



Astrometric alerts for the Solar System Objects (SSO)

W. Thuillot

IMCCE, Paris Observatory, PSL Univ. , CNRS, Sorbonne Univ., Lille Univ.,
Paris, France; William.Thuillot@obspm.fr

- **GFSSO: Gaia alert follow-up Gaia-FUN-SSO**
- **NEOCP: Near-Earth Objects Confirmation Page**
- **ESASSP: ESA Space Safety Programme:**



Goals

- Reactions to new object alerts (GFSSO, NEOCP)
- Follow-up for peculiar objects (ESASSP)
- Contribution to impact risk assessment (ESASSP, NEOCP)
- Computation or improvement of the orbital parameters (all)
- Physical characterization of the objects : + photometry + spectroscopy
- Contribution to a better knowledge of the Solar System objects
- **Data centralization and sharing at MPC**
<https://www.minorplanetcenter.net/>

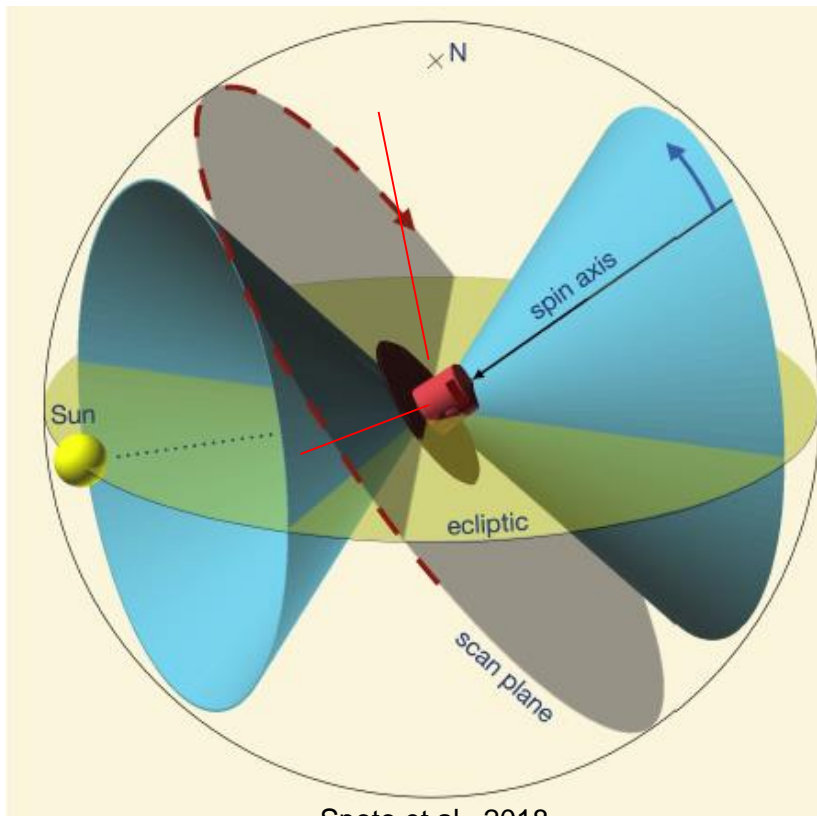


Gaia alert follow-up Gaia-FUN-SSO

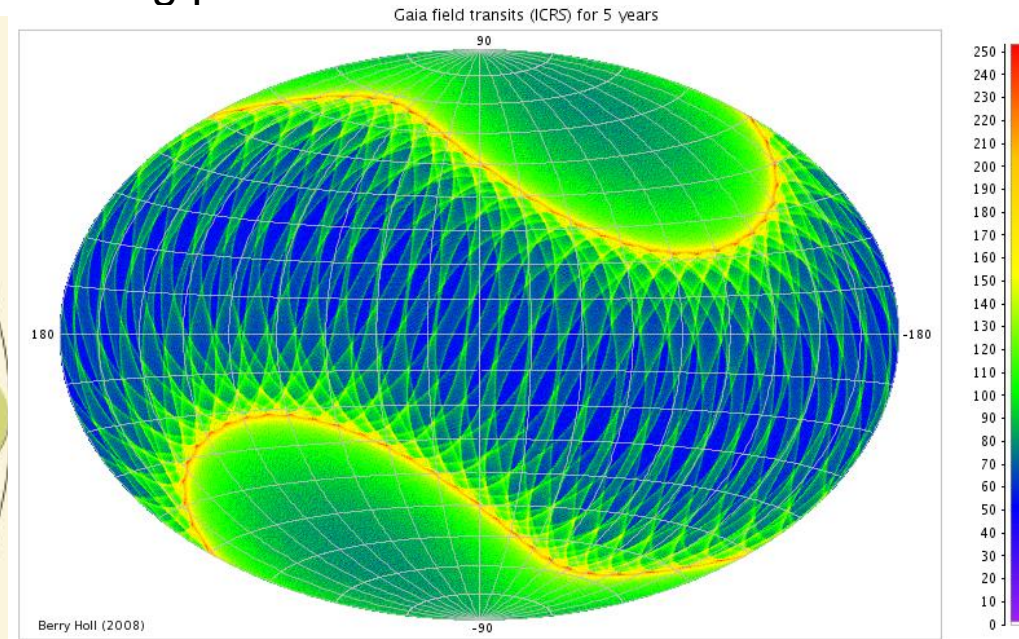
GFSSO

GFSSO: Gaia scanning law

- Posted at L2 Lagrange point
- Spin period: **6h**
- Precession: **63 days** around the Sun-Earth axis
- Revolution of the Sun-Earth axis: **365 days**
- **2 lines of sight** at $106^\circ.5$ in the scanning plane



Spoto et al., 2018

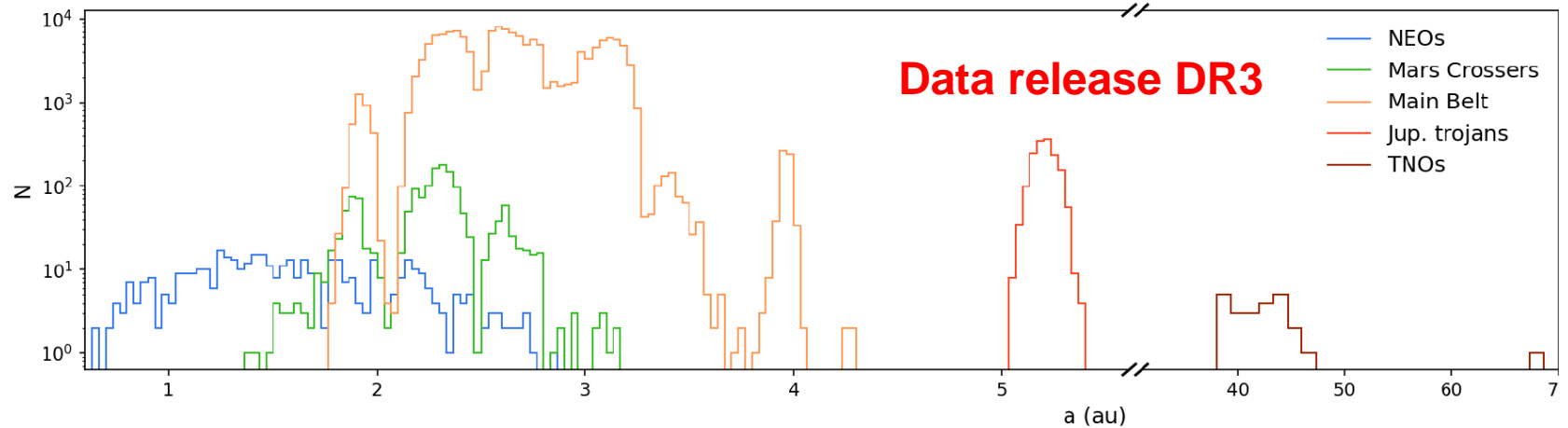


1 astrometric observation = 1 « transit » in 40s in the focal plane (7 lines of 9 CCD)

