

Gaia DR1 in CDS services

Thomas Boch, Arnaud Siebert, *on behalf of the CDS team*

CDS Council, November 7 2016



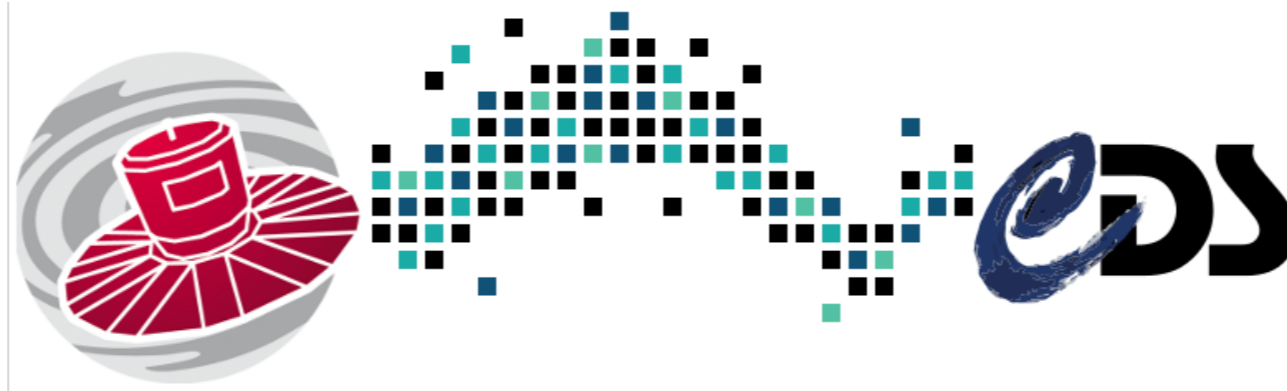
□ Gaia DR1

- Released September 14th 2016
- Content
 - **gaia_source**: position and flux (G band) for *1 billion sources*
 - **TGAS (Tycho Gaia Astrometric Solution)**: position, flux, proper motions and parallax for *2 million sources*
 - light curves for RR Lyrae and Cepheid
 - QSOs catalogue

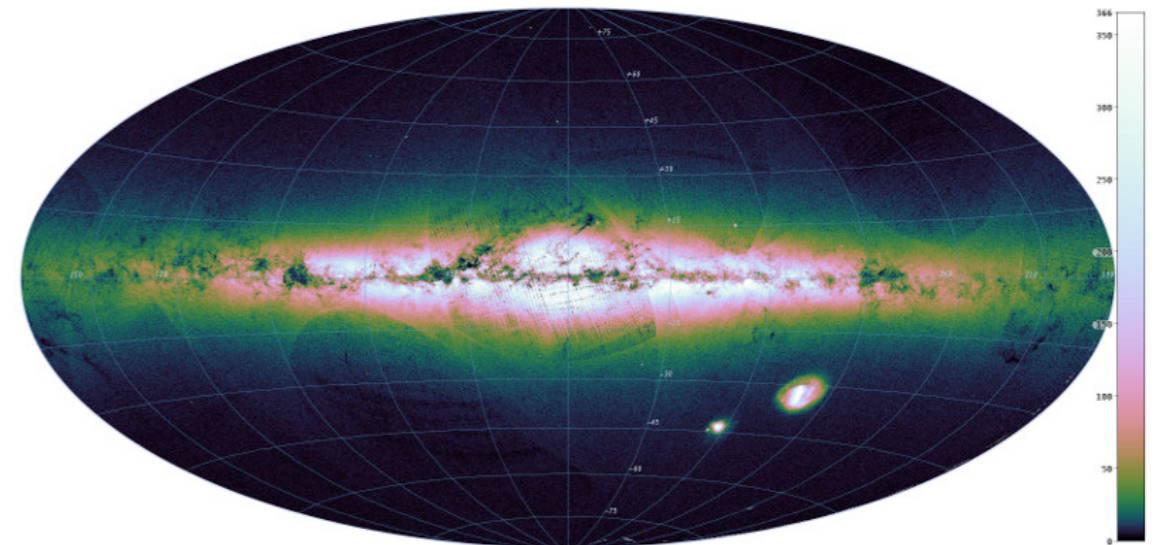
□ Gaia partner data centers

- Gaia partner data centers: " (...) data centers **integrated in CU9** and offering **added value services** (...) The additional services are considered part of the CU9 products and the data centers **may receive the Gaia data with some advance** "
- CDS is a partner data center (along with ARI, AIP, ASDC)
- Data received 1 month in advance
- Ingested in different CDS services in August
- No disclosure of data before official release date
 - Whole process assessed in June with Gaia rehearsal data
- Released on September 14 2016, at the same time than official ESA archive and other partner data centers

