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Gaia DR1 overview and future releases



gaia



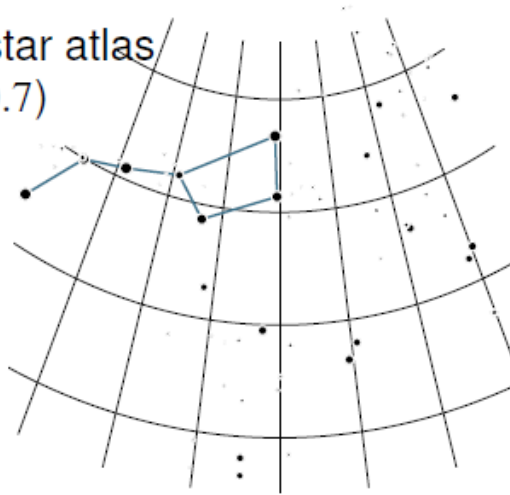
X. Luri

Universitat de Barcelona

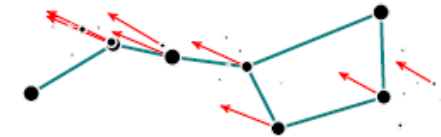
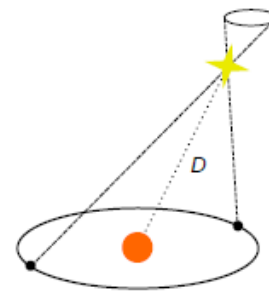


Gaia DR1 contents

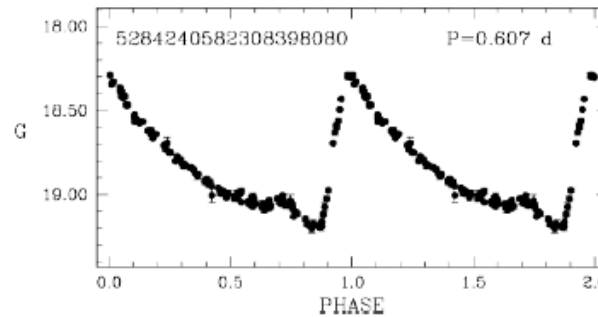
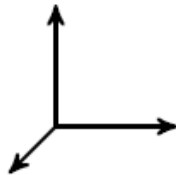
Billion star atlas
($G \lesssim 20.7$)



Tycho-Gaia
Astrometric Solution
(~ 2 million, $G \lesssim 12$)



Positions and magnitudes
for ~ 2000 ICRF quasars



Variable stars near
south ecliptic pole
(~ 600 Cepheids,
 ~ 2600 RR Lyrae)