<https://www.cosmos.esa.int/web/gaia/spacecraft-instruments>

Gaia and the Solar System Objects (SSO)

158 152 asteroids of several kinds (Tanga et al. 2023)

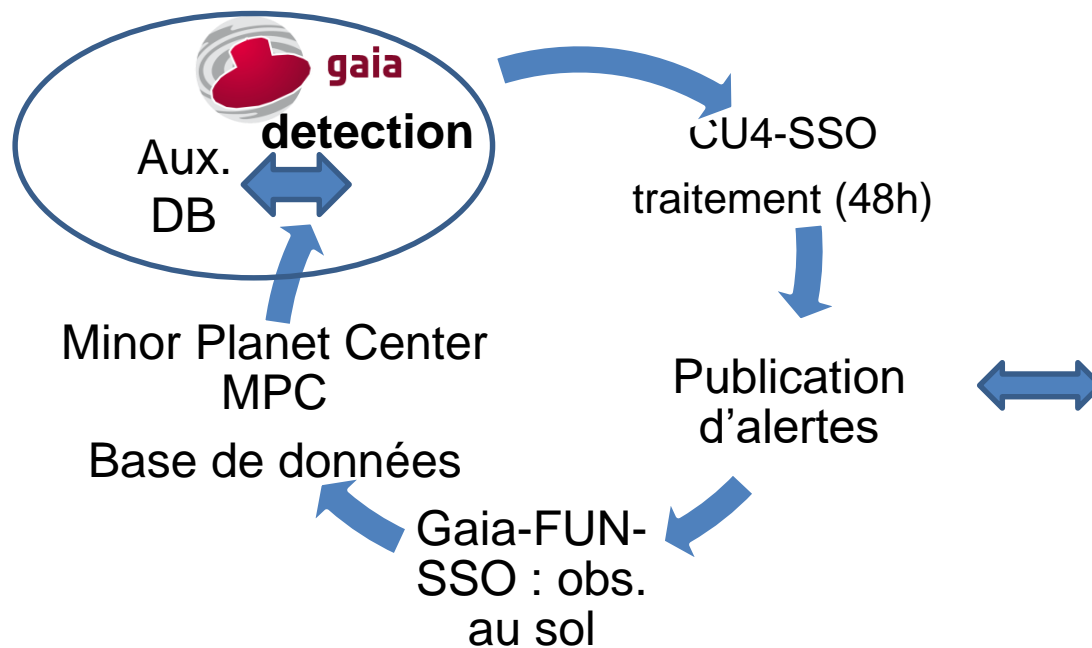


Other data can be accessed at any time:

- Gaia alerts for unreferenced moving objects
- Astrometry from ground-based observatories
- Public access at : <https://gaiafunssso.imcce.fr>
- Validation required in ~10 days

Monitoring Gaia alerts: objectives and resources

- Validate Gaia detections of potentially new objects
- Retrieve the object from the ground and position it (> 48h after Gaia)
- Improve Gaia's orbital reference catalog through MPC (loop)
- Distribute alerts (web server) for astrometry



<https://gaiafunssso.fr>

Gaia Follow-Up Network for Solar System Objects

Goal

The Gaia Follow-Up Network for Solar System Objects (GaiaFUN-SSO) has been set up in the framework of a task (CU4SSO) of the Coordination Unit 4 (Object processing) of the Data Processing and Analysis Consortium (DPAC). Its goal is to coordinate ground-based observations on alert requests by the data processing system using the mission for the confirmation of newly detected moving objects or for the improvement of orbits of some critical targets. Gaia will scan the sky following a pre-defined scanning law and both ground-based observations are required to avoid the loss of newly detected Solar System objects and to facilitate their subsequent identification to the public. These alerts provide an access to the alerts, including the opportunity to help finding the targets, for the registered members of the Data Follow-up Network. The network currently consists in about 30 observers in 27 observing sites, spread all over the world (January 2016).



Results and statistics

We are publishing alerts daily since early November 2016. You can find the statistics on the released alerts and on confirmed Gaia discoveries from the ground in the [all Results page](#).

Workshops

Three GaiaFUN-SSO workshops dedicated to the astrometric follow-up of the Solar System Objects have already been organized in 2010, 2012 and 2014 in Paris Observatory. Discussions have been held about this network and the tasks to be accomplished, the capabilities of the observing sites and the preliminary actions already performed.

- Proceedings of the 2010 workshop have been published and can be freely downloaded [here](#).
- Proceedings of the 2012 workshop have been published and can be freely downloaded [here](#).
- Proceedings of the 2014 workshop have been published and can be freely downloaded [here](#).

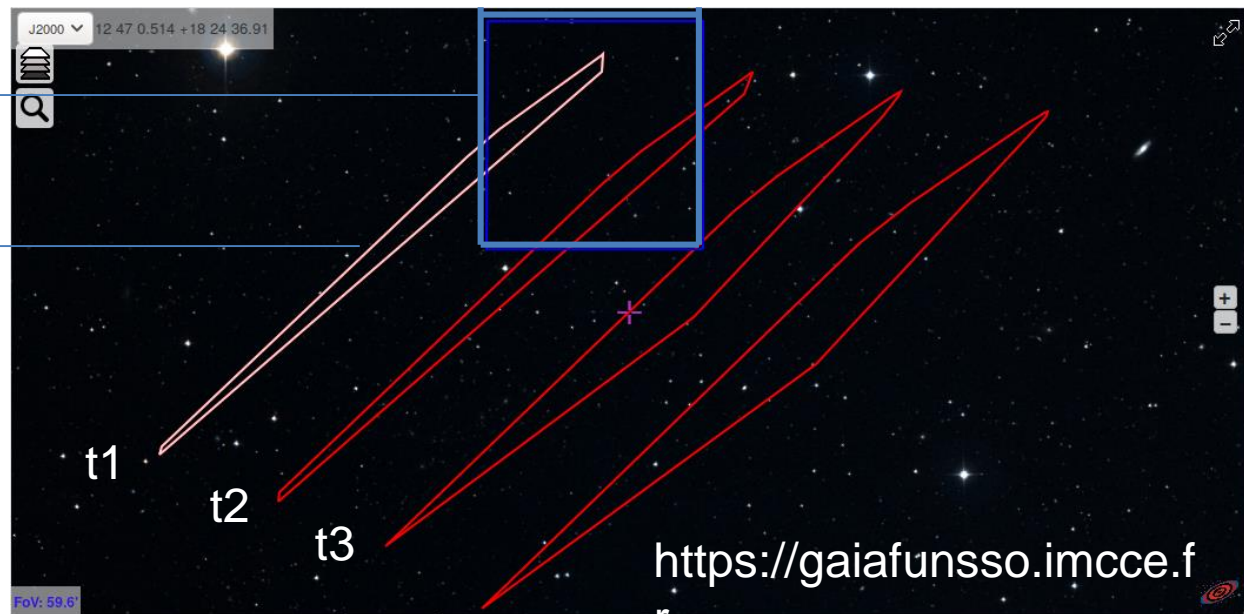
Registration

To get a full access to these pages and to share data, you must be registered as active participant of this observing network. For this registration, please use this form [here](#). This network needs to have a large geographical coverage. If you are interested, do not hesitate to contact us!

