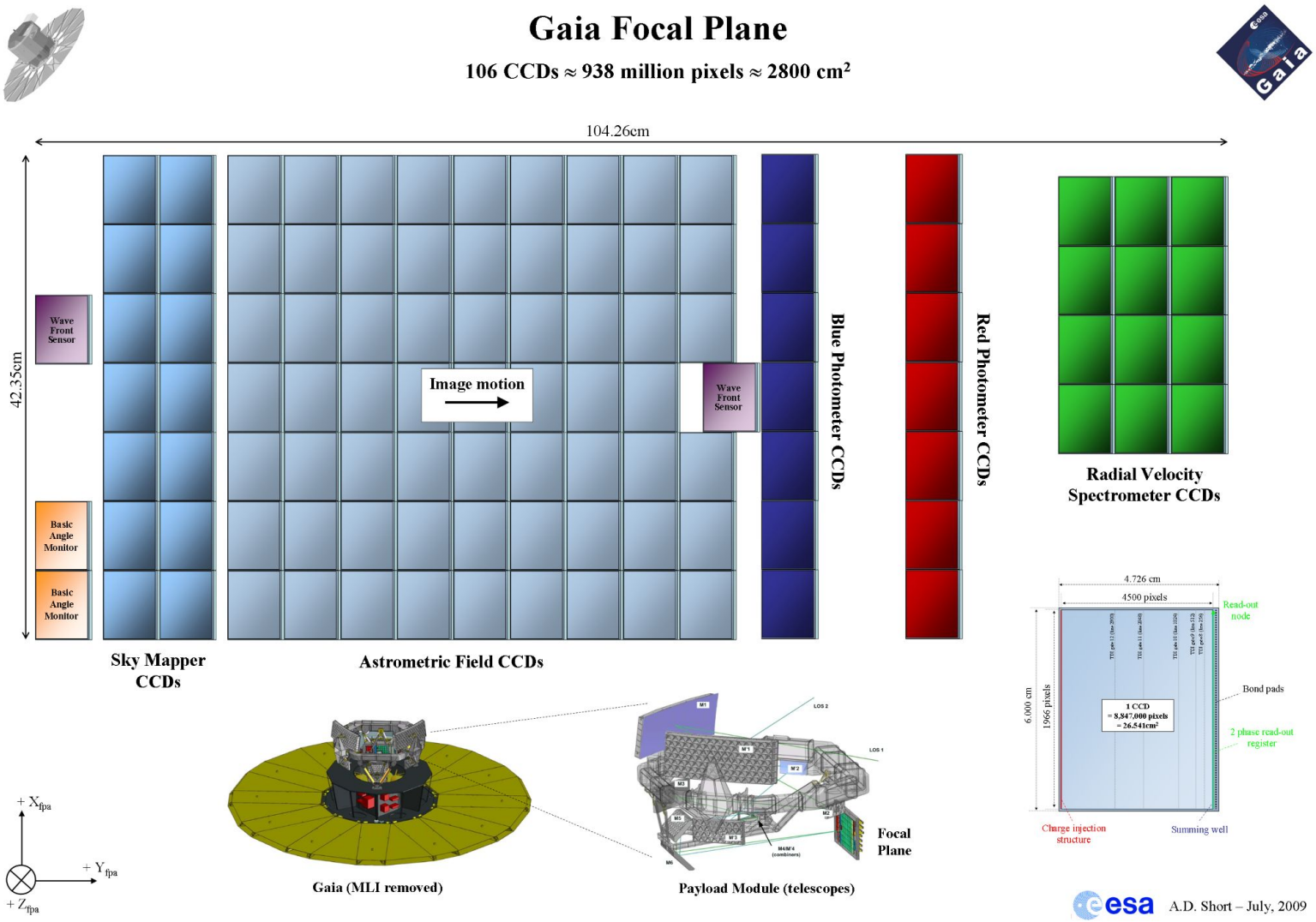
The SIF-Gaia data from engineering images taken in the omega Centauri region, and future data