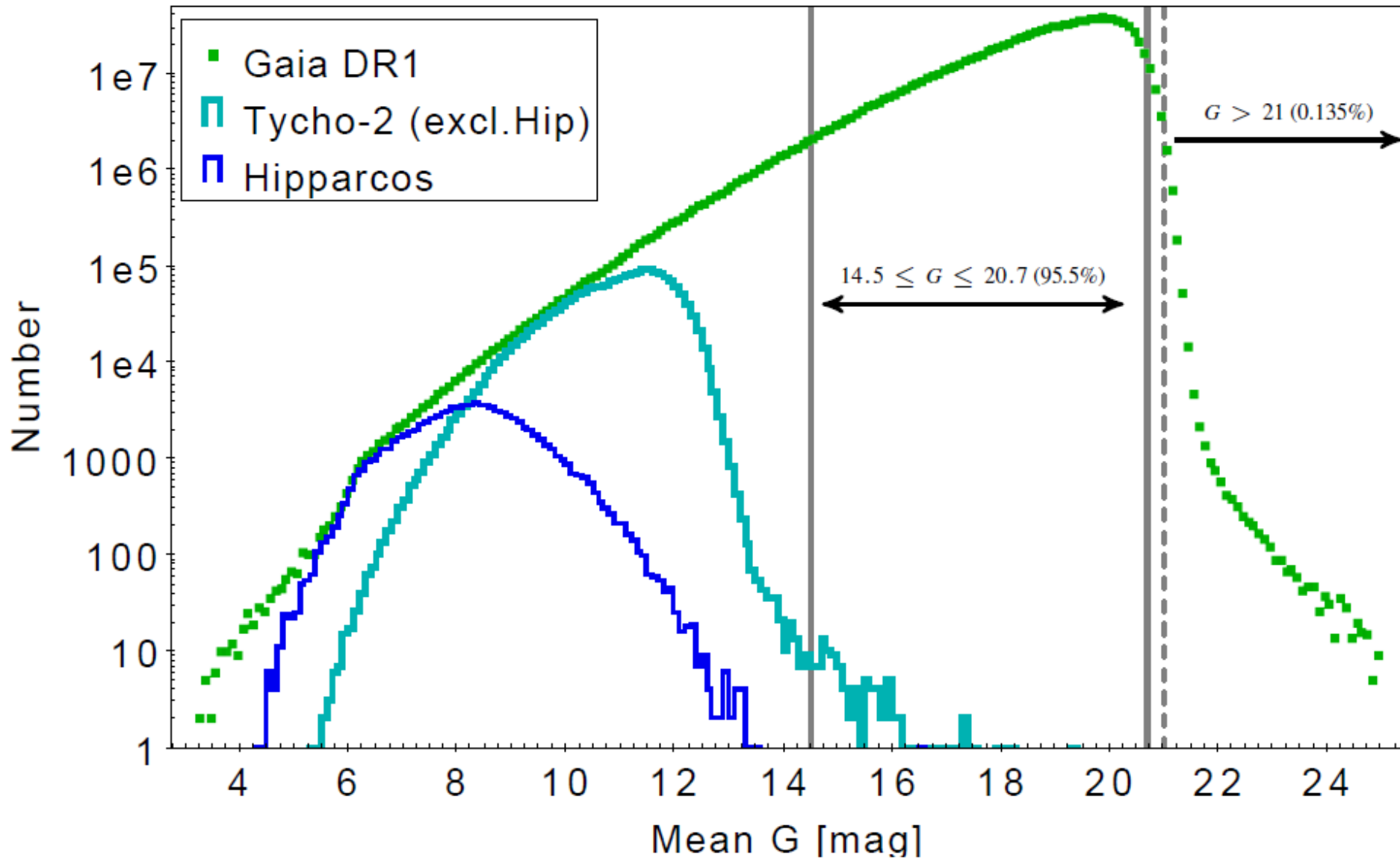
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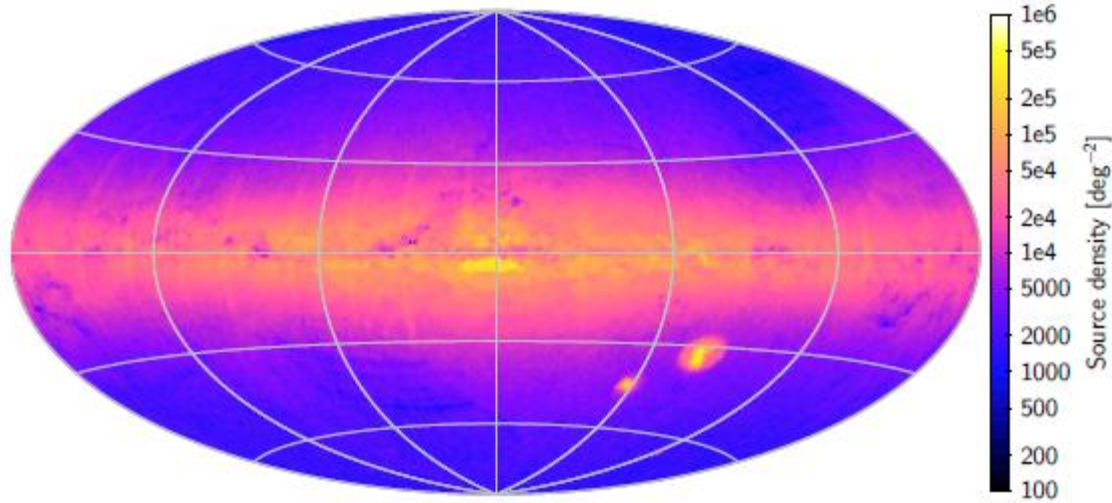
April 2017

