

## ESA's NEO Coordination Centre

### Current NEO statistics

The risk list now contains more than 1100 objects, about 4.5% of the known NEOs.

- Known NEOs: 24 890 asteroids and 113 comets
- NEOs in risk list\*: 1108
- Number of NEOs designated during last month: 258
- NEOs discovered since 1 January 2021: 244

### Focus on

The rotational period of an asteroid is usually determined through an observational technique called light curve determination, a monitoring of the changes in the brightness of an asteroid with time. It is typically performed via differential photometry, comparing the brightness of the asteroid with that of one or more non-variable stars nearby.

Depending on the shape of the asteroid and the orientation of its axis of rotation, the minima and the maxima of the light curve may be uneven, or even non-existent in case of a round asteroid. However, in most cases there is a dominant period in the light curve, associated to the actual period of the axial rotation of the object, which can be determined using Fourier analysis. If the asteroid shape is nearly ellipsoidal, the light curve will display two maxima and two minima during a full axial rotation. This process has been recently used by the NEOCC to determine the rotational period of Apophis, within the IAWN-led observational campaign that has been organised internationally to target this asteroid during the current apparition. This campaign assumes that Apophis was only discovered at the end of 2020, in order to test the preparedness of the community to react to a possible impact threat on a shorter timespan. Our observations indicate that the asteroid light curve has a dominant period of either 9 or 15 hours, corresponding to possible rotational periods of 18 and 30 hours respectively. The best known value for this parameter is currently 30.56 h.

### Upcoming interesting close approaches

No asteroid known today is expected to come within one lunar distance in February.

- 2020 XU6 is a 200-metre object which will reach magnitude 15 during an approach at 10 lunar distances in February.

### Recent interesting close approaches

A really small object was discovered in January.

- 2021 BO is a tiny object that flew by the Earth on 18 January, reaching a minimum distance of about 24 000 km from the centre. With an estimated diameter of less than one meter, it is possibly the second-smallest asteroid ever discovered in space.

### News from the risk list

A new object discovered in January reached a cumulative Palermo scale value of  $-4$ .

- 2021 AM6 is a recently discovered 20-metre object that currently has a 0.1% probability of impacting the Earth in the next century, starting from year 2064.

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

## In other news

- Thanks to new observations collected since December 2020, the non-gravitational phenomenon known as "Yarkovsky effect" has now become clearly detectable on (99942) Apophis. This effect has been considered in the impact monitoring software to update the impact threat for this asteroid.

## Upcoming events

Relevant international meetings over the next months.

- 7th IAA Planetary Defense Conference, 26–30 April 2021, virtual  
<https://iaaspace.org/event/7th-iaa-planetary-defense-conference-2021/>

## Top-10 table of risky objects

The table shows the first ten objects in our risk list. It includes Apophis, computed with all the available measurements up to 17 January 2021 and the "Yarkovsky effect" (see the [news](#) on the NEOCC web portal).

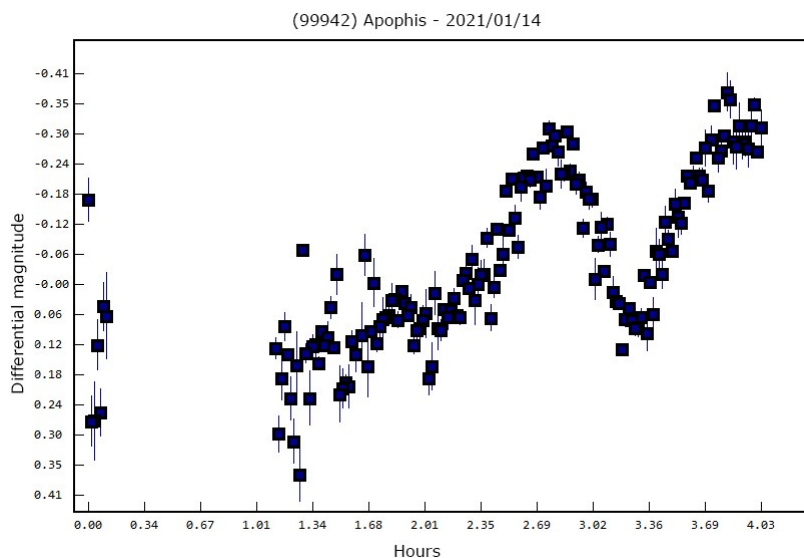
Object name	Size range in m	Date of possible impact	Impact probability	Palermo Scale	Torino Scale	Impact velocity in km/s
2010 RF12	6–13	2095-09-05 23:49	1 / 14	-3.07	0	12.29
1979 XB	500–1200	2056-12-12 21:39	1 / 3 500 000	-3.22	0	27.54
2000 SG344	29–70	2071-09-16 00:57	1 / 1 100	-3.37	0	11.27
2020 OB	50–110	2116-07-23 09:34	1 / 17 000	-3.51	0	28.08
2008 JL3	23–50	2027-05-01 09:06	1 / 7 000	-3.66	0	14.01
2009 JF1	10–22	2022-05-06 08:13	1 / 4 000	-3.70	0	26.41
2018 JD	12–27	2067-05-08 13:22	1 / 800	-3.82	0	13.76
(99942) Apophis	375	2068-04-12 15:13	1 / 900 000	-3.86	0	12.62
2011 DU9	12–27	2046-02-23 20:45	1 / 1 400	-3.90	0	14.21
2012 QD8	60–140	2047-03-08 23:18	1 / 170 000	-3.90	0	23.58

## Links for more information

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

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

Risk List: <http://neo.ssa.esa.int/risk-page>



Light curve of asteroid (99942) Apophis obtained on 14 January 2021 with the Calar Alto Schmidt telescope (Z84). The relative brightness of the asteroid is plotted on the Y axis, while the X axis corresponds to the time of the brightness measurements.

The light curve of Apophis is expected to have a ~30 hour period, and therefore a single night is not sufficient to clearly constrain the period.

As of end of January, there are about a million known asteroids, while a light curve has been determined only for less than 35 thousand of them.

[Credit: ESA/NEOCC]

[neo.ssa.esa.int](http://neo.ssa.esa.int)

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

To unsubscribe or for any further information please send an email to [neocc@ssa.esa.int](mailto:neocc@ssa.esa.int)