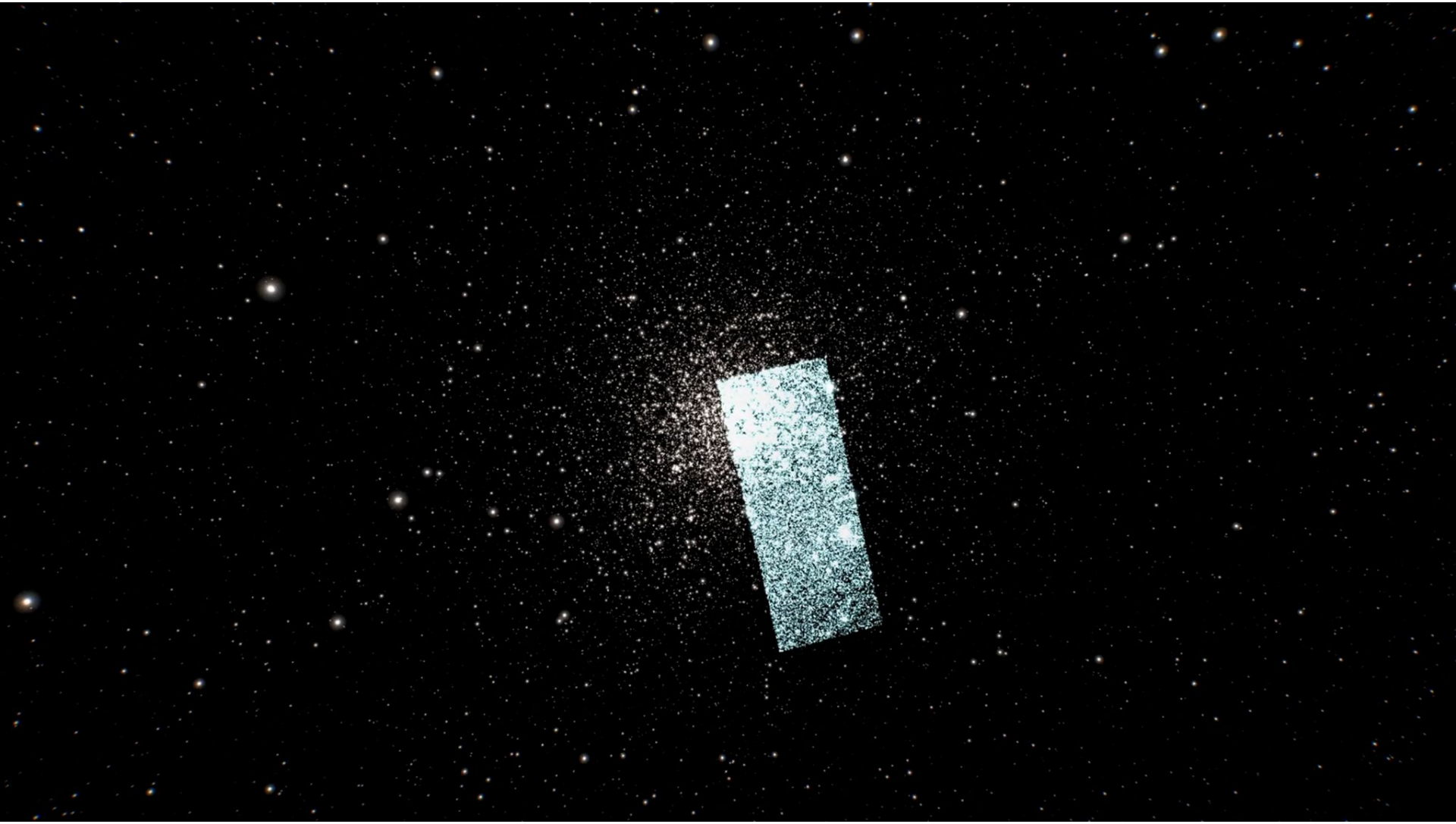
Ferran Torra
(Univ. Barcelona / ICCUB-IEEC)
on behalf of Gaia-Barcelona team

Finançat per
Unió Europea
Fons Europeu
Next Generation
GOBIERNO DE ESPAÑA
Plan de Recuperación, Transformación y Resiliencia
Next Generation Catalunya
Generalitat de Catalunya

Nominal Gaia images



Sky Mapper - Engineering Images



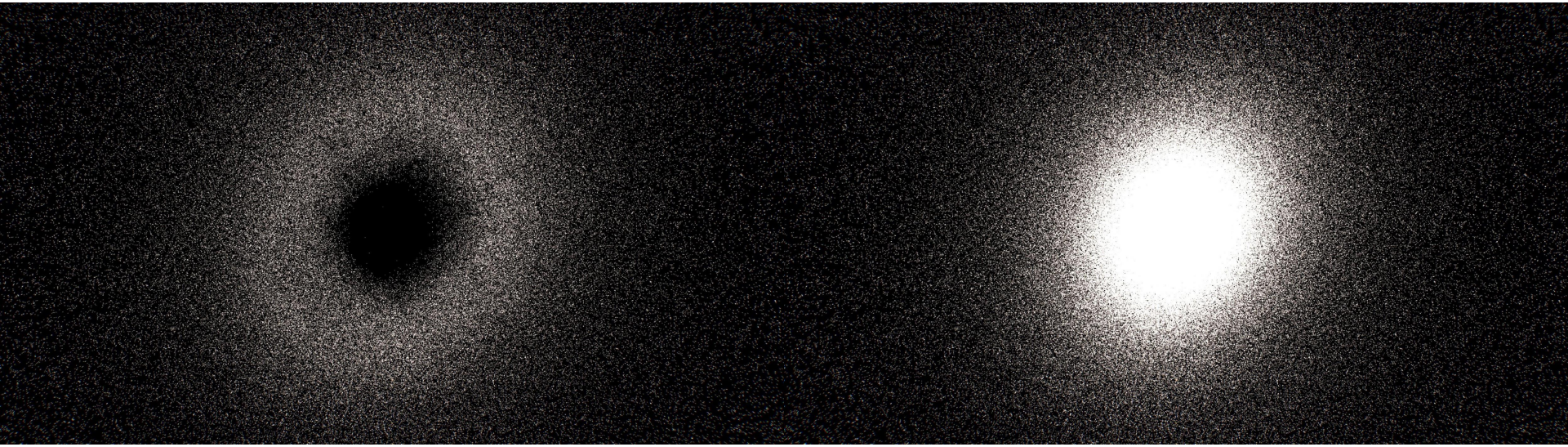
Service Interface Function image analysis

