

→ NEWSLETTER SEPTEMBER 2023

ESA's NEO Coordination Centre

Current NEO statistics

Our risk list crossed the threshold of 1500 listed asteroid.

- Known NEOs: 32 544 asteroids and 121 comets
- NEOs in risk list*: 1504
- NEOs designated during last month: 166
- NEOs discovered since 1 January 2023: 1508

Focus on

In the previous newsletter, we introduced the Minimum Orbit Intersection Distance (MOID) and explained its relevance for planetary defence purposes. The value of the MOID depends on the object's orbital elements, and it is determined only by the geometry of the asteroid orbit in space with respect to the one of the Earth. Because the orbital elements evolve with time due to gravitational perturbations from other planets, the value of the MOID with the Earth evolves as well. Therefore, an asteroid that is not classified as dangerous at the current epoch may become a threat in the future, if the MOID drops close to zero at certain points. Objects that cannot impact the Earth in the next 100 years may become impactors on longer time scales, and computing the secular evolution of the MOID helps to estimate the time windows over which impacts may occur. For example, this behaviour is easily visible for the case for asteroid (101955) Bennu, which cannot impact the Earth for the next 100 years, but has a maximum impact probability of 1/2700 between 2124 and 2300, specifically during the time window when its MOID becomes very small.

Upcoming interesting close approaches

None of the asteroids known at the beginning of the month is expected to come closer than 3 lunar distances in September.

Recent interesting close approaches

Three very small asteroids came closer than the Moon during a three day period in August.

- 2023 QY, 2023 QS1 and 2023 QR were the only three asteroids known to have come within a lunar distance in August. They were all tiny, between 5 and 10 metres in diameter, and they all flew-by our planet between 18 and 20 August.

News from the risk list

A new large but low impact probability object entered the top spot of our risk list.

- 2023 QF5 is a new highest-ranked object in our risk list. It's a large kilometre-sized NEO, but its impact probability is extremely small, less than 1 in a million for a possible approach in 2032.

*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>

In other news

- NASA's OSIRIS-REx spacecraft will drop its sample capsule for its Earth re-entry on 24 September. The spacecraft itself will continue its mission en-route to a fly-by of asteroid (99942) Apophis in 2029.

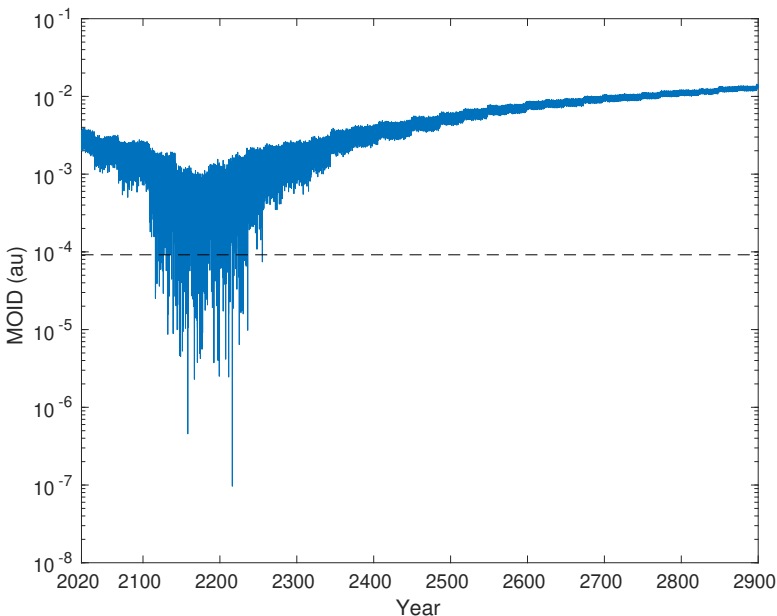
Upcoming events

- 55th Annual Meeting of the AAS Division for Planetary Sciences (joint meeting with the Europlanet Science Congress (EPSC) 2023), 1-6 October 2023, San Antonio, USA
<https://dps.aas.org/meetings/future>
- Astronomical Data Analysis Software & Systems XXXIII (ADASS 2023), 5-9 November 2023, Tucson, USA
<https://adass2023.lpl.arizona.edu>

Future possible impacts of (101955) Bennu

The table shows the 10 future close approaches of (101955) Bennu with the highest impact probability up to the year 2300, ordered by the value of the Palermo Scale, as computed by [Farnocchia et al. 2021](#). It clearly shows that all possible impacts happen in the next century, when Bennu's MOID will be at its secular minimum (see figure below for more information).

Date of possible impact	Impact probability	Palermo Scale
2182-09-24	1 / 2 700	-1.59
2187-09-25	1 / 14 100	-2.32
2192-09-24	1 / 25 650	-2.60
2193-09-24	1 / 62 500	-2.98
2187-09-24	1 / 71 450	-3.03
2194-09-24	1 / 83 500	-3.11
2193-09-24	1 / 263 200	-3.61
2192-09-24	1 / 312 500	-3.68
2197-09-24	1 / 370 400	-3.77
2190-09-24	1 / 400 000	-3.78



Time evolution of the MOID of (101955) Bennu from 1 January 2020 to 1 January 2900. The horizontal dashed line corresponds to 2.15 Earth radii, which is the effective Earth impact radius due to gravitational focusing.

The MOID of Bennu will become smaller than the effective Earth radius in about 100 years, and it will stay below this threshold for approximately 200 years.

All possible impact circumstances (see table above) happen near the timespan when the MOID is at its lowest.

[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>

neo.ssa.esa.int

To subscribe to this newsletter fill the form at <https://neo.ssa.esa.int/subscribe-to-services>

To unsubscribe or for any further information please send an email to neocc@esa.int

