

The Gaia Archive: towards DR3

Héctor Cánovas Cabrera (Support Archive Scientist)
Jos de Bruijne (Archive Scientist)
ESA/ESAC/ESDC

28/10/2021



The Archive in E/DR3



	# sources in Gaia DR3	# sources in Gaia DR2
Total number of sources	1,811,709,771	1,692,919,135
	Gaia Early Data Release 3	
Number of sources with minimally 5 astrometric parameters	1,467,744,818	1,331,909,727
Number of 5-parameter sources	585,416,709	
Number of 6-parameter sources	882,328,109	
Number of 2-parameter sources	343,964,953	361,009,408
Gaia-CRF sources	1,614,173	556,869
Sources with mean G magnitude	1,806,254,432	1,692,919,135
Sources with mean G _{BP} -band photometry	1,542,033,472	1,381,964,755
Sources with mean G _{RP} -band photometry	1,554,997,939	1,383,551,713

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gaia archive

HOMESEARCHVISUALISATIONHELP

Welcome to the Gaia Archive at ESA

Gaia is a European space mission providing astrometry, photometry, and spectroscopy of more than 1000 million stars in the Milky Way. Also data for significant samples of extragalactic and Solar system objects is made available. The Gaia Archive contains deduced positions, parallaxes, proper motions, radial velocities, and brightnesses. Complementary information on multiplicity, photometric variability, and astrophysical parameters is provided for a large fraction of sources.



Top Features



Citation

How to cite and acknowledge Gaia.



Search

Search for Gaia sources using the basic search form or the ADQL (Astronomical Data Query Language) interface for more advanced queries.



Download

Direct download of Gaia data files.



Help

Data release documentation, tutorials and more. For questions, suggestions or problems, please contact the Gaia Helpdesk.



Gaia Mission

News, information, and resources on the Gaia mission for the scientific community.



Partners

Partner data centres also serving Gaia data.

13

See: <https://www.cosmos.esa.int/web/gaia/earlydr3>





ADS Public Library

Gaia

Refereed Gaia papers since launch

Number of Papers:	Date Created:	Date Last Modified:
5709	Apr 2 2019, 2:18pm	Oct 24 2021, 3:21pm

[View Library](#) [Export](#) [Metrics](#) [Explore](#) [Citation Helper](#)

Citation Count ▾

- 1 2018A&A...616A...1G 2018/08 cited: 5,161
[Gaia Data Release 2. Summary of the contents and survey properties](#)
Gaia Collaboration; Brown, A. G. A.; Vallenari, A. and 451 more
- 2 2016A&A...595A...1G 2016/11 cited: 3,006
[The Gaia mission](#)
Gaia Collaboration; Prusti, T.; de Bruijne, J. H. J. and 623 more
- 3 2019ApJ...873..111I 2019/03 cited: 1,777
[LSST: From Science Drivers to Reference Design and Anticipated Data Products](#)
Ivezic, Zeljko; Kahn, Steven M.; Tyson, J. Anthony and 324 more
- 4 2016A&A...595A...2G 2016/11 cited: 1,530
[Gaia Data Release 1. Summary of the astrometric, photometric, and survey properties](#)
Gaia Collaboration; Brown, A. G. A.; Vallenari, A. and 589 more
- 5 2018A&A...616A...2L 2018/08 cited: 1,373
[Gaia Data Release 2. The astrometric solution](#)
Lindgren, L.; Hernández, J.; Bombrun, A. and 87 more
- 6 2018AJ....156...58B 2018/08 cited: 1,245
[Estimating Distance from Parallaxes. IV. Distances to 1.33 Billion Stars in Gaia Data Release 2](#)