Data: Faint stars in omega Centauri

- 526.587 new Gaia sources
- Spatial resolution of 200 mas

Used 66 months of data — Complimentary to Gaia DR3

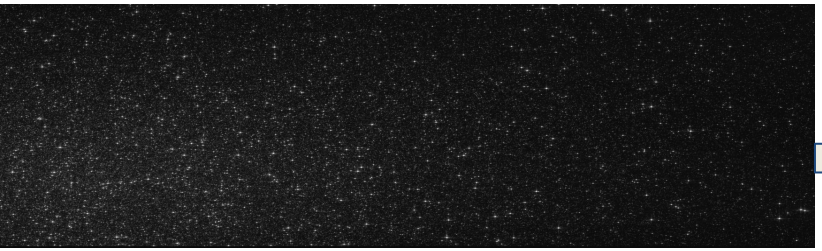
No mixing of standard and SIF CF observations — No* duplication of Gaia DR3 sources

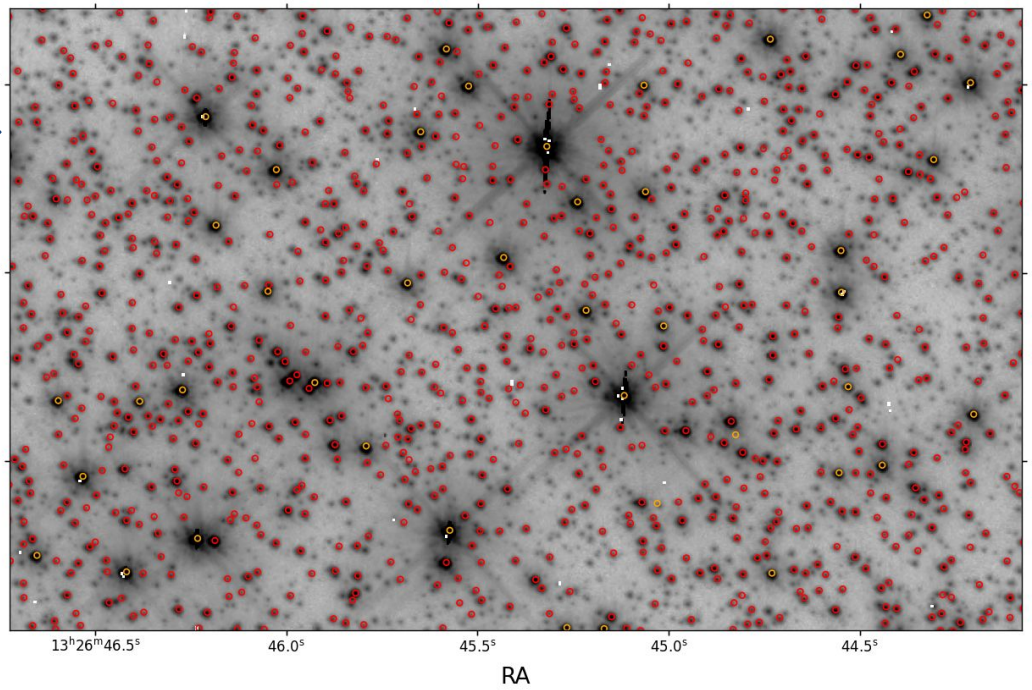


Gaia DR3 sources (Limitations: ~ 1,000,000 objects per deg2)

Gaia SIF CF sources in Omega Centuari

Major Differences to Nominal Gaia Data





Negative

- SIF images are binned 2x2 pixels
- Calibrations suboptimal for SM
- No colour information

Positive

- Detections and PSF fitting are iterated
- 2D Background
- Varying fit window size and position dependent on detected flux

