

Accessing the Gaia catalog at ARI

Grégory Mantelet

Astronomisches Rechen Institut (ARI)
Heidelberg, Germany

May 19, 2016

- 1 What are the data?
- 2 Who will provide the catalog?
- 3 How to get the catalog?
- 4 Data access services
- 5 Get ready!

1. What are the data?

- **The Gaia Data Release 1** (*~ 1 billion sources*)
 - position
 - mean magnitude
 - formal errors
 - quality parameters (e.g. fit goodness)
 - correlations
- **TGAS - Tycho2-Gaia Astrometric Solution** (*~ 2 million sources*)
 - proper motions
 - parallax
- **Variable star catalog** (*RR Lyraes, Cepheids*) *observed in the EPSL period (~ 4 weeks)*
- **Crossmatches with some external catalogs** (2MASS, Hipparcos, Tycho2, SDSS, PPMXL, ...) - *computed and provided by ASDC*

When?

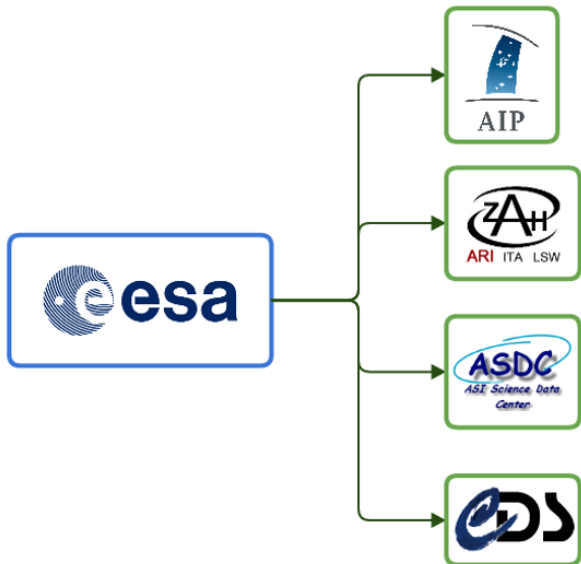
At the end of this summer.

2. Who will provide the catalog?

2. Who will provide the catalog?



2. Who will provide the catalog?



3. How to get the catalog?

3. How to get the catalog?

Do not download it! Query it!

Why?

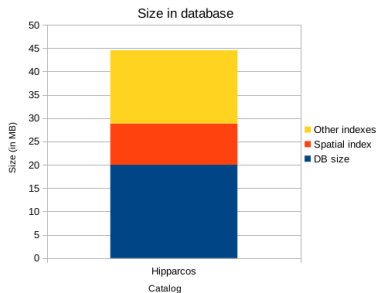
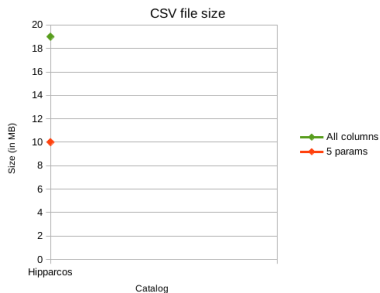
Because it is huge.

Downloading it implies that you will lose time and efforts when dealing by yourself with:

- the time to download the catalog
- having enough memory on your machine/institute server(s)
- the data format
- the ingestion in database + indexation
- ...

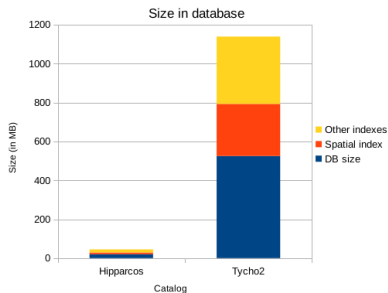
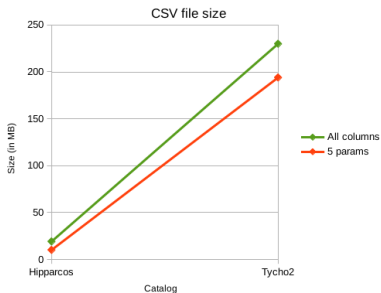
3. How to get the catalog?