DR1 magnitude distribution

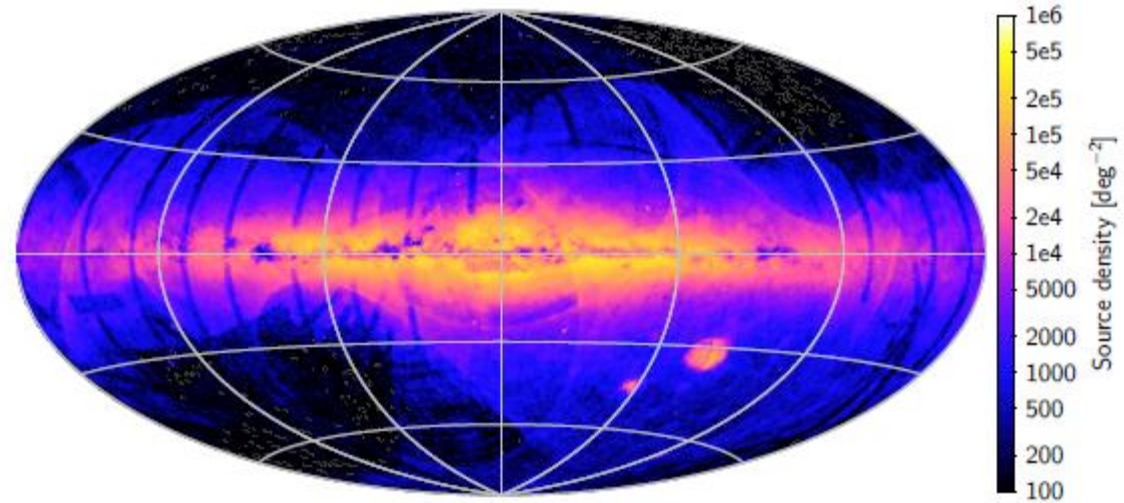


New sources

685 million sources matched to IGSL



