

V2202 Cygni, un système binaire du halo galactique

Jean-François Le Borgne

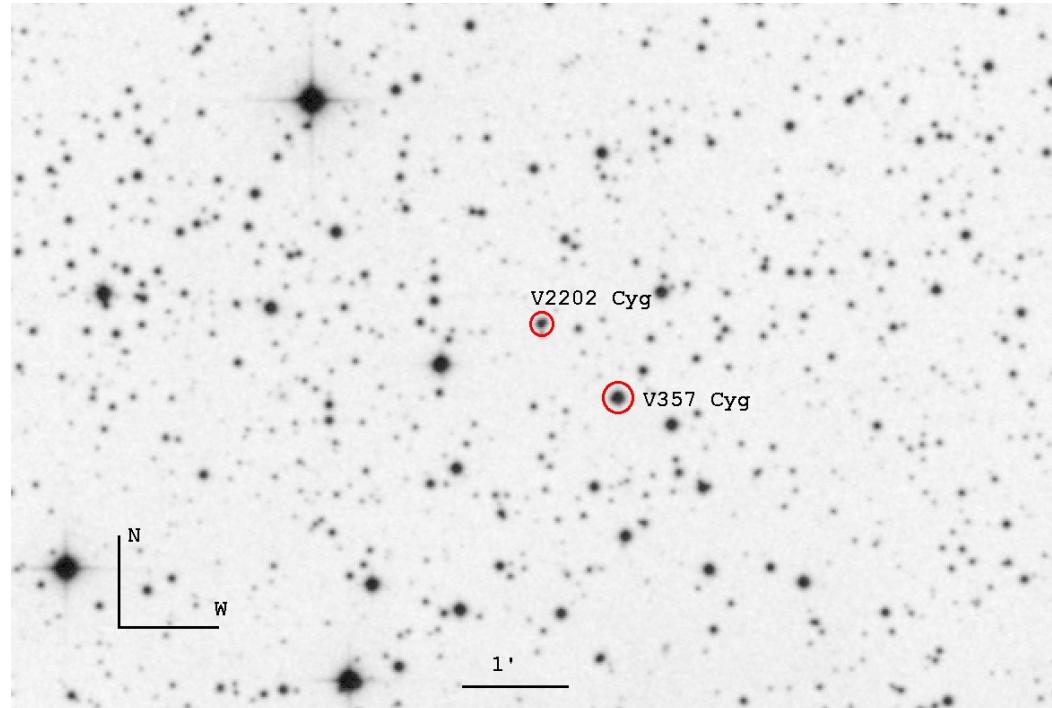
Professeur/astronome émérite, Université Paul Sabatier, Toulouse
Chercheur associé, Laboratoire d'Astrophysique, Marseille
Groupe Européen d'Observation Stellaire (GEOS)
Association Marseillaise d'AStronomie (AMAS)

*En collaboration avec Mercè Correa et Florence Libotte
Association Astronomique de Sabadell, Barcelone*

V2202 Cyg est classifiée comme étoile variable :
Étoile pulsante de type RRc:
Variations de magnitude : 15.3-15.43 (V)

Références :
Catalogue Général des Étoiles Variables (GCVS) et
Schmidt et Seth (1996, Astronomical Journal, 112, 2769)

UCAC4 611-115735
Coordonnées équatoriales J2000 :
ra=21:09:01.627920, dec=+32:00:19.25928.
Magnitudes V=15.230 et B=16.151 (B-V=0.920)



Digital Sky Survey, filtre rouge

Observation par Mercè Correa et Florence Libotte

Association Astronomique de Sabadell (Barcelone)

V2202 Cyg est dans le champ de l'étoile pulsante

V357 Cyg : période 0.341838 jour.

Télescope de 25 cm : 3 nuits d'observation.

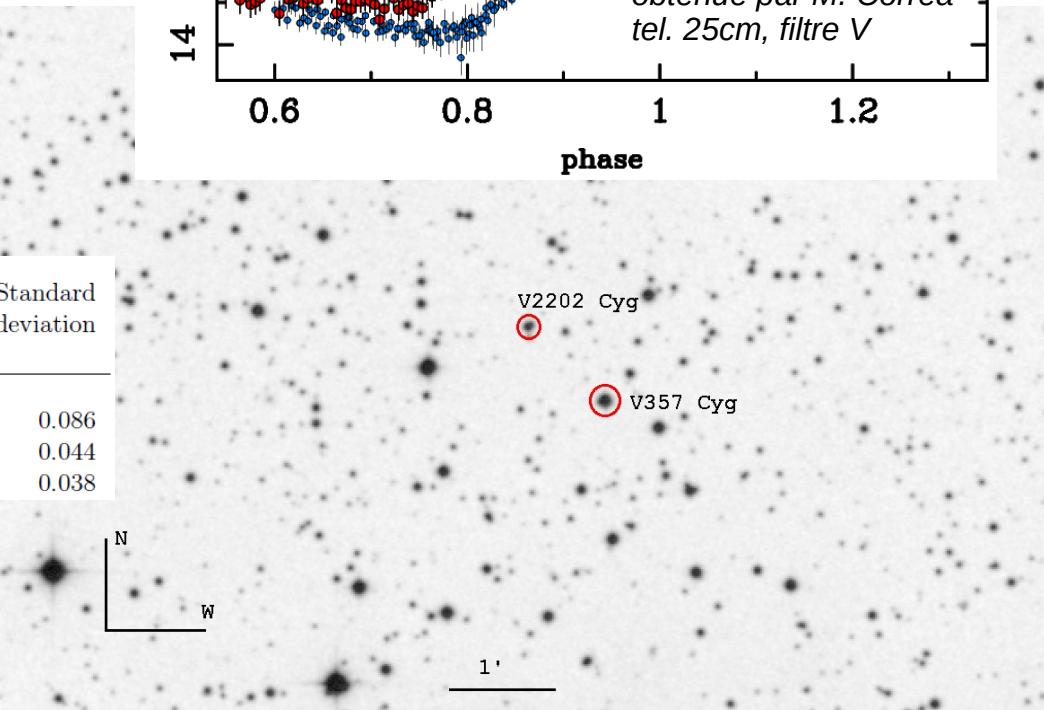
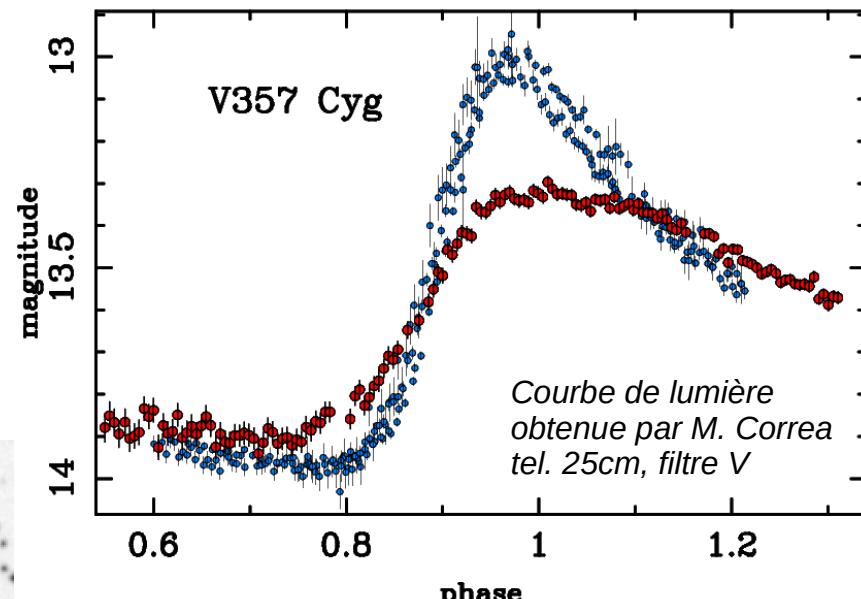
Télescope de 50 cm (AAS) : 2 nuits d'observation.