New XM observations criteria

Updated XM parameters and calibrated based on reference HST catalogue

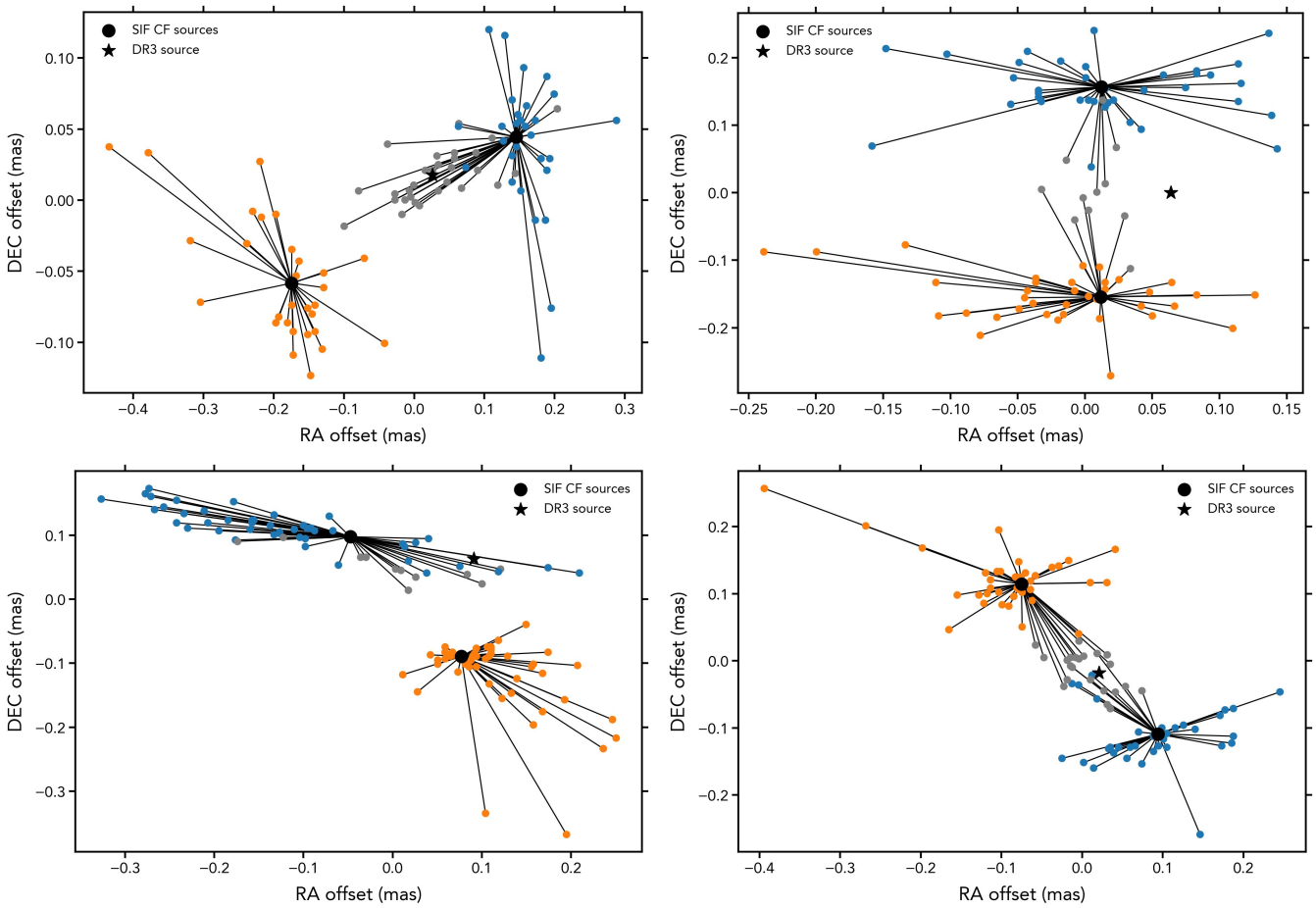
Filters (discarded sources after observation clustering)

- Number of observations < 11 observations
- Observation fraction < 50%
- Positional uncertainty > 100 mas
- Within 160 mas of a brighter star

- Discarded deteccions with less than 50 counts (fainter than mag 22.5)

- → Updated the cluster-source module in XM to avoid merge-split sources and assign 1to1 Gaia DR3 source to SIF CF source (by distance criterion)
  No mixing of standard and SIF CF observations — No* duplication of Gaia DR3 sources

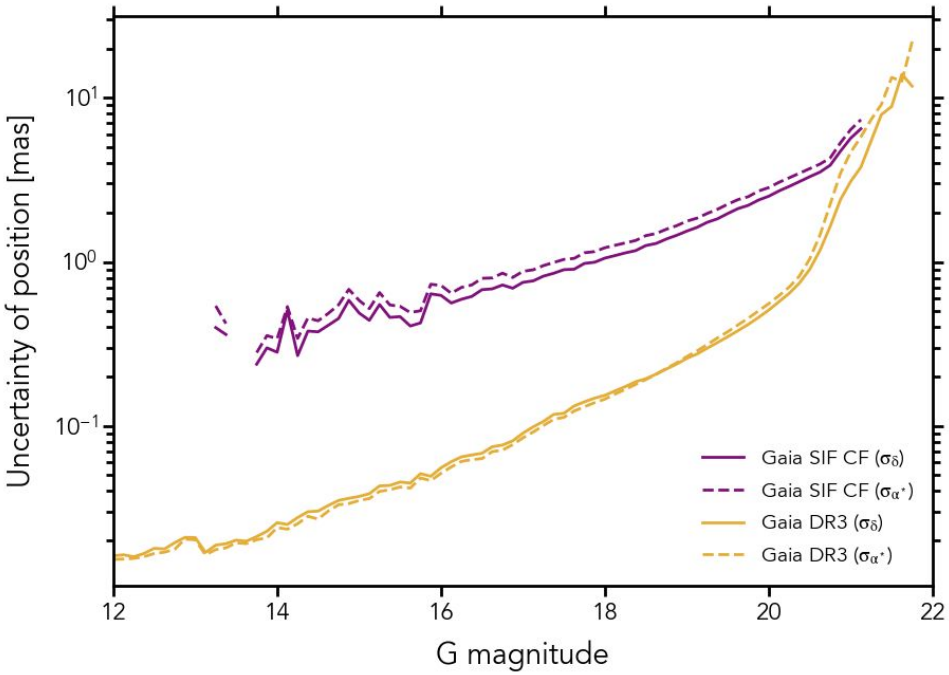
Matches with Gaia DR3 sources



- 347 matched sources within 160mas are actually resolved blended sources in SIF CF
- 1 of both SIF sources is assigned to the Gaia DR3 sources (the bright one), the other is considered a new SIF CF source

