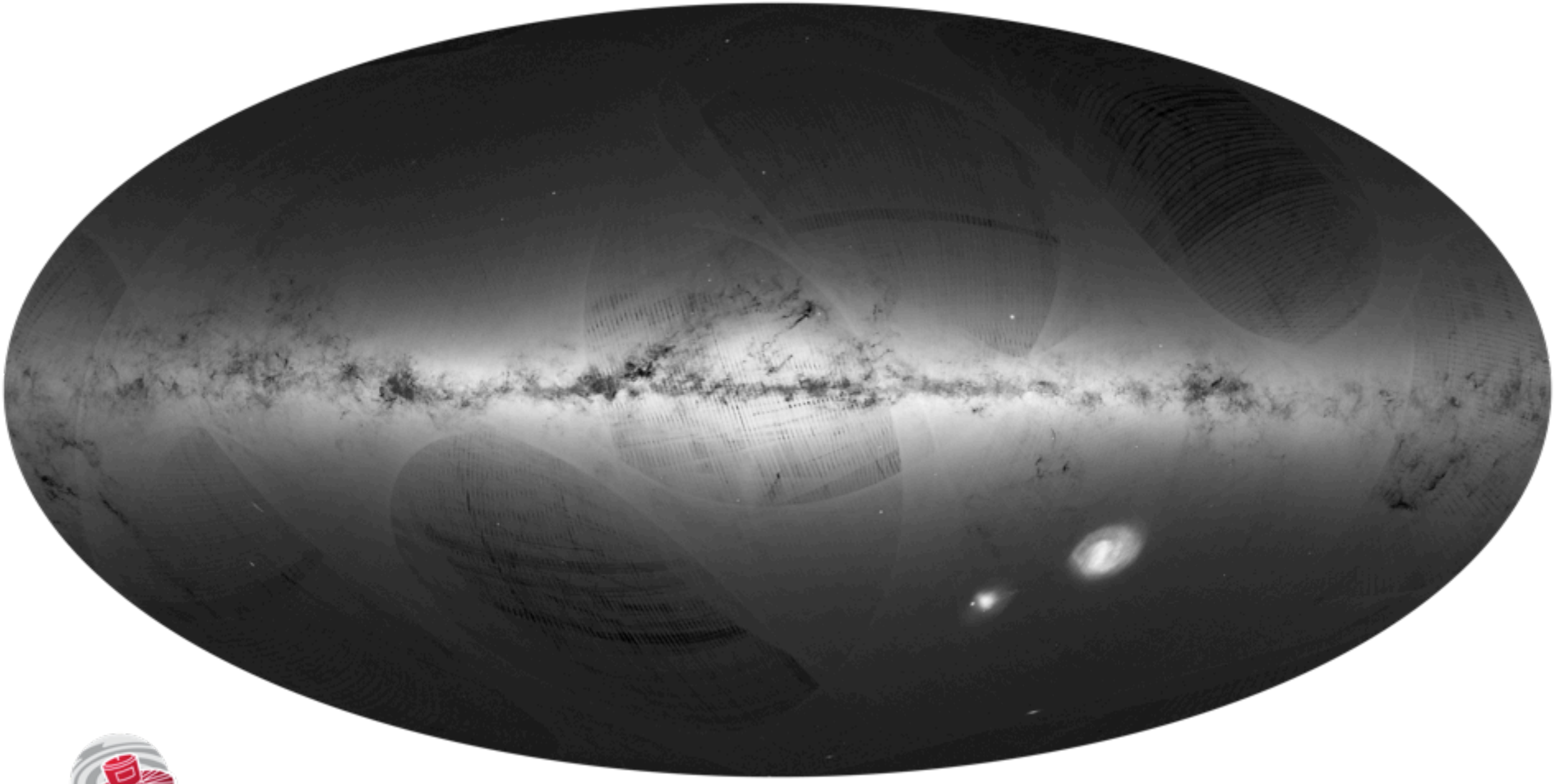
Gaia status

Jos de Bruijne

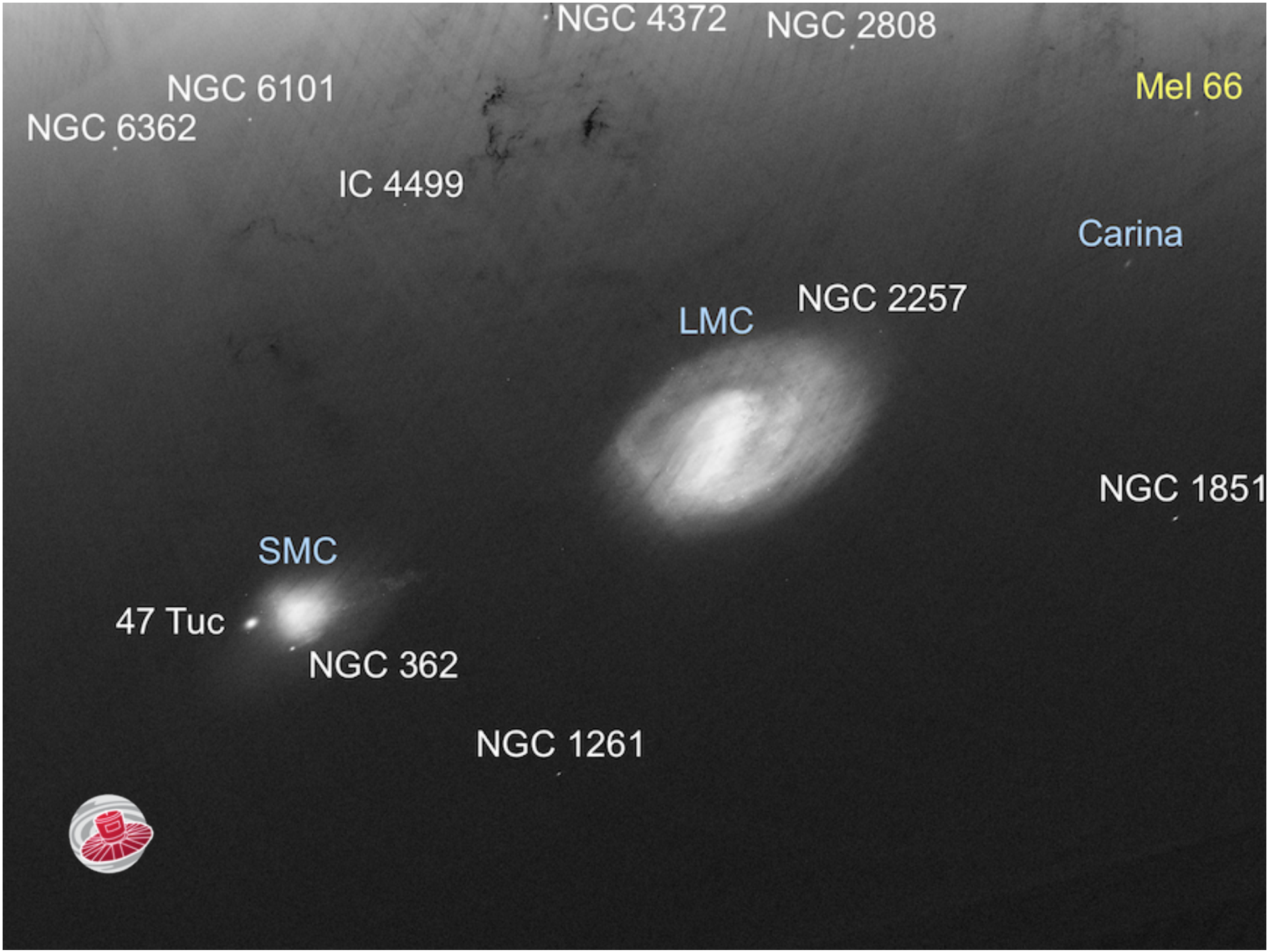
@Jos_de_Bruijne @ESAGaia #GaiaMission

Gaia Science Alerts #7, 7 December 2016, SRON Utrecht

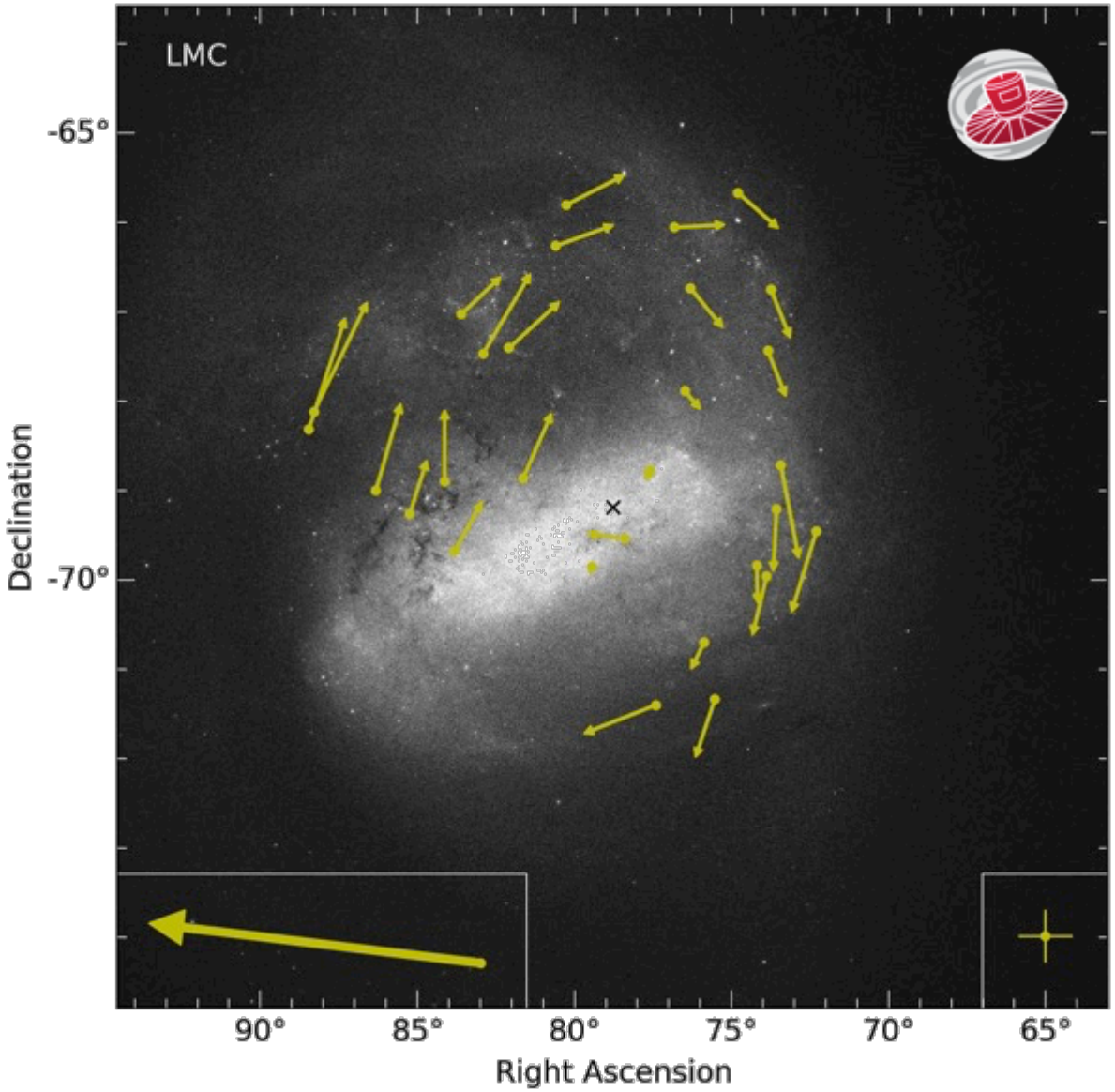
DR1: 15,000 queries over 24 hrs requested 20 TB



