

Gaia Data Release 3: Accessing Gaia DR3 data

Dr. Nick Rowell University of Edinburgh on behalf of the Gaia consortium

National Astronomy Meeting 3rd July 2023

Data access points



The Gaia Archive at ESA https://gea.esac.esa.int/archive/





Data access points



The Gaia Archive at ESA https://gea.esac.esa.int/archive/

Partner data centres:



CDS http://cdsweb.u-strasbg.fr/gaia



ARI (Heidelberg) https://gaia.ari.uni-heidelberg.de



Space Science Data Center http://gaiaportal.asdc.asi.it



AIP (Potsdam) https://gaia.aip.de



Flatiron

https://flathub.flatironinstitute.org/gaiadr3







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Gaia DR3 4111834567779557376		
Astrometry Photometry Spectroscopy	Astrophysical parameters	
Description	Value	Unit
Equatorial ICRS (RA,DEC) at epoch 2016	256.5229102004, -26.5805651308	deg
Galactic (I, b) at epoch 2016	357.0803450631, 8.5731964881	deg
Parallax	1.1538 ± 0.0241	mas
RA proper motion	0.3896 ± 0.0256	mas yr ⁻¹
DEC proper motion	-0.2893 ± 0.0165	mas yr ⁻¹
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- The advanced search facility allows users to perform queries on the database using Astronomical Data Query Language (ADQL)
- ADQL is a language for querying relational databases that is tailored to astronomical datasets
- It supports common astronomical operations e.g. cone searches, proper motion propagation, and it knows different reference frames
- Good references:
 - ADQL cookbook: www.gaia.ac.uk/data/gaia-data-release-1/adql-cookbook
 - Gaia Archive help pages: www.cosmos.esa.int/web/gaia-users/archive/writing-queries
- Basic query construction:

SELECT * FROM gaiadr3.gaia_source





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0.03270200629433478	1636148068921376768	Gaia DR3 4057482061536827008	4057482061536827008	1036091491	2016	266.3811239852798	0.015942628	-28.998103554565258	0.012455022	0.689718978337322
0.049213899988096534	1636148068921376768	Gaia DR3 4057481580494165888	4057481580494165888	115402482	2016	266.3961349068716	0.013481404	-29.05357658658583	0.01079274	0.4079738531270782
0.08203452901999679	1636148068921376768	Gaia DR3 4057488250585684480	4057488250585684480	639110292	2016	266.47653159355485	0.086195916	-28.944549604098608	0.06732362	0.3478533573251864
0.08777788506733702	1636148068921376768	Gaia DR3 4057483646380771584	4057483646380771584	1456435063	2016	266.39121152764295	0.023304338	-28.922942023840754	0.018219754	1.4690969053625107
0.08936608863253366	1636148068921376768	Gaia DR3 4057483062268391296	4057483062268391296	662270120	2016	266.33105889399053	0.022994984	-28.959261662972395	0.018822692	1.5417420967363484
0.10672667244796251	1636148068921376768	Gaia DR3 4057476563972698112	4057476563972698112	44164892	2016	266.51750059850445	0.04265731	-28.94752153873395	0.03436231	0.3182926041036272
0.12045438780355776	1636148068921376768	Gaia DR3 4057469146571463808	4057469146571463808	283536635	2016	266.5435273625594	0.020575272	-29.055111563219167	0.016335908	0.4689398602818703
0.1262952929724264	1636148068921376768	Gaia DR3 4057486601318288768	4057486601318288768	1452725847	2016	266.342473216923	0.018852646	-28.899563492970323	0.0142724365	0.427341266822602
0.13943080698048615	1636148068921376768	Gaia DR3 4057466908885996032	4057466908885996032	34937530	2016	266.47715558098196	0.018564114	-29.136887611646937	0.014320312	0.30998569170816115
0.14075109949599665	1636148068921376768	Gaia DR3 4057467497303664512	4057467497303664512	1712131209	2016	266.37131422837365	0.01872735	-29.14282269956864	0.014262437	0.9352141534416208
0.14993300807435972	1636148068921376768	Gaia DR3 4057466157273822464	4057466157273822464	65679287	2016	266.5754026654681	0.017654184	-29.06489165511335	0.013717432	0.4610922744250312
0.15112493353116369	1636148068921376768	Gaia DR3 4057480584061931008	4057480584061931008	784379780	2016	266.26190766306576	0.026456567	-29.074845044447642	0.020849852	1.007006793856833
0.16478466900949157	1636148068921376768	Gaia DR3 4057477045010171392	4057477045010171392	152272813	2016	266.5719251525898	0.017257813	-28.914325157291735	0.013818254	0.5661554554287637
0.1694041220503768	1636148068921376768	Gaia DR3 4057105238280140160	4057105238280140160	189862392	2016	266.24772918534273	0.052990068	-29.090541529330988	0.04148615	0.5958964620977629
0.1764690588736407	1636148068921376768	Gaia DR3 4057105517457073664	4057105517457073664	15478832	2016	266.2246716990601	0.022782516	-29.061794959208704	0.017884005	0.5152913885299929
0.20780737605618965	1636148068921376768	Gaia DR3 4057091150787104896	4057091150787104896	769056925	2016	266.3555325864866	0.015402617	-29.208597692320964	0.012133942	1.172773665088278
0.21499289697246812	1636148068921376768	Gaia DR3 4057463305415513984	4057463305415513984	1135726189	2016	266.43567645127746	0.018145058	-29.222171485841216	0.014143117	0.788391924219534
0.22112011712445814	1636148068921376768	Gaia DR3 4057464297546951680	4057464297546951680	187090956	2016	266.56821817791536	0.014919228	-29.18499700855427	0.011407923	0.37174307134658796
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RAS NAM 3rd July 2023 • Gaia Data Release 3: Accessing Gaia DR3 Data • Nick Rowell & the Gaia collaboration



