

ESA's Planetary Defense Activities

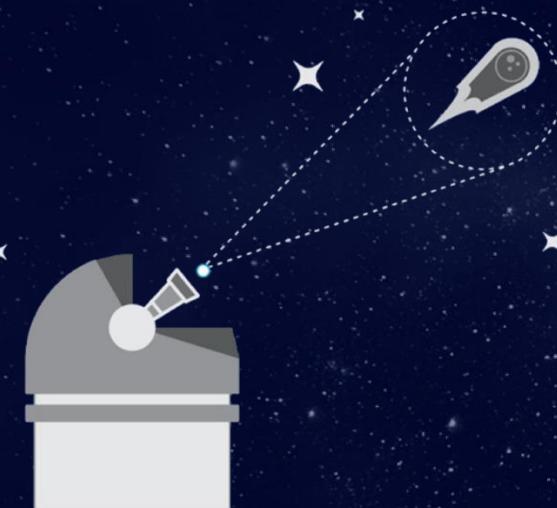
Richard Moissl and the Planetary Defence Office Team



*"The goal of Space Safety is [] **the protection of our planet, humanity and assets in space and on Earth from dangers originating in Space**" (PB-SSA 2018(24))*

- Detecting Near Earth Objects, determining their dynamic and physical properties
- Assessment and prediction of impact risk, warning decision makers and disaster relief forces in case of threats
- Risk mitigation through potential reconnaissance and/or deflection missions