ESA/Gaia/DPAC

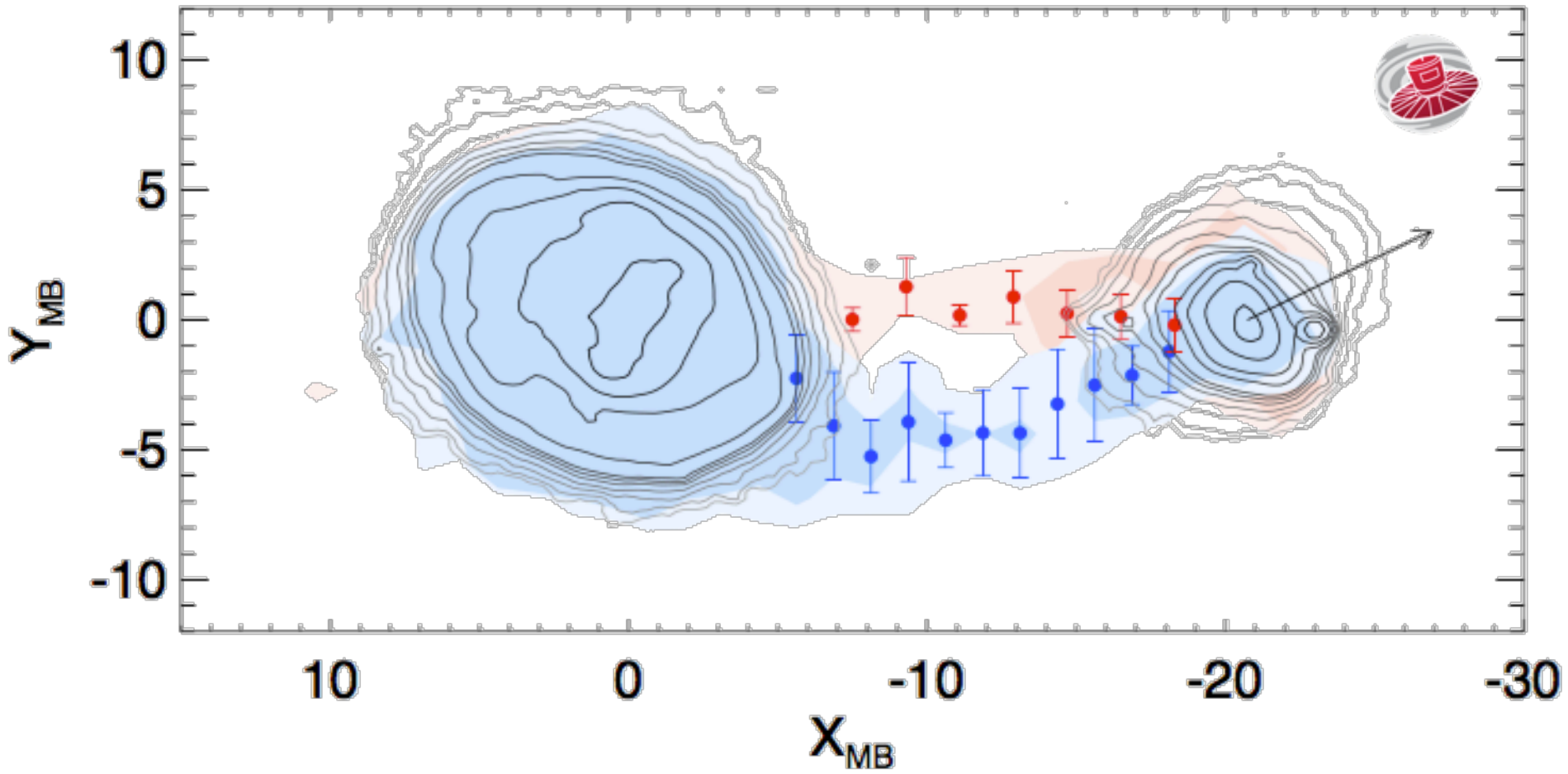

NGC 4372
NGC 2808
NGC 6101
Mel 66
NGC 6362
IC 4499
Carina
NGC 2257
LMC
NGC 1851
SMC
47 Tuc
NGC 362
NGC 1261

Rotation of the LMC seen with TGAS



van der Marel & Sahlmann, 2016, ApJL (arXiv:1609.04395)

RR Lyraes bridge the Magellanic Clouds



Find RR Lyrae variables from G magnitude errors!
Belokurov et al., 2016, MNRAS (arXiv:1611.04614v1)

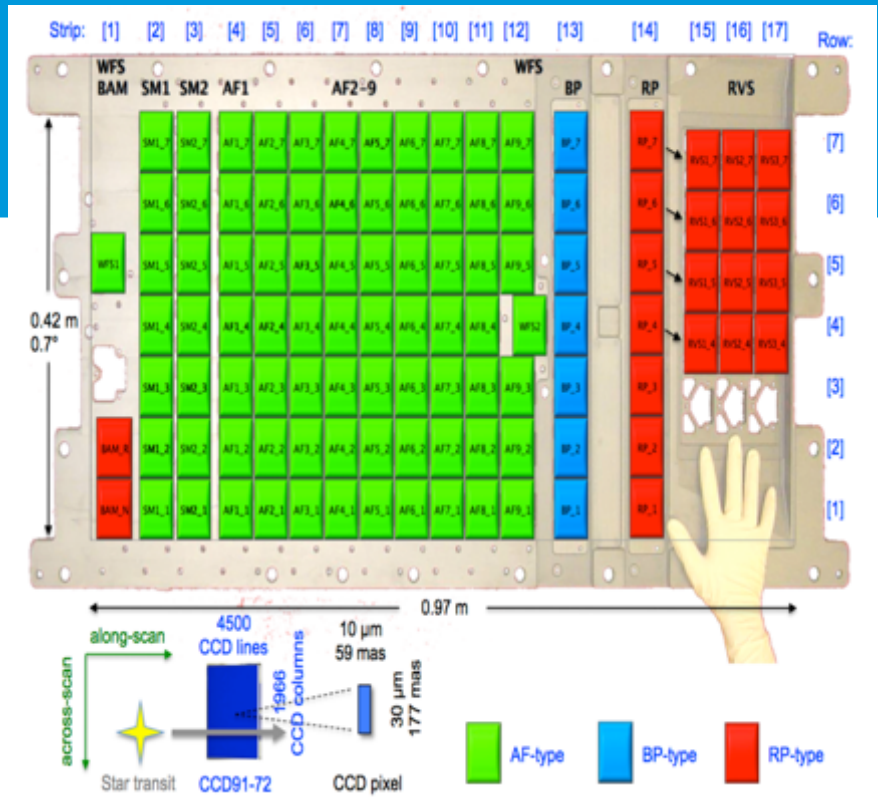
Gaia in one viewgraph

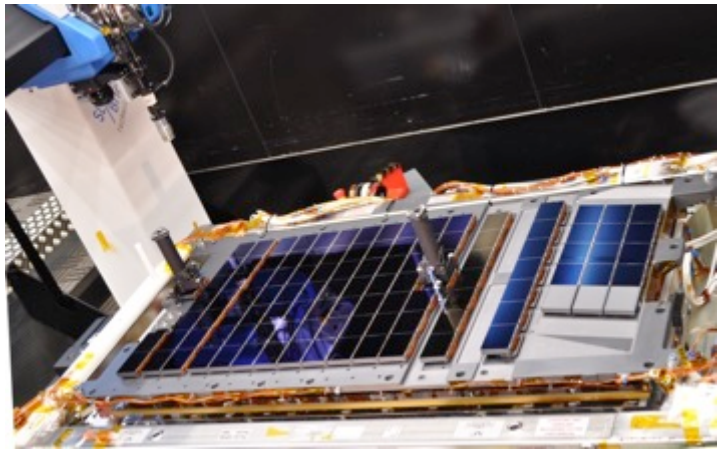
- Operations continue smoothly (since July 2014)
- 60,591,882,240 transits observed (status Monday lunch time)
- Ground-station bookings challenging for even years (Mars effect)
- Power, link, pointing, and propellant budgets are (very) healthy

- Nominal 5-year mission ends mid-2019
- Currently 866 days in routine phase (~48%)
- End-of-mission due to cold-gas exhaustion end-2023 (±1 year)
- Mission-extension process underway (looks promising)

Gaia astrometry

- Astrometric measurements: 545,326,956,544
- Bright limit G ~ 2–3 mag
- Faint limit G ~ 20.7 mag
- Selected crowded regions and all bright stars (G < 3 mag) imaged with Sky Mapper



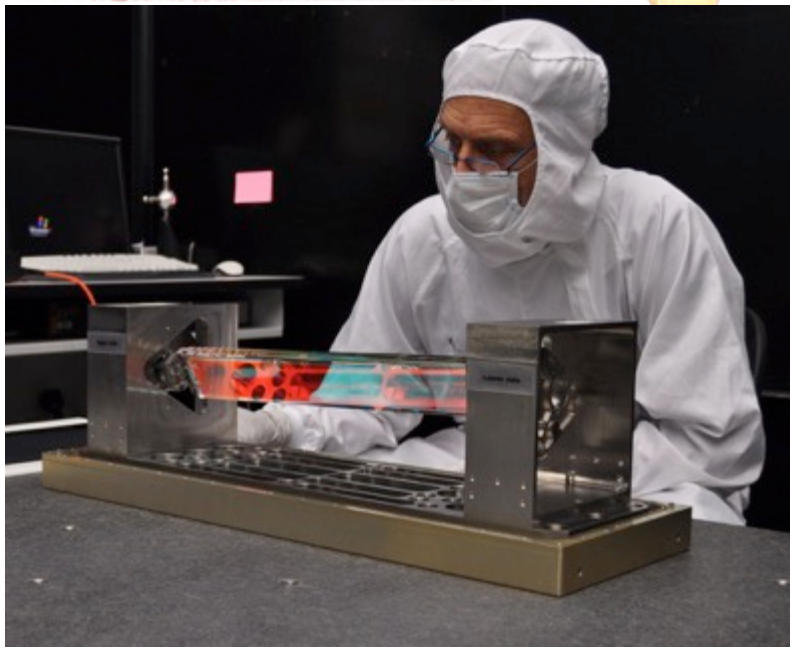


gaia European Space Agency

Figures courtesy ESA and Airbus D&S

Gaia photometry

- Photometric measurements: 130,432,811,008
- G band (with astrometry) plus low-resolution spectrophotom-etry for the same objects:
  - BP: 330–680 nm
  - RP: 640–1050 nm