(+ cameras CCD, filtres V et R)

V2202 Cyg n'a pas varié pendant ces 5 nuits :

	filter	Number of measurements	JD	Number of nights	Mean mag.	Standard deviation
M. Correa	V	309	2459771-2459885	3	15.244	0.086
M. Correa	R	342	2459771-2459885	3	14.912	0.044
Sabadell	V	127	2458764 and 2459795	2	15.174	0.038

⇒ Besoin d'une confirmation



Digital Sky Survey, filtre rouge



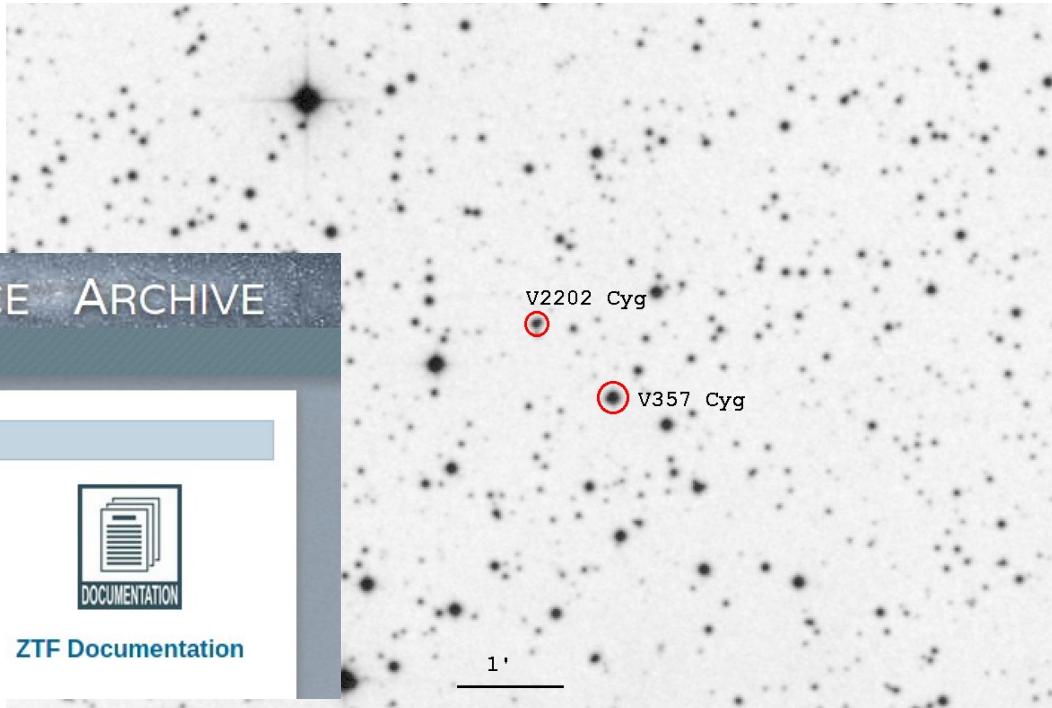
<https://sites.astro.caltech.edu/palomar/>



Projet ZTF à l'observatoire du Mont Palomar :
télescope Schmidt de 48 inches (1.2 m)

Accès aux données publiques :
<https://irsa.ipac.caltech.edu/Missions/ztf.html>

The screenshot shows the NASA/IPAC Infrared Science Archive (IRSA) homepage. The top navigation bar includes links for IRSA, DATA SETS, SEARCH, TOOLS, and HELP. A prominent search bar is labeled "Zwicky Transient Facility". Below the search bar are four icons: "ZTF" (a telescope icon), "CATALOGS" (a magnifying glass over a grid icon), "VO/API" (an icon with "http://"}, and "DOCUMENTATION" (an icon of stacked papers). Below these icons are links: "ZTF Image Access", "Catalog Search", "ZTF Program Interface", and "ZTF Documentation".

