0.9$
- Investigation on mass-light connection in cluster environments

- Tricky issues
  - careful treatment of bright cluster galaxies and diffuse cluster light
  - (faint) cluster member contamination