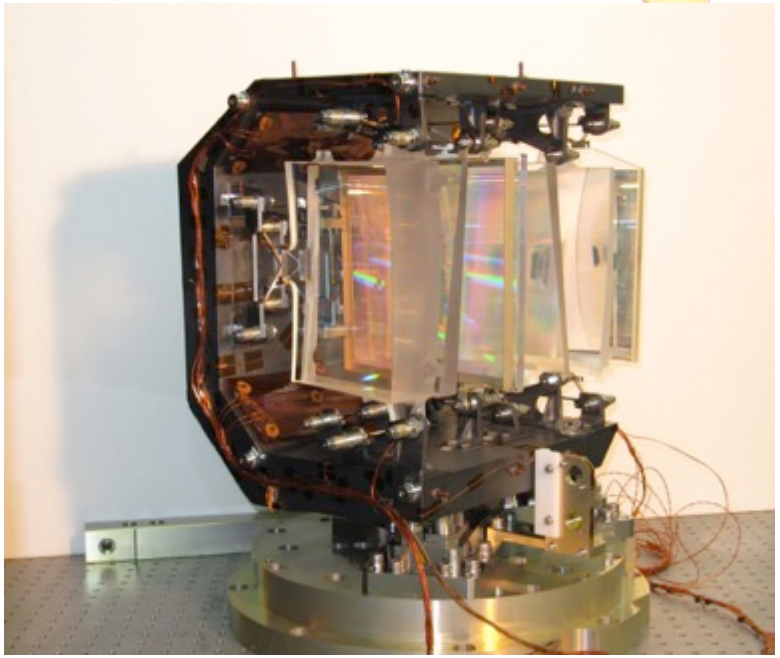


gaia European Space Agency

Figures courtesy ESA and Airbus D&S

Gaia spectroscopy

- Spectroscopic measurements: 11,434,727,424
- 845–872 nm with R ~ 11,700
- Bright limit G ~ 2–3 mag
- Faint limit G_{RVS} ~ 16.2 mag
- Faint: mission-average radial velocities only (~150 million objects)
- Bright: transit spectroscopy and radial velocities (few million objects)

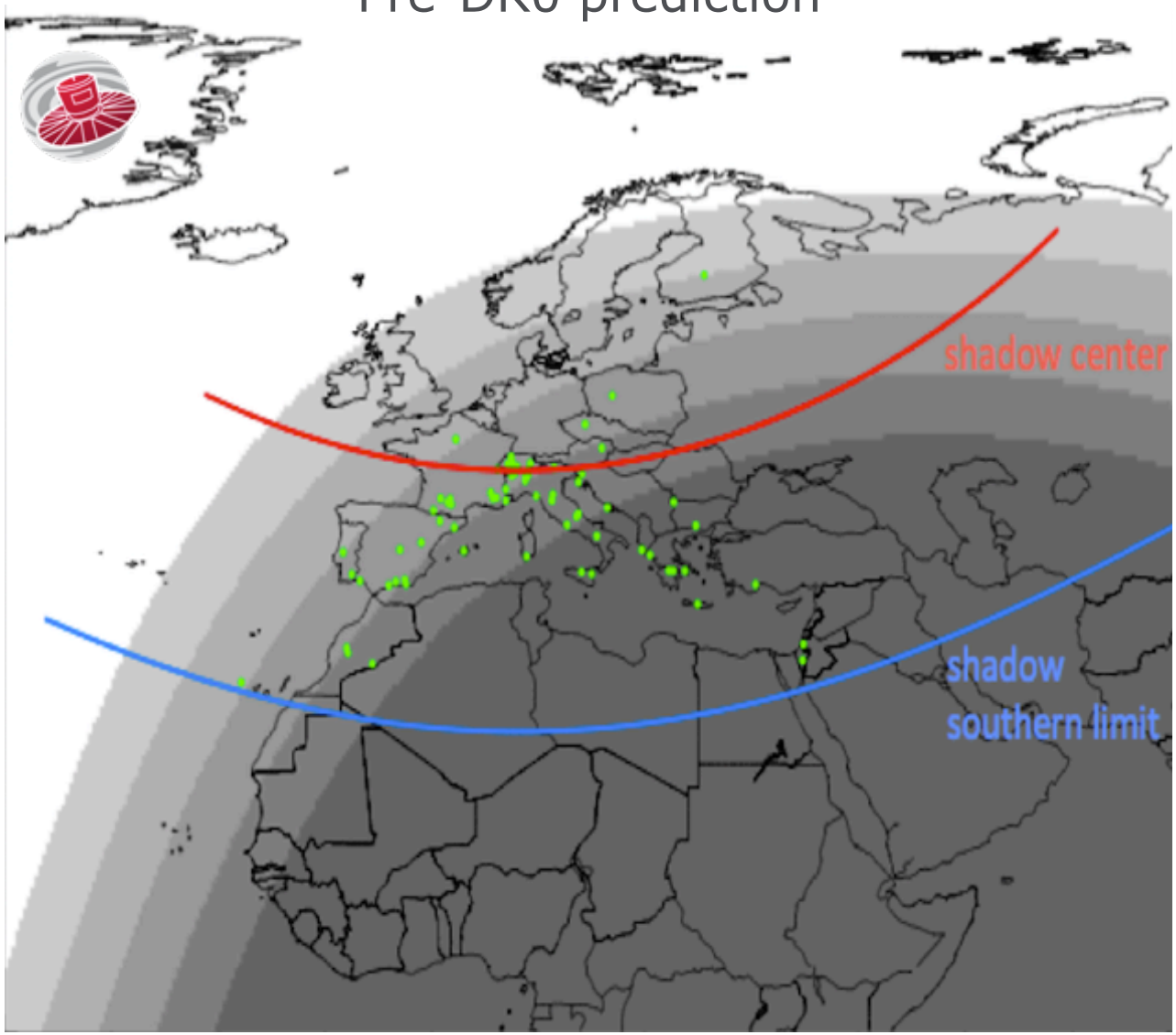


gaia European Space Agency

Figures courtesy ESA and Airbus D&S

Gaia DR0: UCAC4 345-180315

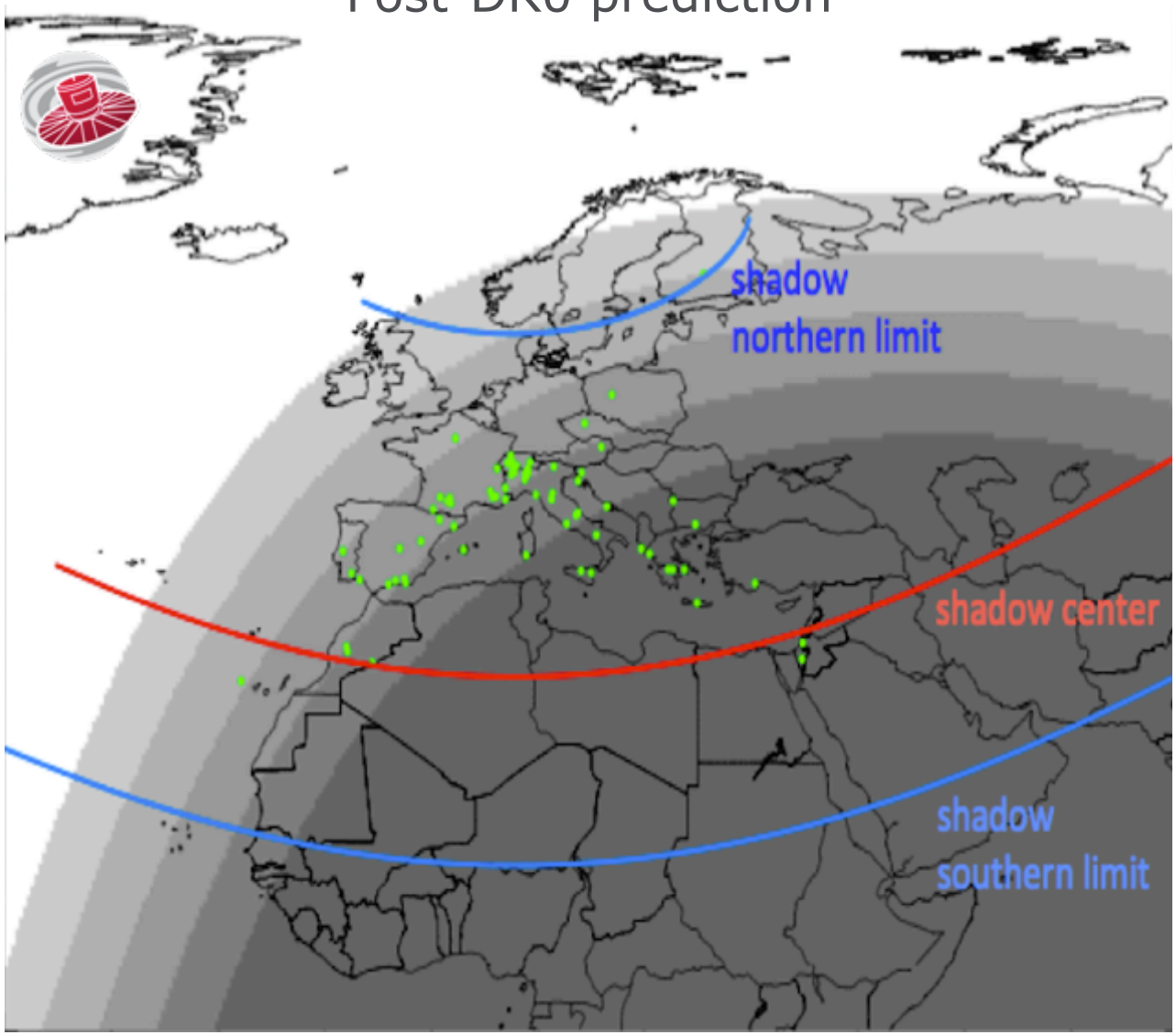
Pre-DR0 prediction



ESA/Gaia/DPAC/
B. Sicardy, D. Berard, E. Meza, R. Leiva (LESIA, Observatoire de Paris),
A. Carbognani (Osservatorio Astronomico Valle d'Aosta, Italy),
P. Tanga (Observatoire de la Côte d'Azur, Nice)