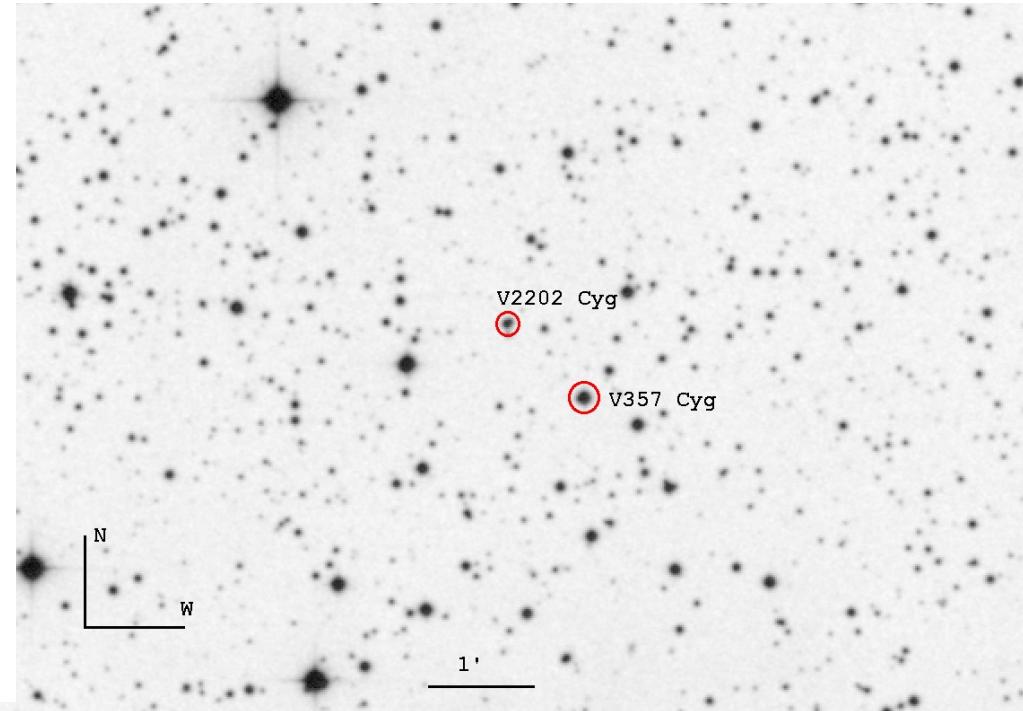
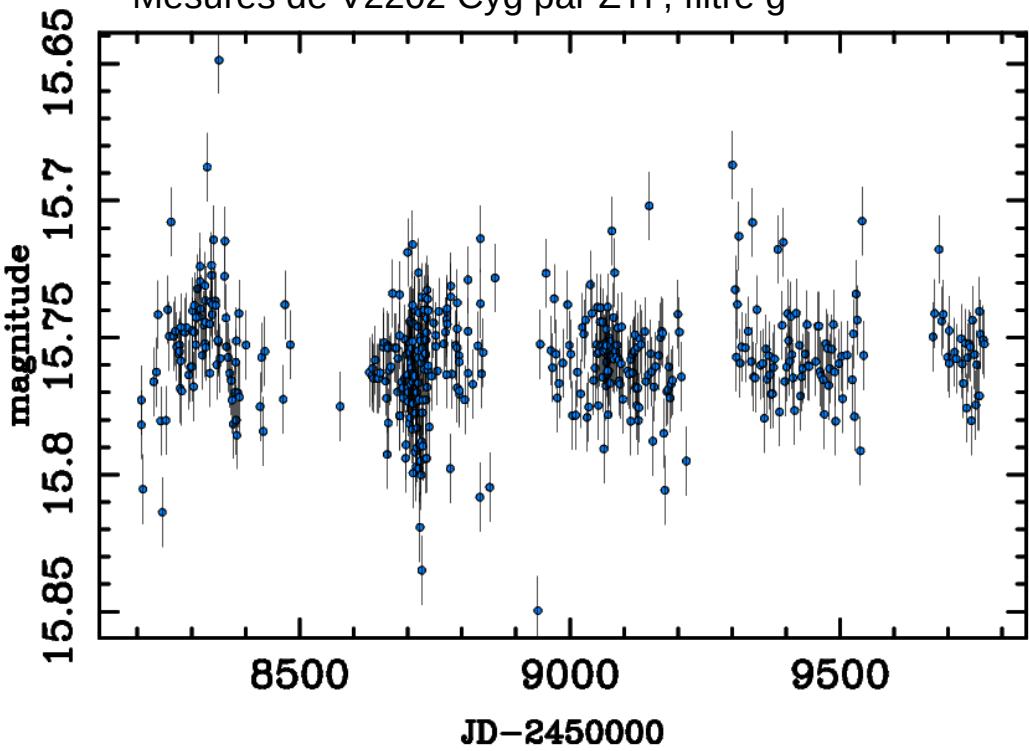


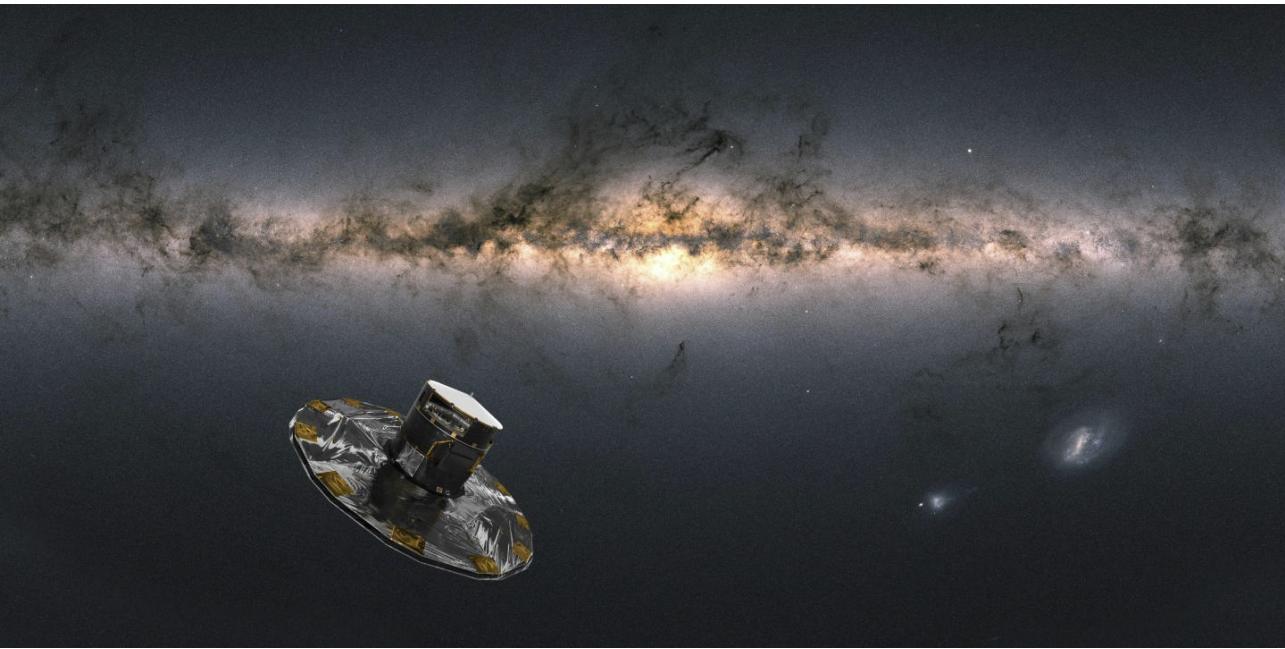
Statistique sur 4 ans des mesures du ZTF :