456 million new sources in Gaia DR1



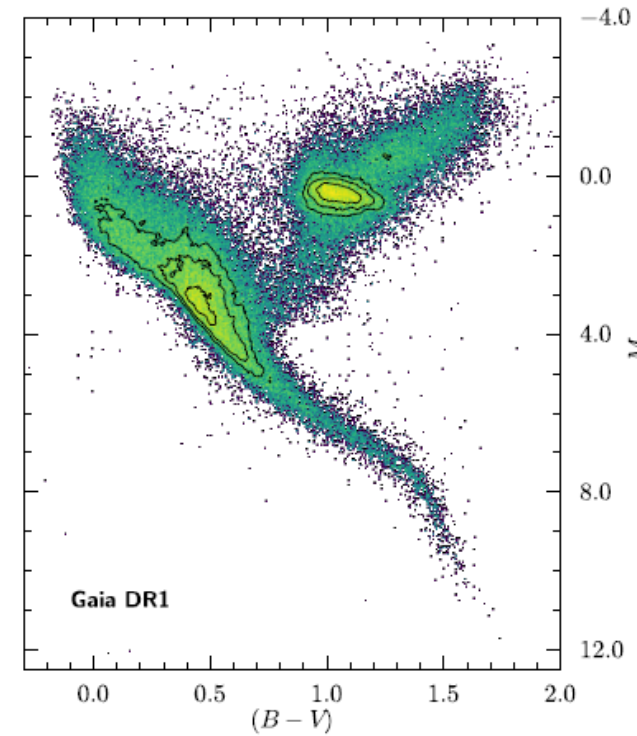
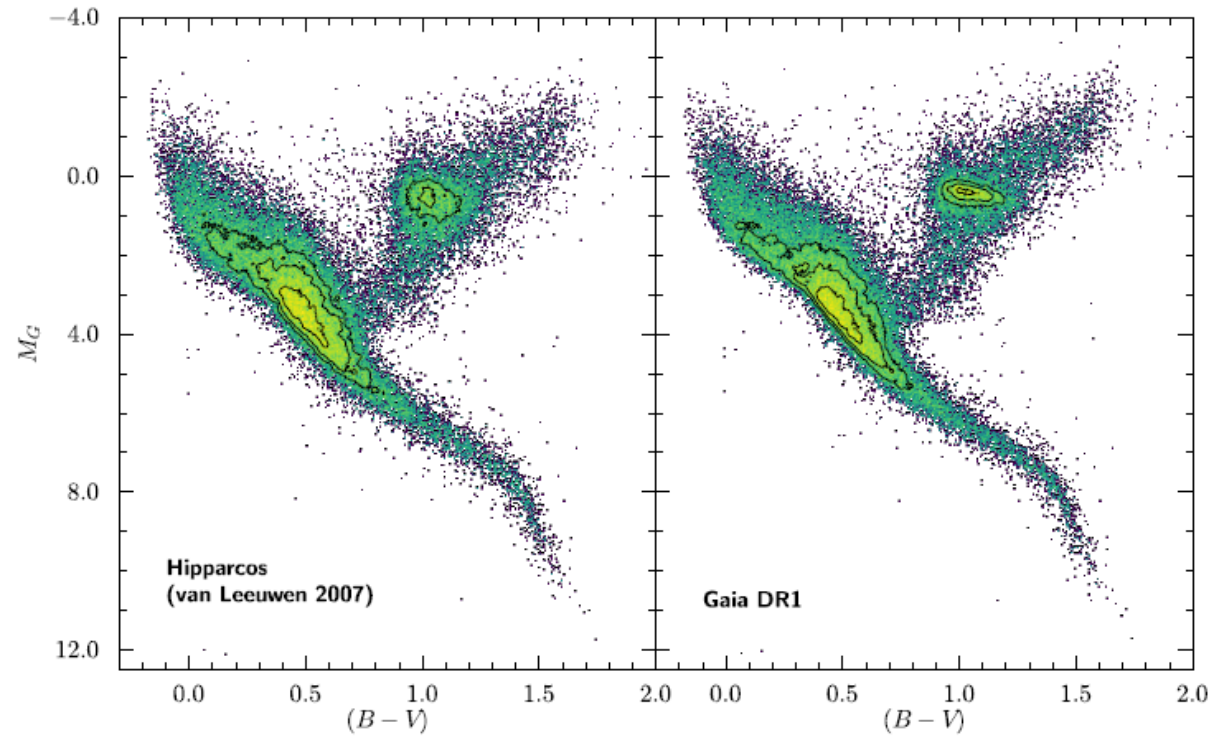
Highly precise positions