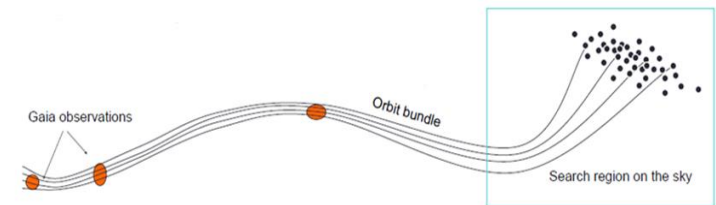
Asteroid challenge

Probable
presence
of the object

Search area



- « Ephemerides » and sky chart on the web
- Predictions from very short orbital arcs...
- Statistical method MCMC => bundle of orbits
- **Sky projection => search areas**



Asteroid challenge: <https://gaiafunssso.imcce.fr>

🏠 Gaia-FUN-SSO

📊 Results

📄 Circulars

★ Gaia alert

☆ GBOT alert

🔧 Settings

🗺️ Help ▾

🚪 Logout

🔑 Admin

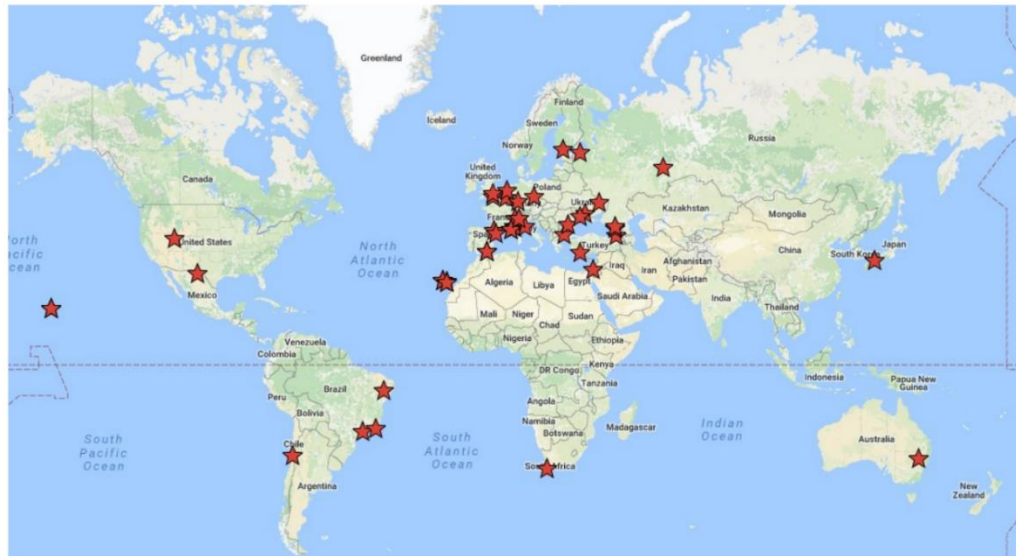
👤 Thuillot

Gaia Follow-Up Network for Solar System Objects

Goal

The Gaia Follow-Up Network for Solar System Objects (Gaia-FUN-SSO) has been set up in the framework of a task (DU459) of the Coordination Unit 4 (Object processing) of the Gaia Data Processing and Analysis Consortium (DPAC). Its goal is to coordinate ground-based observations on alert triggered by the data processing system during the mission for the confirmation of newly detected moving objects or for the improvement of orbits of some critical targets. Gaia will scan the sky following a pre-defined scanning law and such ground-based observations are required to avoid the loss of newly detected Solar System objects and to facilitate their subsequent identification by the probe.

These pages provide an access to the alerts, including the ephemeris to help finding the targets, for the registered members of the Gaia Follow-up network. The network currently consists in about 80 observers in 27 observing sites, spread all over the world (January 2018).



Results and statistics

We are publishing alerts daily since early November 2016. You can find the statistics on the released alerts and on confirmed Gaia discoveries from the ground in the [Results](#) page.

🗺️ Please report bugs [here](#) in project "Gaia-FUN-SSO", or contact us at gaia-fun-ssso@imcce.fr.

Asteroid challenge: <https://gaiafunso.imcce.fr>

















Register to access complete information:

- Topocentric position predictions
- With velocity predictions

Potential discoveries of Solar System Objects by Gaia

This page lists all the calls, dubbed *alerts* for follow-up observations on Solar System Objects recently discovered by the [ESA Gaia](#) mission, currently visible for the criteria you specified for your instrument ([W86](#)). You can obtain detailed information on each alert in the *Details* pages and report the results (positive, missed) of your observations in the *Report* pages (see links in the table).

If you observed an alert which is no longer listed below, use [this link](#) to report observations.

List of active alerts										Selected alerts: 8/8	
ID ▲ ▼	Begin ▲	End ▲ ▼	V_{mag} ▲ ▼	RA ▲ ▼	Dec ▲ ▼	N_{Transit} ▲ ▼	Dyn. ▲ ▼	Area ▲ ▼	Name ▲ ▼	Report	Details
74473	2023-11-20	2023-12-08	20.3	54.618	-25.0298	5	MainBelt	0.01633	g7u000		
74464	2023-11-19	2023-12-07	20.45	66.1578	-24.4027	3	MainBelt	0.2697	g7t010		
74457	2023-11-18	2023-12-04	20.08	69.0243	-21.7489	4	MainBelt	0.74263	g7t00F		
74461	2023-11-18	2023-12-06	20.34	54.6489	-25.1654	4	MainBelt	0.08621	g7t00E		
74453	2023-11-17	2023-12-03	20.31	69.0139	-21.6991	3	MainBelt	2.16655	g7t00D		
74441	2023-11-17	2023-12-05	19.95	72.8224	-20.4351	8	MainBelt	0.02346	g7t00A		
74432	2023-11-16	2023-12-04	19.83	50.2799	-26.6923	7	MainBelt	0.30052	g7t002		
74424	2023-11-15	2023-12-03	20.23	84.1784	-10.2468	4	NEO	0.27569	g7t001		

Asteroid challenge: <https://gaiafunso.imcce.fr>

RA DEC
of the most likely zone

Prediction
quality

List of current alerts

Validity dates

Estimation of object type

Estimated area size (°)

Potential discoveries of Solar System Objects by Gaia

This page lists all the calls, dubbed *alerts* for follow-up observations on Solar System Objects recently discovered by the [ESA Gaia](#) mission, currently visible for the criteria you specified for your instrument ([W86](#)). You can obtain detailed information on each alert in the *Details* pages and report the results (positive, missed) of your observations in the *Report* pages (see links in the table).

If you observed an alert which is no longer listed below, use [this link](#) to report observations.

List of active alerts										Selected alerts: 8/8	
ID	Begin	End	V _{mag}	RA	Dec	N _{Transit}	Dyn.	Area	Name	Report	Details
74473	2023-11-20	2023-12-08	20.3	54.618	-25.0298	5	MainBelt	0.01633	g7u000		
74464	2023-11-19	2023-12-07	20.45	66.1578	-24.4027	3	MainBelt	0.2697	g7t010		
74457	2023-11-18	2023-12-04	20.08	69.0243	-21.7489	4	MainBelt	0.74263	g7t00F		
74461	2023-11-18	2023-12-06	20.34	54.6489	-25.1654	4	MainBelt	0.08621	g7t00E		
74453	2023-11-17	2023-12-03	20.31	69.0139	-21.6991	3	MainBelt	2.16655	g7t00D		
74441	2023-11-17	2023-12-05	19.95	72.8224	-20.4351	8	MainBelt	0.02346	g7t00A		
74432	2023-11-16	2023-12-04	19.83	50.2799	-26.6923	7	MainBelt	0.30052	g7t002		
74424	2023-11-15	2023-12-03	20.23	84.1784	-10.2468	4	NEO	0.27569	g7t001		

Data loading (copy of the MPC message)



Detailed information on g7t002

You will find below detailed information on the target and its probable position on the plane of the sky.