Gaia DR0: UCAC4 345-180315

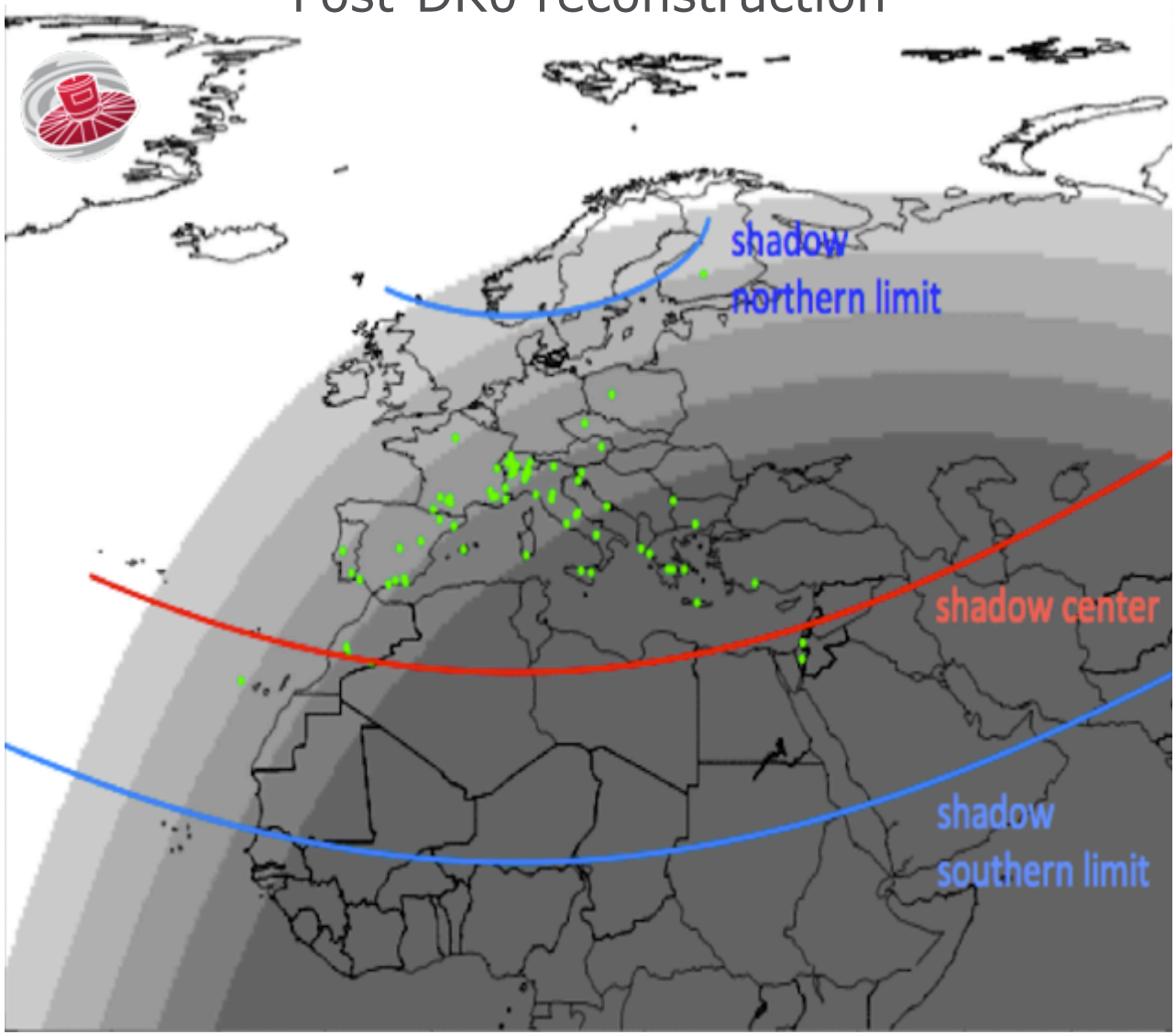
Post-DR0 prediction



ESA/Gaia/DPAC/
B. Sicardy, D. Berard, E. Meza, R. Leiva (LESIA, Observatoire de Paris),
A. Carbognani (Osservatorio Astronomico Valle d'Aosta, Italy),
P. Tanga (Observatoire de la Côte d'Azur, Nice)

Gaia DR0: UCAC4 345-180315

Post-DR0 reconstruction



ESA/Gaia/DPAC/
B. Sicardy, D. Berard, E. Meza, R. Leiva (LESIA, Observatoire de Paris),
A. Carbognani (Osservatorio Astronomico Valle d'Aosta, Italy),
P. Tanga (Observatoire de la Côte d'Azur, Nice)

Gaia DR1: 14 September 2016

1. TGAS: 2,057,050 sources with position, proper motion, parallax + mean G magnitude
2. Some 1,140,622,719 sources with position + mean G mag
3. Some 2,152 ICRF quasars with position + mean G mag
4. Some 3,194 Cepheid and RR Lyrae G-mag light curves

- All sources have been treated as single stars
- A global parallax zero point offset of ±0.1 mas may be present
- The recommendation is to consider the quoted uncertainties on the parallaxes as $\pm\sigma_{\varpi}$ (random) ±0.3 mas (systematic)
- Averaging parallaxes over small regions of the sky will **not** reduce the uncertainty on the mean below the 0.3-mas level

DR1 caveats

- The completeness level across the sky is inhomogeneous due to operational activities and the so-far limited mission time
- Bright stars ($G \lesssim 7$ mag) are missing
- High proper motion stars ($\mu > 3.5$ arcsec yr^{-1}) are missing
- Extremely blue and extremely red sources are missing
- Stars with large astrometric standard errors are missing
- In dense areas (above ~400,000 stars deg^{-2}), the effective faint limit is up to a few mag brighter than 20.7 mag
- For double stars at separations below ~4 arcsec, there is a decrease in the completeness of the detection of secondaries

- These effects will (largely) disappear in DR2

TGAS source density

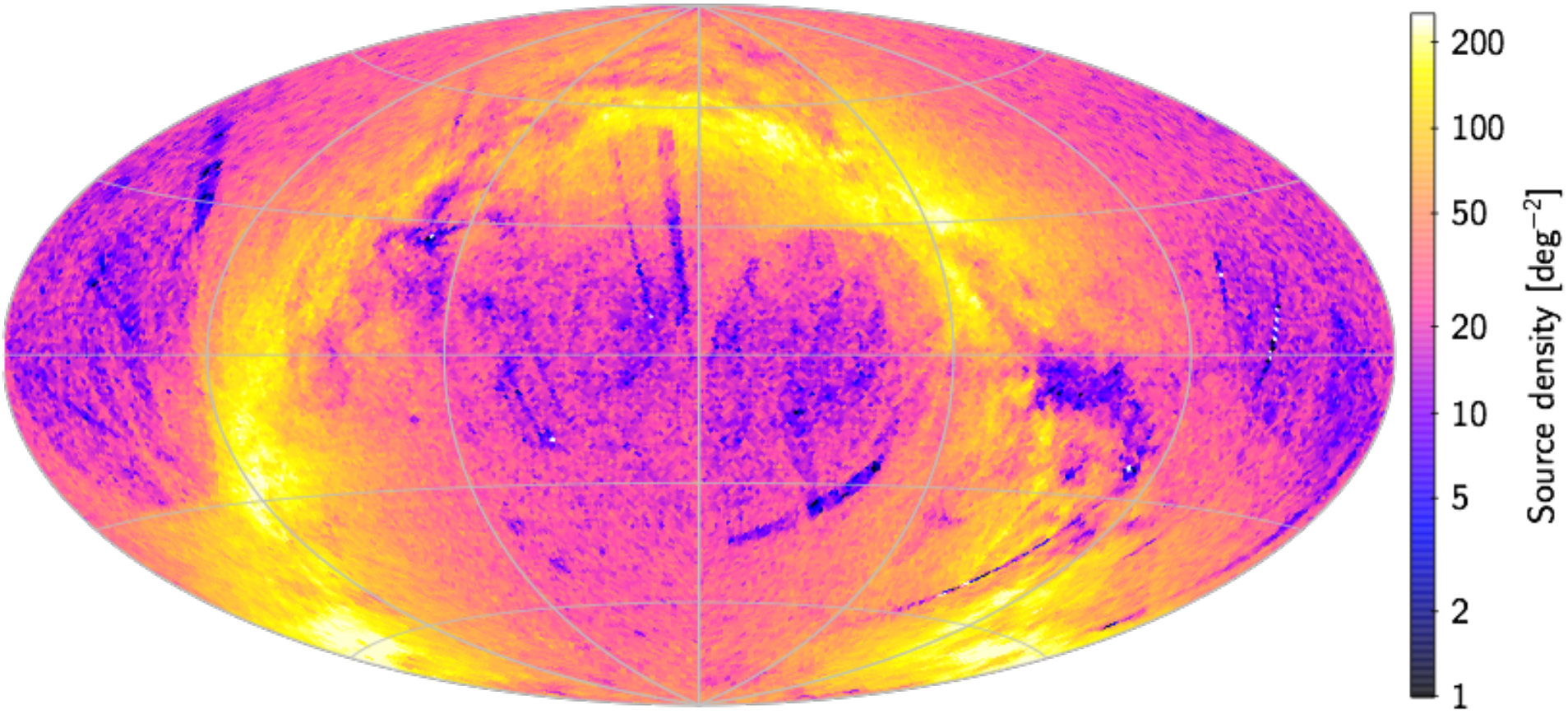
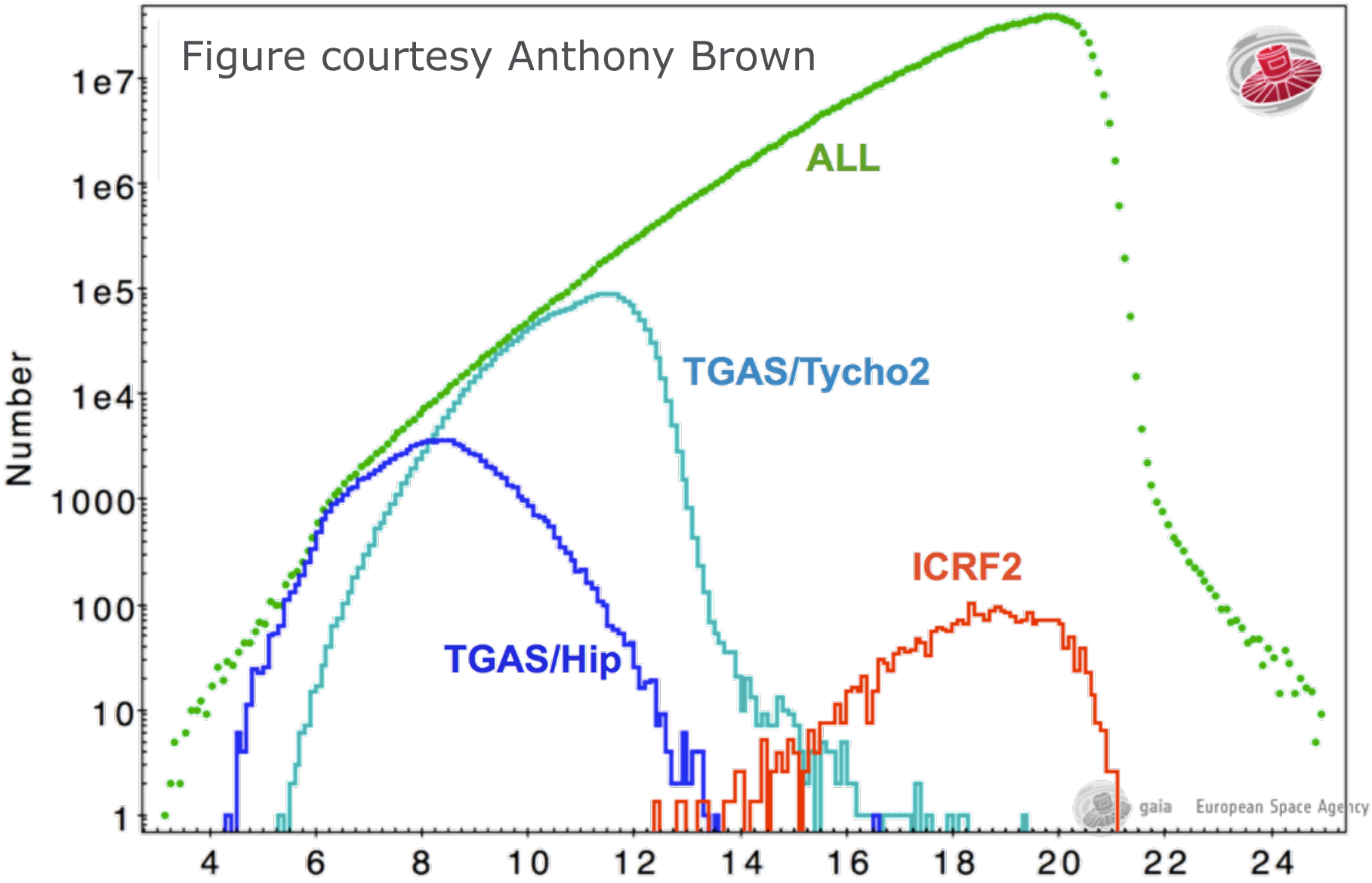


