GaiaNIR
ESA-led NIR all-sky astrometry mission

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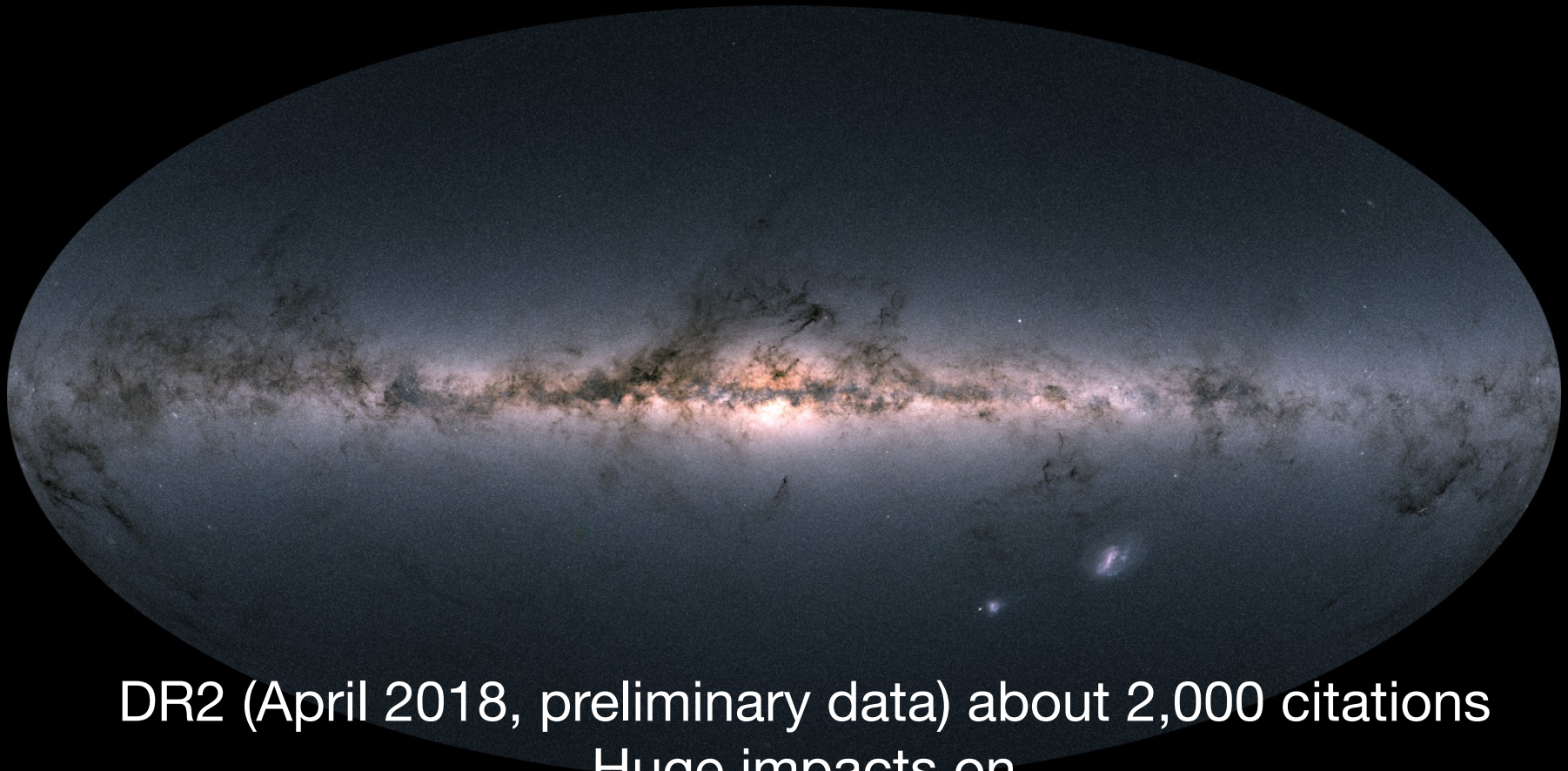
ESA Gaia mission (2013-2022)
Optical All-Sky Astrometry mission