Object Information

- Gaia ID: -4194910922
- Database ID: 74432
- Name: g7t002
- Magnitude (V): $19.8^{+0.3}_{-0.1}$
- Date of observation: 11/12/2023
- Number of transit: 7

Report observation [Back to Gaia alerts](#) [Get Transit](#)

Characteristics of your instrument: W86

	Field of View	RA	Dec
<input checked="" type="checkbox"/>	25x25 arcmin ²	03:21:32.040	-26:44:14.640

Information about the alert with nb of transits

Sky chart (Aladin lite)

Sky view with Aladin – Object expected magnitude V= $19.8^{+0.3}_{-0.1}$

Footprints of areas to search for (in red) and the field of view (in blue, 25x25 arcmin²) of your device (W86). You can change your device and its parameters in your settings.

Telescope FOV Here 12'x12' Most likely zone (blue)

Search zone for date 1

and date 2

Available epochs 28

Check all [Uncheck all](#) [Invert selection](#)

Show?	Epoch	RA	Dec	V _{mag}	Rate	Orientation	Area	Polygon
<input type="checkbox"/>	2023-11-22 14:18:11	03:23:16.200	-27:14:20.400	$19.8^{+0.3}_{-0.1}$	0.86	-35.8	0.15166	+
<input type="checkbox"/>	2023-11-22 20:18:11	03:23:03.816	-27:16:02.280	$19.8^{+0.3}_{-0.1}$	0.86	-37.4	0.16358	+

Reported observations 1

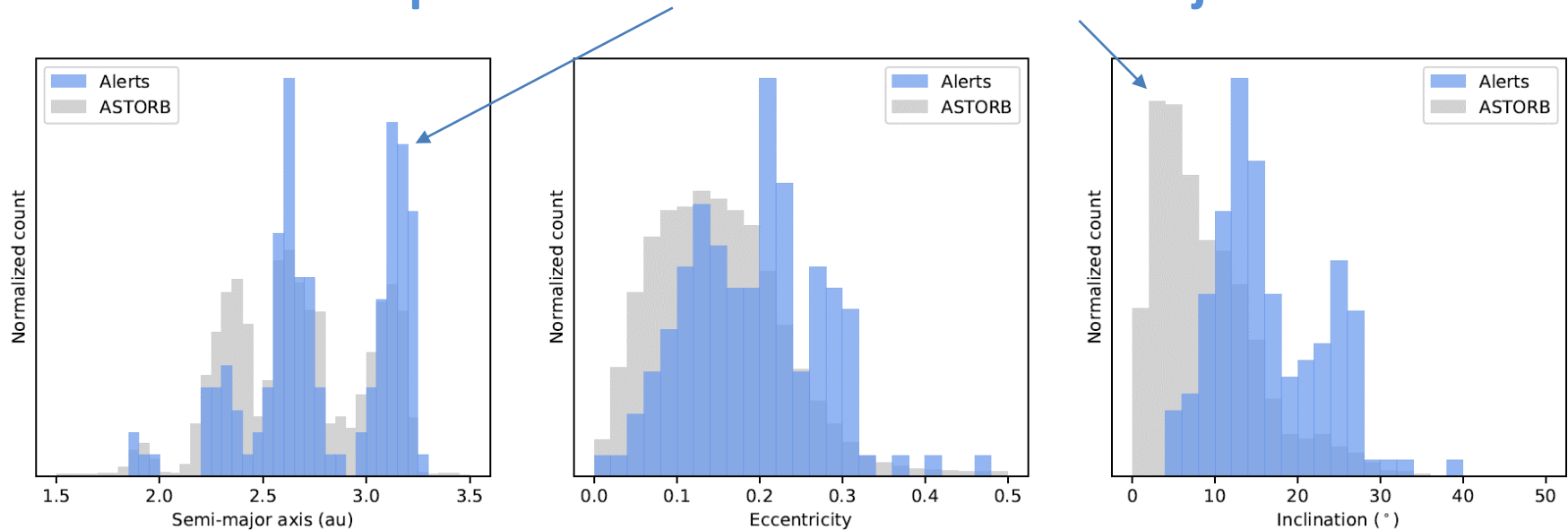
Epoch	Who	Where	Result
2023-11-19 00:00:00	Thuillot	Sutherland-LCO C	✓

Success !

Ephemerides= Centre of the area and velocity parameters

Global analysis: normalized histograms (a, e, i)

Gaia-FUN-SSO detections vs ASTORB Comparison of ~500 vs ~> 50 000 objects



Bias toward high inclinations and eccentricities (Carry et al. 2021)




Observational bias ? Specific SSO population ?

Near-Earth Objects Confirmation Page

NEOCP

NEO Confirmation Page

https://minorplanetcenter.net//iau/NEO/toconfirm_tabular.html

HOME ABOUT HELPDESK

OBSERVERS DATA NEW CONTACT STATUS EXTERNAL

• [MPC Preparation \(Info\)](#)

The NEO Confirmation Page

Please ensure you are familiar with the [notes at the bottom of this page](#).
Also, additional notes on the NEOCP and information on how we remove objects on the NEOCP are also available [here](#).

Page last updated on Nov. 23.547 UTC.

[Problems?](#) [Comments?](#)

Select object(s) from the current list of objects needing confirmation (NEO desirability score, discovery date, rough current position and magnitude given, as well as number of observations, arc, nominal H and number of days since it was last observed). Objects flagged with an "S" in the Note column are [possibly in geocentric orbit](#) and might soon be removed.

All objects with $V =$ to , with Decl. between ° and °, with an NEO desirability score of % to %

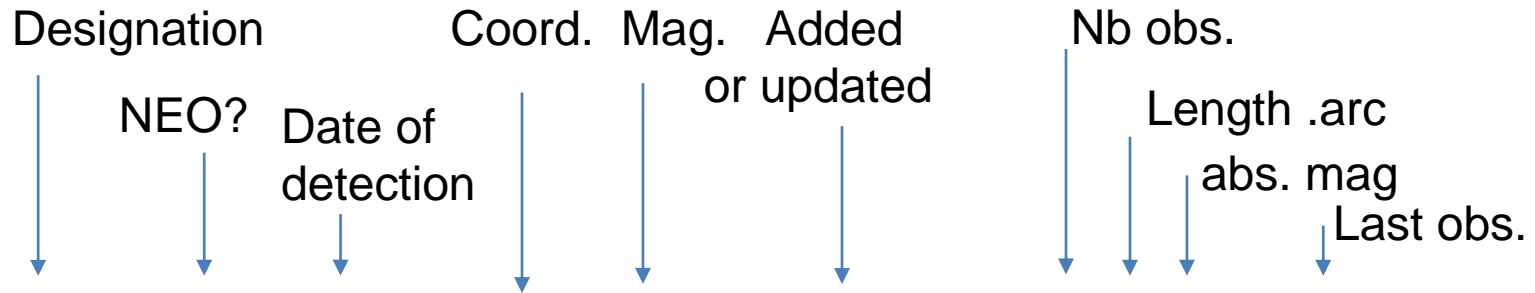
or just the objects selected below:

Temp Desig	Score	Discovery	R.A.	Decl.	V	Updated	Note	NObs	Arc	H	Not Seen/dy
<input type="checkbox"/> N00n67q	100	2023 11 19.2	13 46.7	+64 34	16.4	Added Nov. 22.93 UT		19	1.62	15.1	2.772
<input type="checkbox"/> SCAX131	100	2023 11 06.8	17 54.8	+30 51	17.1	Updated Nov. 22.68 UT		4	0.02	13.1	16.772
<input type="checkbox"/> 3LK7G21	79	2023 11 21.3	07 54.4	-35 02	18.3	Updated Nov. 23.51 UT		23	1.97	23.2	0.263
<input type="checkbox"/> C42GTT1	100	2023 11 23.2	03 52.1	+13 46	18.5	Updated Nov. 23.36 UT		11	0.18	24.6	0.203
<input type="checkbox"/> TMG0089	100	2023 11 22.6	01 35.8	-03 59	18.9	Updated Nov. 22.74 UT		11	0.03	25.3	0.952
<input type="checkbox"/> C9WYGP2	74	2023 11 22.4	05 17.6	+43 43	19.4	Updated Nov. 23.54 UT		42	1.10	24.6	0.021
<input type="checkbox"/> C426GW1	77	2023 11 21.4	04 49.5	+01 29	19.5	Updated Nov. 23.40 UT		47	1.89	22.6	0.247



NEO Confirmation Page


https://minorplanetcenter.net//iau/NEO/toconfirm_tabular.html



Temp Desig	Score	Discovery	R.A.	Decl.	V	Updated	Note	NObs	Arc	H	Not Seen/dy
<input type="checkbox"/> N00n67q	100	2023 11 19.2	13 46.7	+64 34	16.4	Added Nov. 22.93 UT		19	1.62	15.1	2.772
<input type="checkbox"/> SCAX131	100	2023 11 06.8	17 54.8	+30 51	17.1	Updated Nov. 22.68 UT		4	0.02	13.1	16.772
<input type="checkbox"/> 3LK7G21	79	2023 11 21.3	07 54.4	-35 02	18.3	Updated Nov. 23.51 UT		23	1.97	23.2	0.263
<input type="checkbox"/> C42GTT1	100	2023 11 23.2	03 52.1	+13 46	18.5	Updated Nov. 23.36 UT		11	0.18	24.6	0.203
<input type="checkbox"/> TMG0089	100	2023 11 22.6	01 35.8	-03 59	18.9	Updated Nov. 22.74 UT		11	0.03	25.3	0.952
<input type="checkbox"/> C9WYGP2	74	2023 11 22.4	05 17.6	+43 43	19.4	Updated Nov. 23.54 UT		42	1.10	24.6	0.021
<input type="checkbox"/> C426GW1	77	2023 11 21.4	04 49.5	+01 29	19.5	Updated Nov. 23.40 UT		47	1.89	22.6	0.247

NEO Confirmation Page

https://minorplanetcenter.net//iau/NEO/toconfirm_tabular.html

HOME ABOUT HELPDESK

OBSERVERS DATA NEW CONTACT STATUS EXTERNAL

• [MPC Preparation \(Info\)](#)

The NEO Confirmation Page

Please ensure you are familiar with the [notes at the bottom of this page](#).
Also, additional notes on the NEOCP and information on how we remove objects on the NEOCP are also available [here](#).

Page last updated on Nov. 23.547 UTC.

[Problems?](#) [Comments?](#)

Select object(s) from the current list of objects needing confirmation (NEO desirability score, discovery date, rough current position and magnitude given, as well as number of observations, arc, nominal H and number of days since it was last observed). Objects flagged with an "S" in the Note column are [possibly in geocentric orbit](#) and might soon be removed.

All objects with $V =$ to , with Decl. between ° and °, with an NEO desirability score of % to %

or just the objects selected below:

Temp Desig	Score	Discovery	R.A.	Decl.	V	Updated	Note	NObs	Arc	H	Not Seen/dy
<input checked="" type="checkbox"/> N00n67q	100	2023 11 19.2	13 46.7	+64 34	16.4	Added Nov. 22.93 UT		19	1.62	15.1	2.772
<input checked="" type="checkbox"/> SCAX131	100	2023 11 06.8	17 54.8	+30 51	17.1	Updated Nov. 22.68 UT		4	0.02	13.1	16.772
<input type="checkbox"/> 3ER7G21	79	2023 11 21.3	07 54.4	-35 02	18.3	Updated Nov. 23.51 UT		23	1.97	23.2	0.263



NEO Confirmation Page

https://minorplanetcenter.net//iau/NEO/toconfirm_tabular.html

<input type="checkbox"/> P210dBq	100	2023 11 17.3	00 52.0	+29 58	24.3	Updated Nov. 22.71 UT		3	0.03	25.8	6.248
<input type="checkbox"/> W08352	100	2023 11 18.8	02 39.7	+12 21	25.6	Updated Nov. 22.72 UT		3	0.01	29.0	4.749
<input type="checkbox"/> W10949	100	2023 11 19.9	16 41.6	-12 38	99.9	Updated Nov. 22.71 UT		3	0.01	30.6	3.665
<input type="checkbox"/> W09491	100	2023 11 17.8	16 00.2	-21 48	99.9	Updated Nov. 22.69 UT		3	0.01	28.8	5.714
<input type="checkbox"/> W07096	100	2023 11 18.8	16 15.7	-22 28	99.9	Updated Nov. 22.72 UT		3	0.01	29.4	4.711

The information in the table (including any PCCP objects) is available in a [text file](#). The layout of this file matches the table layout exactly, except that the R.A. is converted to decimal hours and the Decl. to decimal degrees.

Select your viewing point:

- Geocentric Observatory code
- Longitude E, latitude °, altitude m.

Longitudes and latitudes should be entered in decimal degrees.

Other options:

Ephemeris interval: 1 hour 30 mins 10 mins 1 min

Start ephemerides at now + hours

Display positions in: truncated sexagesimal or full sexagesimal or decimal units

Display motions as: "/sec, "/min, "/hr or °/day.

Total motion and direction Separate R.A. and Decl. coordinate motions Separate R.A. and Decl. sky motions

Full output Brief output

Suppress output at or when object's altitude is below °.

NEO Confirmation Page

https://minorplanetcenter.net//iau/NEO/toconfirm_tabular.html

Quick links : [Home Page](#) : [Contact Us](#) : [Index](#) : [Site Map](#) : [Search Site](#)

NEO Confirmation Page: Query Results

Below are the results of your request from the Minor Planet Center's NEO Confirmation Page.

Use the feedback form to report [problems](#) or [to comment on this page](#).

Ephemerides are for observatory code 511.

N00n67q

Get the [observations](#) or [orbits](#).