Uncertainties

Uncertainties an order of magnitude larger than Gaia DR3



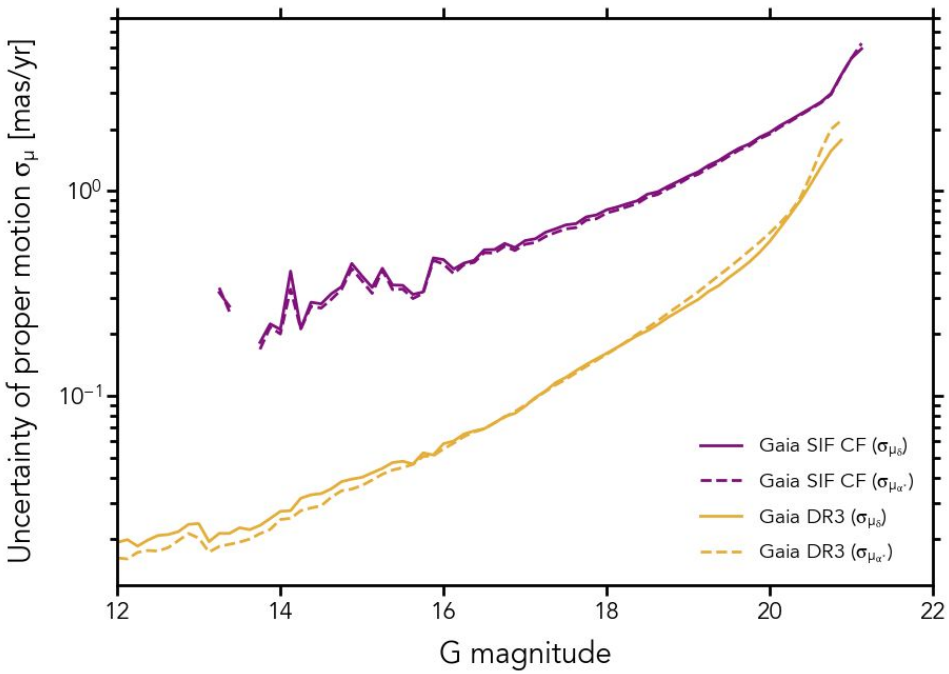
Median positional uncertainty

3.03 mas in RA

2.69 mas in Dec

Uncertainties

Uncertainties an order of magnitude larger than Gaia DR3



Median positional uncertainty

3.03 mas in RA

2.69 mas in Dec

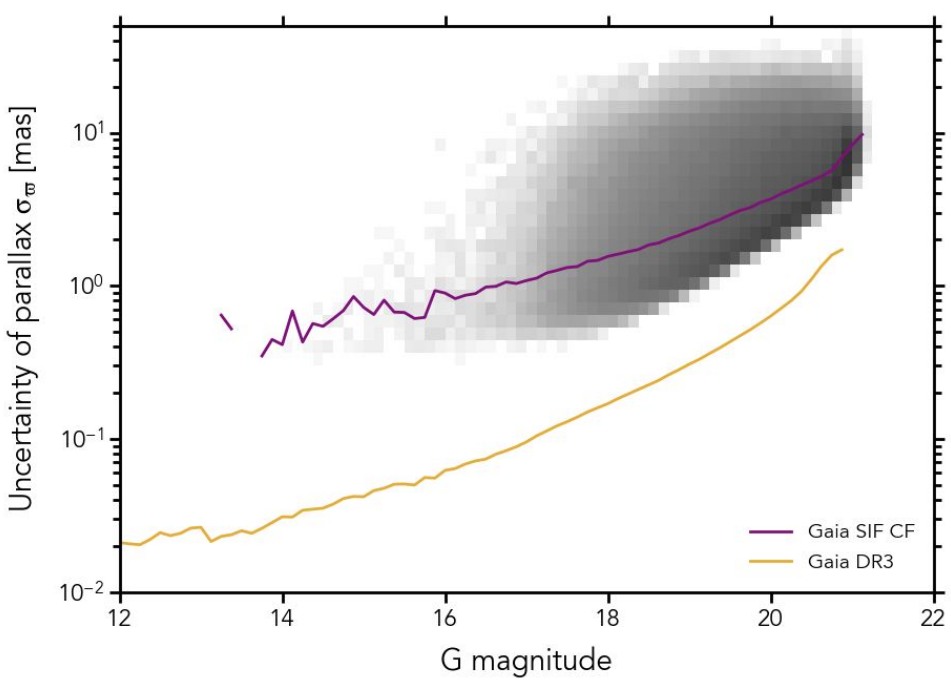
Median proper motion uncertainty

2.02 mas/year in RA

2.06 mas/year in Dec

Uncertainties

Uncertainties an order of magnitude larger than Gaia DR3