ZTF confirme l'absence de variation.

filter	Number of measurements	JD	Number of nights	Mean mag.	Standard deviation
ZTF	r	1125	2458217-2458979	425	15.046
ZTF	g	474	2458206-2459069	374	15.758

Mesures de V2202 Cyg par ZTF, filtre g





Caractérisation de V2202 Cyg : satellite GAIA de l'ESA

Mesurer la position, le mouvement et la distance de plus d'un milliard d'étoiles de la Galaxie.
Estimer leur propriétés physiques à l'aide de la photométrie

Les données publiques de GAIA sont disponibles depuis le site du Centre de Données de Strasbourg (CDS) : <https://cds.unistra.fr/>



Centre de Données astronomiques de Strasbourg
Strasbourg astronomical Data Center



CDS
PORTAL

Entry point to all services 



SIMBAD

Object database 



VizieR

Catalogue database 



MAGDA

Interactive sky atlas 

VizieR

[VizieR home](#) · [Photometry viewer](#) · [Query VizieR using TAP](#) · [X-match tables](#) · [Query images/spectra](#)

The VizieR service is now hosted by CDS domain (cds.unistra.fr). Please, modify your configuration for the new domain.

Search Criteria

Preferences

max: 50

HTML Table

All columns

► Compute

Mirrors

CDS, France

Find catalogs among 23396 available

[Clear](#)

[Find...](#)

[Expand search](#)

?

Catalog, author's name, word(s) from title, description, etc.
e.g.: AGN, Veron, I/239, or bibcodes...

► [Search for catalogs by column descriptions \(UCD\)](#) ?

► [Search for catalogs containing additional data](#)

Wavelength

Radio
Millimeter
IR
optical
UV
EUV
X-ray

Mission

AKARI
ANS
ASCA
BeppoSAX
Cassini-Huygens
CGRO
Chandra

Astronomy

Abundances
Ages
AGN
Associations
Astroseismology
Atomic_Data
Binaries:cataclysmic

Search by Position across 25903 tables

Target Name (resolved by [Sesame](#)) or Position:

[Clear](#)

V2202 Cyg

J2000

Target dimension:

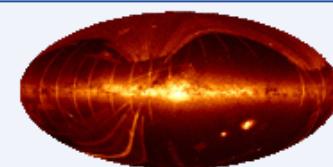
4

arcsec

[Go!](#)

NB: The epoch used for the query is the original epoch of the table(s)

Radius Box size



?

[More about VizieR](#)

≤ 154 matching catalogs

[Find Catalogs](#)



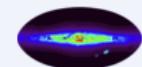
Tools related to VizieR

- [Catalogue collection](#) : Search VizieR catalogues available via various services (FTP, VizieR, TAP, ...)
- [CDS Portal](#) : Access CDS data including VizieR, Simbad and Aladin using the CDS portal
- [Spectra, images in VizieR](#) : Search Spectra, images in VizieR
- [Photometry viewer](#) : Plot photometry (sed) including all VizieR
- [TAP VizieR](#) : query VizieR using ADQL (a SQL extension dedicated for astronomy)
- [CDS cross-match service](#) : fast cross-identification between any 2 tables, including VizieR catalogues, SIMBAD

I/355/gaiadr3

Gaia DR3 Part 1. Main source (Gaia Collaboration, 2022)

Gaia data release 3 (Gaia DR3). (original column names in green) (1811709771 rows)

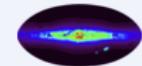
2022yCat.1355....0G [ReadMe+ftp](#)[spectrum](#) [timeSerie](#)[start AladinLite](#)[plot the output](#)[query using TAP/SQL](#)

<u>Full</u>	<u>r</u> arcsec	<u>RAJ2000</u> "h:m:s"	<u>DEJ2000</u> "d:m:s"	<u>RA_ICRS</u> deg	<u>DE_ICRS</u> deg	<u>Source</u>	<u>e_RA_ICRS</u> mas	<u>e_DE_ICRS</u> mas	<u>Plx</u> mas	<u>e</u> mas	<u>PM</u> mas/yr	<u>pmRA</u> mas/yr	<u>e</u> (...)	<u>p</u> (...)
<u>1</u>	0.254	21 09 01.6342859387	+32 00 19.263998032	317.25679400616	+32.00530105088	1853179780083903872	0.0241	0.0316	1.2981	0.0451	11.646	-2.961	0.032	-1
<u>2</u>	2.213	21 09 01.4732994422	+32 00 20.580637497	317.25612139112	+32.00566723038	1853179780083903744	0.0370	0.0493	1.4185	0.0713	11.644	-3.312	0.050	-1

I/355/paramp

Gaia DR3 Part 1. Main source (Gaia Collaboration, 2022)

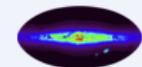
1D astrophysical parameters produced by the Apsis processing chain developed in Gaia DPAC CU8 (1590932717 sources) (astrophysical_parameters) (original column names in green) (1590932717 rows)

[start AladinLite](#)[plot the output](#)[query using TAP/SQL](#)

<u>Full</u>	<u>r</u> arcsec	<u>RAJ2000</u> "h:m:s"	<u>DEJ2000</u> "d:m:s"	<u>Source</u>	<u>RA_ICRS</u> deg	<u>DE_ICRS</u> deg	<u>PQSO</u>	<u>PGal</u>	<u>Pstar</u>	<u>PWD</u>	<u>Pbin</u>
<u>1</u>	0.254	21 09 01.6305614785	+32 00 19.083783167	1853179780083903872	317.25679400616	+32.00530105088	0.000000000	0.000000000	0.99969655	0.000000000	0.00030342
<u>2</u>	2.213	21 09 01.4691338694	+32 00 20.402029381	1853179780083903744	317.25612139112	+32.00566723038	0.000000000	0.000000000	0.99992080	0.000000000	0.00007925

I/355/paramsup

Gaia DR3 Part 1. Main source (Gaia Collaboration, 2022)