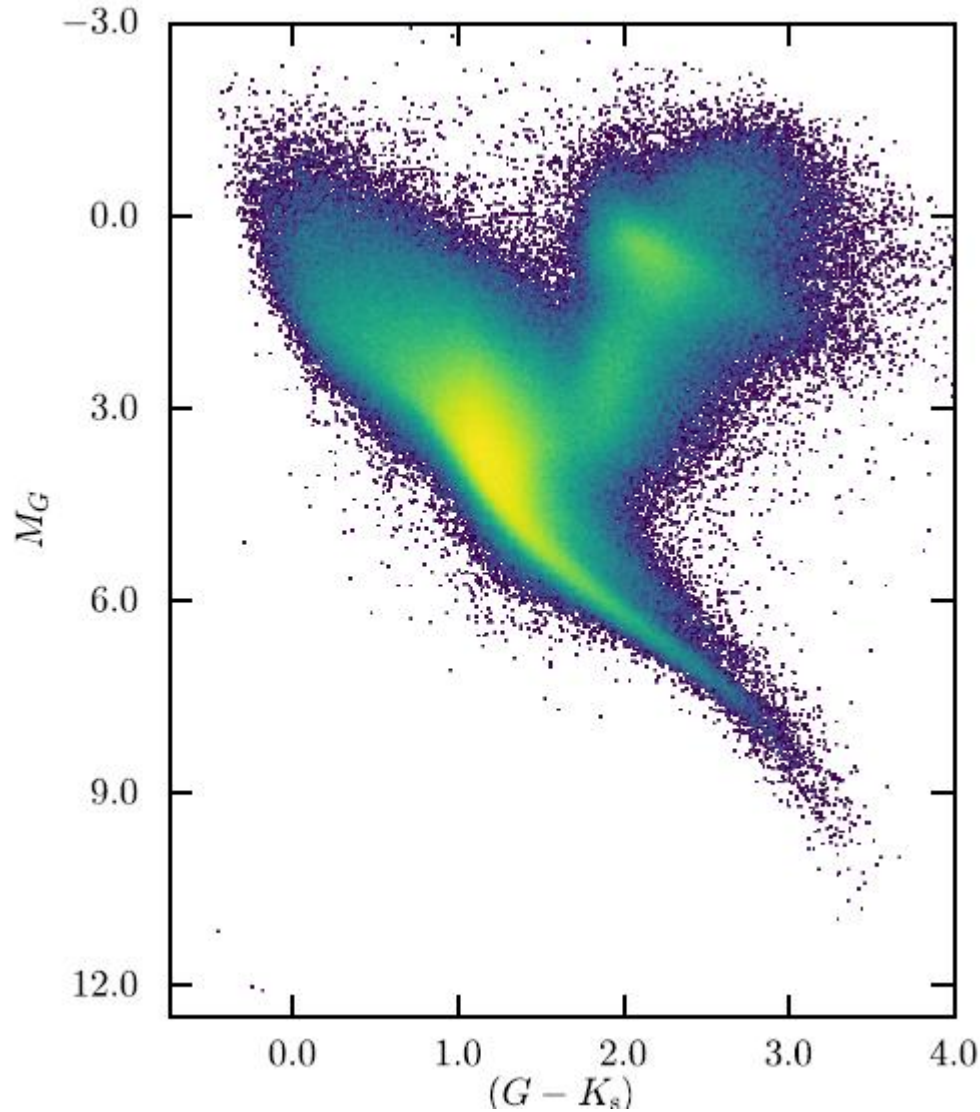
- (α, δ) for 1.1 billion sources to $G = 20.7$
- Epoch J2015.0, alignment to ICRF < 0.1 mas, rotation < 0.03 mas yr⁻¹
- Typical position uncertainty 10 mas
- Positions of 2191 ICRF sources from special astrometric solution (Mignard et al., 2016, A&A)
- 90% with pos < 3.35 mas
- no systematic differences with radio positions of more than few tenths of mas

HR diagrams with TGAS

Hipparcos and Gaia DR1 parallaxes precise to $\leq 20\%$
43 546 stars, 90% stars inside 280 pc