Median positional uncertainty

3.03 mas in RA

2.69 mas in Dec

Median proper motion uncertainty

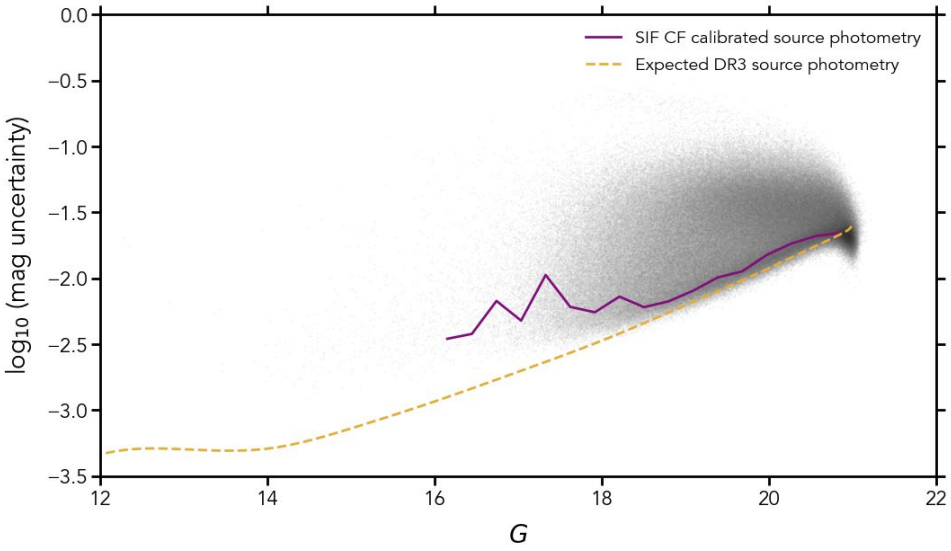
2.02 mas/year in RA

2.06 mas/year in Dec

Median parallax uncertainty

3.95 mas

Uncertainties



Uncertainties an order of magnitude larger than Gaia DR3

Median positional uncertainty

3.03 mas in RA

2.69 mas in Dec

Median proper motion uncertainty

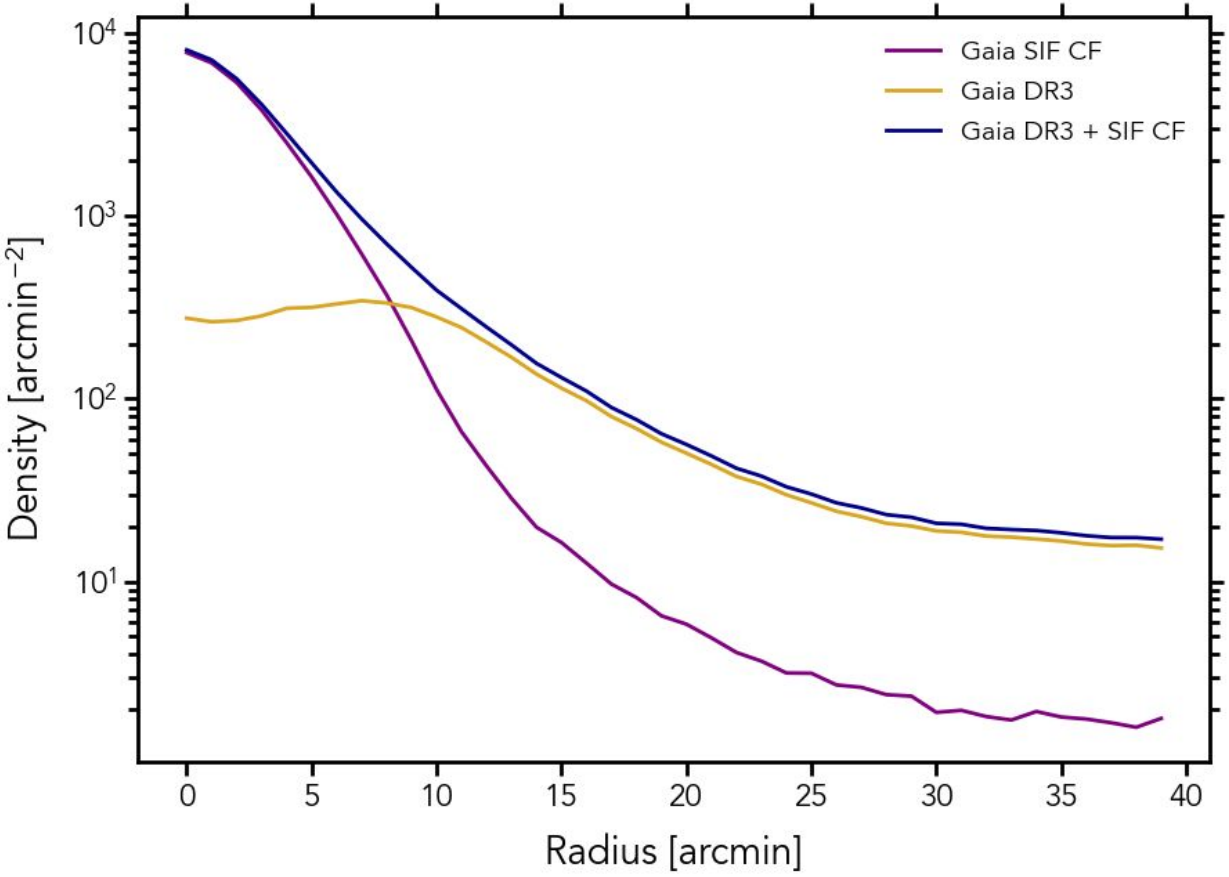
2.02 mas/year in RA

2.06 mas/year in Dec

Median parallax uncertainty