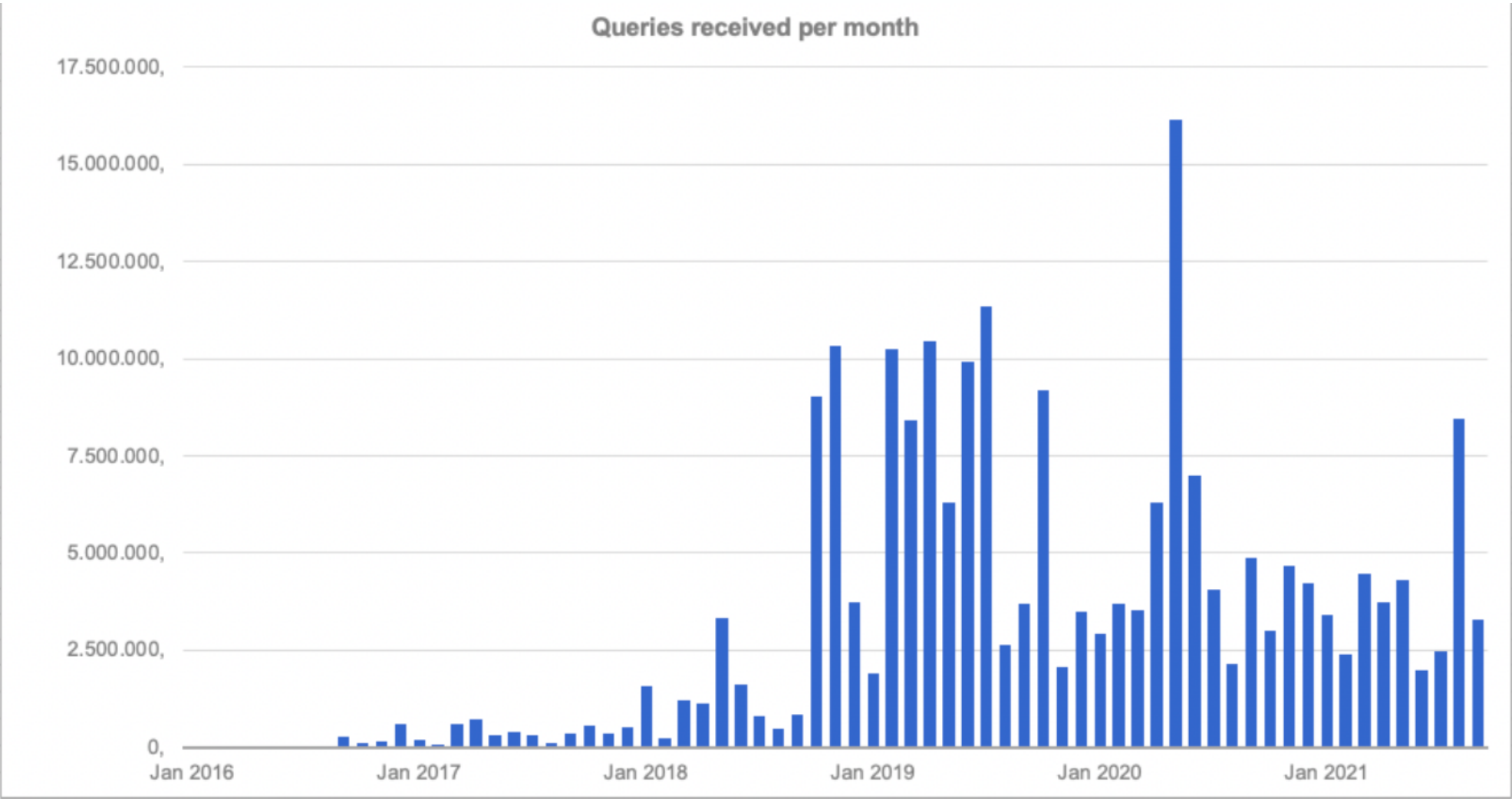
- DR2 Summary Article: 4.4 citations/day
- EDR3 Summary Article: 3.4 citations/day

See: <https://www.cosmos.esa.int/web/gaia/peer-reviewed-journals>



Queries received per month

3 queries / second
2 queries / second
1 query / second



Credits: ESDC/JdB (DR3 Road Map)



GUI: Accessing the Data in EDR3 (TAP+)

[Gmail](#) [Images](#)

[Google Search](#) [I'm Feeling Lucky](#)

Google offered in: [español](#) [català](#) [galego](#) [euskara](#)