The Three Pillars of ESA's Planetary Defence



Observation



Assessment

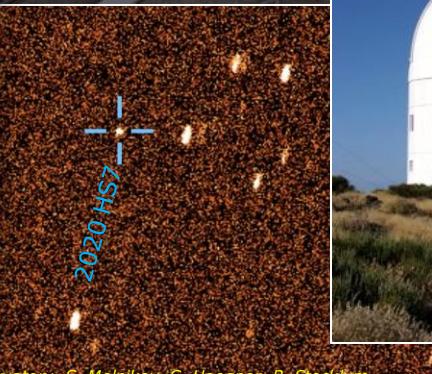


Mitigation

Observations



Marco Micheli
Session 3
Today 15:15



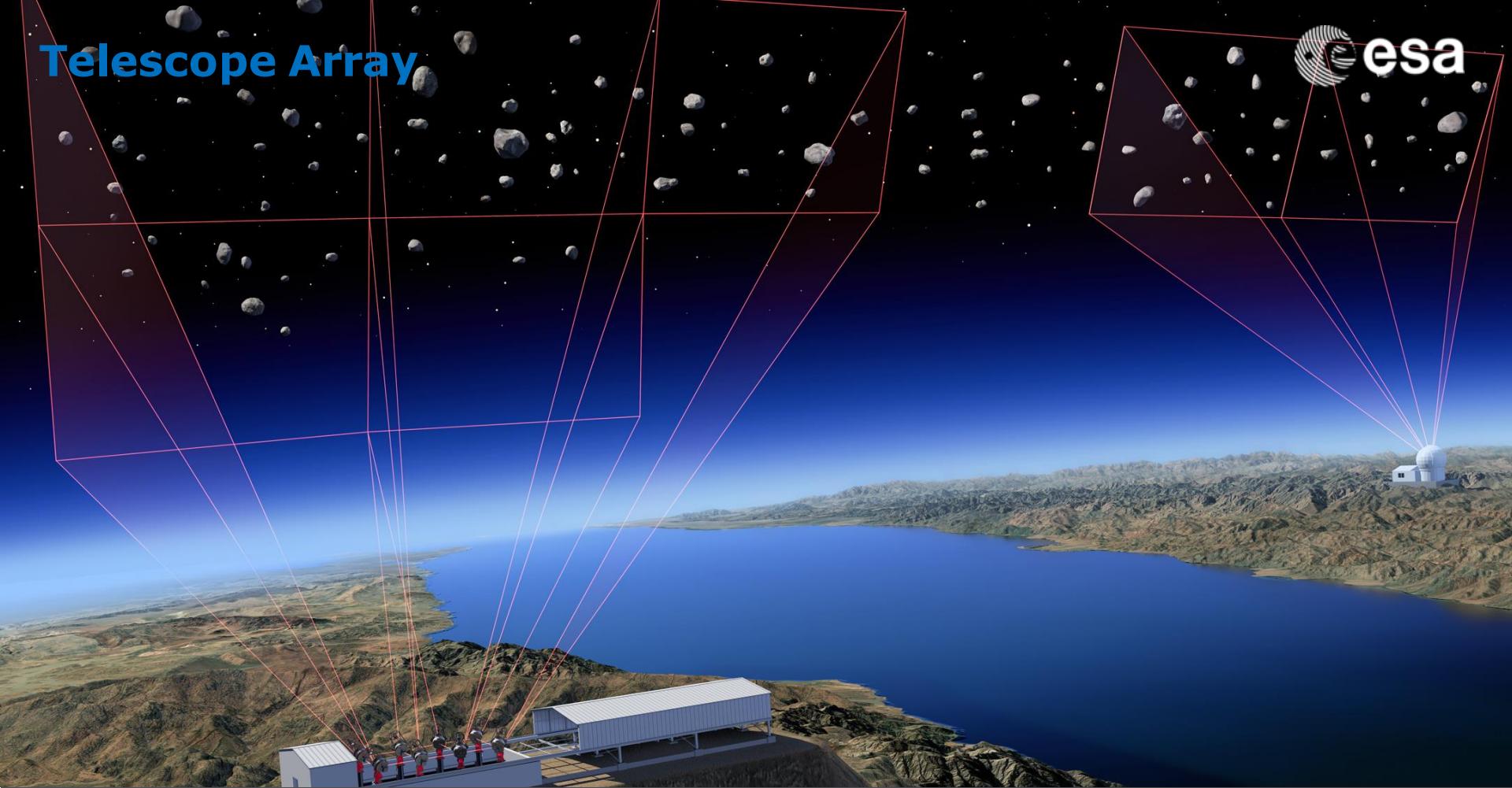
The Flyeye Survey Telescope Network



Dora Föhring
Session 3
Today 17:22

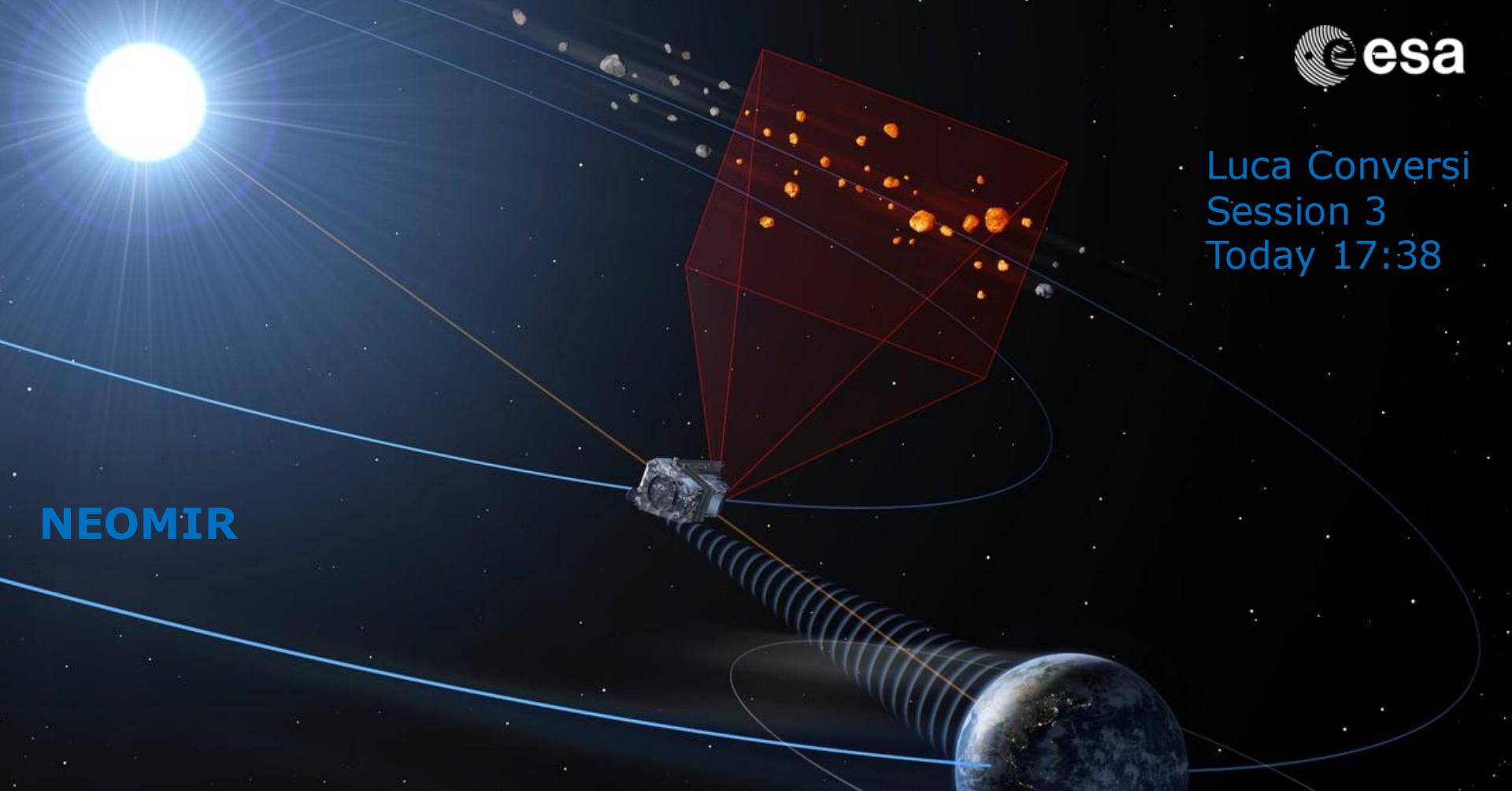


Telescope Array



Luca Conversi
Session 3
Today 17:38

NEOMIR



Assessment

Meerkat: Early warning system

Meerkat Asteroid Guard Dashboard Lists Sky Map Request Logs Info External Temporary Designation eesa

Meerkat Asteroid Guard

45 Number of NEOCP objects 2020-08-31 04:03 Last NEOCP Input in UTC 2020-08-31 09:14 Last Backend Connection in UTC

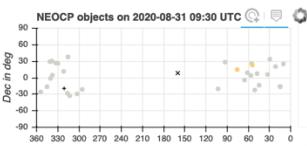
0 Number of Objects IP>2.0% 2 Number of Objects IP>0.2% 1.16% Highest Impact Probability

Meerkat Analysis Timeline

COMP. DATE	TEMP. DESIG.	N. OBS.	IMP. PROB.	NEO PROB.	ISO SCORE	IEO PROB.	MIN. WRMS
2020-08-31 04:06	ZTF0ER8	5	0	0.99999	0.00008	0	0.06
2020-08-30 18:03	C33UJ92	16	0	0	0.00391	0	0.51
2020-08-29 18:56	A10pOl	5	0.00018	0.76839	0.00007	0	0.52
2020-08-29 17:53	C33UJ92	12	0	0.05471	0.00216	0	0.47
2020-08-29 17:48	P114Xrm	3	0	0.38102	0.00002	0	0.55
2020-08-29 17:44	P214XyT	4	0	0.75348	0.00004	0	0.06
2020-08-29 17:41	P214XZIA	4	0.00012	0.87336	0.00005	0	0.48