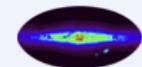
Additional parameters from the Apsis processing chain, compared to the main table astrophysical parameters, from modules that produce more than one result for a parameter (473020612 sources) (astrophysical_parameters^{supp}) (original column names in green) (473020612 rows)[start AladinLite](#)[plot the output](#)[query using TAP/SQL](#)

<u>Full</u>	<u>r</u> arcsec	<u>RAJ2000</u> "h:m:s"	<u>DEJ2000</u> "d:m:s"	<u>Source</u>	<u>RA_ICRS</u> deg	<u>DE_ICRS</u> deg	<u>Solid</u>	<u>Teff</u> K	<u>logg</u> [cm/s2]	<u>[M/H]</u> [-]	<u>Dist</u> pc	<u>A0</u> mag	<u>AG</u> mag	<u>ABP</u> mag
<u>1</u>	0.254	21 09 01.6305614785	+32 00 19.083783167	1853179780083903872	317.25679400616	+32.00530105088	1636148068921376768							
<u>2</u>	2.213	21 09 01.4691338694	+32 00 20.402029381	1853179780083903744	317.25612139112	+32.00566723038	1636148068921376768							

I/355/xpsummary

Gaia DR3 Part 1. Main source (Gaia Collaboration, 2022)

Auxiliary information about the mean BP/RP spectrum (219197643 sources) (xp_summary) (original column names in green) (219197643 rows)



G mag	B mag	R mag	T_{eff} K	$\log(g)$ cm/s^2	[Fe/H]	M_G mag	Radius R_\odot	Luminosity L_\odot	distance pc
GAIA 1853179780083903872 = V2202 Cyg									
15.135	15.615	14.470	4843.1	4.3536	-1.1103	5.6911	0.956	0.510	747.8079

Paramètres physiques de V2202 Cyg d'après GAIA DR3 (Gaia Collaboration, 2022)

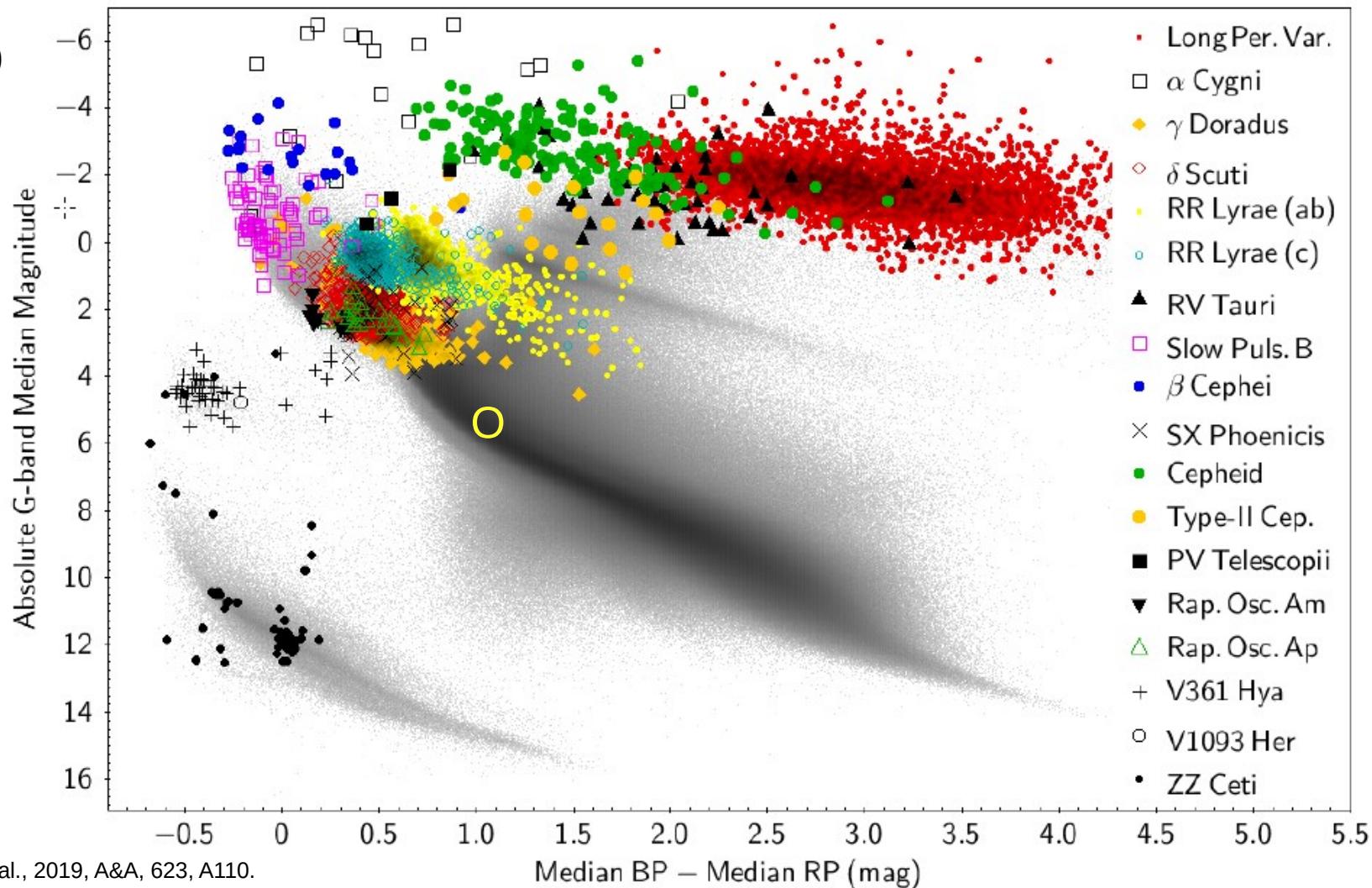
Interprétation des paramètres :

	V2202 Cyg	Soleil
Température effective (T_{eff}) :	4843.1 K	5770 K
Gravité ($\log(g)$) :	4.3536 cm/s^2	4.439 cm/s^2
Métallicité [Fe/H] :	-1.11	0.0
Magnitude absolue G :	5.6911	~5
Rayon :	$0.956 R_\odot$	1.0
Luminosité :	$0.510 L_\odot$	1.0
Distance :	747.8 pc	