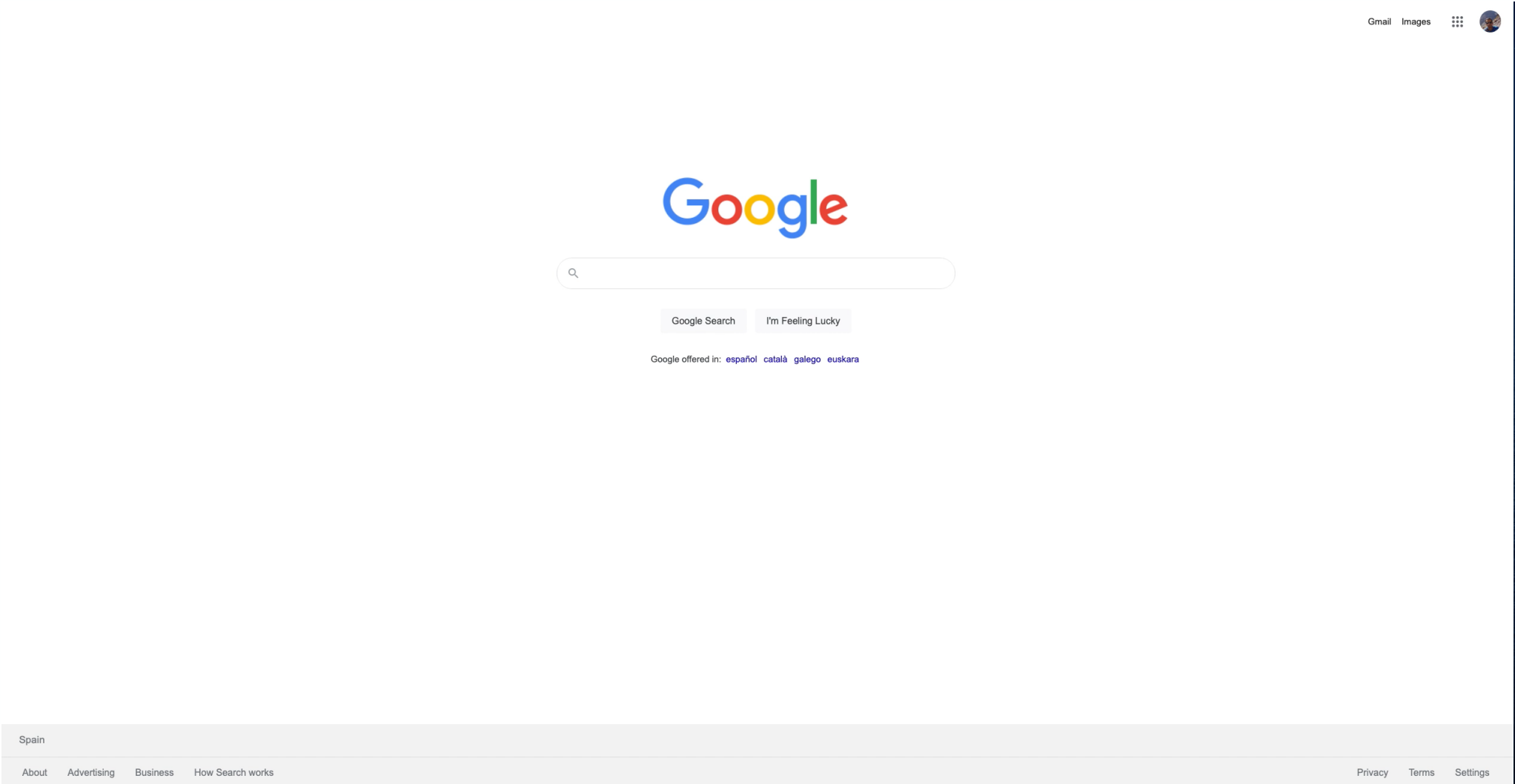
Spain

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GUI: Accessing the Data in EDR3 (TAP+)





GUI: Accessing the Archive in EDR3 (Datalink)



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Hector Canovas (hcanovas)

gaia archive

HOME SEARCH VISUALISATION HELP VOSPACE SHARE

Basic Advanced (ADQL) Query Results

gaia

Other

Gaia Data Release 1

Gaia Data Release 2

Gaia Early Data Release 3

- gaiaedr3.gaia_source

Auxiliary

Cross match

Simulation

User tables

- user_hcanovas.cham_galli_2021
- user_hcanovas.cham_galli_2021_to_edr3
- user_hcanovas.epslin_sample_cham_dr3_dr2
- user_hcanovas.gouliermis_2006
- user_hcanovas.helpdesk_test
- user_hcanovas.kervella_2019
- user_hcanovas.most_cited_simbad_stars
- user_hcanovas.pleiades_apass
- user_hcanovas.pleiades_dr2
- user_hcanovas.pleiades_edr3
- user_hcanovas.pleiades_gsc23
- user_hcanovas.pleiades_ps1
- user_hcanovas.pleiades_rave_dr5
- user_hcanovas.pleiades_twomass

Job name: aaug_dl_demo

```
1 SELECT source_id, ra, dec, pmra, pmdec
2 FROM gaiadr2.gaia_source AS gaia
3
4 WHERE contains(POINT(56.75, 24.12),CIRCLE(gaia.ra, gaia.dec, 1.0)) = 1
5
6 AND sqrt(power(gaia.pmra - 20.5, 2) + power(gaia.pmdec + 45.5, 2)) < 6.0
7
```

Ctrl+Space for query autocompletion

Reset Form

Submit Query

Status	Job	Creation date	Num. rows	Size	
✓	aaug_dl_demo	27-Oct-2021, 21:28:39	543	22 KB	
✓	1635002027705O	23-Oct-2021, 17:13:47	834	33 KB	
✓	1635001988634O	23-Oct-2021, 17:13:08	834	33 KB	
✓	1635001934390O	23-Oct-2021, 17:12:14	1089	43 KB	
✓	1635001824338O	23-Oct-2021, 17:10:24	1000	48 KB	
✓	1635001769238O	23-Oct-2021, 17:09:29	3405	159 KB	
✓	1635001422134O	23-Oct-2021, 17:03:42	3405	159 KB	
✓	1635001332216O	23-Oct-2021, 17:02:12	3405	159 KB	
✓	1635001132601O	23-Oct-2021, 16:58:52	3405	159 KB	