□ Gaia DR1 at CDS



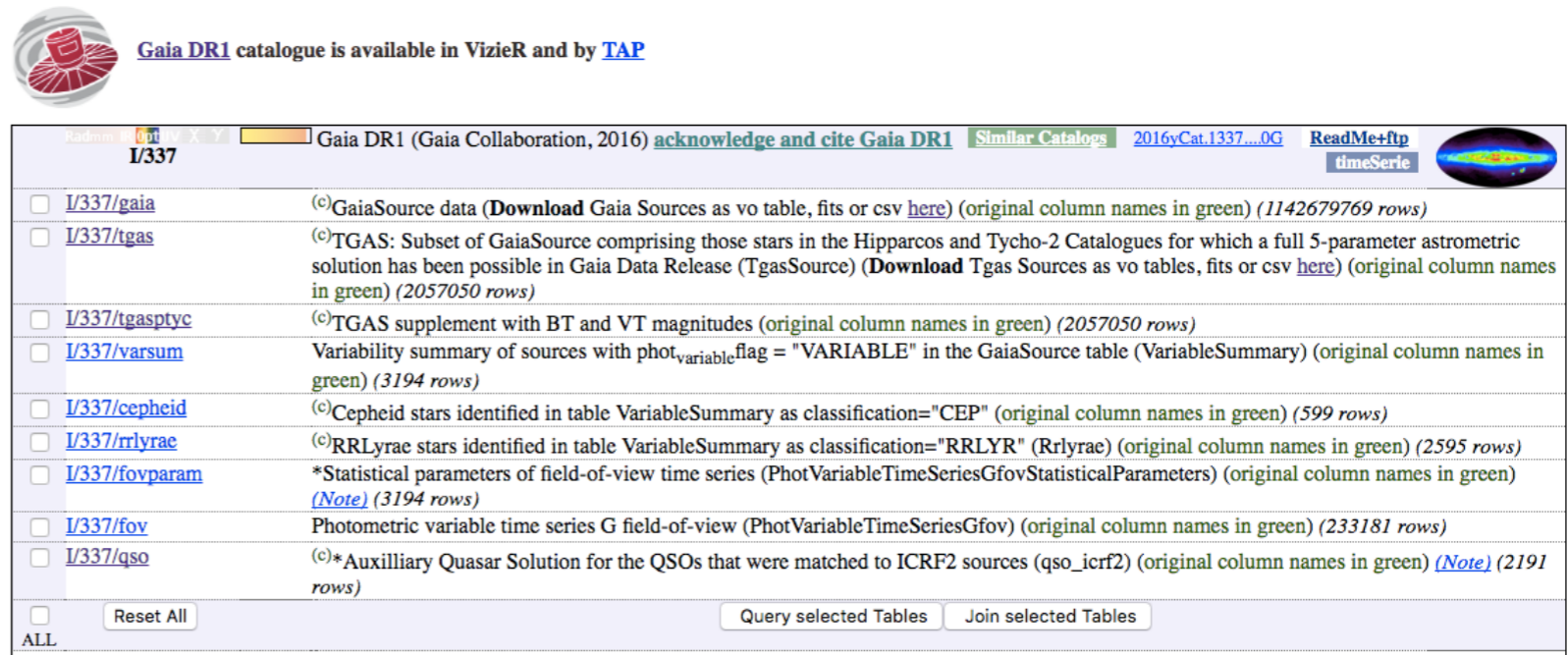
- VizieR
- TAP VizieR
- Cross-match service
- Aladin
- HiPS catalogue



<http://cds.unistra.fr/gaia>

□ Gaia DR1 at CDS: VizieR

- VizieR web interface
- Query by position + constraints on fields
- Cone Search interface
- Light curves visualization



Gaia DR1 (Gaia Collaboration, 2016) [acknowledge and cite Gaia DR1](#) [Similar Catalogs](#) [2016vCat.1337...0G](#) [ReadMe+ftp](#) [timeSerie](#)