Date	UT		R.A. (J2000) Decl.				Elong.	V	Motion		Object		Sun Alt.	Moon		Uncertainty
	h	m	°	'	"	°			"	P.A.	Azi.	Alt.		Phase	Dist.	
2023 11 23	1300		13 46 38.7	+64 34 35	88.3	16.4	2.43	174.6	144	+53	+22	0.83	111	-10	Map/Offsets	
2023 11 23	1330		13 46 39.7	+64 33 23	88.3	16.4	2.43	174.5	144	+50	+20	0.83	111	-05	Map/Offsets	
2023 11 23	1400		13 46 40.8	+64 32 10	88.3	16.4	2.44	174.4	144	+46	+16	0.83	111	+00	Map/Offsets	
2023 11 23	1430		13 46 41.9	+64 30 57	88.3	16.4	2.44	174.3	145	+43	+13	0.83	111	+05	Map/Offsets	
2023 11 23	1500		13 46 43.1	+64 29 44	88.3	16.4	2.44	174.1	146	+40	+09	0.83	111	+11	Map/Offsets	
2023 11 23	1530		13 46 44.3	+64 28 32	88.3	16.4	2.44	174.0	147	+37	+05	0.84	111	+16	Map/Offsets	
2023 11 23	1600		13 46 45.4	+64 27 19	88.3	16.4	2.44	173.9	149	+34	+00	0.84	111	+21	Map/Offsets	
2023 11 23	1630		13 46 46.7	+64 26 06	88.3	16.4	2.44	173.7	151	+32	-05	0.84	110	+26	Map/Offsets	
2023 11 23	1700		13 46 47.9	+64 24 54	88.3	16.4	2.44	173.6	154	+29	-10	0.84	110	+31	Map/Offsets	
2023 11 23	1730		13 46 49.2	+64 23 41	88.2	16.4	2.43	173.5	156	+27	-15	0.84	110	+36	Map/Offsets	
2023 11 23	1800		13 46 50.5	+64 22 29	88.2	16.4	2.43	173.4	159	+25	-21	0.84	110	+40	Map/Offsets	
2023 11 23	1830		13 46 51.8	+64 21 16	88.2	16.4	2.43	173.3	162	+23	-26	0.85	110	+44	Map/Offsets	
2023 11 23	1900		13 46 53.1	+64 20 04	88.2	16.4	2.42	173.2	165	+21	-31	0.85	110	+47	Map/Offsets	
... <suppressed> ...																
2023 11 23	2330		13 47 05.2	+64 09 21	88.1	16.4	2.37	173.1	195	+21	-67	0.86	109	+36	Map/Offsets	
2023 11 24	0000		13 47 06.5	+64 08 11	88.1	16.4	2.37	173.0	198	+22	-65	0.86	109	+31	Map/Offsets	



NEO Confirmation Page

https://minorplanetcenter.net//iau/NEO/toconfirm_tabular.html

Quick links : [Home Page](#) : [Contact Us](#) : [Index](#) : [Site Map](#) : [Search Site](#)

NEO Cc

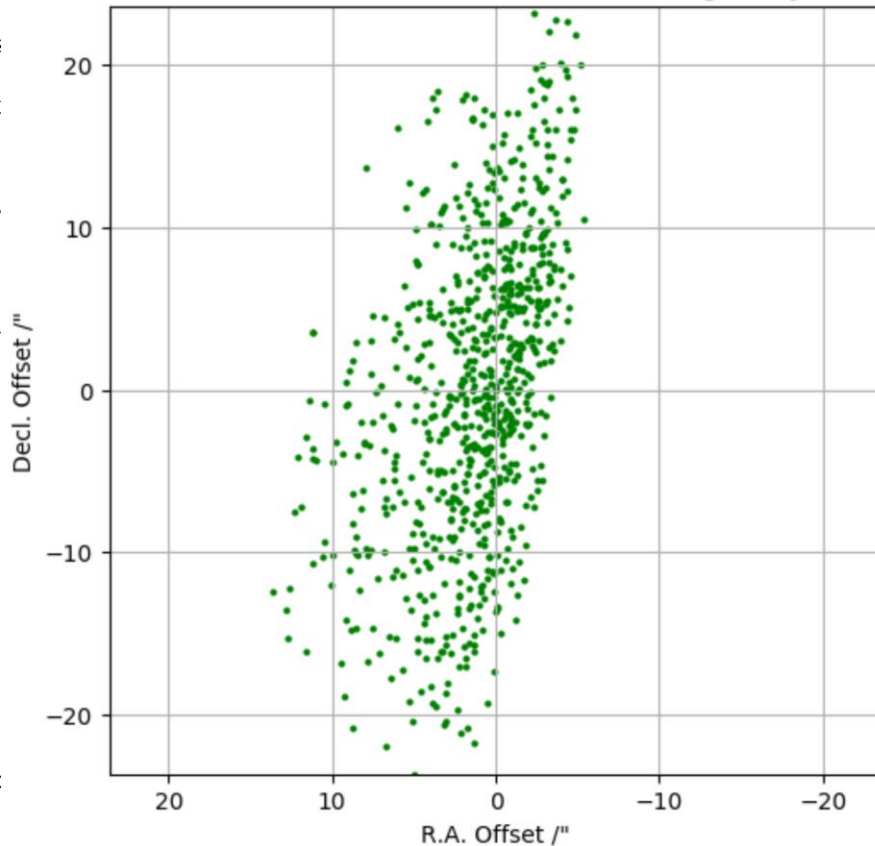
Below are the res
Use the feedback
Ephemerides are

N00n67q

Get the [observati](#) ^{on}

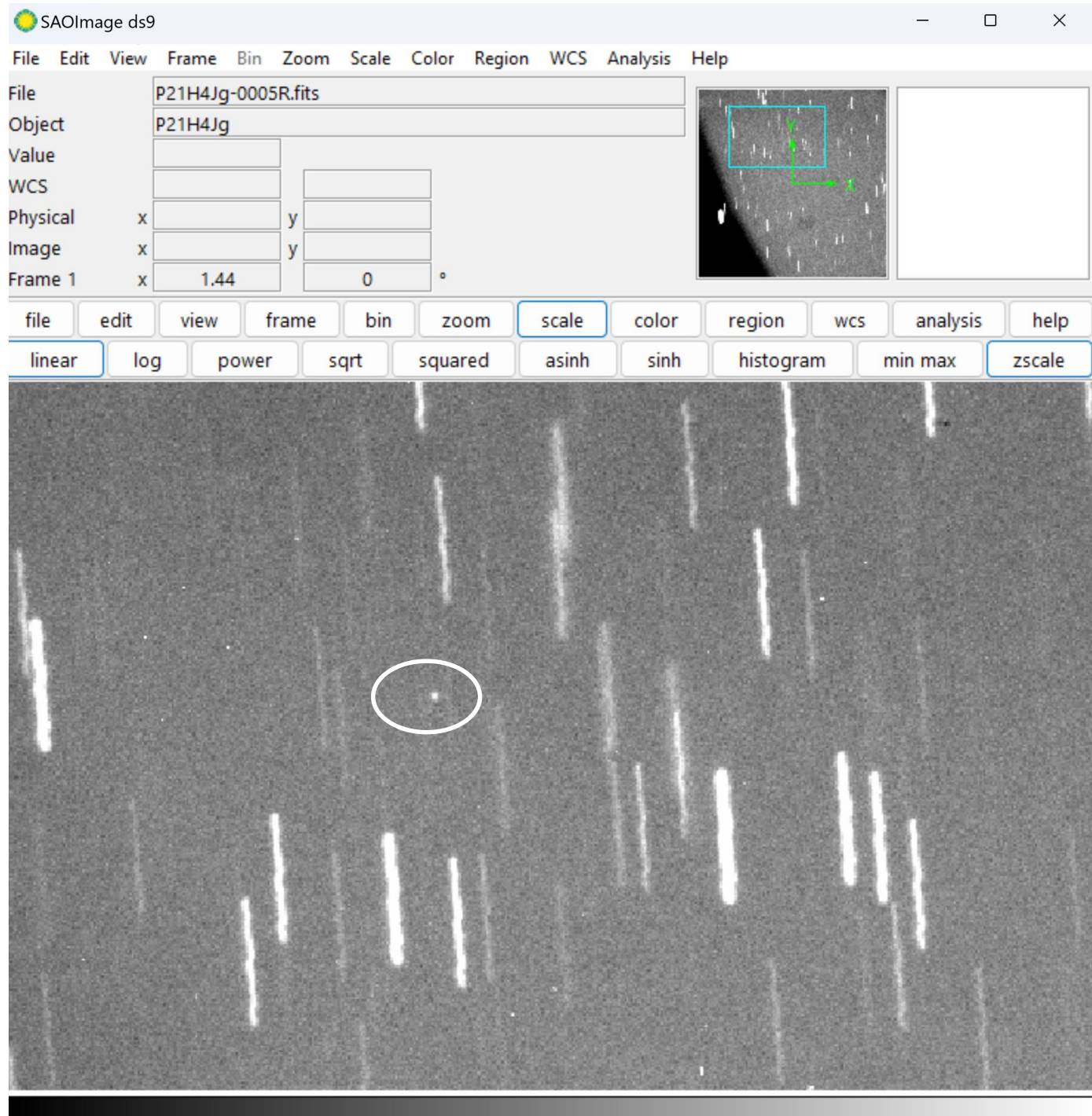
Date	UT h m	Deci. Offset /"
2023 11 23 1300		
2023 11 23 1330		
2023 11 23 1400		
2023 11 23 1430		
2023 11 23 1500		
2023 11 23 1530		
2023 11 23 1600		
2023 11 23 1630		
2023 11 23 1700		
2023 11 23 1730		
2023 11 23 1800		
2023 11 23 1830		
2023 11 23 1900		
... <suppressed:		
2023 11 23 2330		
2023 11 24 0000		