Figure courtesy Lennart Lindegren

DR1 magnitude distribution



Hipparcos vs. Gaia TGAS distances

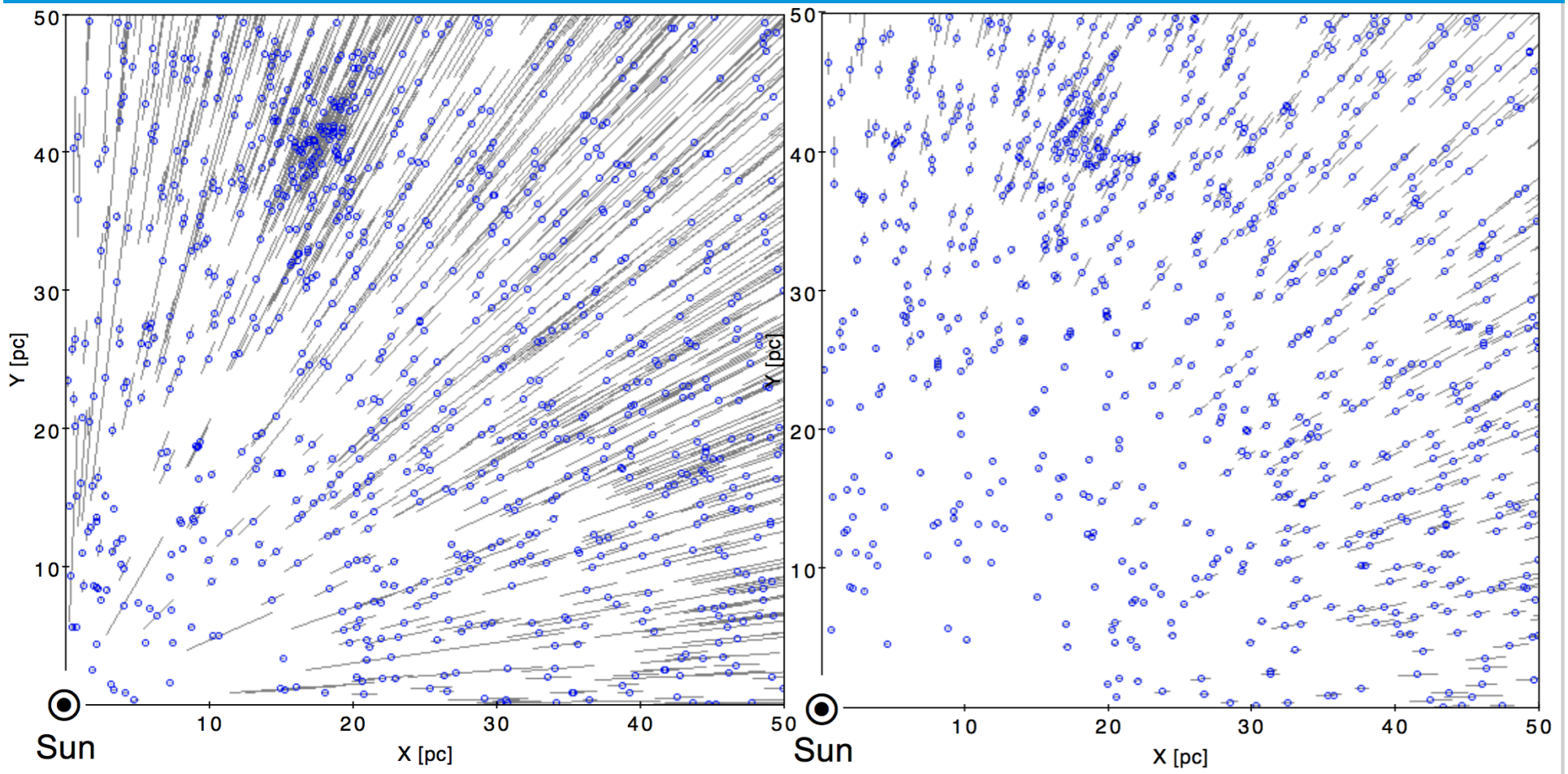


Figure courtesy Lennart Lindegren

Hipparcos vs. Gaia TGAS distances

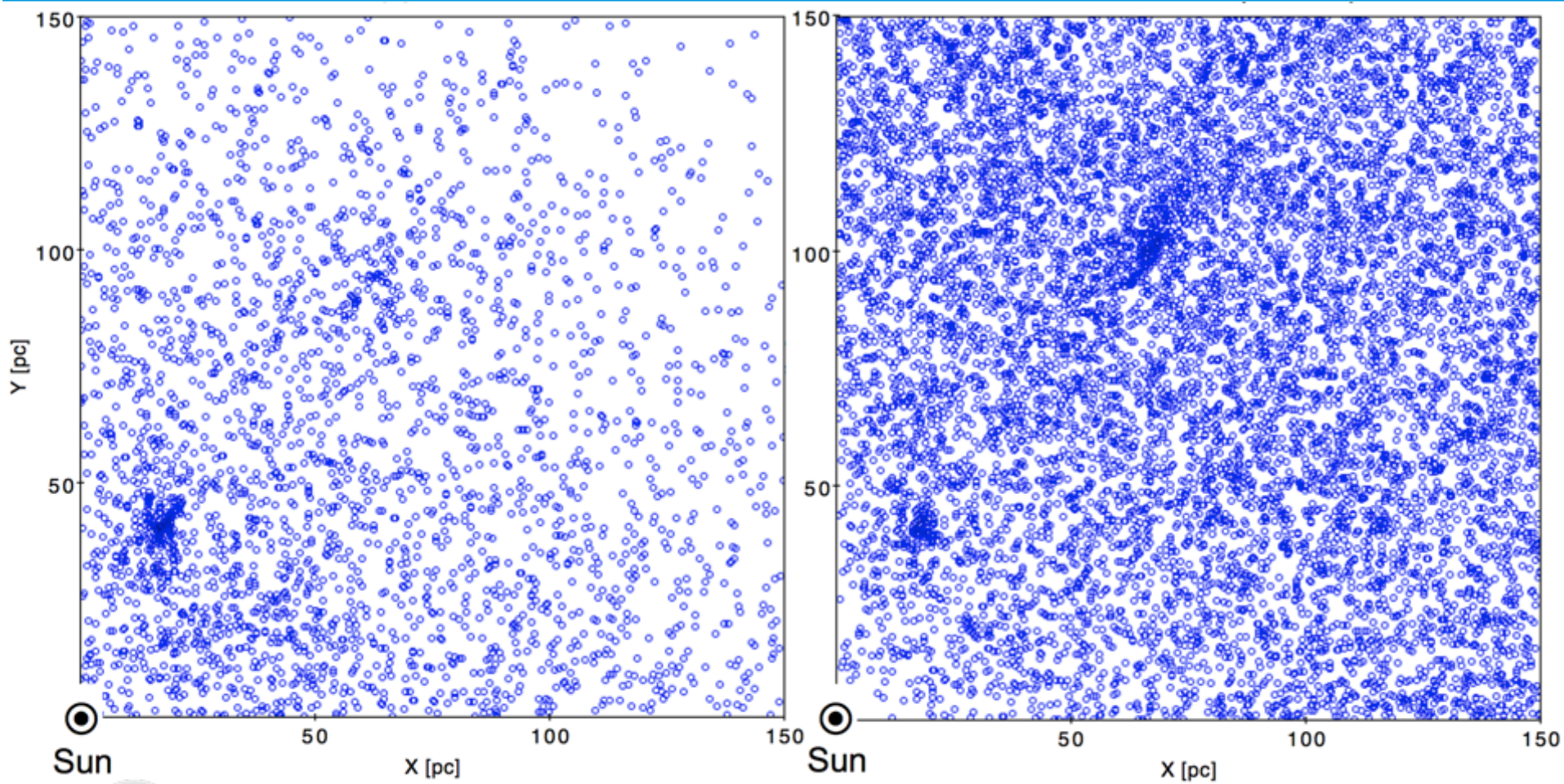
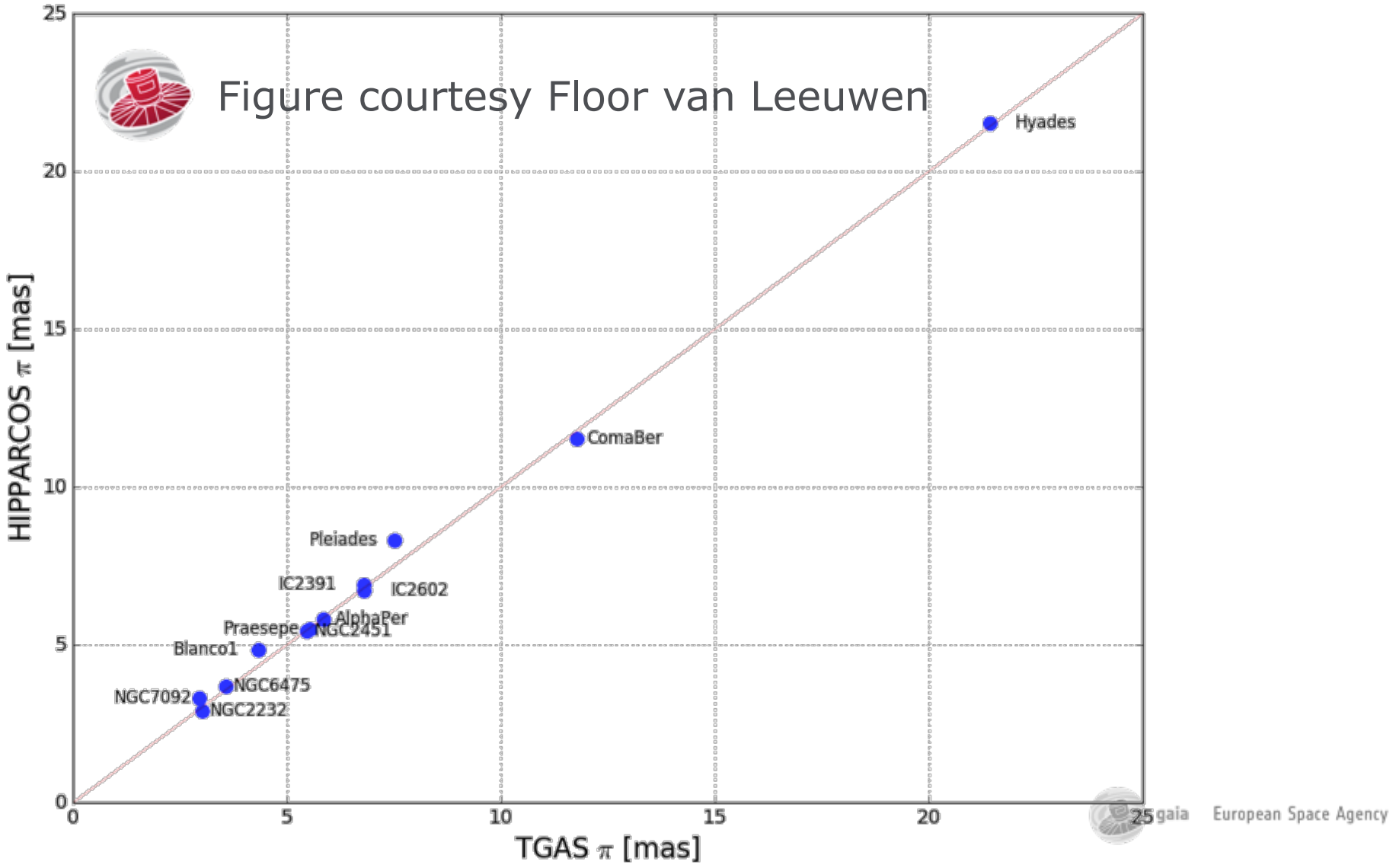