<input type="checkbox"/>	I/337/gaia	(c)GaiaSource data (Download Gaia Sources as vo table, fits or csv here) (original column names in green) (1142679769 rows)
<input type="checkbox"/>	I/337/tgas	(c)TGAS: Subset of GaiaSource comprising those stars in the Hipparcos and Tycho-2 Catalogues for which a full 5-parameter astrometric solution has been possible in Gaia Data Release (TgasSource) (Download Tgas Sources as vo tables, fits or csv here) (original column names in green) (2057050 rows)
<input type="checkbox"/>	I/337/tgasptyc	(c)TGAS supplement with BT and VT magnitudes (original column names in green) (2057050 rows)
<input type="checkbox"/>	I/337/varsum	Variability summary of sources with phot_variable_flag = "VARIABLE" in the GaiaSource table (VariableSummary) (original column names in green) (3194 rows)
<input type="checkbox"/>	I/337/cepheid	(c)Cepheid stars identified in table VariableSummary as classification="CEP" (original column names in green) (599 rows)
<input type="checkbox"/>	I/337/rlyrae	(c)RRLYrae stars identified in table VariableSummary as classification="RRLYR" (Rrlyrae) (original column names in green) (2595 rows)
<input type="checkbox"/>	I/337/fovparam	*Statistical parameters of field-of-view time series (PhotVariableTimeSeriesGfovStatisticalParameters) (original column names in green) (Note) (3194 rows)
<input type="checkbox"/>	I/337/fov	Photometric variable time series G field-of-view (PhotVariableTimeSeriesGfov) (original column names in green) (233181 rows)
<input type="checkbox"/>	I/337/qso	(c)*Auxilliary Quasar Solution for the QSOs that were matched to ICRF2 sources (qso_icrf2) (original column names in green) (Note) (2191 rows)

ALL

□ Gaia DR1 at CDS: VizieR

- VizieR web interface
- Query by position + constraints on fields
- Cone Search interface
- Light curves visualization

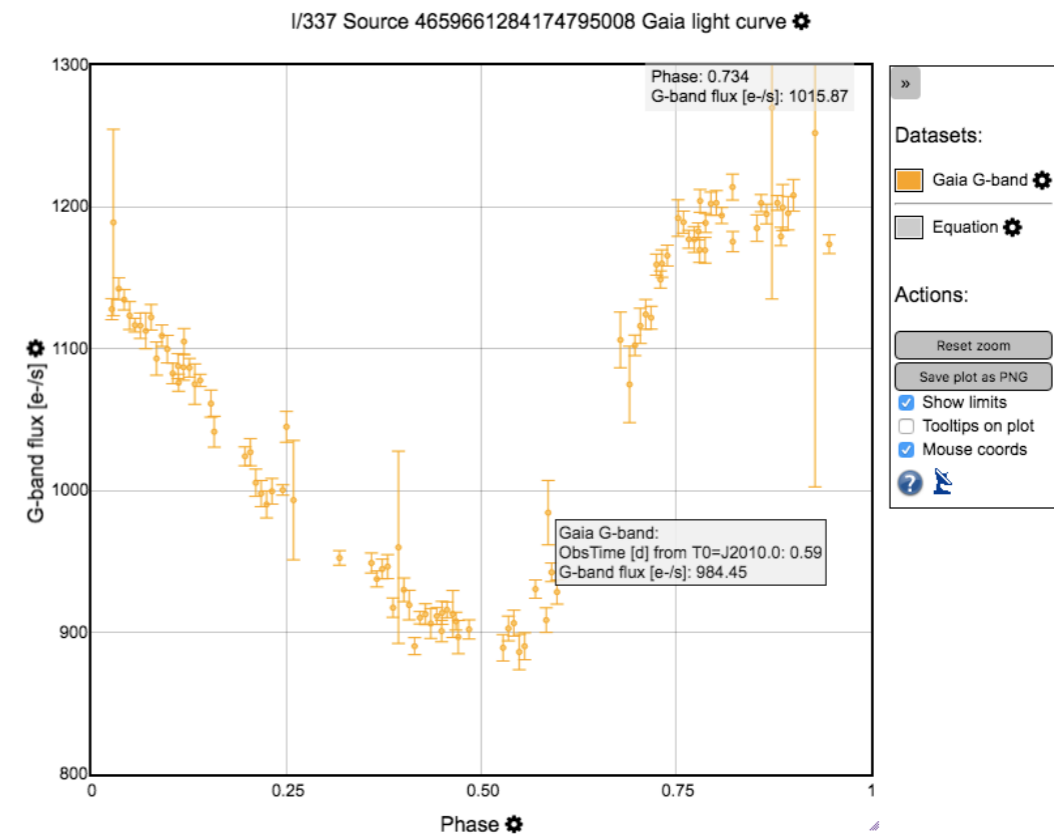
The screenshot shows the 'Simple Target' interface in VizieR. It features two tabs: 'Simple Target' (active) and 'List Of Targets'. The main search area is titled 'Target Name (resolved by [Sesame](#)) or Position:'. It contains a 'Clear' button, a text input field with 'M45', a 'J2000' dropdown menu, a text input field with '20', and another dropdown menu with 'arcmin'. Below these is a radio button selection for 'Radius' (selected) and 'Box size'. A table below the search area lists constraints:

Field	Value	Unit
Plx	5..10	mas
e_Plx	<0.4	mas

□ Gaia DR1 at CDS: VizieR

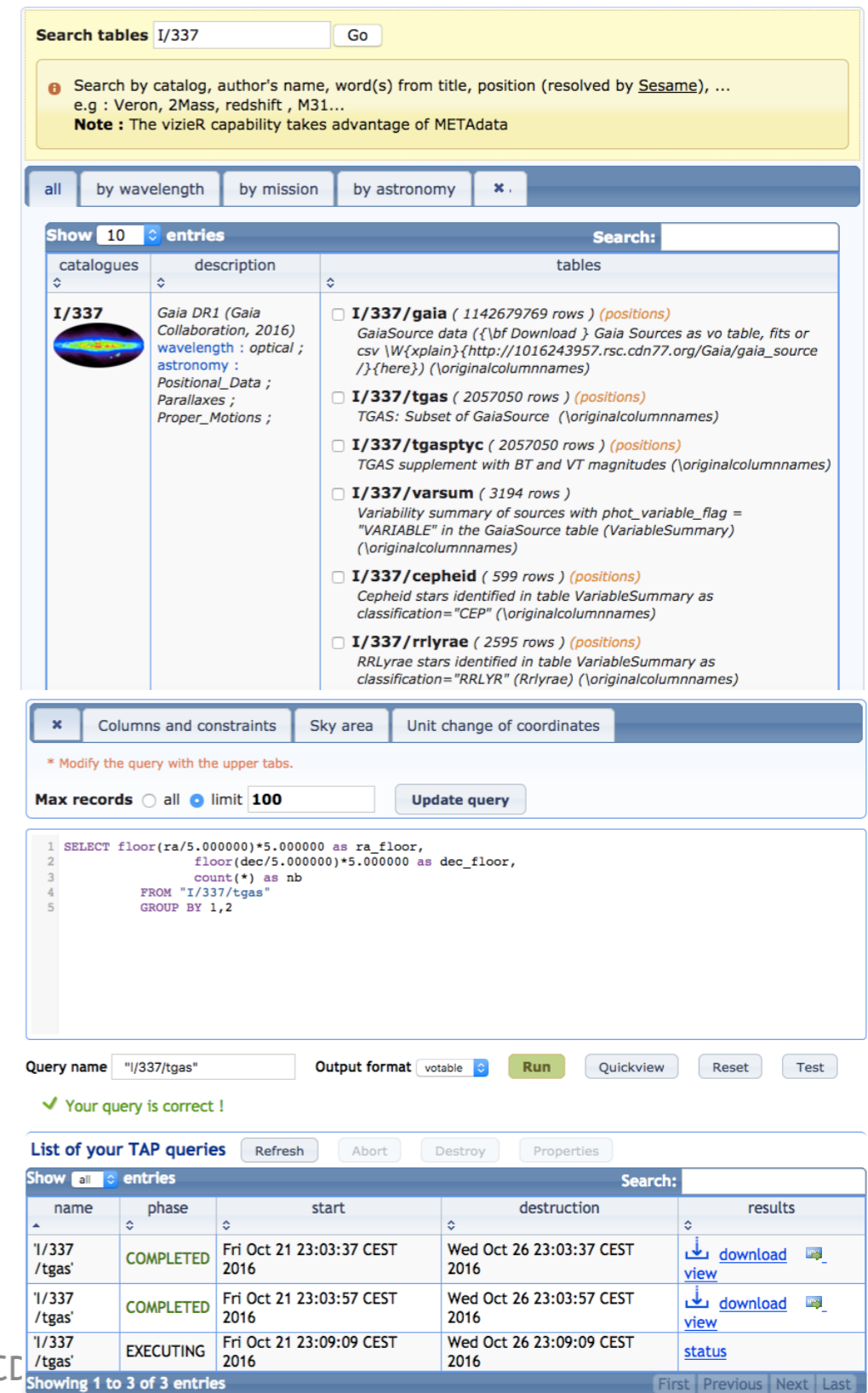
- VizieR web interface
- Query by position + constraints on fields
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<u>Full</u>	<u>HIP</u>	<u>TYC2</u>	<u>Source</u>	<u>RA ICRS</u> deg	<u>e</u> mas	<u>DE ICRS</u> deg	<u>e</u> mas	<u>Plx</u> mas	<u>e</u> mas	<u>pmRA</u> mas/yr	<u>pmD</u> mas/yr
<u>1</u>	<u>17692</u>		65017627244152064	056.8374571684	0.312	+23.8031539045	0.223	7.17	0.38	19.078	-45.46
<u>2</u>		<u>1800-1567-1</u>	65207705316826752	056.8518153901	0.250	+23.9144901927	0.220	7.65	0.30	18.854	-43.75
<u>3</u>		<u>1800-1579-1</u>	65212103363335296	056.7676517819	0.318	+23.9950255841	0.180	7.13	0.32	22.722	-44.92
<u>4</u>		<u>1799-79-1</u>	65221483571888128	056.4652392295	0.247	+24.0386890228	0.222	7.41	0.25	19.719	-44.88
<u>5</u>		<u>1800-1974-1</u>	65230829420741632	056.5573526278	0.276	+24.1965619563	0.172	7.56	0.27	17.724	-12.32
<u>6</u>		<u>1800-1908-1</u>	65231482255770112	056.6137540453	0.367	+24.2548128138	0.167	7.74	0.32	19.956	-44.29
<u>7</u>		<u>1800-1607-1</u>	66715273197982848	056.8306946920	0.312	+24.1389324034	0.164	7.64	0.30	17.879	-43.46