Uncertainty Map for N00n67q (2023 11 23.542)
Plot based on 19 observations covering 2 days



	Moon	Dist.	Alt.	Uncertainty
3	111	-10		Map/Offsets
3	111	-05		Map/Offsets
3	111	+00		Map/Offsets
3	111	+05		Map/Offsets
3	111	+11		Map/Offsets
4	111	+16		Map/Offsets
4	111	+21		Map/Offsets
4	110	+26		Map/Offsets
4	110	+31		Map/Offsets
4	110	+36		Map/Offsets
4	110	+40		Map/Offsets
5	110	+44		Map/Offsets
5	110	+47		Map/Offsets
6	109	+36		Map/Offsets
6	100	+31		Map/Offsets





« tracking » mode

Motion of the
telescope

=

Motion of the
object

NEO Confirmation Page

Detection successful => Astrometric data under the MPC format

```
COD 511
CON W. Thuillot, Coordinator of Gaia-Alert at Haute Prov. Obs.
CON Paris Observatory-IMCCE-SYRTE and OCA Nice, FRANCE
CON [William.Thuillot@obspm.fr]
OBS W. Thuillot, M. Saitlenfest
MEA W. Thuillot, S. Bouquillon, F. Taxis, T. Carlucci, C. Barache
TEL 1.20-m f/6 reflector + CCD
NET GAIA-EDR3
BND G
COM On behalf of the Gaia-FUN-SSO
ACK NEOCP observations at OHP 511
AC2 William.Thuillot@obspm.fr

K23N01N C2023 07 15.01828 20 09 17.00 +00 27 02.1 R 511
K23N01N C2023 07 13.02646 20 09 18.68 +00 27 58.1 R 511
K23N01N C2023 07 15.03029 20 09 20.73 +00 29 12.5 R 511
K23N01N C2023 07 15.03906 20 09 25.08 +00 31 48.7 R 511
K23N01N C2023 07 15.04199 20 09 26.18 +00 32 28.2 R 511
```

=> File: OHP-Observations-41.txt

« curl » command to send data to MPC:

curl https://minorplanetcenter.net/submit_obs -F "source=<OHP-Observations-41.txt"



NEO Confirmation Page

M.P.E.C. 2023-W13

Issued 2023 November 17, 07:36 UT

The Minor Planet Electronic Circulars contain information on unusual minor planets, routine data on comets and natural satellites, and occasional editorial announcements. They are published on behalf of Division F of the International Astronomical Union by the Minor Planet Center, Smithsonian Astrophysical Observatory, Cambridge, MA 02138, U.S.A.

Prepared using the Tamkin Foundation Computer Network

MPC@CFA.HARVARD.EDU

URL <https://www.minorplanetcenter.net/> ISSN 1523-6714

2023 VN10

Observations:

K23V10N*1C2023	11	15.31725406	45	10.746+60	57	04.97	18.29GVEW013703
K23V10N 1C2023	11	15.32235106	45	04.417+60	56	29.00	VEW013703
K23V10N 1C2023	11	15.32745206	44	57.970+60	55	51.82	19.10GVEW013703
K23V10N 1C2023	11	15.33255106	44	51.749+60	55	17.08	19.88GVEW013703
K23V10N C2023	11	15.35320306	44	25.519+60	52	47.75	18.74GVEW013I52
K23V10N C2023	11	15.35340406	44	25.231+60	52	46.24	18.55GVEW013I52
K23V10N KC2023	11	17.08908006	12	59.15+56	59	06.3	19.0 GVEW013J95
K23V10N KC2023	11	17.11550706	12	26.926+56	56	42.25	18.4 GVEW013J95
K23V10N KC2023	11	17.11619106	12	26.270+56	56	36.67	18.5 GVEW013J95
K23V10N KC2023	11	17.11687206	12	25.553+56	56	30.48	18.5 GVEW013J95
K23V10N KC2023	11	17.11755106	12	24.881+56	56	24.90	18.6 GVEW013J95

Observer details:

- 104 San Marcello Pistoiese. Observers P. Bacci, M. Maestriperieri. Measurer P. Bacci. 0.60-m f/4.0 reflector + CCD.
- 106 Crni Vrh. Observer H. Mikuz. 0.60-m f/3.3 reflector + CMO.
- 204 Schiaparelli Observatory. Observers L. Buzzi, G. Galli. 0.84-m f/3.5 reflector + CCD.
- 511 Haute Provence. Observers D. Souami, W. Thuillot. Measurers W. Thuillot, S. Bouquillon, F. Taxis, T. Carlucci, C. Barache. 1.20-m f/6 reflector + CCD.
- 703 Catalina Sky Survey. Observer J. B. Farnham. Measurers E. C. Beshore, D. Fay, J. B. Farnham, D. C. Fols, A. R. Gibbs, A. D. Grauer, H. Groeller, J. K. Hogan, R. A. Kowalski, S. M. Larson, G. J. Leonard, D. Rankin, R. L. Seaman, F. C. Shelly, K. W. Wierzbos. 0.68-m Schmidt + 10K CCD.
- 734 Farpoint Observatory, Eskridge. Observers D. Cromer, G. Hug, D. Goodin, R. Valentine. Measurer D. Cromer. 0.69-m f/3.54 reflector + CMO.



NEO Confirmation Page

M.P.E.C. 2023-W13

Issued 2023 November 17, 07:36 UT

The Minor Planet Electronic Circulars contain information on unusual minor planets, routine data on comets and natural satellites, and occasional editorial announcements. They are published on behalf of Division F of the International Astronomical Union by the Minor Planet Center, Smithsonian Astrophysical Observatory, Cambridge, MA 02138, U.S.A.