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Non-tabular data in Gaia DR3

- Many of the new DR3 products are of non-tabular nature
 - BP/RP spectra, epoch photometry, MCMC samples, ...
 - For practical reasons these are not stored as tables in the archive relational database
 - Not accessible using TAP+ services; fields cannot be used in ADQL queries
 - This is possible via the UK Gaia Data Mining Platform [see Nigel's talk to follow]
- These are accessed using DataLink services

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- Archive queries provide links to additional data products outside of the main catalogue
- TOPCAT can access DataLink products (as well as tabular data via TAP+)
- Python module astroquery.gaia provides programmatic access to DataLink products
- There are tutorials and many examples on the Gaia Archive pages
 - https://www.cosmos.esa.int/web/gaia-users/archive/datalink-products



Additional software tools

- TOPCAT
 - Accessing, visualising, manipulating tabular data (see Mark Taylor's talk)
 - www.star.bris.ac.uk/~mbt/topcat/
- astroquery.gaia

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- Python module for accessing Gaia tabular and non-tabular data
- https://astroquery.readthedocs.io/en/latest/gaia/gaia.html
- Several software tools for working with Gaia data have been released with DR3
 - https://www.cosmos.esa.int/web/gaia/dr3-software-tools
- GaiaXPy for manipulating BP/RP spectra
 - https://gaia-dpci.github.io/GaiaXPy-website/



Summary

- The ESA Gaia Archive is the main access point for all Gaia data release products
 - https://gea.esac.esa.int/archive/
- Issues discovered since each data release are reported on the known issues pages
 - https://www.cosmos.esa.int/web/gaia/dr3-known-issues
- There are numerous ways to access the data either directly through the Archive, partner data centres or via third party applications
- There are tabular and non-tabular data
 - Tabular data can be used in selections when making queries
 - Non-tabular data must be downloaded
- Many useful tutorials are available on the Archive help pages