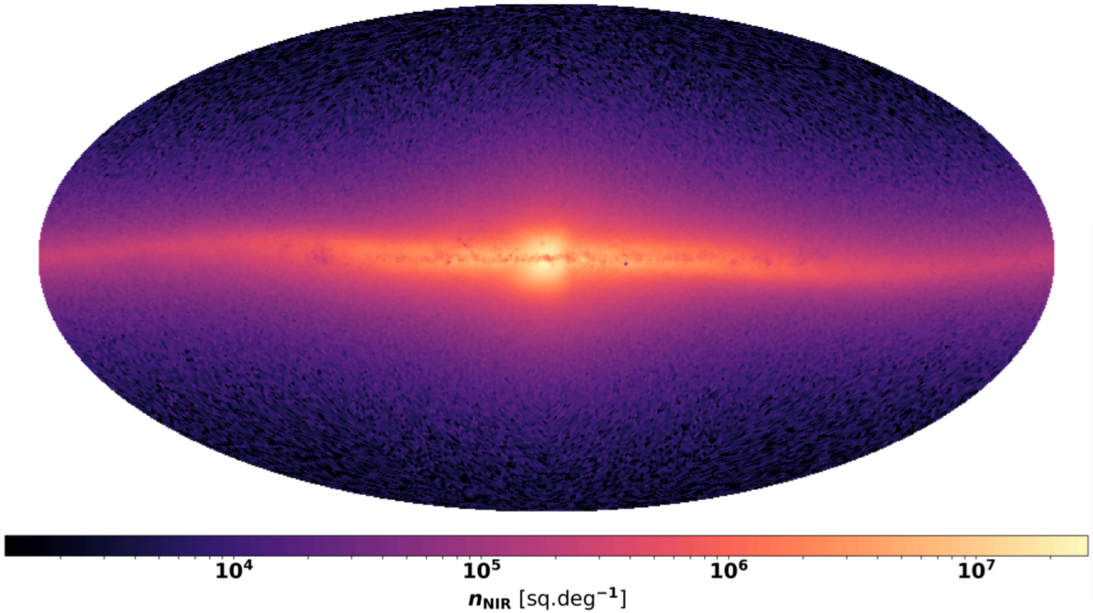


DR2 (April 2018, preliminary data) about 2,000 citations
Huge impacts on
from solar system, exoplanet to Galaxy and cosmology!

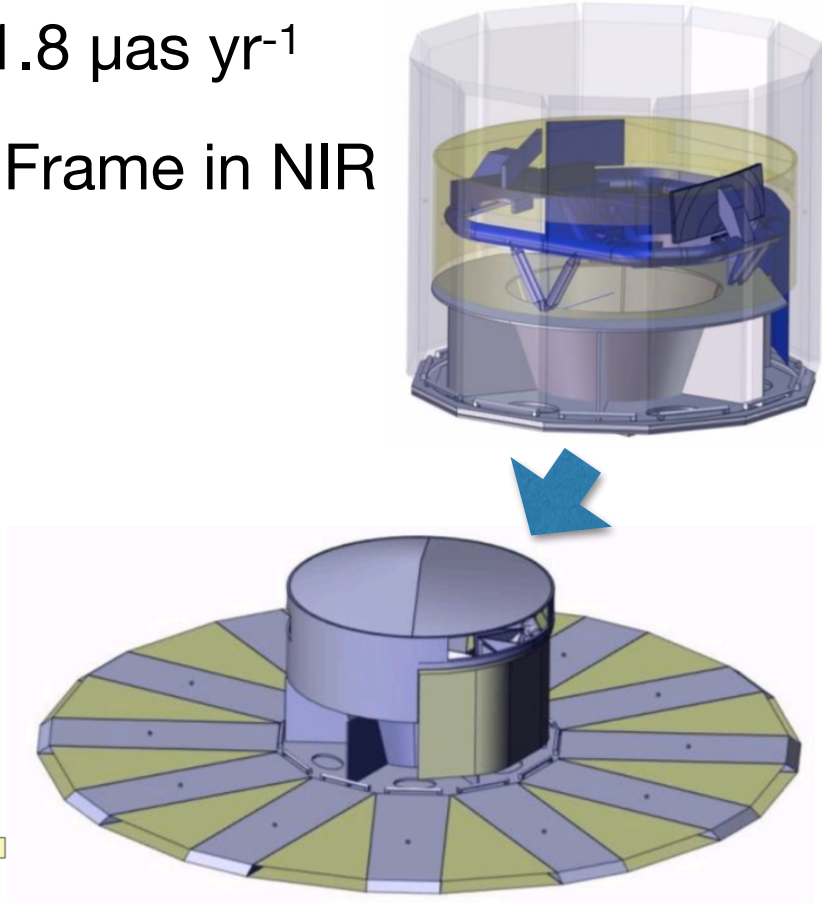
Astrometry: parallax (distance) and proper motion
providing new dimensions of information