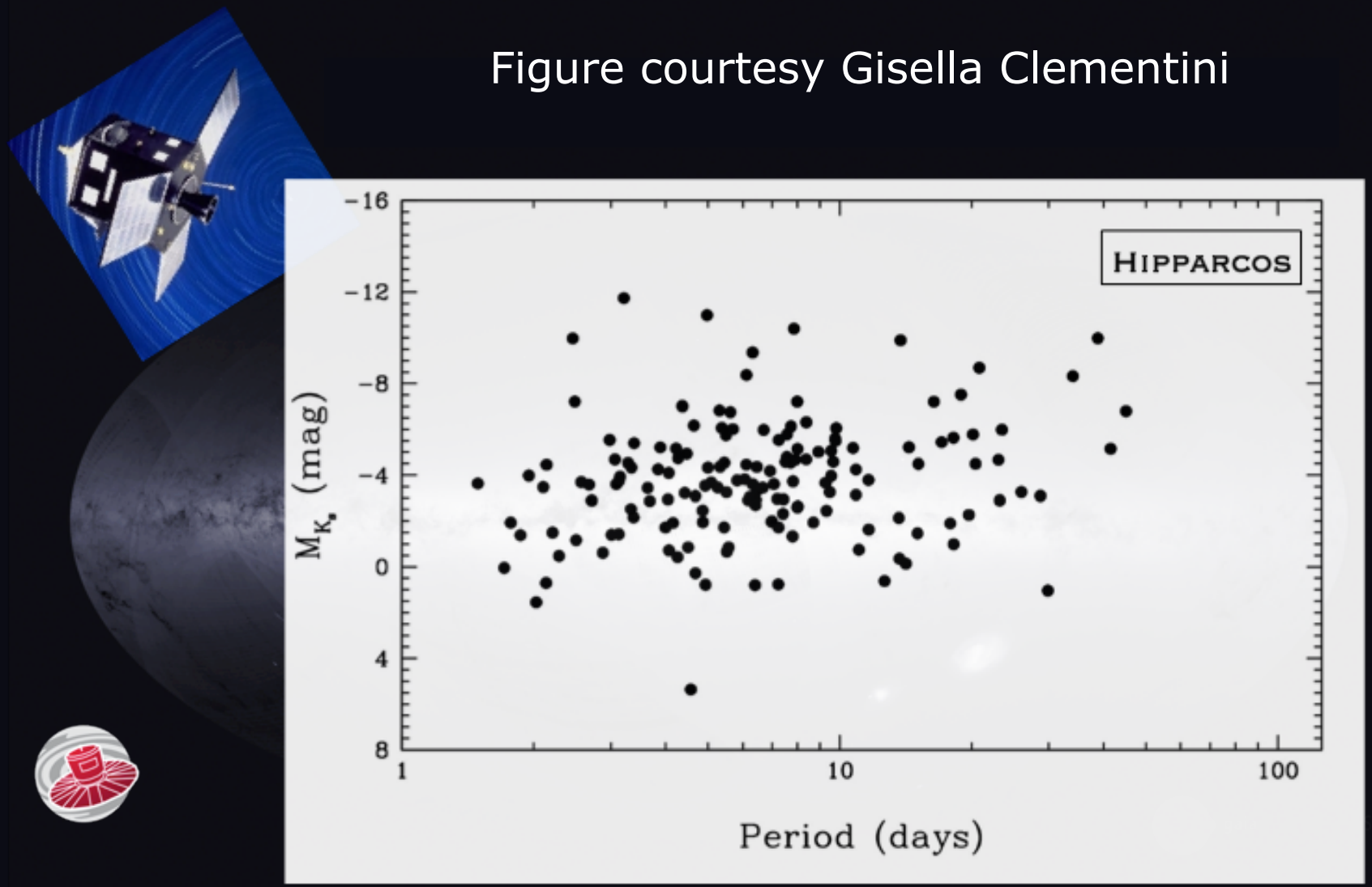
Figure courtesy Lennart Lindegren

Hipparcos vs. Gaia TGAS distances



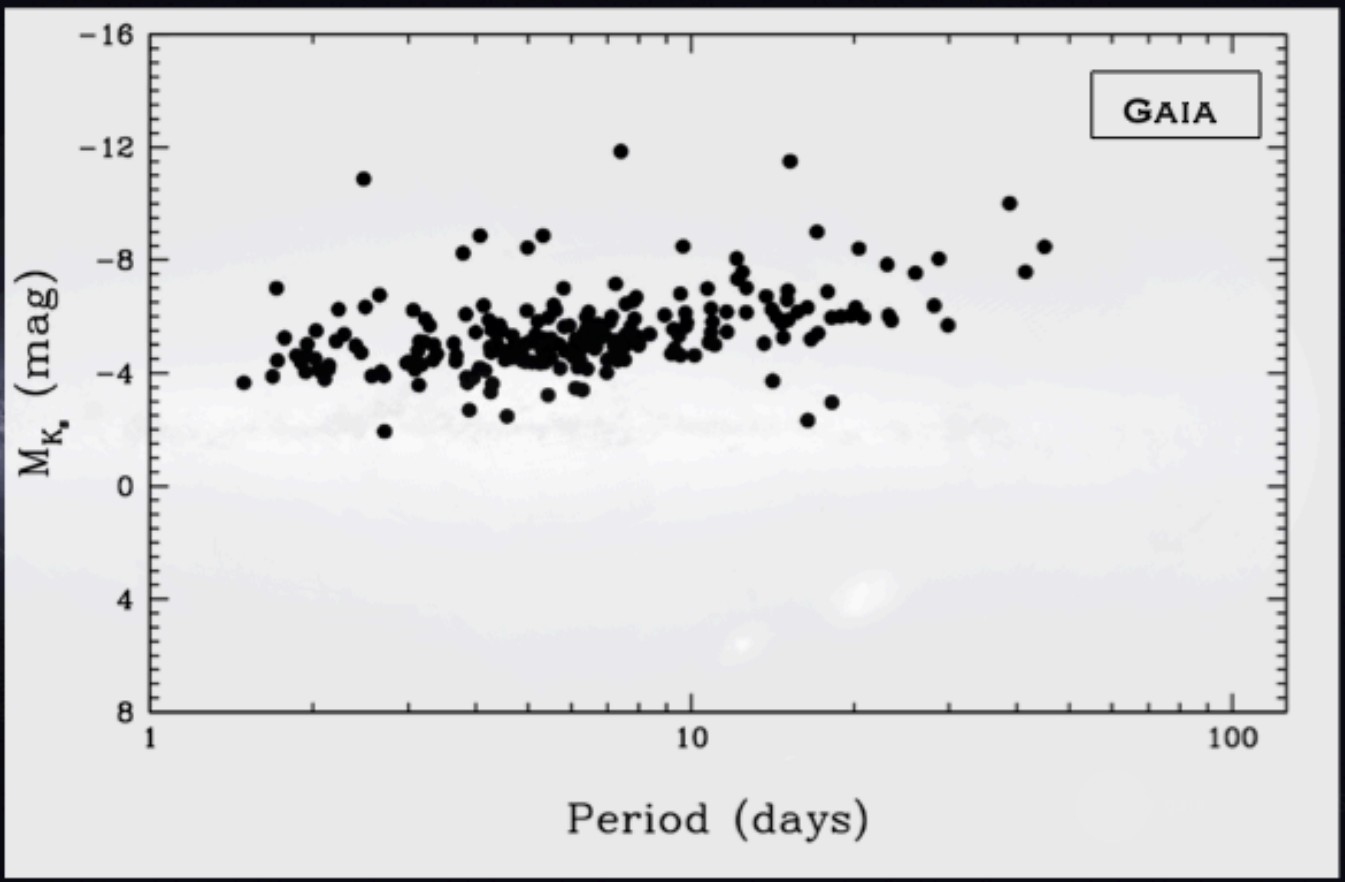
Hipparcos vs. Gaia TGAS distances

Figure courtesy Gisella Clementini



Hipparcos vs. Gaia TGAS distances

Figure courtesy Gisella Clementini