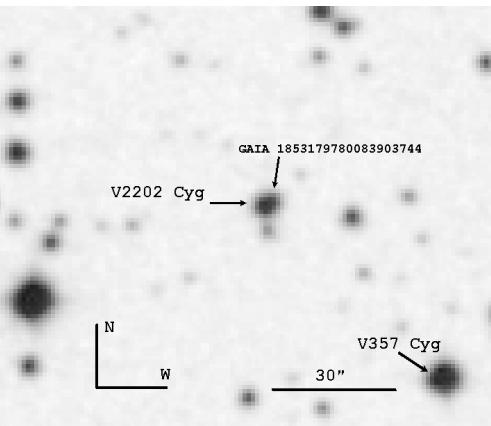
V2202 Cyg :

Mag. abs. G : 5.69
B-R : 1.14

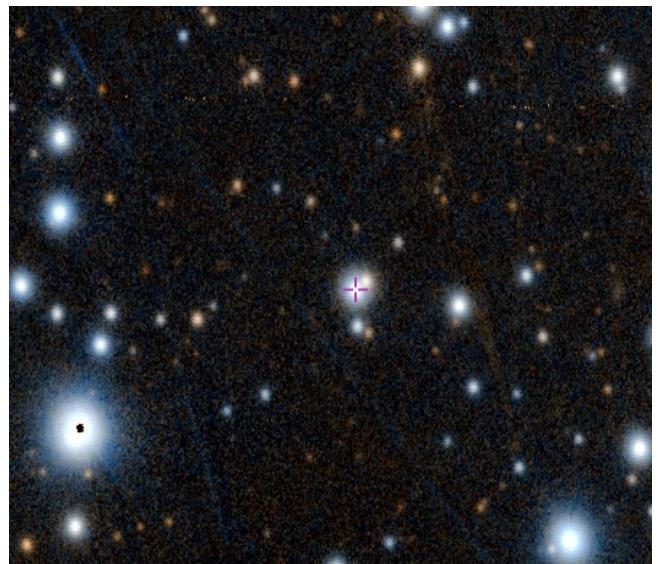
Gaia Collaboration et al.: Gaia DR2: CaMD of Variable Stars



V2202 Cyg fait partie d'un système stellaire binaire.



Digital Sky Survey, filtre rouge



G mag	B mag	R mag	T_{eff} K	$\log(g)$ cm/s^2	[Fe/H]	M_G mag	Radius R_\odot	Luminosity L_\odot	distance pc
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GAIA 1853179780083903872 = V2202 Cyg
 15.135 15.615 14.470 4843.1 4.3536 -1.1103 5.6911 0.956 0.510 747.8079

GAIA 1853179780083903744
 17.243 17.958 16.278 3820.2 4.4640 -1.2293 8.2425 0.548 0.0706 610.5618

GAIA source id.	Parallax (mas)	Proper motion (mas/year)			Total
		In RA	In DEC		
1853179780083903872 = V2202 Cyg	1.2981 ± 0.0451	-2.961 ± 0.032	-11.263 ± 0.042	11.646	
1853179780083903744	1.4185 ± 0.0713	-3.312 ± 0.050	-11.163 ± 0.063	11.644	

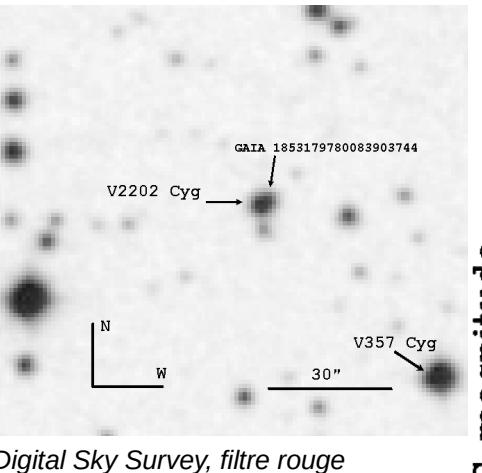
Le télescope Pan-STARRS1 est un télescope de 1.8m de diamètre situé au sommet de Haleakala sur l'île de Maui, Hawaï. Il est équipé de la plus grande caméra digital existante avec près de 1.4 milliard de pixels.

Sa mise en œuvre est principalement financée par le programme de la NASA de surveillance des astéroïdes s'approchant de la Terre.

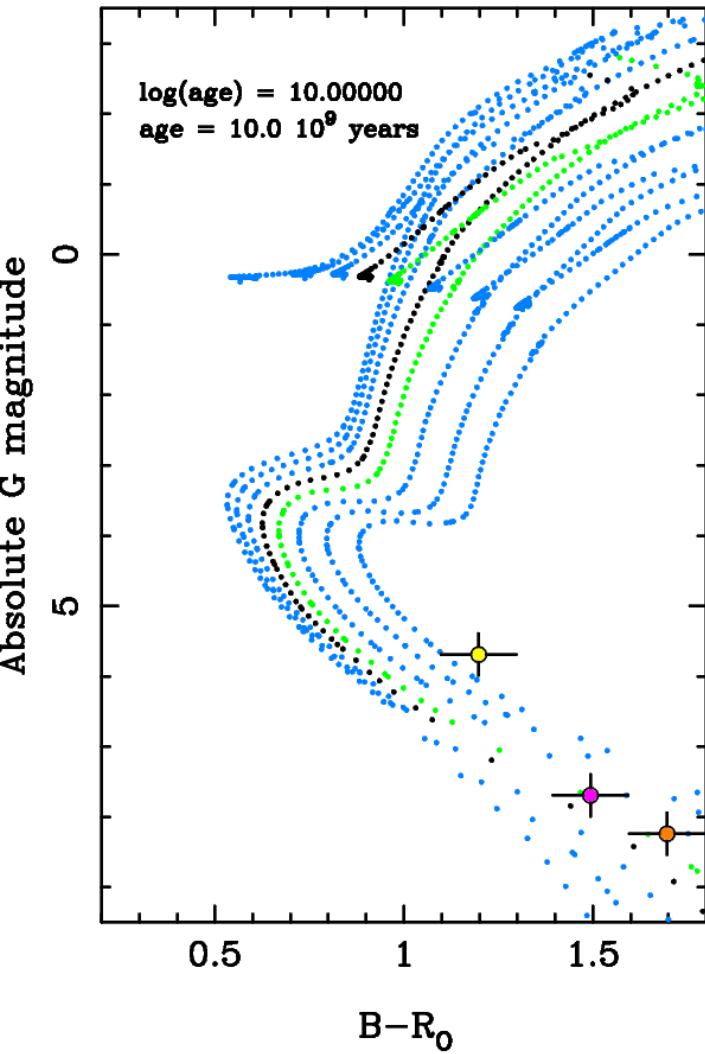
L'accès aux données de Pan-STARRS est possible depuis la page publique:
<https://outerspace.stsci.edu/display/PANSTARRS/>



V2202 Cyg fait partie d'un système stellaire binaire.