GaiaNIR
All-sky NIR astrometry in 2040s.

- NIR (λ=0.8-1.8 μm, G_{NIR}<20 mag)
  Gaia-level astrometry (~10 μas)
- 14 times better proper motion, ~1.8 μas yr^{-1}
- Update Gaia Celestial Reference Frame in NIR



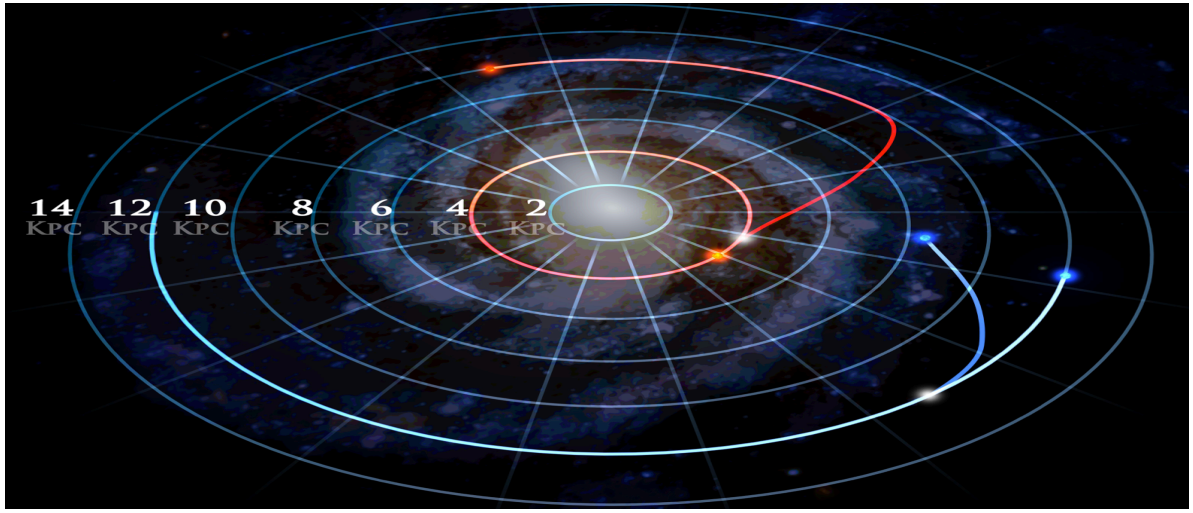
Gaia NIR sky (Hobbs+Kawata et al. 2019)



ESA CDF Study Report (2017)

NIR (λ=0.8-1.8 μm, G_{NIR}<20 mag) Gaia-level astrometry (~10 μas)
5 times more stars (~8B stars) than Gaia seeing through the dust

- Origin of the bar and spiral arms, wiggle in the disk
  → Radial Migration, Galactoseismology
  Where are we from? The Sun's past orbit
  Galactic Habitable Orbit?