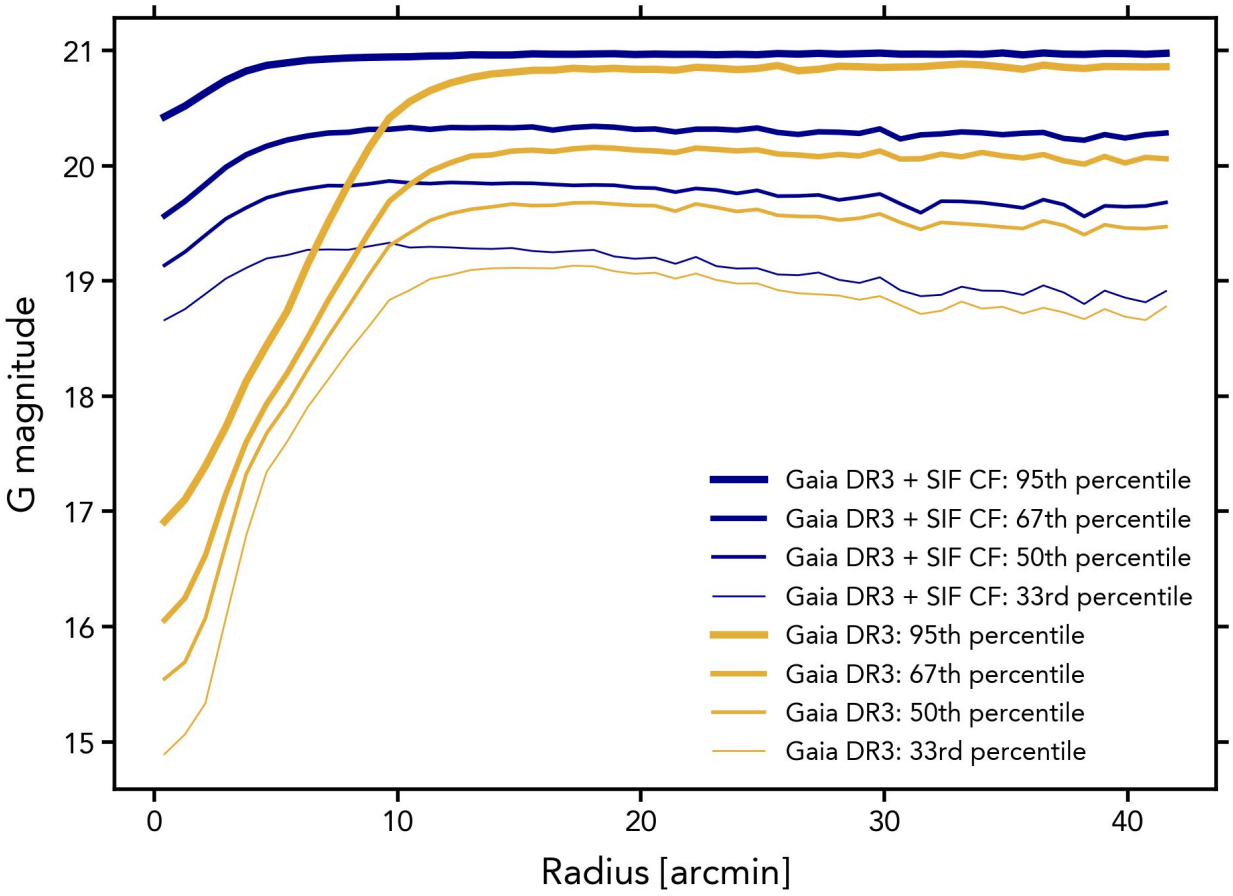
3.95 mas

Source Density



- Below 12′
  SIF CF sources contribute to the combined cataloge
- Below 9′
  SIF CF sources dominate the combined catalogue
- In the centre SIF CF finds 10x more sources than DR3

Source Density



- Below 12′
  SIF CF sources contribute to the combined cataloge
- Below 9′
  SIF CF sources dominate the combined catalogue
- In the centre SIF CF finds 10x more sources than DR3
- In Omega Centauri core the combined catalogue goes 3 mag deeper than DR3