Gaia DR1 parallaxes precise to $\leq 20\%$
77 771 stars, 90% inside 450 pc

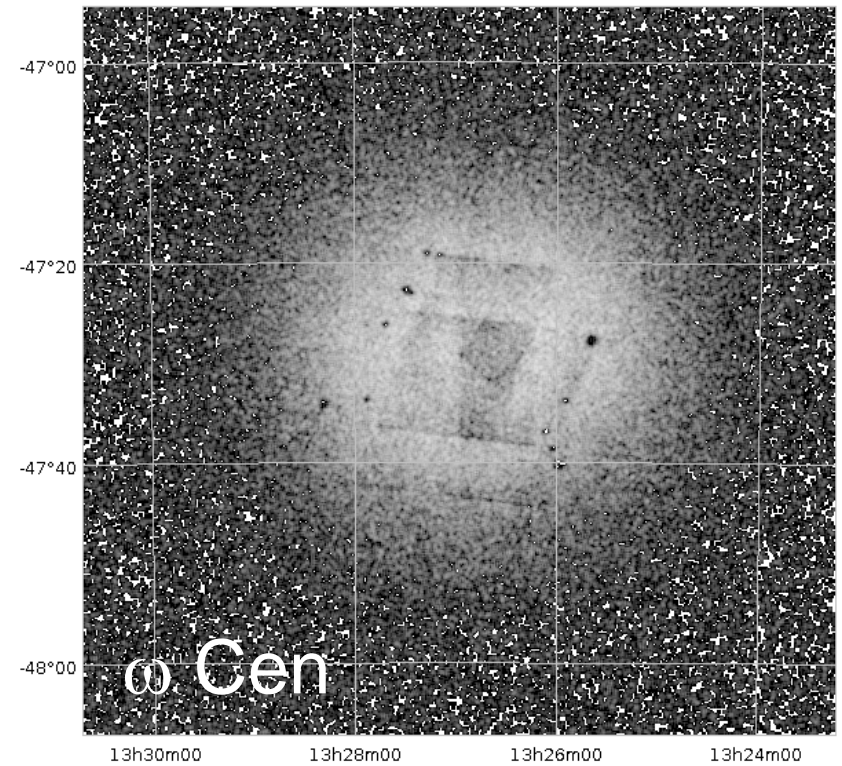
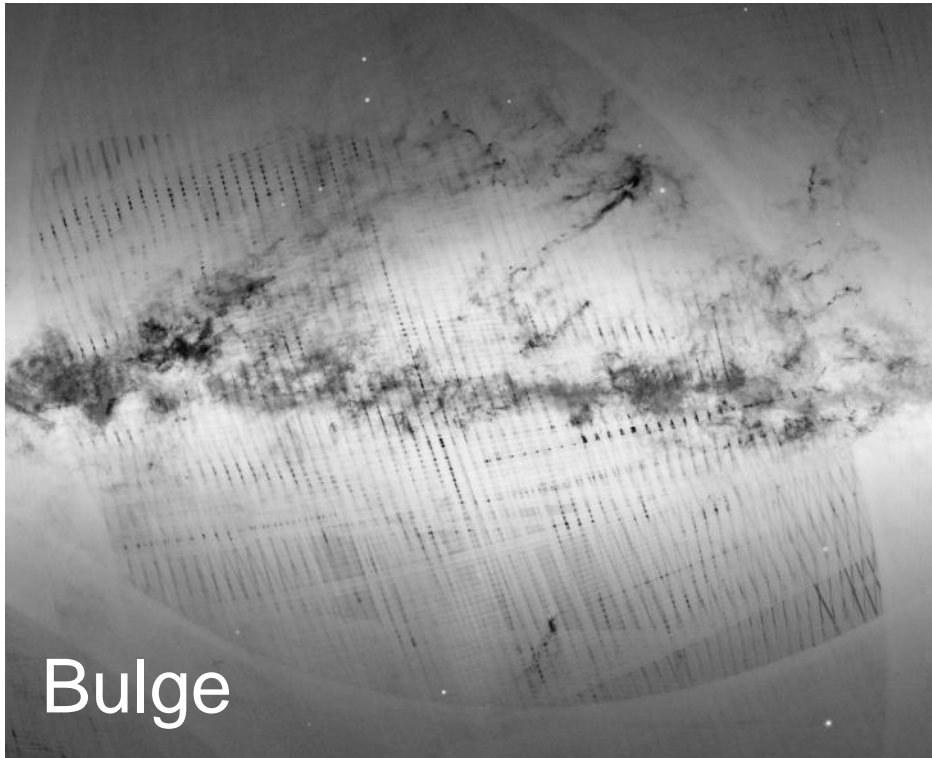