Sky Map

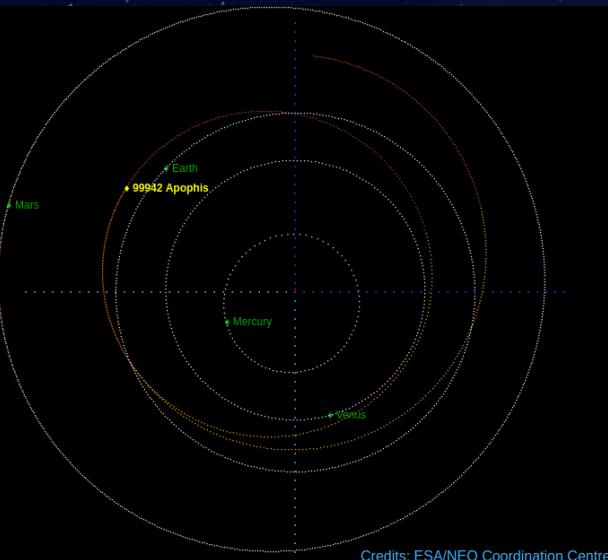
NEOCP objects on 2020-08-31 09:30 UTC



Highest Impact Probabilities

TEMP. DESIG.	N. OBS.	IMP. PROB.	GEO. IMP. PROB.	VIS. MAG.	RA	DEC	UNC
ZTF0EK3	4	0.01164	0.01136	23.1	54.31	22.95	3475
ZTF0EJh	4	0.00467	0.0022	23.4	75.69	14.88	4465
C31KU02	4	0.00136	0	21.2	65.34	-4.15	178
ZTF0ENm	4	0.00103	0.00059	20.1	316.26	-28.13	974
C33ZZN2	6	0.00087	0	20.8	56.18	4.14	4
C340EH2	4	0.0004	0	21.6	61.17	9.21	11

Aegis: Orbit Determination and Impact Monitoring software



Laura Fagioli, Francesco Gianotto et al.
Poster Session (related poster by Marco Fenucci)

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Orbit determination.
Coordination with NASA

Richard Moissl| The ESA PDO| PDC2023 | 2023/04/04



Information Provision



NEOCC Portal

Regina Rudawska
Poster Session

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

near-earth objects coordination centre

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

→ NEOCC DATABASE STATISTICS

Last update: 2023-04-03 15:41:24 UTC

NEAs in Risk List
1462 objects

Current NEAs
31625 objects

Current NECs
120 objects

→ NEWS / NEWSLETTERS / CAFS

All news

2023-02-13 02:03 - 2023-02-13 04:19
First observation: 2023-02-12 20:18:07 | Last observation: 2023-02-12 21:12:28

New imminent impactor found by...
The atmospheric impact of this 1-metre object has been observed as a fireball...
● 2023-02-14 09:12 UTC [Read more](#)

NEWS
AEGIS, a more performant and precise OD/IM software
● 2022-12-20 11:30 UTC [Read more](#)

2023-11-19 07:37 - 2023-11-19 08:33
First observation: 2023-11-18 20:53:05 | Last observation: 2023-11-19 00:17:48

Sixth meteoroid detected prior to...
The object produced a bright fireball over the Great Lakes area
● 2022-11-22 15:18 UTC [Read more](#)

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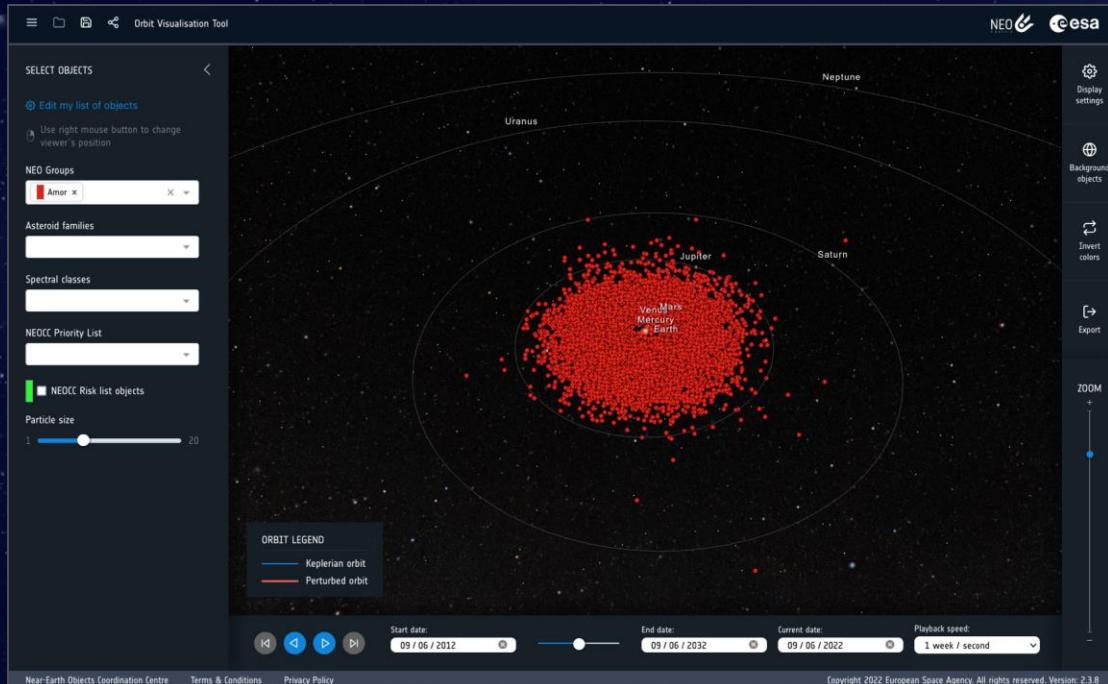