□ Gaia DR1 at CDS: VizieR TAP

- Gaia DR1 tables available in TAP VizieR
- Users can query Gaia tables and complement/join them with any available VizieR table (notably *Hipparcos*, *Tycho*, large surveys like *2MASS*, *SDSS*, etc)
- Web interface: <http://tapvizier.u-strasbg.fr/adql/>
- TAP endpoint: <http://tapvizier.u-strasbg.fr/TAPVizieR/tap/>



The screenshot displays the VizieR TAP interface. At the top, there is a search bar with 'I/337' entered and a 'Go' button. Below this, a message box provides search instructions and a note about METAdata. The main interface is divided into several sections:

- Search results:** A table with columns 'catalogues', 'description', and 'tables'. The 'I/337' catalogue is selected, showing a list of tables such as 'I/337/gaia', 'I/337/tgas', 'I/337/tgasptyc', 'I/337/varsum', 'I/337/cepheid', and 'I/337/rrlyrae'.
- Query editor:** A section with tabs for 'Columns and constraints', 'Sky area', and 'Unit change of coordinates'. It includes a 'Max records' dropdown set to 'limit 100' and an 'Update query' button.
- SQL query:** A text area containing a SQL query:

```
1 SELECT floor(ra/5.000000)*5.000000 as ra_floor,
2         floor(dec/5.000000)*5.000000 as dec_floor,
3         count(*) as nb
4 FROM "I/337/tgas"
5 GROUP BY 1,2
```
- Query execution:** A section with a 'Query name' field containing 'I/337/tgas', an 'Output format' dropdown set to 'votable', and buttons for 'Run', 'Quickview', 'Reset', and 'Test'. A green checkmark indicates 'Your query is correct!'.
- Query history:** A section titled 'List of your TAP queries' with buttons for 'Refresh', 'Abort', 'Destroy', and 'Properties'. It contains a table with columns 'name', 'phase', 'start', 'destruction', and 'results'.