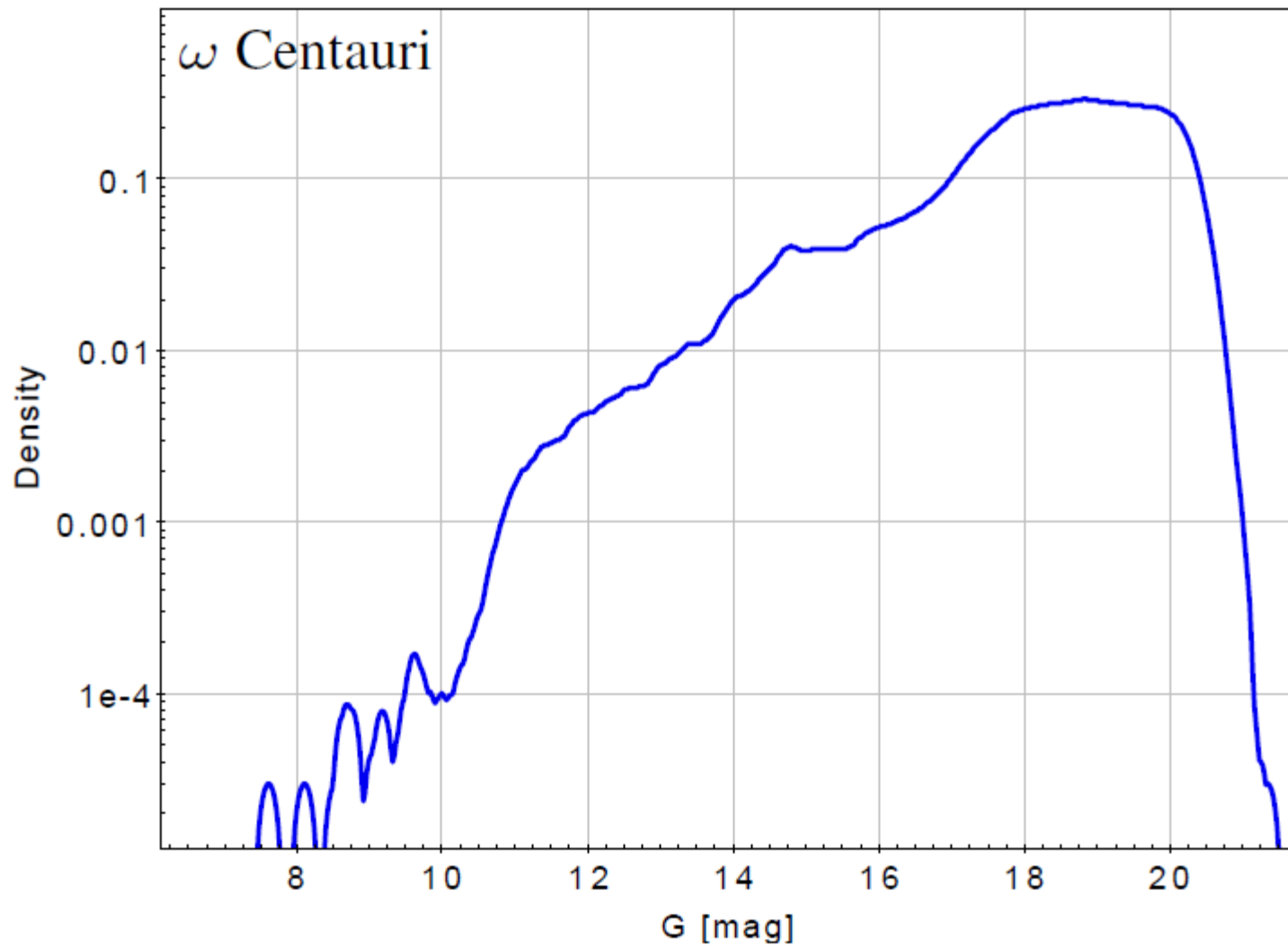
Full Gaia DR1 data set

- 1 million stars with parallaxes precise to $\leq 20\%$
- 90% inside 590 pc
- Future
 - ▶ ~ 10 million parallaxes precise to 1%
 - ▶ ~ 150 million precise to 10%
 - ▶ ~ 280 million precise to 20%

DR1 completeness



- Ill-defined and celestial position dependent faint limit
- Scanning law + filtering on data quality → source density artifacts
- High density regions (few 100 000 stars/deg²) affected by several factors
- Below 4 arcsec separation many secondary components of binaries missing