	Hipparcos	Tycho2	PPMXL	Gaia (estimation)
Nb Col x Row	25 x 118,218			
Nb Rows Ratio	1x			
CSV (in MB)	19			
DB (in MB) (data + indexes)	20 + 25			



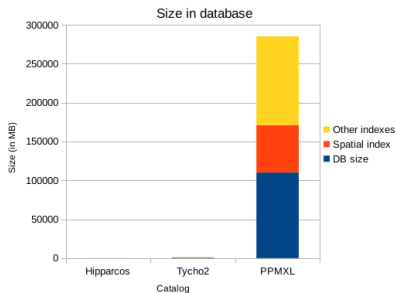
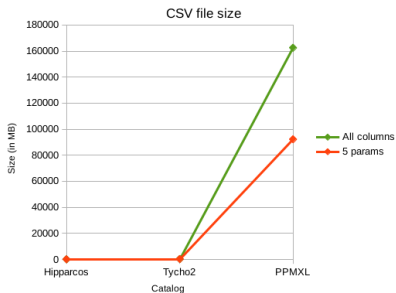
3. How to get the catalog?

	Hipparcos	Tycho2	PPMXL	Gaia (<i>estimation</i>)
Nb Col x Row	25 x 118,218	16 x 2,539,913		
Nb Rows Ratio	1x	~21x		
CSV (in MB)	19	230		
DB (in MB) (data + indexes)	20 + 25	525 + 614		



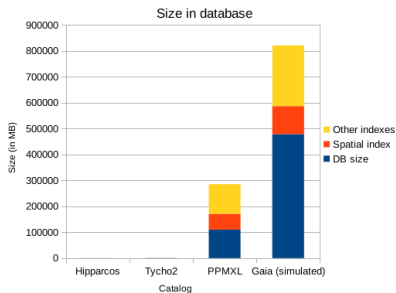
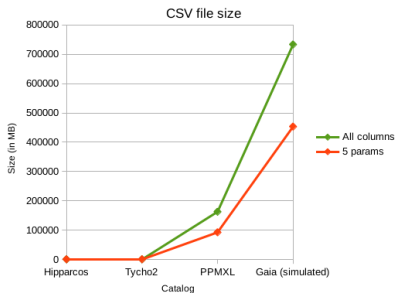
3. How to get the catalog?

	Hipparcos	Tycho2	PPMXL	Gaia (<i>estimation</i>)
Nb Col x Row	25 x 118,218	16 x 2,539,913	25 x 910,468,688	
Nb Rows Ratio	1x	~21x	~7,702x	
CSV (in MB)	19	230	162,537	
DB (in MB) (data + indexes)	20 + 25	525 + 614	110,000 + 175,000	



3. How to get the catalog?

	Hipparcos	Tycho2	PPMXL	Gaia (<i>estimation</i>)
Nb Col x Row	25 x 118,218	16 x 2,539,913	25 x 910,468,688	40 x 1,881,000,000
Nb Rows Ratio	1x	~21x	~7,702x	~15,911x
CSV (in MB)	19	230	162,537	733,590
DB (in MB) (data + indexes)	20 + 25	525 + 614	110,000 + 175,000	478,000 + 342,000



4. Data access services

- 1 What are the data?
- 2 Who will provide the catalog?
- 3 How to get the catalog?
- 4 Data access services
 - ESAC
 - AIP
 - ASDC
 - CDS
 - ARI
 - Let's sum up
- 5 Get ready!

4.a. ESAC

- TAP - Table Access Protocol

gaia archive

HOME SEARCH STATISTICS VISUALIZATION HELP DOCUMENTATION

ADD NEW QUERY PREVIEW

Job name:

Submit Query

Status	Job	Creation date	Rows	Size
✓	146158809302040	18-May-2016, 18:28:23	4	1.9G

Apply jobs filter Filter this selection Select all jobs Delete selected jobs

Copyright 2006 - 2016 © European Space Agency All Rights Reserved.