1-20 of 772

Download format: VOTable

Apply jobs filter

Select all jobs

Delete selected jobs

v2.13



GUI: Accessing the Archive in EDR3 (Datalink)



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Hector Canovas (hcanovas)

gaia archive

HOME SEARCH VISUALISATION HELP VOSPACE SHARE

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gaia

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- gaiaedr3.gaia_source

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- user_hcanovas.cham_galli_2021_to_edr3
- user_hcanovas.epslin_sample_cham_dr3_dr2
- user_hcanovas.gouliermis_2006
- user_hcanovas.helpdesk_test
- user_hcanovas.kervella_2019
- user_hcanovas.most_cited_simbad_stars
- user_hcanovas.pleiades_apass
- user_hcanovas.pleiades_dr2
- user_hcanovas.pleiades_edr3
- user_hcanovas.pleiades_gsc23
- user_hcanovas.pleiades_ps1
- user_hcanovas.pleiades_rave_dr5
- user_hcanovas.pleiades_twomass

Job name: aaug_dl_demo

Query examples

```
1 SELECT source_id, ra, dec, pmra, pmdec
2 FROM gaiadr2.gaia_source AS gaia
3
4 WHERE contains(POINT(56.75, 24.12),CIRCLE(gaia.ra, gaia.dec, 1.0)) = 1
5
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[v2.13]



PyAccessing the Archive in EDR3 (TAP+ & Datalink)



jupyter demo_light_curve_pleiades Last Checkpoint: 11 minutes ago (autosaved)

Logout

File Edit View Insert Cell Kernel Navigate Help

Trusted

Python 3 (ipykernel) O

Run Code

```
In [1]: 1 from astroquery.gaia import Gaia
        2 import matplotlib.pyplot as plt
        3 import numpy as np
```

Created TAP+ (v20200428.1) - Connection:

Host: gea.esac.esa.int

Use HTTPS: True

Port: 443

SSL Port: 443

Created TAP+ (v20200428.1) - Connection:

Host: gea.esac.esa.int

Use HTTPS: True

Port: 443

SSL Port: 443

```
In [2]: 1 def make_canvas(xlabel = '', ylabel = '', fontsize = 18, grid = True):
        2     plt.legend(fontsize = fontsize)
        3     plt.xticks(fontsize = fontsize)
        4     plt.yticks(fontsize = fontsize)
        5     plt.xlabel(xcol, fontsize = fontsize)
        6     plt.ylabel(ycol, fontsize = fontsize)
        7     if grid:
        8         plt.grid()
```

```
In [3]: 1 Gaia.login()
```

INFO: Login to gaia TAP server [astroquery.gaia.core]

User: hcanovas

Password:

OK

INFO: Login to gaia data server [astroquery.gaia.core]

OK

1 Retrieve 1-degree Pleiades Cone search

```
In [4]: 1 cone_ra = 56.75
        2 cone_dec = 24.12
        3 cone_rad = 1.0 # Radius in Degrees
        4
        5 query = f'SELECT source_id, ra, dec, pmra, pmdec, parallax \
        6 FROM gaiadr2.gaia_source AS gaia \
```



Trusted