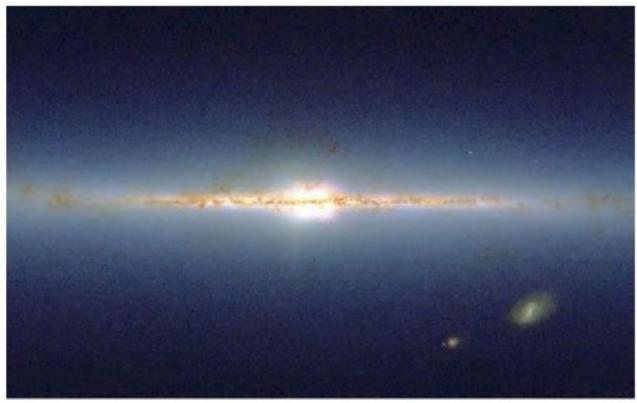
G mag	B mag	R mag	T_{eff} K	$\log(g)$ cm/s^2	[Fe/H]	M_G mag	Radius R_\odot	Luminosity L_\odot	distance pc
<hr/>									
GAIA 1853179780083903872 = V2202 Cyg									
15.135	15.615	14.470	4843.1	4.3536	-1.1103	5.6911	0.956	0.510	747.8079
<hr/>									
GAIA 1853179780083903744									
17.243	17.958	16.278	3820.2	4.4640	-1.2293	8.2425	0.548	0.0706	610.5618
<hr/>									
GAIA source id.		Parallax (mas)		Proper motion (mas/year)			Total		
				In RA		In DEC			
1853179780083903872 = V2202 Cyg		1.2981 ± 0.0451		-2.961 ± 0.032		-11.263 ± 0.042	11.646		
1853179780083903744		1.4185 ± 0.0713		-3.312 ± 0.050		-11.163 ± 0.063	11.644		



Isochrones dans le diagramme couleur-magnitudes.
Modèles de Padoue. <http://stev.oapd.inaf.it/cmd>



(a)



(b)

Structure de la Galaxie

Disque

Étoiles jeunes, gaz et poussières
Forte métallicité

Bulbe

Étoiles anciennes
Faible métallicité

Halo

Étoiles anciennes
Faible métallicité
Galaxies naines capturées (courants stellaires)

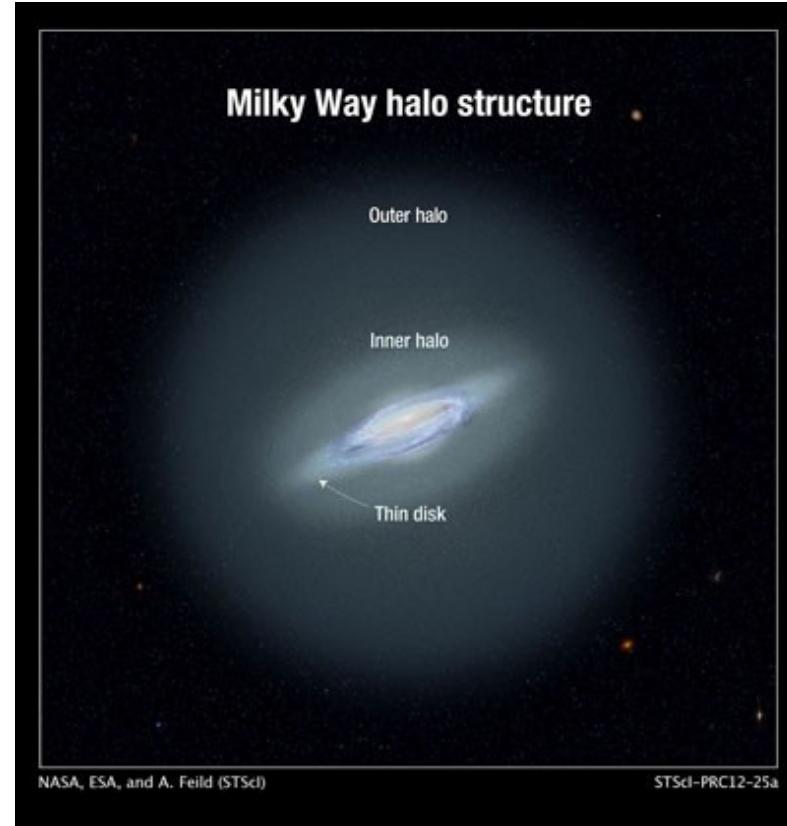
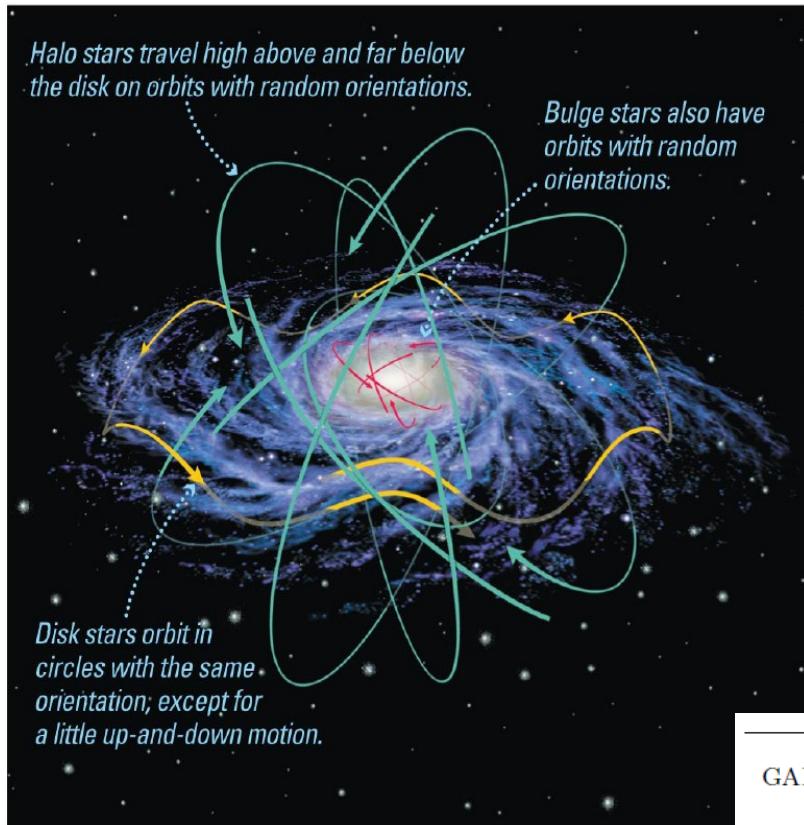