name	phase	start	destruction	results
'I/337/tgas'	COMPLETED	Fri Oct 21 23:03:37 CEST 2016	Wed Oct 26 23:03:37 CEST 2016	download view
'I/337/tgas'	COMPLETED	Fri Oct 21 23:03:57 CEST 2016	Wed Oct 26 23:03:57 CEST 2016	download view
'I/337/tgas'	EXECUTING	Fri Oct 21 23:09:09 CEST 2016	Wed Oct 26 23:09:09 CEST 2016	status

Showing 1 to 3 of 3 entries

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- Web interface: <http://tapvizier.u-strasbg.fr/adql/>
- TAP endpoint: <http://tapvizier.u-strasbg.fr/TAPVizieR/tap/>

The screenshot displays the 'Table Access Protocol (TAP) Query' interface. The 'Metadata' section is active, showing a search for 'gaia'. The left sidebar lists various tables, with 'I/337/gaia' selected. The main panel shows a table of columns with their data types, indexed status, units, and descriptions. Below the metadata, the 'Service Capabilities' section shows 'Query Language: ADQL-2.0', 'Max Rows: 1000000000 (default)', and 'Uploads: 10krow/'. The 'ADQL Text' section shows a query: 'SELECT TOP 1000 * FROM "I/337/tgas"'. The 'Run Query' button is visible at the bottom.

Name	DataType	Indexed	Unit	Desc
astrometric_n_obs_ac	SMALLINT	<input type="checkbox"/>		Tota
phot_g_mean_flux	DOUBLE	<input checked="" type="checkbox"/>	e-/s	G-b;
solution_id	BIGINT	<input type="checkbox"/>		Solut
source_id	BIGINT	<input checked="" type="checkbox"/>		Sour
ecl_lat	DOUBLE	<input type="checkbox"/>	deg	Eclip
scan_direction_mean_k4	DOUBLE	<input type="checkbox"/>	deg	Mea
dec_pmdec_corr	REAL	<input type="checkbox"/>		? Coi
ra_error	REAL	<input checked="" type="checkbox"/>	mas	Stani
phot_g_mean_mag	REAL	<input checked="" type="checkbox"/>	mag	G-b;
astrometric_n_obs_al	SMALLINT	<input type="checkbox"/>		Tota
pmra_error	REAL	<input type="checkbox"/>	mas/yr	? Sta
scan_direction_mean_k3	DOUBLE	<input type="checkbox"/>	deg	Mea
parallax_pmra_corr	REAL	<input type="checkbox"/>		? Coi

□ Gaia DR1 at CDS: xmatch service

- Fast positional cross-identification of Gaia sources with any VizieR table with position (or user-uploaded table)
- Web interface: <http://cdsxmatch.u-strasbg.fr/xmatch>
- HTTP API
 - *astroquery*
 - *Topcat*

CDS X-Match Service

Choose tables to cross-match

GAIA DR1 TGAS 2MASS

Gaia DR1 (Gaia Collaboration, 2016) 2,057,050 rows

2MASS All-Sky Catalog of Point Sources (Cutri+ 2003) 470,992,970 rows

Begin the X-Match

Visualize and manage your cross-match jobs

Table 1	Table 2	Options	Begin	Status
GAIA DR1 TGAS	2MASS	fixed radius	21/10/2016 at 22:55	completed

Get result

Delete

□ Gaia DR1 at CDS: xmatch service

- Fast positional cross-identification of Gaia sources with any VizieR table with position (or user-uploaded table)
- Web interface: <http://cdsxmatch.u-strasbg.fr/xmatch>
- HTTP API
 - *astroquery*
 - *Topcat*

The screenshot shows the 'CDS Upload X-Match' web interface. It is divided into three main sections: 'Remote Table', 'Local Table', and 'Match Parameters'.
- **Remote Table:** A dropdown menu is set to 'GAIA DR1'. Below it, fields show 'Name: I/337/gaia', 'Alias: GAIA DR1', 'Description: GaiaSource data (Download) Gaia Source', 'Row Count: 1 142 679 769', and 'Coverage: 0.9999797 (order 6)'.
- **Local Table:** The 'Input Table' is '2: III_235B_catalog'. The 'RA column' is '_RAJ2000' with units 'degrees (J2000)'. The 'Dec column' is '_DEJ2000' with units 'degrees (J2000)'.
- **Match Parameters:** 'Radius' is '4.0' with units 'arcsec'. 'Find mode' is 'Best'. 'Rename columns' is 'Duplicates' and 'Suffix' is '_x'. 'Block size' is '50000'.
At the bottom, there are 'Go' and 'Stop' buttons.