```
In [4]: 1 cone_ra = 56.75
2 cone_dec = 24.12
3 cone_rad = 1.0 # Radius in Degrees
4
5 query = f'SELECT source_id, ra, dec, pmra, pmdec, parallax \
6 FROM gaiadr2.gaiia source AS gaiia \
```



The Archive in DR3



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See: <https://www.cosmos.esa.int/web/gaia/earlydr3>





The Archive in DR3



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Sources with mean G _{RP} -band photometry	1,554,997,939	1,383,551,713
	New data in Gaia Data Release 3 (pending validation)	
Sources with radial velocities	≈ 33,000,000	7,224,631
BP/RP spectra	> 100,000,000	-
RVS spectra	≈ 1,000,000	-
Variable source classifications	≈ 13,000,000	550,737
Object classifications	≈ 1,000,000,000	-
Sources with astrophysical parameters	≈ 500,000,000	161,497,595
Non-single stars	≈ a few 100,000	-
QSO host and galaxy morphological characterisation	≈ a few 1,000,000	-
Extended Objects	≈ a few 100,000	-
Solar system objects	≈ 150,000	14,099
Reflectance spectra for solar system objects	≈ 50,000	-
Average BP/RP reflectance spectra of asteroids	≈ 10,000	-
Gaia Andromeda Photometric Survey (GAPS)	≈ 1,000,000	-