Figure 2.1. Représentations de notre galaxie

COMMENTAIRE SUR LA FIGURE 2.1.– (a) La galaxie spirale barrée de type Sb UGC 12158, souvent considérée comme analogue à la Voie lactée à cause de son apparence (crédit : ESA/Hubble & NASA). (b) Une image infrarouge de la Voie lactée, de l'étude 2 Micron All Sky Survey (crédit : 2MASS/J. Charpentier, M. Skrutskie, R. Hurt). Les deux galaxies dans la partie inférieure droite de l'image sont les Grand et Petit Nuages de Magellan.

Paola di Mateo, dans Combes et al., 2021, « Galaxies », ISTE éditions

Structure de la Galaxie



Dynamique stellaire

Disque : orbites dans le plan de la galaxie
 vitesse faible

Halo : orbites à forte inclinaison
 vitesse élevée

Système de V2202 Cyg : inclinaison $\sim 45^\circ$ / plan galactique

A une distance de 748 pc, 11.6 mas/an correspond à une vitesse projetée sur le ciel de 41.1 km/s.

GAIA source id.	Parallax (mas)	Proper motion (mas/year)		Total
		In RA	In DEC	
1853179780083903872 = V2202 Cyg	1.2981 \pm 0.0451	-2.961 \pm 0.032	-11.263 \pm 0.042	11.646
1853179780083903744	1.4185 \pm 0.0713	-3.312 \pm 0.050	-11.163 \pm 0.063	11.644

<u>Source</u>	<u>e_RA_ICRS</u> <u>mas</u>	<u>e_DE_ICRS</u> <u>mas</u>	<u>Plx</u> <u>mas</u>	<u>e</u> <u>mas</u>	<u>PM</u> <u>mas/yr</u>	<u>pmRA</u> <u>mas/yr</u>	<u>e</u> <u>(...)</u>	<u>pmDE</u> <u>mas/yr</u>	<u>e</u> <u>(...)</u>
1853179780083903872	0.0241	0.0316	1.2981	0.0451	11.646	-2.961	0.032	-11.263	0.042
1853179780083903744	0.0370	0.0493	1.4185	0.0713	11.644	-3.312	0.050	-11.163	0.063
1853179780077595264	0.0651	0.0838	0.2378	0.1206	5.914	-3.781	0.089	-4.547	0.112
1853179780077892352	0.3016	0.4362	0.6669	0.6402	9.439	7.414	0.426	-5.842	0.571
1853179775778943744	0.1839	0.2332	0.2910	0.3432	5.695	-3.013	0.255	-4.833	0.299
1853179814437630080	0.2737	0.3809	1.0945	0.5294	7.135	-5.925	0.389	-3.974	0.499
1853179780083902208	0.0226	0.0299	0.2395	0.0432	7.415	-1.622	0.030	-7.235	0.039
1853179814443722624	0.3550	0.4849	0.2008	0.7259	7.417	-3.281	0.513	-6.652	0.703
1853179707059440256	0.1596	0.2108	0.5402	0.3060	3.795	-1.728	0.226	-3.378	0.274
1853179814437631104	0.3655	0.4820	1.4519	0.7571	7.494	-4.743	0.523	-5.803	0.737
1853179775778918272	0.0889	0.1174	0.0244	0.1724	4.135	-2.051	0.122	-3.591	0.151
1853179745718526720	0.8257	1.2736	4.2526	1.6991	5.321	-4.466	0.988	-2.893	1.432
1853179814437344384	0.2098	0.2758	0.3040	0.3995	4.528	-3.978	0.289	-2.163	0.346
1853179780078011392	0.4052	0.5654	-1.1497	0.8699	2.639	-2.282	0.535	-1.325	0.812
1853179741419193856	0.0899	0.1197	1.0053	0.1735	7.829	-2.464	0.124	-7.431	0.153
1853179707059437056	0.2491	0.3590	-0.6919	0.5264	2.895	-0.601	0.354	-2.832	0.507
1853179780083902336	0.0657	0.0866	-0.0643	0.1244	5.472	-1.581	0.091	-5.238	0.117
1853179810138711808	0.2202	0.2787	1.3967	0.4260	4.351	-3.676	0.296	-2.327	0.350
1853179780085501056	0.3486	0.4489	0.6900	0.7662	4.485	-3.926	0.457	-2.169	0.614

Conclusion

Nous sommes partis d'observations faites au fond d'un jardin de Catalogne avec un télescope de 25 cm.

Pour les interpréter, ces observations nous ont conduit à fouiller dans les données publiques de grands projets financés par les impôts des citoyens européens et américains :

- Zwicky Transient Facility (California Institute of Technology)
- ESA / GAIA
- Centre de données de Strasbourg
- Pan-STARRS (Institute for Astronomy, Hawaï) / NASA

Pour nous offrir un voyage dans la Galaxie et explorer ses origines.

5th EVS

2023
European Variable Star Meeting
BARCELONA 27-28 MAY

Full program and
registration at:

[http://rr-lyr.irap.omp.eu/
photometry/EVS5](http://rr-lyr.irap.omp.eu/photometry/EVS5)



Promoting collaboration between European variable star
astronomy organizations and improving Pro-Am partnership

Invited Speakers

Katrien Kolenberg (KU Leuven, Antwerpen)
Robert Szabo (Konkoly Observatory)
Gisella Clementini (INAF)

Organizing Committee

Mercè Correa (AAS, GEOS)
Gemma Domènech (OU, AAS)
Franz-Josef Hambisch (VVS, AAVSO)
Jean-François Le Borgne (IRAP, GEOS)
Florence Libotte (AAS, GEOS)
Lienhard Pagel (BAV)

Venue

CosmoCaixa Science Museum
C/ Isaac Newton, 26
Barcelona, Spain

Important Dates

Abstracts deadline: 1 April 2023
Registration closes: 1 May 2023

Organized by:



In collaboration with:



Institut de Ciències del Cosmos
UNIVERSITAT DE BARCELONA



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