□ Gaia DR1 at CDS: Aladin

- Dedicated form to access Gaia data in Aladin Desktop

Server selector

Others HiPS File all-VO Watch FoV... Tools...

Image servers

Aladin images SkyView UKIDSS Sloan DSS... VLA... Archives... Others...

Catalog servers

All VizieR Surveys Missions SIMBAD NED SkyBot Gaia Others...

Gaia DR1 (Gaia Collaboration, 2016) ?

Target (ICRS, name) Grab coord

Radius 14'

Table I/337/tgasptyc - TGAS supplemented wit...

Plx [mas](ex: > 50)

Gmag (ex: 10..11)

pmRA [mas/yr] (ex: <-...)

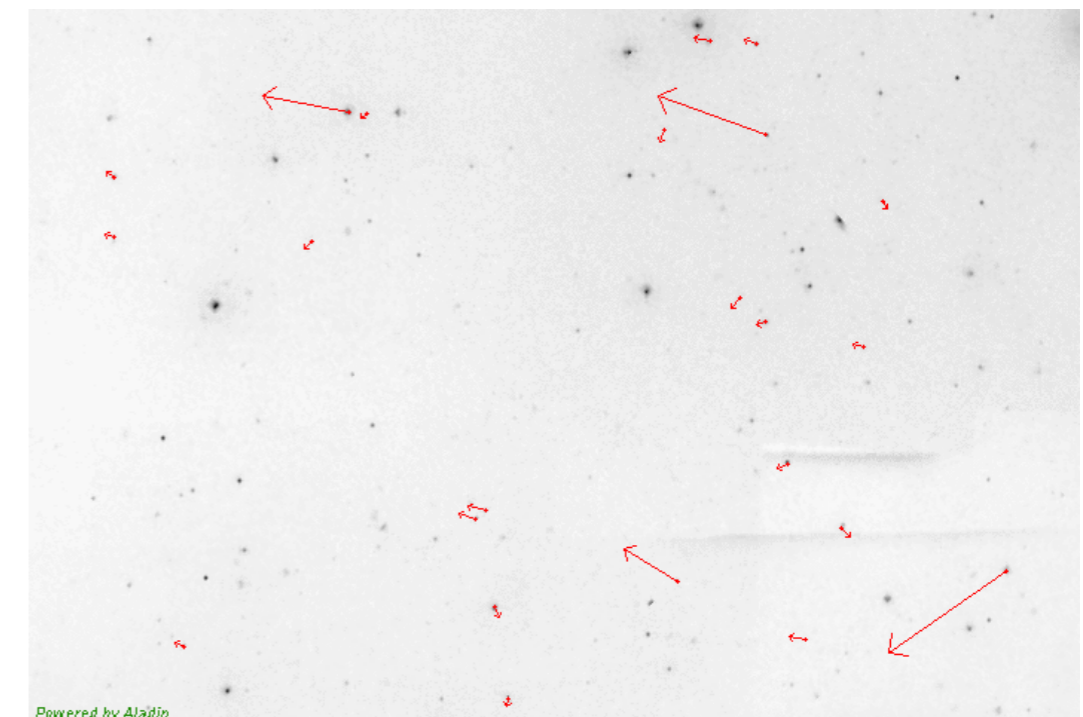
pmDE [mas/yr] (ex: > 3...)

Output columns * - Default columns

Output max 999999

Reset Clear SUBMIT Close ?