TAP = Table Access Protocol

ADQL = Astronomical Data Query Language



UPLOAD
any of your own table
(in VOTable)

SELECT columns/expressions
FROM table(s)
[WHERE constraints]
[ORDER BY select_items]
[GROUP BY select_items]
[HAVING group_constraints]



TAP

Catalog In DB

Result in the format
of your choice

Synchronous Mode
=> quick queries



ADQL query
= Result

TAP

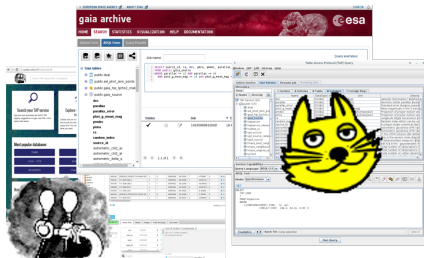
Asynchronous Mode
=> long queries + history
(uses UWS)



ADQL query
= Job ID
When job
finished
Result

TAP

- TAP - Table Access Protocol

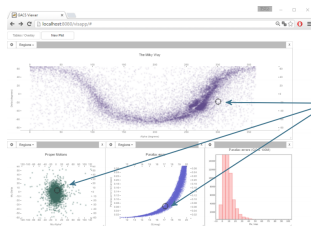


Access interfaces

- Web interface (GACS):
<http://gaia.esac.esa.int/archive/>
- For TAP: TOPCAT and STILTS, TAPHandle, script (e.g. bash, python), ...

4.a. ESAC

- TAP - Table Access Protocol
- Visualization



- Web app; displays in browser; PC, tablets, mobile phones
- Multiple panels; resizable and movable
- Interactive (zoom, pan, etc)
- Linked views

Figure: Screenshot of a prototype of the Visualization service in GACS

Access interfaces

- Web interface (GACS):
<http://gaia.esac.esa.int/archive/>

4.a. ESAC

- TAP - Table Access Protocol
- Visualization
- Statistics

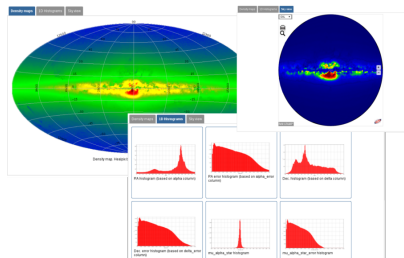


Figure: Statistics available on GACS for a simulated Gaia catalog

Access interfaces

- Web interface (GACS):
<http://gaia.esac.esa.int/archive/>

4.b. AIP

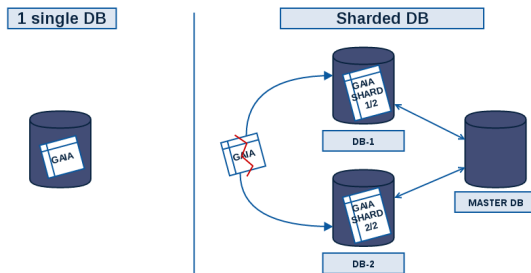
- SQL Service (using UWS for the query processing) on top of a *sharded* database

Access interfaces

- Web interface: <https://gaia.aip.de>
- With a *UWS* client: Command line client (*in Python*) developed by AIP

4.b. AIP

- SQL Service (using UWS for the query processing) on top of a *sharded* database



Access interfaces

- Web interface: `https://gaia.aip.de`
- With a *UWS* client: Command line client (*in Python*) developed by AIP

4.c. ASDC

- catalog access through a web form (*e.g. cone search and more complex query but neither in ADQL or SQL*)

Access interfaces

- Web interface **only**

4.c. ASDC

- catalog access through a web form (*e.g. cone search and more complex query but neither in ADQL or SQL*)
- there may be a TAP service sometime

Access interfaces

- Web interface **only** (*until a TAP service is released*)

4.c. ASDC

- catalog access through a web form (*e.g. cone search and more complex query but neither in ADQL or SQL*)
- there may be a TAP service sometime
- web page to make inter-catalogue queries with the surveys which will be officially cross-matched with Gaia