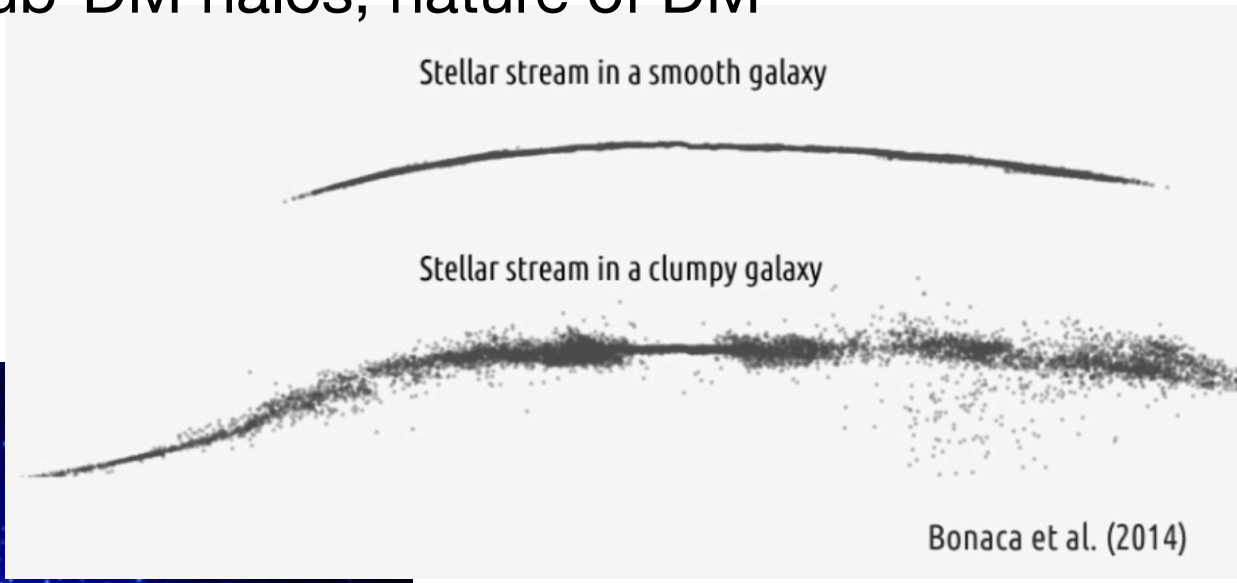


Credit:SDSS

- Plus more … star forming regions
  binaries (WD, BH and etc.) the distance to the GW sources
  astrometric microlensing: primordial BHs as DM
  Mira variable age, distance calibration
  exoplanet of dusty young stars

~20 yrs time separation with Gaia and JASMINE
→14 times better proper motion ~1.8 μas yr^{-1} ~ 10 km/s at 1 Mpc
for ~1.6B stars common to Gaia, Galactic Centre stars to JASMINE

- Proper motion and internal stellar motion of Local Group galaxies, including LMC, SMC, M31, M33
- Gaps in stellar streams, wide binary populations
  → distribution of sub-DM halos, nature of DM