Prepared using the Tamkin Foundation Computer Network

MPC@CFA.HARVARD.EDU

URL <https://www.minorplanetcenter.net/>

ISSN 1523-6714

2023 VN10

Ecart O-C (")

Observations:

K23V10N*1C2023	11	15.31725406	45	10.746+60	57	04.97	18.29GVEW013703	
K23V10N	1C2023	11	15.32235106	45	04.417+60	56	29.00	VEW013703
K23V10N	1C2023	11	15.32745206	44	57.970+60	55	51.82	19.10GVEW013703
K23V10N	1C2023	11	15.33255106	44	51.749+60	55	17.08	19.88GVEW013703
K23V10N	C2023	11	15.35320306	44	25.519+60	52	47.75	18.74GVEW013152
K23V10N	C2023	11	15.35340406	44	25.231+60	52	46.24	18.55GVEW013152

231115	I52	0.0	0.3+	231115	106	0.0	0.0	231117	204	0.0	0.2-
231115	I52	0.0	0.1+	231115	L01	0.0	0.0	231117	204	0.2-	0.1-
231115	I52	0.2+	0.1-	231115	106	0.1-	0.1-	231117	204	0.1+	0.0
231115	I52	0.1+	0.1-	231115	106	0.0	0.0	231117	511	0.2+	0.0
231115	I52	0.0	0.0	231116	Z84	0.1+	0.1+	231117	511	0.6+	1.4+
231115	I52	0.0	0.1+	231116	Z84	0.0	0.0	231117	511	0.2-	0.1+
231115	734	0.2-	0.0	231116	Z84	0.1+	0.2-	231117	511	0.5-	0.1+
231115	734	0.1+	0.1-	231116	U55	0.4-	0.9-	231117	511	0.2-	1.1+
231115	734	0.1+	0.1+	231116	H21	0.1+	0.0	231117	511	0.1+	0.1-
231115	104	0.6-	0.4+	231116	H21	0.0	0.0	231117	511	0.2-	0.0

703 Catalina Sky Survey. Observer J. B. Fazekas. Measurers E. C. Beshore, D. Fay, J. B. Fazekas, D. C. Fuls, A. R. Gibbs, A. D. Grauer, H. Groeller, J. K. Hogan, R. A. Kowalski, S. M. Larson, G. J. Leonard, D. Rankin, R. L. Seaman, F. C. Shelly, K. W. Wierzchos. 0.68-m Schmidt + 10K CCD.
734 Farpoint Observatory, Eskridge. Observers D. Cromer, G. Hug, D. Goodin, R. Valentine. Measurer D. Cromer. 0.69-m f/3.54 reflector + CM0.



ESA Space Safety Programme

ESASSP

ESA Space Safety Programme: ESA-SSP

<https://neo.ssa.esa.int/home>

→ EUROPEAN SPACE AGENCY | SPACE SAFETY PROGRAMME

Q CONTACT US SIGN IN

near-earth objects coordination centre



NEOCC Home
About NEOCC
NEOCC Observing Facilities

MAIN SERVICES

Risk List
Close Approaches List
Priority List
Removed from Risk List
Past Impactors
Newsletters Archive
CAFS Archive
News Archive

SEARCH

Asteroids
Comets
Image Archive
Fireballs

TOOLS

NEO Toolkit
NEO Population Generator
NEO Propagator

OUTREACH

Discovery Statistics
NEO Chronology
NEOCC Riddles
Gallery
Media Entries

The NEOCC is ESA's centre for computing asteroid and comet orbits and their probabilities of Earth impact.

→ NEOCC DATABASE STATISTICS

Last update: 2023-11-23 13:55 UTC

NEAs in Risk List



1562
objects

Current NEAs



33632
objects

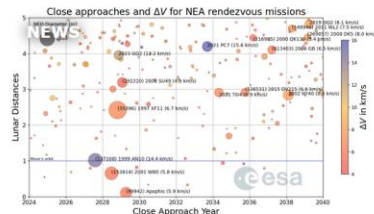
Current NECs



122
objects

→ NEWS / NEWSLETTERS / CAFS

[All news](#)



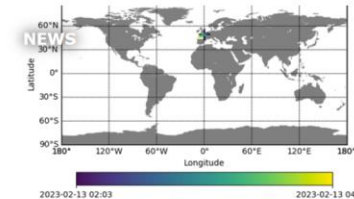
A significant number of large near-Earth...

Several mission opportunities to close-approach asteroids up to 2040.



NEOCC turns 10

ESA's NEO Coordination Centre celebrates its 10th anniversary.



New imminent impactor found by...


The atmospheric impact of this 1-metre object has been observed as a fireball.



ESA Space Safety Programme: ESA-SSP

<https://neo.ssa.esa.int/home>

→ EUROPEAN SPACE AGENCY | SPACE SAFETY PROGRAMME | CONTACT US | SIGN IN

near-earth objects coordination centre 

NEOCC Home
About NEOCC
NEOCC Observing Facilities

MAIN SERVICES

- Risk List
- Close Approaches List
- Priority List
- Removed from Risk List
- Past Impactors
- Newsletters Archive
- CAFS Archive
- News Archive

SEARCH

- Asteroids
- Comets
- Image Archive
- Fireballs

TOOLS

- NEO Toolkit
- NEO Population Generator
- NEO Propagator

OUTREACH

- Discovery Statistics
- NEO Chronology
- NEOCC Riddles
- Gallery
- Media Entries
- Public Outreach

→ **PRIORITY LIST** [Faint list](#)

















Last update: 2023-11-23 00:00 UTC

The Priority List addresses the problem of efficiently planning and executing NEO follow-up observations. It classifies the need to observe especially newly discovered objects into four categories, urgent, necessary, useful and low priority. The aim is to ensure that the highest possible percentage of these bodies can be recovered at other apparitions. The sorting order can be changed by clicking on the table headers.

The software running at the NEOCC was originally developed by the Istituto Nazionale di Astrofisica (INAF, Italy) and its results made available through INAF's Spaceguard portal. It was also made operational in our system since 2014. The implemented method is discussed in the following article by A. Boattini et al. (2006), A New Protocol for the Astrometric Follow-up of Near Earth Asteroids, that can be found [here](#).

Brightest Mag. Faintest Mag. Min. Declination Max. Declination

Priority List

Priority 	Object designation 	Inserted 	R.A. in hh:mm 	Declination in deg 	Elongation in deg 	Visual magnitude in mag 	Sky uncert. in arcsec 	End of visibility 
NE	 2023VN10	2023-11-23	04h56m	39.5	157	18.5	4	2024-01-06
US	 2023UC11	2023-11-23	00h48m	68.8	124	18.6	0	2023-12-20
UR	 2023WA2	2023-11-23	03h24m	35.5	163	18.9	3	2023-12-07
LP	 2023UT	2023-11-23	01h39m	42.7	144	18.9	0	2024-01-15
UR	 2023WE2	2023-11-23	03h32m	33.7	166	19.1	4	2023-12-06
NE	 2023WC2	2023-11-23	07h21m	13.6	131	19.1	1	2023-12-09
US	 2023VR4	2023-11-23	00h40m	27.1	135	19.1	0	2023-12-14



Conclusions

- GFSSO • Alerts irregularly distributed wrt time with average mag around 20
- Detection astrometry => high precision not required
- Contribute to the completeness of the orbital reference catalog
- Contribute to understanding bias (a,e,i)
- NEOCP • Confirmation of very recently detected NEOs
- possibly imminent impactor
- Frequent additions and updates
- ESASSP • Monitoring of objects with impact risks



Dynamic characterization: need for astrometry

Ephemeris accuracy drift against time

Usefulness of the observation by a network (weather)

Data centralization and sharing at MPC