NEO Toolkit and API access



Dario Oliviero
Poster Session

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Mitigation



e esa

Juan Luis Cano
Session 8
Thursday 11:56



space situational awareness
→ NEAR-EARTH OBJECTS

Close approach fact sheet for asteroid 2018 LA
A small asteroid impacted the Earth on 02 June 2018.

Impact date	2018-06-02
Impact time	~16:45 UTC
Minimum distance from Earth surface	The object impacted the Earth
Fly-by speed	17.0 km/s
Size range	2-5 m

Orbit information

Epoch	Orbital period years (days)	Aphelion Distance au	Perihelion distance au	Eccentricity	Inclination deg	Rotation Period hours
2018-05-02	1.61 (586)	1.959	0.783	0.429	4.279	Not known

The medium-sized asteroid 2012TC4 had a close approach with the Earth on 12 October 2017. The minimum distance was outside the geostationary ring. This is a special-interest event.

Flyby information:
Flyby date: 2017-10-12
Closest approach time: 05:41 UTC +/- 8 s
Flyby distance from Earth surface: 43832 km +/- 1 km
Flyby speed: ~26 km/s
Size range: 13.1 m to 30.0 m
Discovery date: 2012-10-04
Discovery site: Haleakala

Orbit information:
The flyby caused a change in the orbit elements.
Days before and after flyby: Before = 2017-09-12, after = 2017-22-12
Orbital periods in years/days: Before = 0.005/1.67, after = 0.006/2.06
Aphelion distances in au: Before = 1.878, after = 2.275
Perihelion distances in au: Before = 0.934, after = 0.965
Eccentricities: Before = 0.336, after = 2017-22-12
Inclinations in deg: Before = 0.857, after = 0.536

Mitigation Information:
No mitigation actions required for this object.
Days since closest approach: 1203
Cumulative impact probability: 0
Composition (Taxonomic type): Unknown
Rotation period in hours: 0.204

Other information:
Peak brightness magnitude: 12.7
Date of previous encounter: 2012-20-12
Date of next encounter: 2050-10-19
Encounter peculiarities: An international observation campaign devoted to the very close flyby of 2012TC4 had been organised.

United Nations
COPUOS/OOSA

Inform in case of credible threat

Parent Government Delegates

Determine impact time, location and severity

P_i > 1%

Space Missions Planning Advisory Group (SMPAG)

S > 50m

Space Agencies and Offices

Observers, analysts, modelers...

I International Asteroid Warning Network (IAWN)

