

→ NEWSLETTER NOVEMBER 2023

ESA's NEO Coordination Centre

Current NEO statistics

More than 400 new NEOs were discovered during the month of October.

- Known NEOs: 33 368 asteroids and 121 comets
- NEOs in risk list*: 1547
- NEOs designated during last month: 420
- NEOs discovered since 1 January 2023: 2318

Focus on

Shortly after the Chelyabinsk fireball in 2013, an 8-metre wide hole was reported in the frozen surface of the Lake Chebarkul. Indeed, the meteorite fall had been fortuitously recorded by a security camera. Ten years ago, on 15 October 2013, the meteorite was dredged up from the bottom of the lake. It was 1-metre wide and weighed half a tonne (the total mass of the asteroid was 10 000 tonnes).

When an asteroid enters the atmosphere, it suffers a mass loss process called ablation. Most of the meteoroids disintegrate above 80 km from the Earth's surface, where the atmosphere is still rarefied. But if the body is large enough, it reaches the lower layers of the atmosphere. There it suffers from a huge ram pressure[†], which eventually exceeds the internal strength of the body, and leads to a catastrophic fragmentation. This is what produced the airburst and subsequent shock wave that reached Chelyabinsk Oblast and caused material damage. Nevertheless, some fragments may eventually survive and decelerate further until the ablation process ends. We then speak about a meteorite, covered by the characteristic black crust, which fell at atmospheric terminal velocity (between 200 and 300 km/h).

Upcoming interesting close approaches

A large asteroid will safely pass by close to Earth in November.

- (363505) 2003 UC20 is a large 1.9 km asteroid that will pass by the Earth on 2 November at about 14 lunar distances. A flyby of an object of this size is an infrequent event.

Recent interesting close approaches

Two tiny asteroids flew by in October.

- 2023 TO17 and 2023 UB are two newly discovered 4-metre asteroids that passed by the Earth in mid-October. At their closest approach, just under 60 000 km away from the Earth, they both reached magnitude 15.

News from the risk list

Two new objects rank high in our risk list.

- 2023 TL4, a recently discovered 300-metre asteroid, has now reached the second position on our risk list, for a possible impact in 2119. It is currently oscillating between Torino Scale levels 0 and 1 as new observations are added, slightly increasing or decreasing the impact probability.
- 2023 TB2, a 60-metre object, also ranks high on our list, in this case due to various low-probability encounters starting in year 2086.

*The risk list of all known objects with a non-zero (although usually very low) impact probability can be found at <https://neo.ssa.esa.int/risk-list>

[†]The molecules in front of the meteoroid are compressed causing its temperature to quickly rise.

In other news

- The OSIRIS-REx Sample Return Capsule has been opened by NASA, revealing samples of asteroid (101955) Bennu.

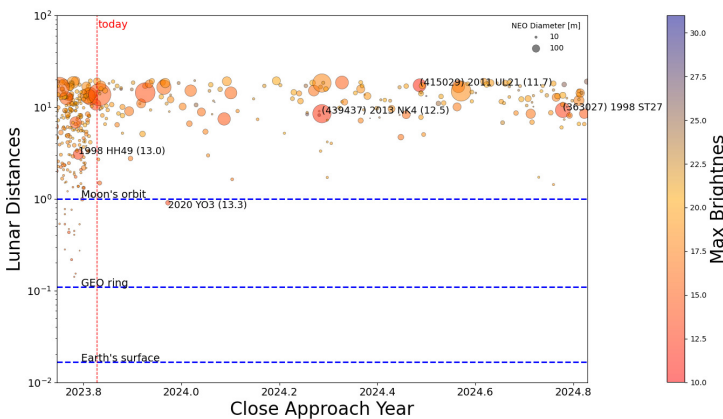
Upcoming events

- Astronomical Data Analysis Software & Systems XXXIII (ADASS 2023), 5-9 November 2023, Tucson, USA <https://adass2023.lpl.arizona.edu>
- 55th Lunar and Planetary Science Conference (LPSC 2024), 11-15 March 2024, The Woodlands, USA <https://www.hou.usra.edu/meetings/lpsc2024/>
- Apophis T-5 Years, 22-23 April 2024, Noordwijk, The Netherlands <https://www.hou.usra.edu/meetings/apophis2024/>

Current risk list, sorted by cumulative Palermo Scale

The table shows the top ten objects currently in our risk list, but sorted by cumulative Palermo Scale, instead of the usual maximum value. This sorting highlights objects like 2023 TB2, which is characterised by a large number of possible future impact events, whose probabilities add up to a larger cumulative value.

Designator	Size range in m	Date of possible impact	Cumulative Impact probability	Cumulative Palermo scale	Torino scale	Impact velocity in km/s
1979 XB	500–1200	2056-12-12 21:39	1 / 1 400 000	-2.74	0	27.54
2000 SG344	29–70	2071-09-16 00:57	1 / 400	-2.79	0	11.27
2023 TL4	260–600	2119-10-10 20:24	1 / 500 000	-2.90	0	36.69
2023 TB2	50–110	2117-09-01 13:29	1 / 7000	-3.07	0	13.12
2008 JL3	23–50	2027-05-01 09:06	1 / 6000	-3.08	0	14.01
2005 QK76	24–50	2030-02-26 08:15	1 / 16 000	-3.42	0	22.66
2020 VV	10–20	2050-10-11 10:13	1 / 190	-3.47	0	11.47
2023 DO	21–50	2057-03-23 19:43	1 / 2000	-3.52	0	13.18
2008 UB7	40–100	2060-10-31 18:27	1 / 22 000	-3.54	0	21.57
2021 GX9	22–50	2032-04-16 21:51	1 / 20 000	-3.63	0	20.17



The plot shows all known close approaches at the end of October 2023, from one month ago to one year in the future. The plot extends to a minimum distance of 0.05 au, the usual threshold for the definition of a close approach.

Immediately noticeable is a much larger number of small very close approaches before today's date compared to the future. This is an artefact of our discovery capabilities: small objects can only be discovered when they are very close to us, and therefore most of them are not known in advance, and only become known during a current very close passage near our planet.

[Credit: ESA / PDO]

Links for more information

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

Close approaches page: <https://neo.ssa.esa.int/close-approaches>

Risk List: <https://neo.ssa.esa.int/risk-list>

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