See: <https://www.cosmos.esa.int/web/gaia/earlydr3>



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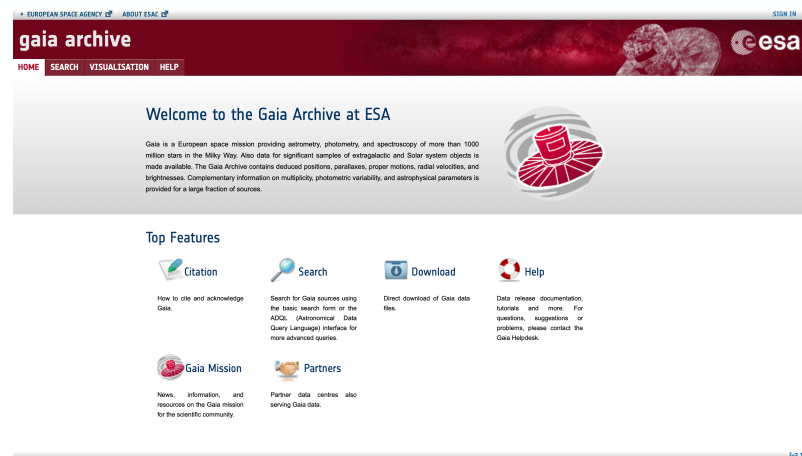
See: <https://www.cosmos.esa.int/web/gaia/earlydr3>



The Archive in DR3



ASTROMETRY PHOTOMETRY QUALITY FLAGS



X-MATCHES EXTRA CATALOGUES + ARCHIVE FUNCTIONALITIES



The Archive in DR3



**ASTROMETRY
PHOTOMETRY
QUALITY FLAGS**

**Astrophysical Parameters
Extinction
Outliers**



**X-MATCHES
EXTRA CATALOGUES
+ ARCHIVE FUNCTIONALITIES**

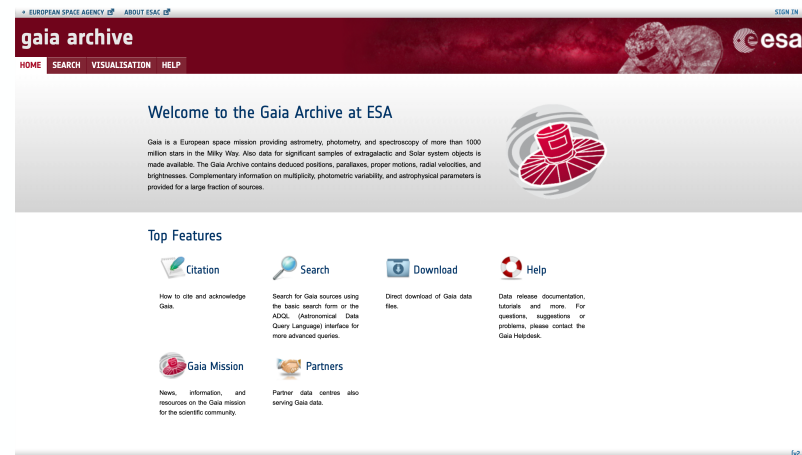


The Archive in DR3



**ASTROMETRY
PHOTOMETRY
QUALITY FLAGS**

**Astrophysical Parameters
Extinction
Outliers**



**Epoch Photometry
XP Spectra
RVS Spectra
MCMC: GSP & MSC**

**X-MATCHES
EXTRA CATALOGUES
+ ARCHIVE FUNCTIONALITIES**



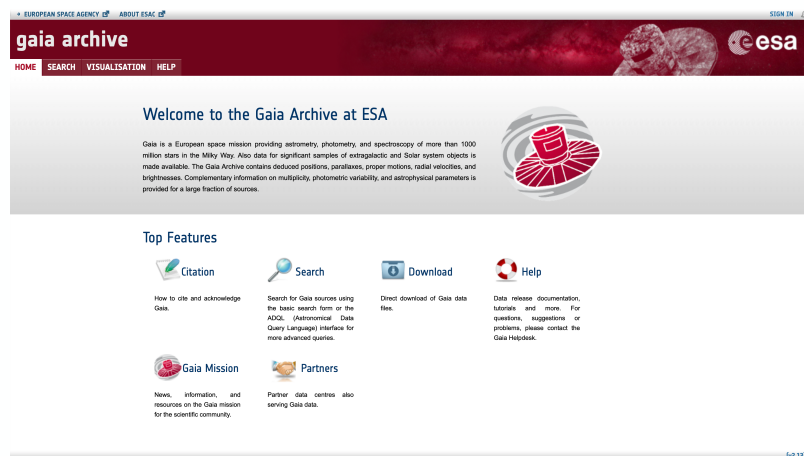
The Archive in DR3



Variability
Cepheids
RR Lyr
Companions

ASTROMETRY
PHOTOMETRY
QUALITY FLAGS

Astrophysical Parameters
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Epoch Photometry
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X-MATCHES
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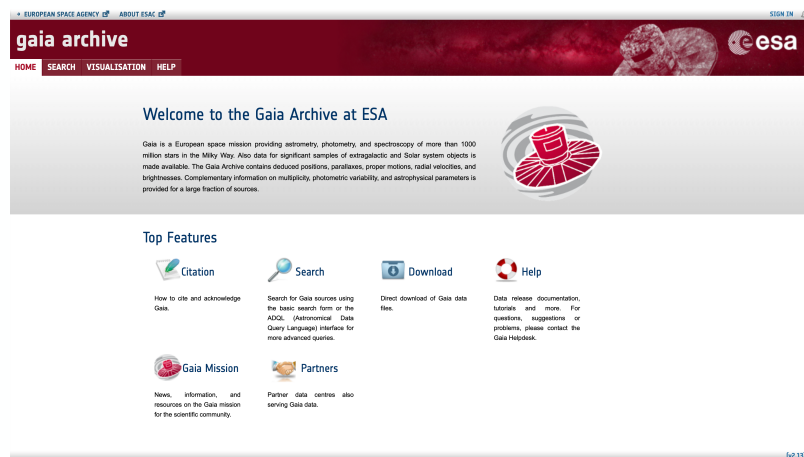