Tycho-2 vs. TGAS proper motions

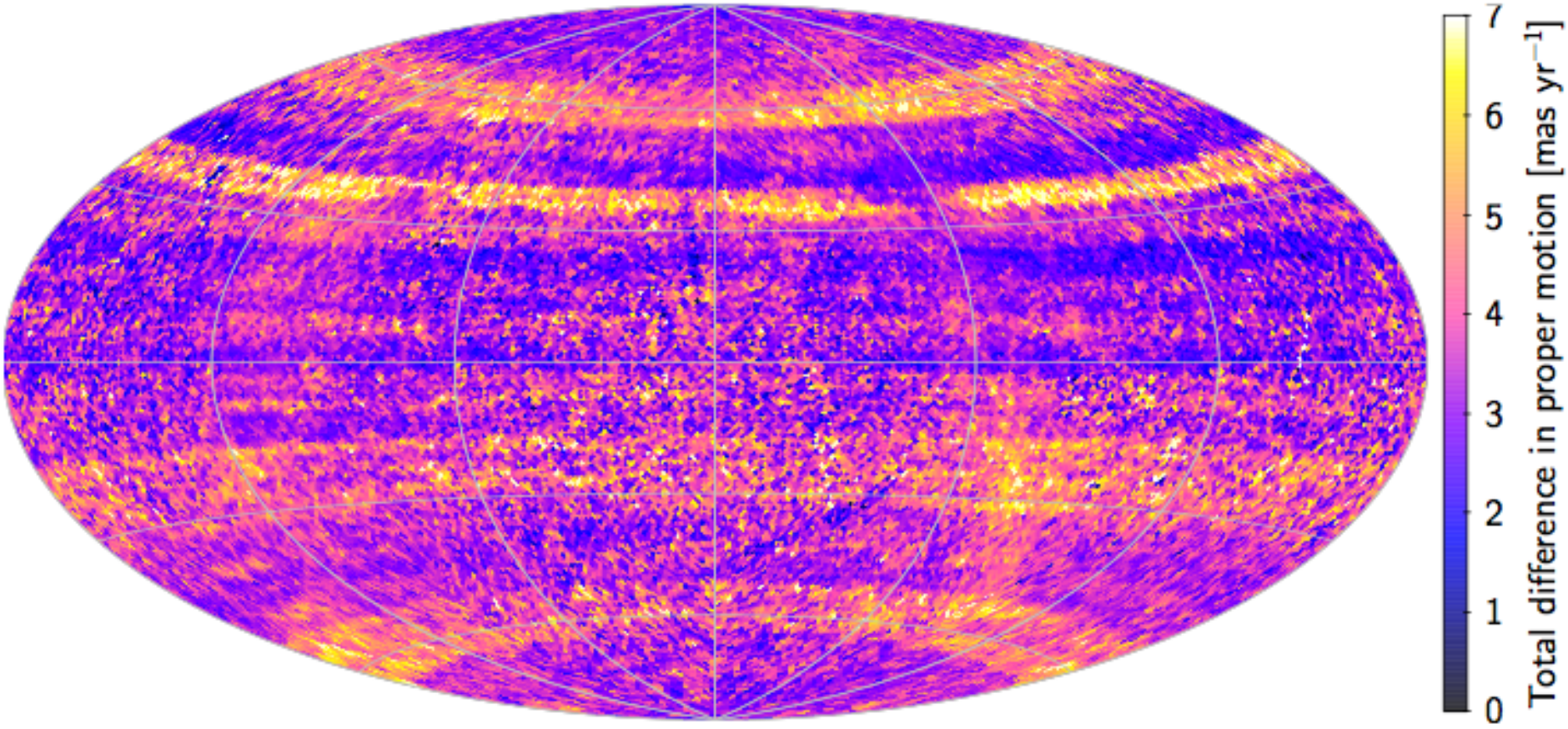
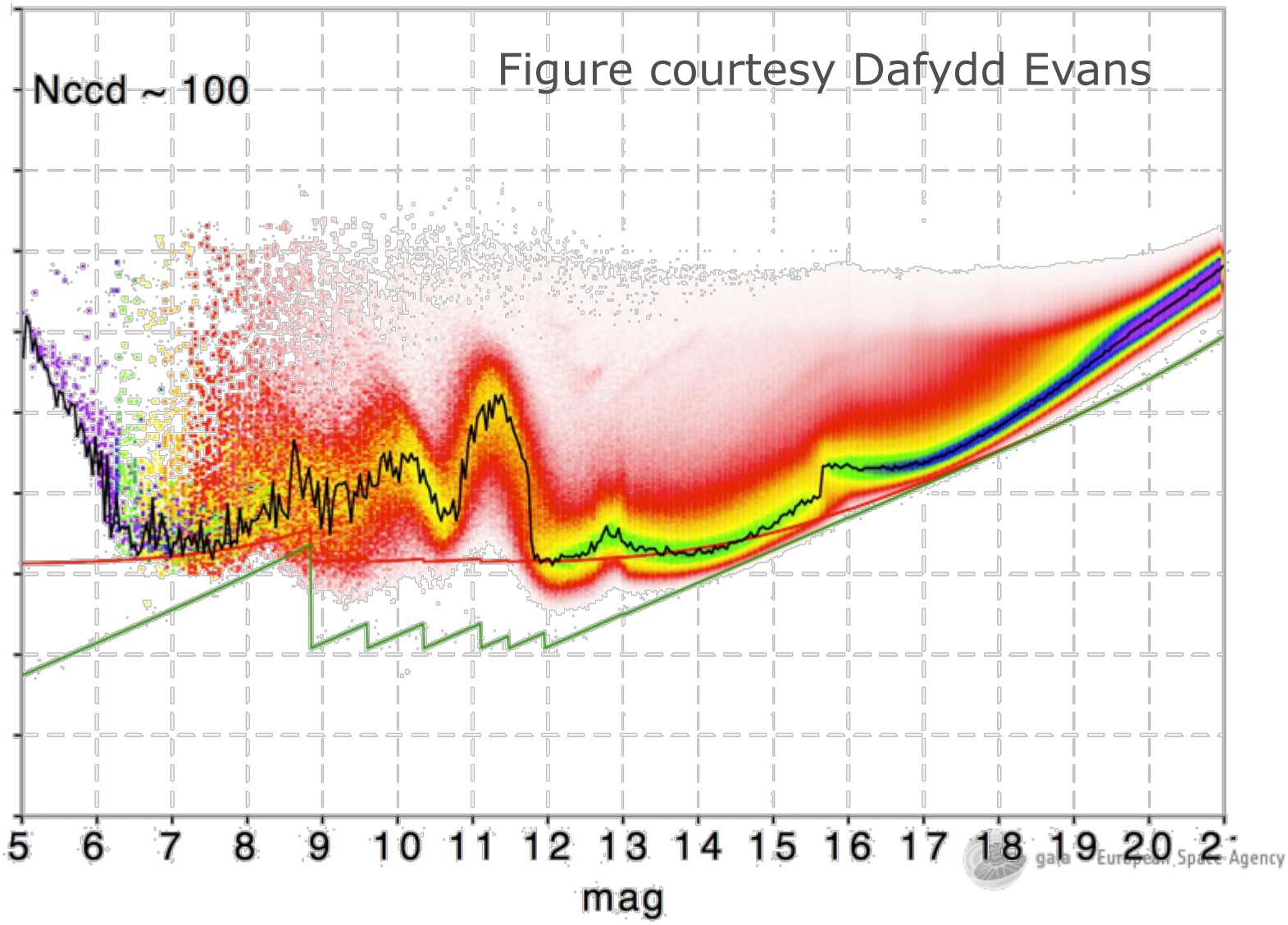


Figure courtesy Lennart Lindegren

DR1 G-band photometry



Gaia DR2

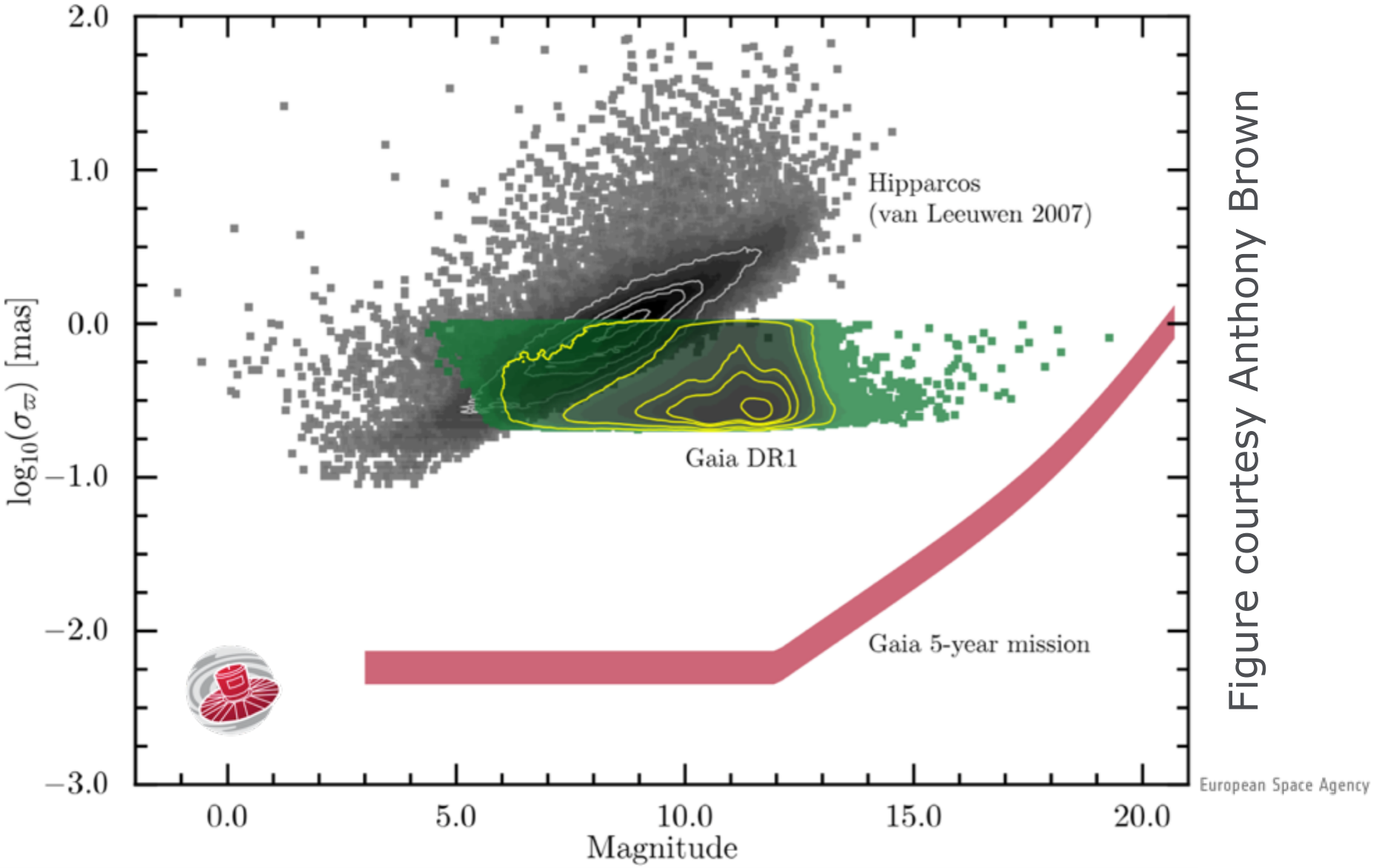
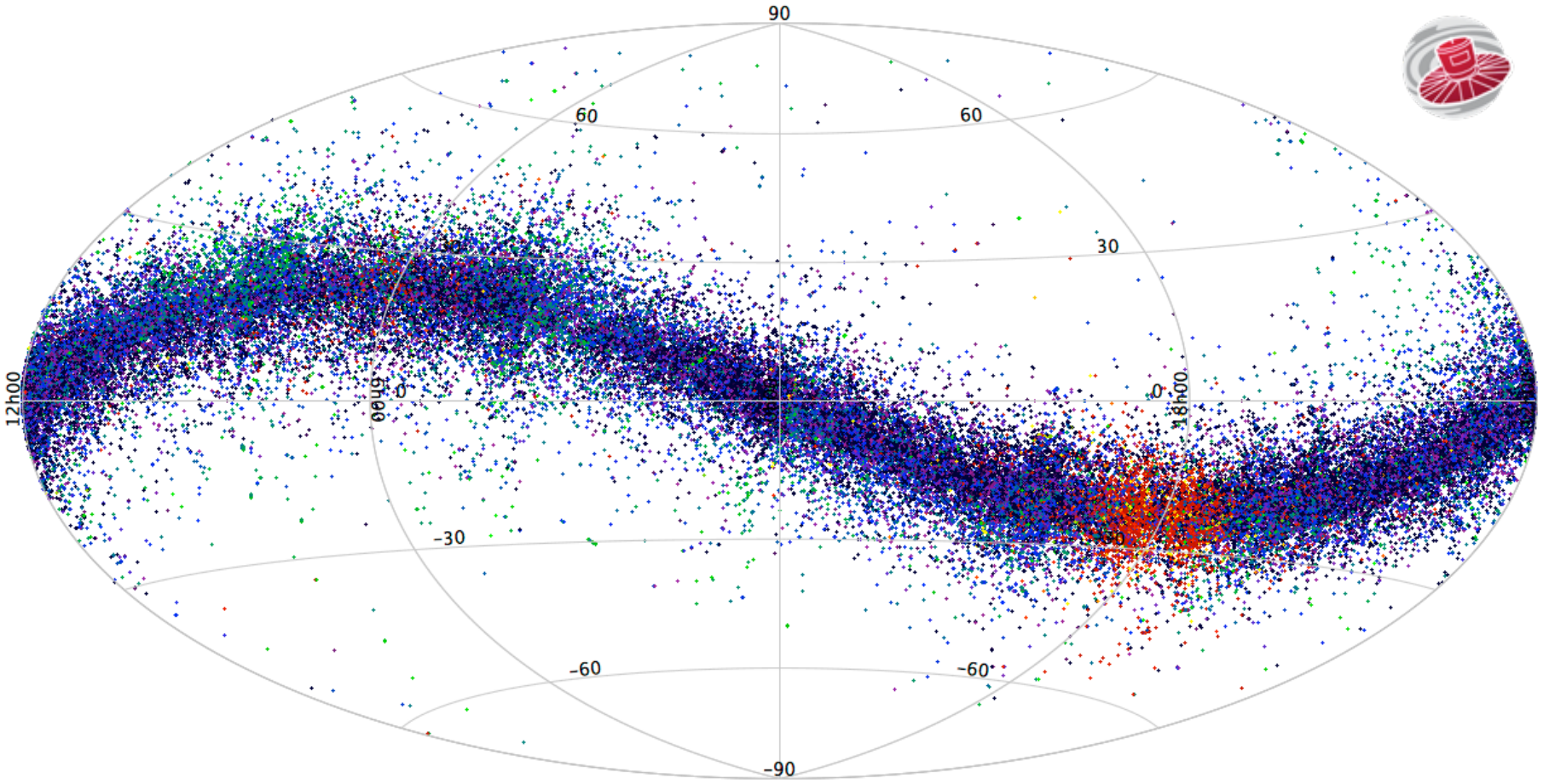