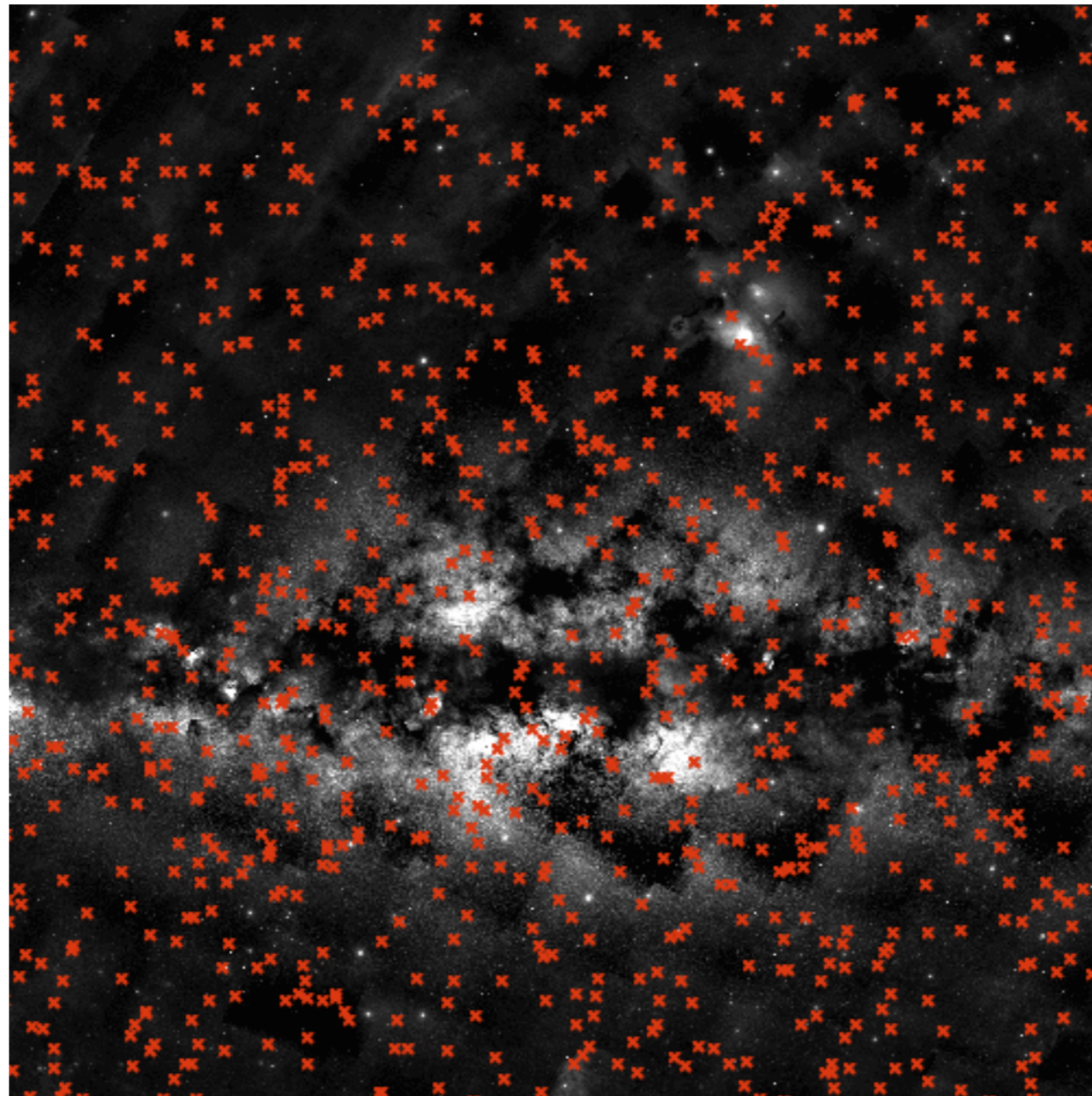
- Visualization of proper motions



Powered by Aladin

□ Gaia DR1 at CDS: HiPS catalogue

- HiPS progressive catalogue built from Gaia data
<http://cds.unistra.fr/Gaia/DR1/AL-visualisation.gml>



□ Access statistics

September 14th to October 31st 2016:

- **VizieR**

- 3.4 million queries
- 2800 different IPs

- **Cross-match**

- 190 million positions submitted
- 200+ different users
- 4 billion cross-id associations generated (1.3 TB)

□ This is just the beginning



□ This is just the beginning

- DR1: good training set for DR2 and upcoming releases

Second release: Q4 2017

Potentially, the catalogue will be consisting of:

- Five-parameter astrometric solutions of objects with single-star behaviour will be released under the assumption that at least 90% of the sky can be covered.
- Integrated BP/RP photometry, with appropriate standard errors for sources where basic astrophysical parameter estimation has been verified (these parameters will also be released).
- Mean radial velocities will be released for objects showing no radial-velocity variation and for which an adequate synthetic template could be selected, under the assumption that this can be done for 90% of the bright stars on the sky.

- Challenges

- time domain, user interface to access, filter, explore large data and analyze them
- existing infrastructure (*HiPS, MOC, widgets, storage space*) will help