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NSS: 2-body orbits

NSS: Acceleration

NSS: Non-linear spectro



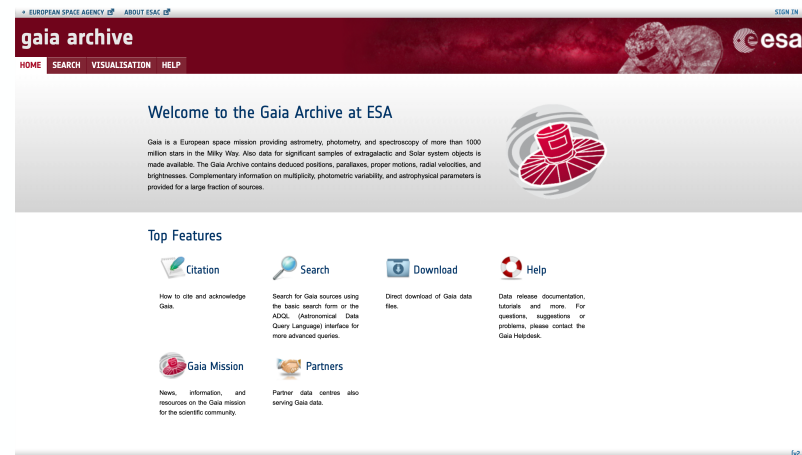
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NSS: 2-body orbits
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Extra-Galactic: QSO
Extra-Galactic: Galaxy





The Archive in DR3



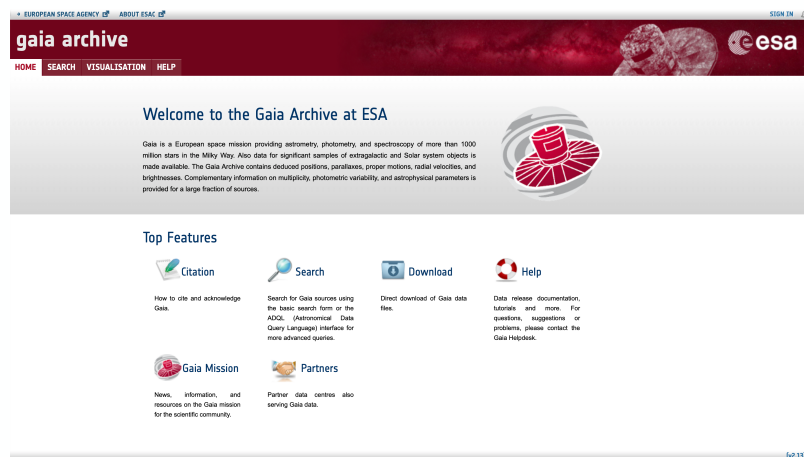
Variability
Cepheids
RR Lyr
Companions

Solar System: sources
Solar System: ref. spectra

Epoch Photometry
XP Spectra
RVS Spectra
MCMC: GSP & MSC

ASTROMETRY
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The Archive in DR3



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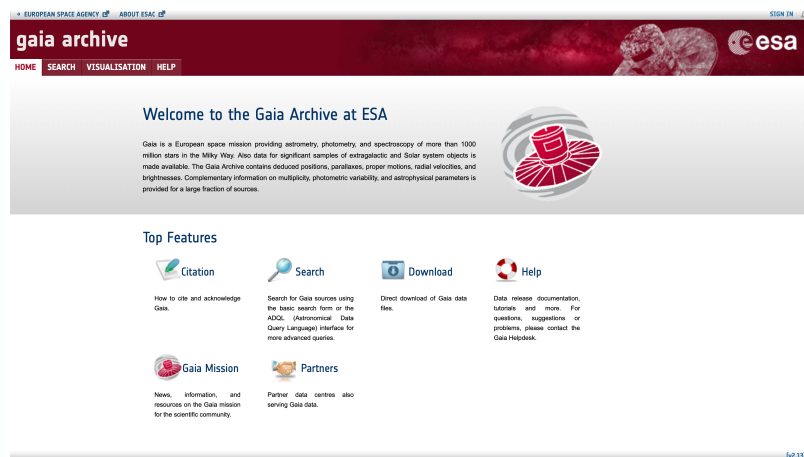
Micro-lensing

Solar System: sources
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Epoch Photometry
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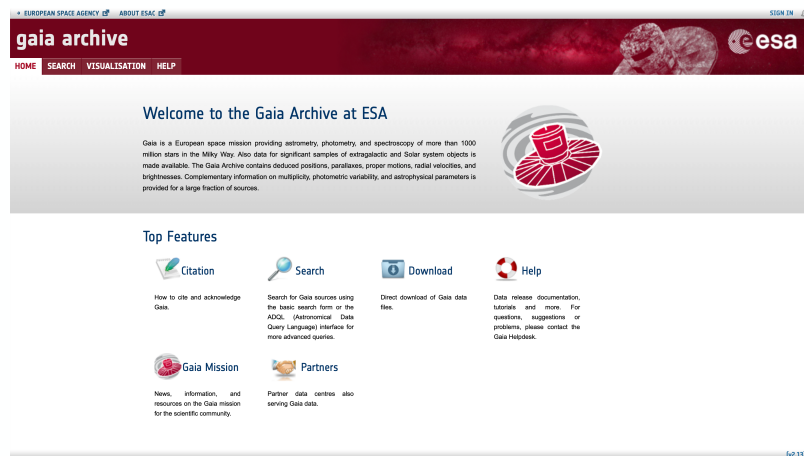
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X-MATCHES
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Astrophysical Parameters