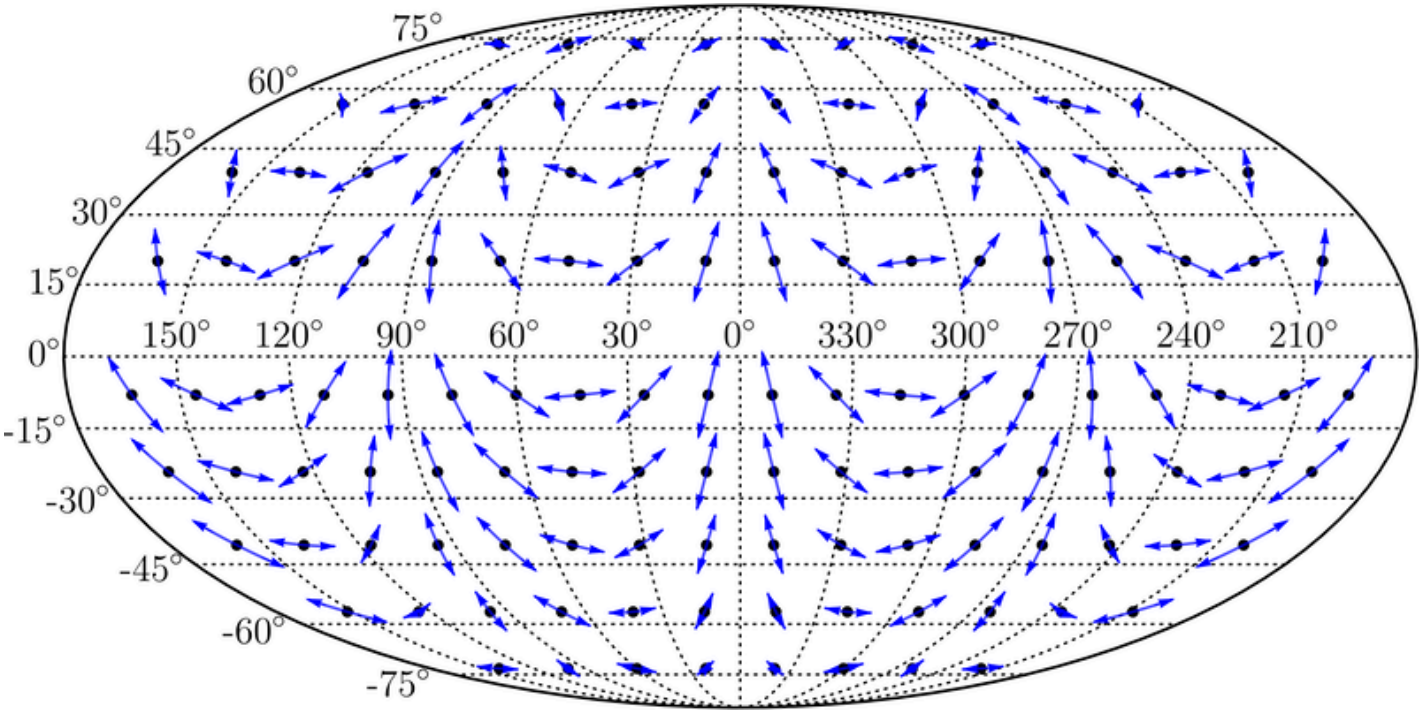


Improved proper motion

- Long period exo-planets
- Solar system:
  acceleration of asteroids in the main asteroid belt,
  understanding the origin of Near Earth Objects

NIR Celestial Reference Frame in 2040s when Gaia CRF is degraded

- Reference frame for future (NIR) observation
- Astrometric gravitational wave
  primordial gravitational wave?



Moore et al. (2017)

Are you just waiting for the final catalogue? Why not contributing to the high impact mission!

- Japanese on-going legacy in Astrometry: e.g. VERA, JASMINE
  (N)IR space astronomy: e.g. Subaru, PRIME, TAO, SPICA, TMT
  Gravitational Wave: KAGRA, LiteBIRD

- Potential Japanese contribution
  Launcher
  Super-Super Invar (low expansion alloy, JASMINE)
  Galactic centre JASMINE - GaiaNIR proper motion analysis
  Subaru/PFS? spectroscopic follow up

- GaiaNIR status
  Selected asse one of 3 ESA's new science idea in 2017
  ESA CDF completed in 2017 (284 page report)
  Voyage 2050 WP submitted (w/Kawata, Gouda)
  2040s launch?