Access interfaces

- Web interface **only** (*until a TAP service is released*)

4.c. ASDC

- catalog access through a web form (*e.g. cone search and more complex query but neither in ADQL or SQL*)
- there may be a TAP service sometime
- web page to make inter-catalogue queries with the surveys which will be officially cross-matched with Gaia
- advanced crossmatch service (several crossmatch algorithms will be proposed)

Access interfaces

- Web interface **only** (*until a TAP service is released*)

4.c. ASDC

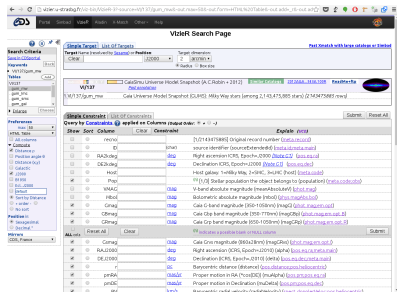
- catalog access through a web form (*e.g. cone search and more complex query but neither in ADQL or SQL*)
- there may be a TAP service sometime
- web page to make inter-catalogue queries with the surveys which will be officially cross-matched with Gaia
- advanced crossmatch service (several crossmatch algorithms will be proposed) **only from the Gaia's 3rd release**

Access interfaces

- Web interface **only** (*until a TAP service is released*)

4.d. CDS

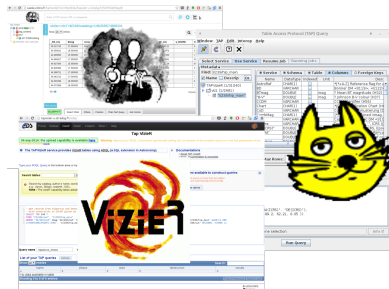
- VizierR



Access interfaces

- Web page: <http://vizier.u-strasbg.fr/viz-bin/VizieR>
- TOPCAT and STILTS

- VizieR
- TAP



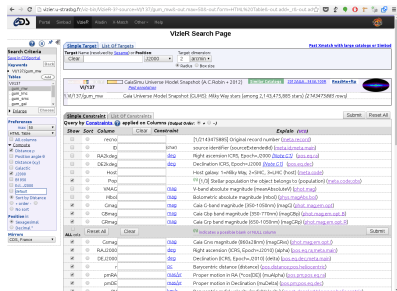
Access interfaces

- Web page: <http://tapvizier.u-strasbg.fr/adql/>
- TOPCAT and STILTS
- another TAP client (e.g. TAPHandle)
- script (e.g. bash, python)

4.d. CDS

- VizieR

- TAP
- Cone Search



Access interfaces

- Web page: <http://vizier.u-strasbg.fr/viz-bin/VizieR>
- TOPCAT and STILTS
- script (e.g. bash, python)

■ VizierR

- TAP
- Cone Search
- *MOC*

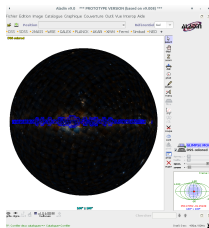


Figure: MOC of GLIMPSE displayed in Aladin

Access interfaces

- Aladin Desktop

- VizieR
 - TAP
 - Cone Search
 - MOC
- Aladin
 - *Progressive catalog (HIPS)*

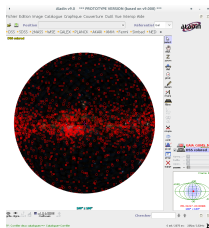


Figure: Progressive catalog (HIPS) of GUMS-MW displayed in Aladin

Access interfaces

- Aladin Desktop

4.d. CDS

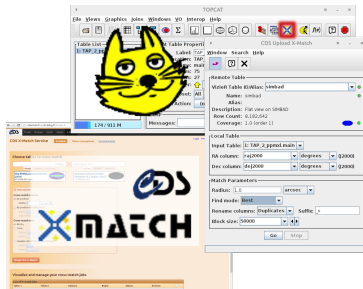
■ VizierR

- TAP
- Cone Search
- MOC

■ Aladin

- *Progressive catalog (HIPS)*

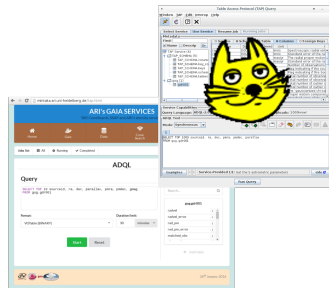
■ Crossmatch Service



Access interfaces

- Web page: <http://cdsxmatch.u-strasbg.fr/xmatch>
- TOPCAT and STILTS
- script (e.g. bash, python)