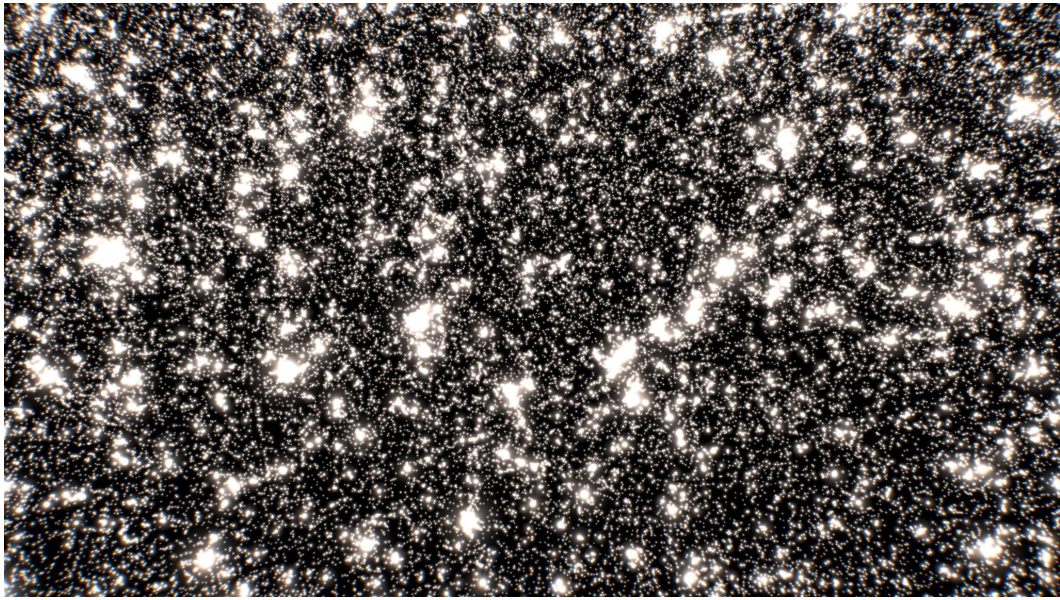
8 more fields to come

Globular Clusters

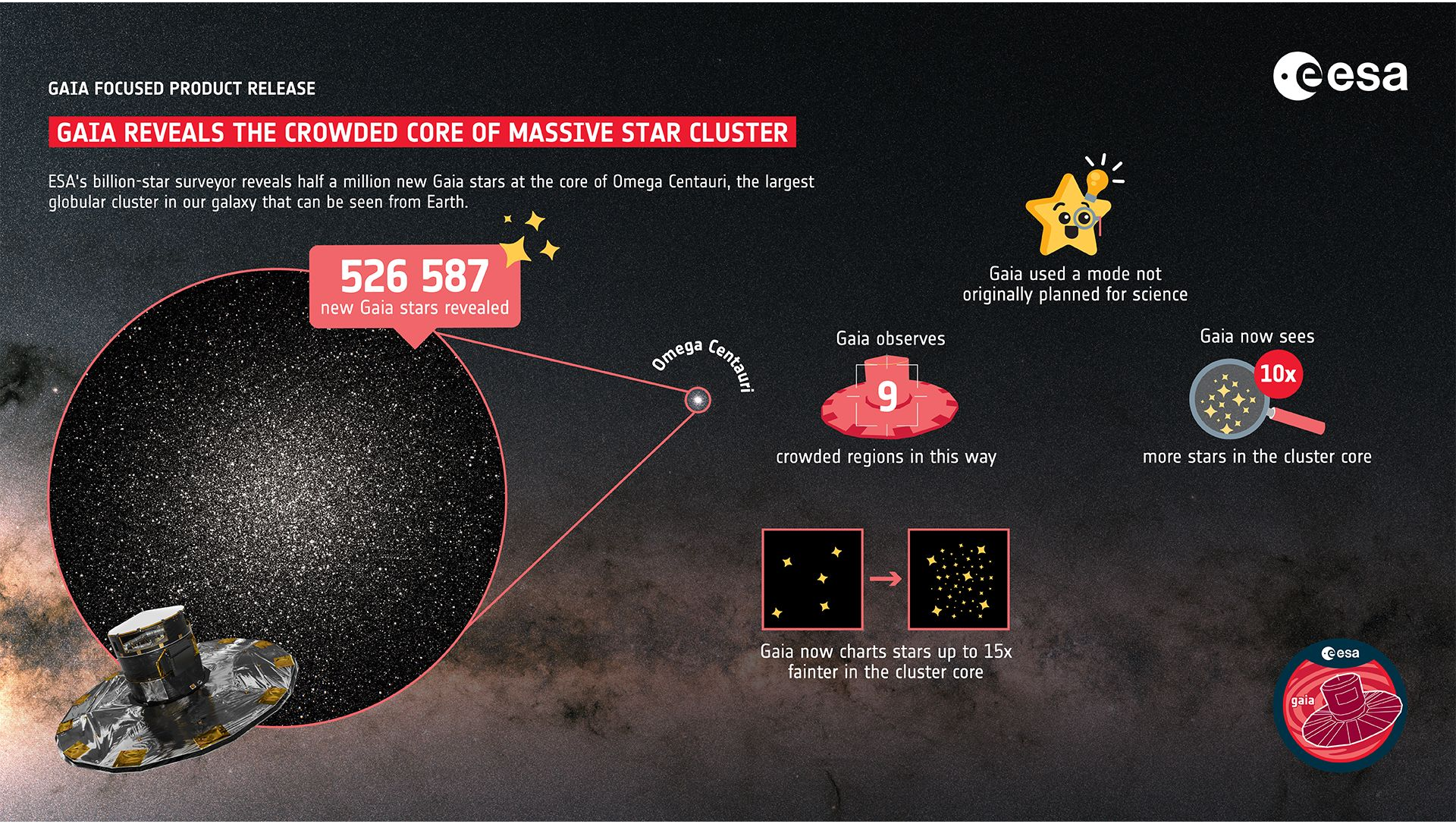
- NGC 5139 (Omega Cen, este FPR)
- NGC 104 (47 Tuc)
- NGC 6121 (M4)
- NGC 6656 (M22)
- NGC 4372

Other fields

- Large Magellanic Cloud
- Small Magellanic Cloud
- Baade's window
- Sagittarius I



- New treatments in Nominal data for Gaia DR4 as well


GAIA FOCUSED PRODUCT RELEASE
GAIA REVEALS THE CROWDED CORE OF MASSIVE STAR CLUSTER
ESA's billion-star surveyor reveals half a million new Gaia stars at the core of Omega Centauri, the largest globular cluster in our galaxy that can be seen from Earth.
526 587
new Gaia stars revealed
Omega Centauri
Gaia used a mode not originally planned for science
Gaia observes
9
crowded regions in this way
Gaia now sees
10x
more stars in the cluster core
Gaia now charts stars up to 15x fainter in the cluster core
esa
gaia