Figure courtesy Anthony Brown

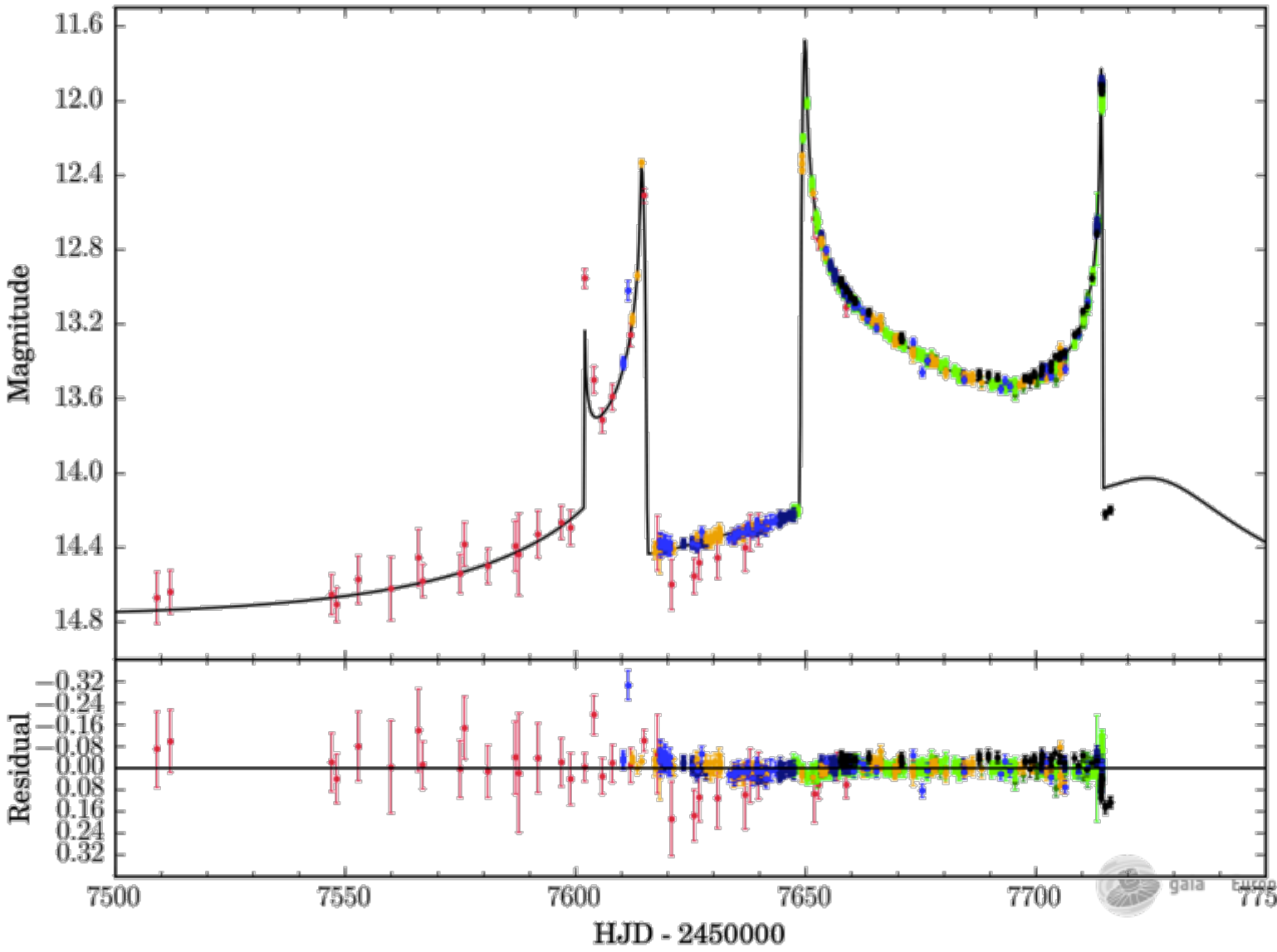
Asteroid detection (CU4/SSO-ST)



ESA/Gaia/DPAC/CU4, L. Galluccio, F. Mignard, P. Tanga (Observatoire de la Côte d'Azur)

gaia European Space Agency

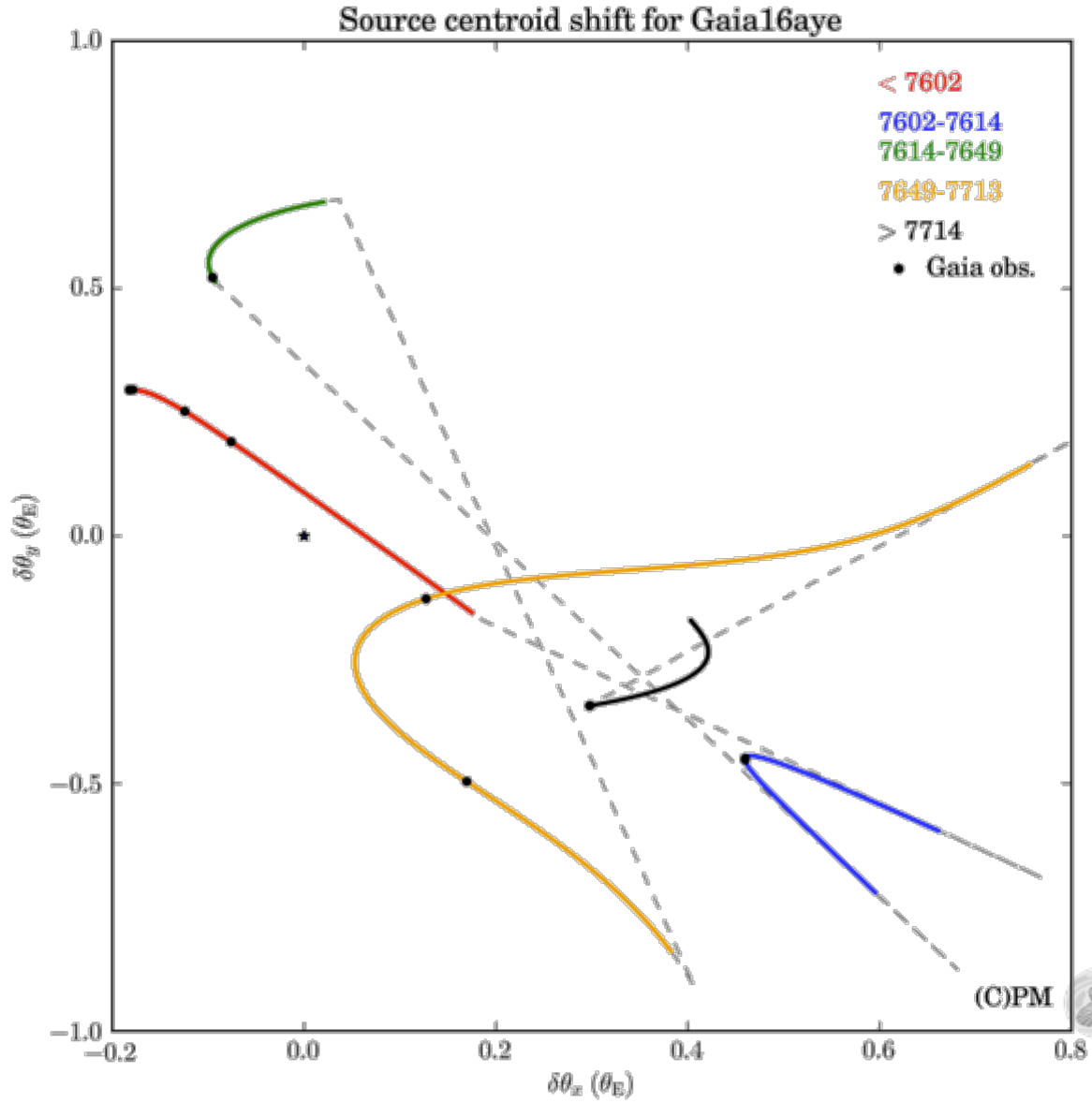
Gaia Ayers Rock (Gaia16aye)



http://www.astrouw.edu.pl/~pmroz/Gaia16aye.html

gaia European Space Agency

Gaia Ayers Rock (Gaia16aye)



http://www.astrouw.edu.pl/~pmroz/Gaia16aye.html

gaia European Space Agency

Future news

- There are **no more plans** to change:
  - The on-board detection / rejection parameters
  - The on-board storage and downlink priority configuration
  - The Sky-Mapper imaging strategy (LMC & SMC, Baade's & Sgr I windows, ω Cen, 47 Tuc, M4, M22, and NGC 4372)

- There are **no concrete plans** for:
  - Decontamination but ... contamination is actively monitored
  - Re-focusing but ... focus is actively monitored
  - Scanning-law changes but ... GAREQ requests may appear

More information

- ESA websites (gaia.esa.int and cosmos.esa.int/gaia)
- Mission app and Alerts app
- @ESAGaia and ESAGaiaMission
- Data (archives.esac.esa.int/Gaia)
- First Look Scientists and Payload Experts weekly reports on SVN + Monthly Operations Reports from MOC on Livelink (DPAC only)
- GAIAVERSE gaiaverse.eu

Choose your community!

EN · FR · DE · IT · ES · CA · SL · JA · MK · HR · EL · EU · PT

gaia European Space Agency