Many bright stars missing at $G \leq 7$

High proper motion stars ($\mu > 3.5$ arcsec yr⁻¹) missing



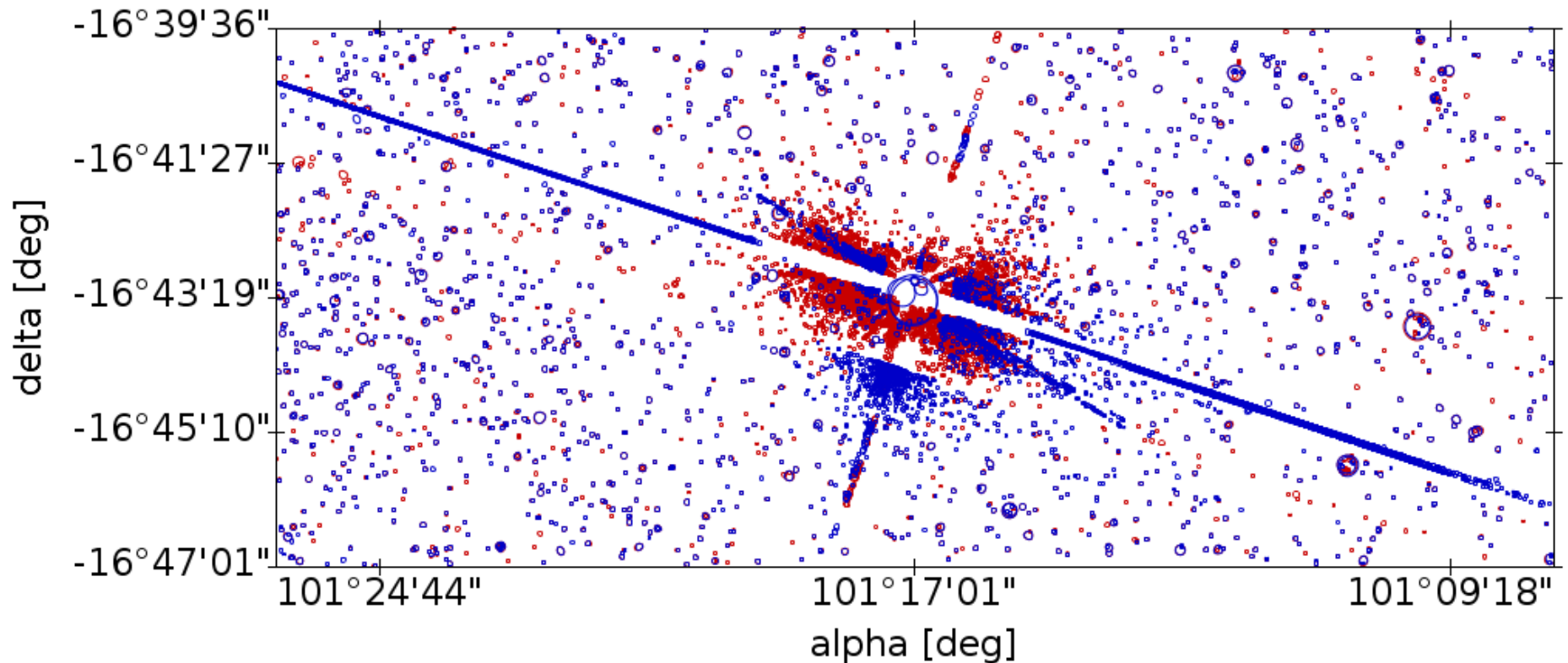
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Spurious objects



- Bright objects cause spurious on-board detections
- Vast majority removed during data processing
- Small fraction of Gaia DR1 sources may have photometry affected by inclusion of a spurious transit

Future: Gaia DR2

- Targeted for Q1 2018
- Astrometry and photometry based on roughly 22 months of data
- Gaia stand-alone astrometric solution (unlike TGAS, no priors needed); 5-parameter astrometry for all sources
- Broad band photometry, G, GBP, GRP (broad band colours); improved photometric calibrations, proper pass-band calibrations
- Median radial velocities for bright ($GRVS < 12$), constant RV, stars
- More variable stars results
- SSO data
- T_{eff} , A_0 from GBP, GRP