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Science-alerts

NSS: 2-body orbits

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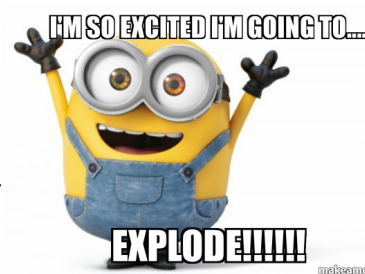
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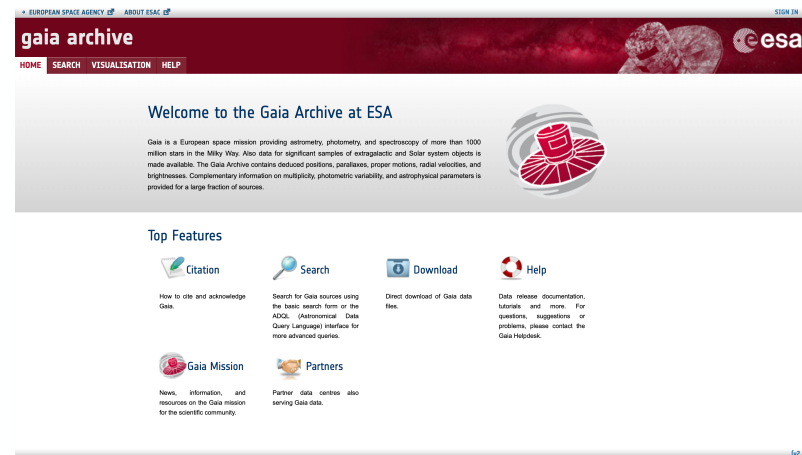


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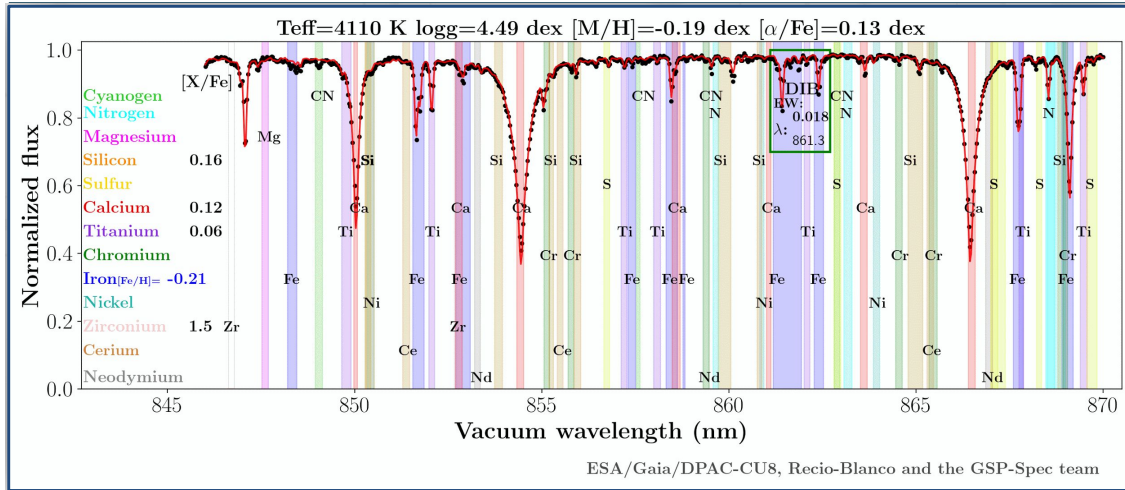
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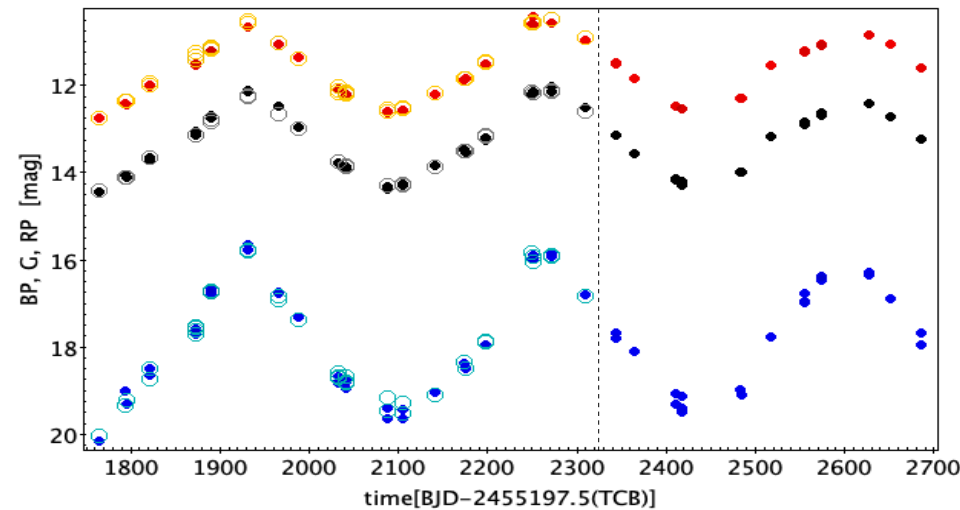
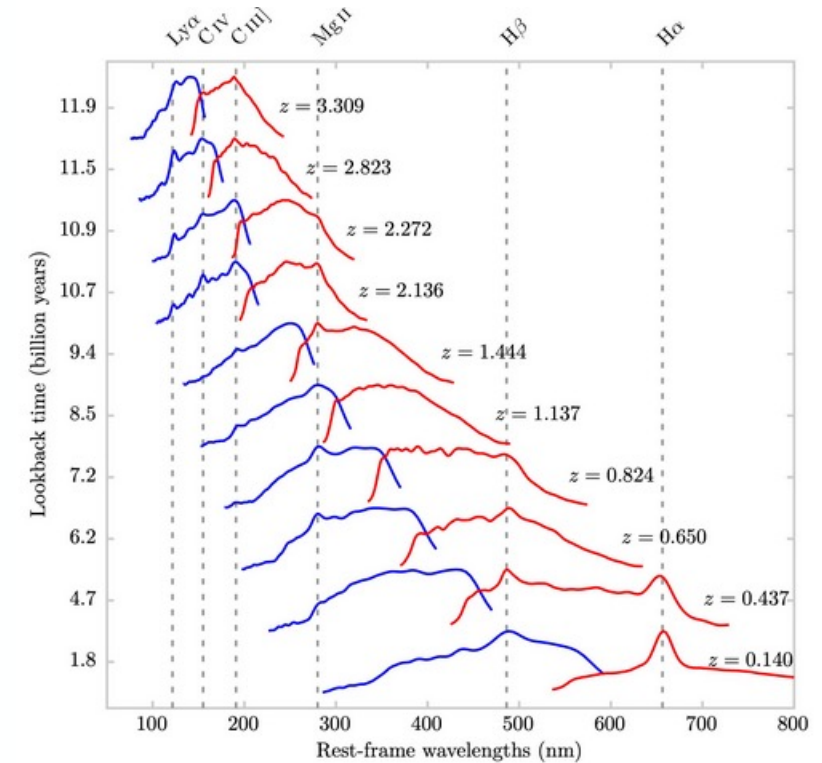
MCMC: GSP & MSC

Extra-Galactic: QSO
Extra-Galactic: Galaxy





BP RP spectra of QSOs



Adapted from Gaia talks at EAS 2021: Orlagh Creevey et al., Laurent Eyer et al., Antonella Vallenari et al. - (all of them and more are available at <https://www.cosmos.esa.int/web/gaia/dr3>)



In short: get ready for the DR3 party





In short: get ready for the DR3 party



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Feedback is ALWAYS useful!



- Single Object Webpage (ALL data for 1 object in a separate web)?
- Programmatic Tutorials?
- Quick-Inspection tools (e.g. X-Y visualisation)?
- Datalink data on TAP (so it can be queried)?
- ...?