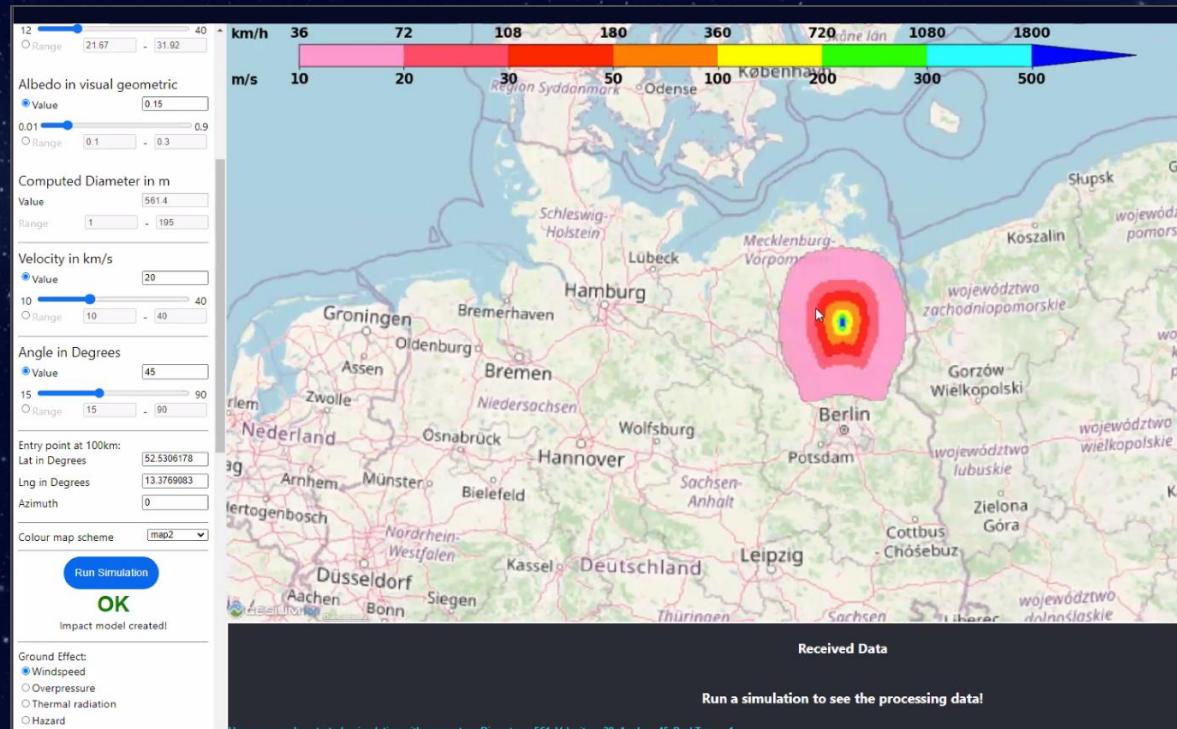
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+ THE EUROPEAN SPACE AGENCY

Impact Effects Tools



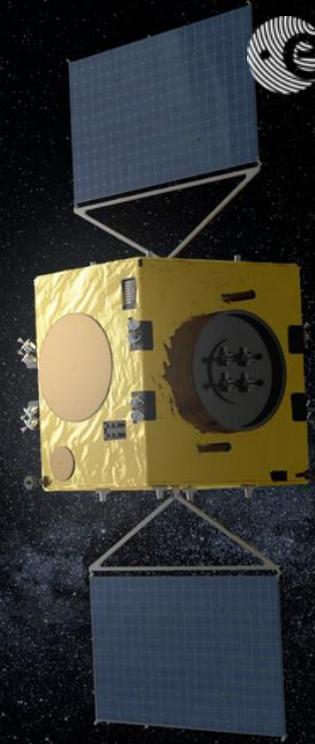
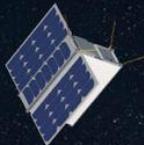
Robert Luther
Session 7a
Thursday 9:25

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The Hera Mission



esa

Apophis Reconnaissance Mission



Image: ScienceMark Garlick/
Photo Library/Getty Images



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Thank you!



Backup Slides

Information provision

- Access to our data – API and Python script (beta version):

→ AUTOMATED DATA ACCESS

The "API support" for the NEOCC web services is currently limited to some HTTPS GET requests with raw text-based responses. Note that the API is considered as experimental — pending funding availability we hope to be able to offer a more convenient interface at some point. This means that we may modify, change or remove the interface at any moment and without advance warning. In that case, a best effort will be made to update this help page with the new details.

USAGE

As mentioned above, all automated data accesses use the HTTP protocol and the GET method, that is, the request and all parameters are transmitted in the URL. All URLs below should be prefixed with our server URL: <https://neo.ssa.esa.int/>

Some have parameters, which are represented with the format `$param`, and explained in a table below.

Parameters reference

Placeholder name	Basic data type	Explanation	Limits / validity
<code>\$desig</code>	String	Designator of an object, written as the name or provisional designation (without spaces). If the object is numbered, the catalog number may precede the string, separated by a space. Examples (without quotes): " <code>2007VK184</code> ", " <code>433 Eros</code> ".	Any in the database for which the relevant data is available.
		Used when querying for orbital parameters. It is formed by two values in	

```
In [2]: from ESANE OCC import neocc
In [3]: list_data = neocc.query_list(list_name="nea_list")
In [4]: list_data
Out[4]:
0          433 Eros
1          719 Albert
2          887 Alinda
3         1036 Ganymed
4         1221 Amor
...
29068      2022LX1
29069      2022LY1
29070      2022LZ
29071      2022LZ1
29072      6344P-L
Name: 0, Length: 29073, dtype: object
```