■ TAP

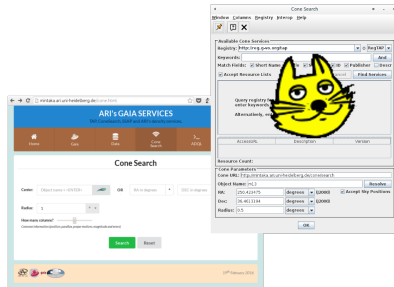


Access interfaces

- Web page: <http://mintaka.ari.uni-heidelberg.de>
- TOPCAT
- another TAP client (e.g. TAPHandle)
- script (e.g. bash, python)

4.e. ARI

- TAP
- Cone Search



Access interfaces

- Web page: <http://mintaka.ari.uni-heidelberg.de>
- TOPCAT
- script (e.g. bash, python)

4.e. ARI

- TAP
- Cone Search
- MOC Search

Access interfaces

- Web page: `http://mintaka.ari.uni-heidelberg.de`
- script (e.g. bash, python)

- TAP
- Cone Search
- MOC Search
- Histogram computation for custom expression

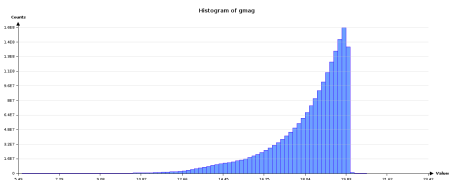


Figure: Histogram of gmag of a simulated Gaia catalog

Access interfaces

- Web page: <http://mintaka.ari.uni-heidelberg.de>
- script (e.g. bash, python)

- TAP
- Cone Search
- MOC Search
- Histogram computation for custom expression
- Skymap computation for custom expression

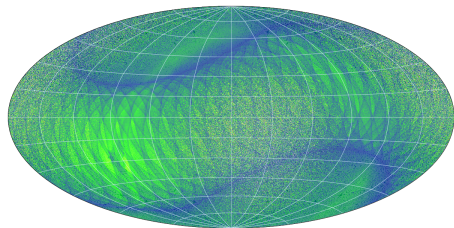


Figure: Skymap of `ra_error` of a simulated Gaia catalog

Access interfaces

- Web page: <http://mintaka.ari.uni-heidelberg.de>
- script (e.g. bash, python)

Let's sum up!

	Data query	Crossmatch	Visualization
AIP	SQL Service		
ARI	TAP, Cone-Search, MOC-Search, Histo., Skymap	<i>(simple via TAP)</i>	Gaia-Sandbox, Skymap
ASDC	Query via Web form (<i>, TAP</i>)	On the web page <i>+ advanced service from GDR-3</i>	
CDS	VizieR (TAP, ConeSearch, MOC)	Crossmatch Service	Aladin
ESAC	TAP	<i>(simple via TAP)</i>	Yes

5. Get ready!

- Gaia Data Access Workshop from the 21st to the 24th of November 2016 in Haus der Astronomie in Heidelberg
- *Organized by the Gaia team in collaboration with GAVO*

If you have any question, comment or suggestion of new feature/service:

- **About VO tools/services/standards:**
ask to the GAVO team (*particularly Markus D. and Hendrik H.*)
- **About Gaia services at ARI:**
ask to Grégory M.
- **About Gaia data in general:**
ask to the Gaia team

Questions for you

- How many of you would register to a mailing list for news about ARI's services for Gaia?
- Is there another service related to Gaia that you would like to have?

Questions for me?

Any question?