

## → NEWSLETTER APRIL 2022

### ESA's NEO Coordination Centre

#### Current NEO statistics

The average discovery rates in the first months of 2022 have been similar to those of the previous year.

- Known NEOs: 28 616 asteroids and 117 comets
- NEOs in risk list\*: 1353
- NEOs designated during last month: 284
- NEOs discovered since 1 January 2022: 818

#### Focus on

Many of our readers will probably already know about the recent impact of asteroid 2022 EB5 in the Northern Atlantic Ocean on 11 March. About a dozen observatories, mostly in Europe, successfully detected the object within a time frame of about an hour between the publication of the discovery observations and the impact itself. Detecting this object proved to be very challenging: the object moved extremely fast in the sky, and the object's ephemeris changed almost every minute, every time new observations were published. Unfortunately, detecting the object was not the end of the story. A fast-moving asteroid like this one typically leaves a trail on the frames, and extracting accurate astrometry from faint and long trails is a challenge of its own. This was combined with the need to obtain a very accurate timestamp for each observation: when an object crosses your field at a speed of a few arcminutes per second, it is essential to know the time of your observation to a sub-second accuracy for your observations to provide their full value. Finally, the data produced by the observers needed to be properly analysed by the orbit computers, taking into account all the possible sources of uncertainty in the astrometric and time measurements. The results were nevertheless impressive: with data obtained over less than 2 hours, the exact time and point of impact of this object with the Earth's upper atmosphere could be determined to better than a second and a kilometre, respectively. This is proof of how well astronomy and celestial mechanics can predict the dynamics of an object, when the input data is of good quality.

#### Upcoming interesting close approaches

The closest known approaches of April are happening at the beginning of the month.

- 2022 GQ and 2022 GC are coming to about 50 000 km in early April.

#### Recent interesting close approaches

In addition to 2022 EB5, another small object came very close in March.

- 2022 FD1, discovered by the same observatory as the impactor just a couple of weeks later, came to a couple of Earth radii from the Earth on 25 March.

#### News from the risk list

In addition to the impactor, another object reached a pretty high impact probability, but has now dropped significantly.

- 2022 FD reached an impact probability of about 1 in 1600 just after discovery, for a possible impact in 2036. Subsequent observations were sufficient to exclude that impact, and only future low probability ones now remain possible.

\*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

- A long term impact threat analysis update has been completed for asteroid (29075) 1950 DA. The resulting estimated impact probability in 2880 is approximately 1 in 50 000, and the Palermo Scale value is now about -2. For more information check this [news](#).

## Upcoming events

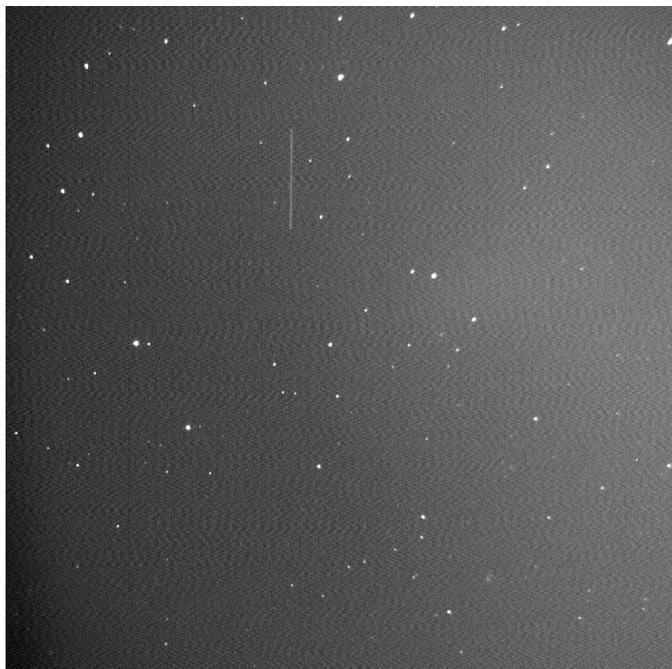
Three events are on the list of relevant international meetings in the coming months.

- Apophis T-7 Years: Knowledge Opportunities for the Science of Planetary Defense, 11-13 May 2022, virtual <https://www.hou.usra.edu/meetings/apophis2022>
- Europlanet Science Congress (EPSC) 2022, 18-23 September 2022, Granada, Spain <https://www.epsc2022.eu>
- 54<sup>th</sup> Annual Meeting of the AAS Division for Planetary Sciences, 2-7 October 2022, London, Canada <https://dps.aas.org/meetings/future>

## List of past impactors

Below is the list of the only five asteroids that have been detected before their impact with the Earth. In the case of 2022 EB5 the estimated impact energy assuming the standard albedo of 0.14 renders a value one order of magnitude smaller than the one measured, suggesting a larger object.

| Object name | Impact time in UT  | Time between discovery and impact in hours | Impact latitude in deg | Impact longitude in deg | Size range in m | H magnitude | Expected energy in kt of TNT equivalent | Discovery site         |
|-------------|--------------------|--|------------------------|-------------------------|-----------------|-------------|---|------------------------|
| 2008 TC3    | 2008-10-07 02:45   | 20   | 21 N                   | 31 E                    | 4               | 30.3        | 0.7                                     | Mt. Lemmon Survey      |
| 2014 AA     | ~ 2014-01-02 02:30 | ~ 22                                       | ~ 13 N                 | ~ 30 W                  | 2–4             | 30.9        | 0.2                                     | Mt. Lemmon Survey      |
| 2018 LA     | 2018-06-02 16:44   | 8  | 21 S                   | 24 E                    | 2–5             | 30.5        | 0.9                                     | Mt. Lemmon Survey      |
| 2019 MO     | ~ 2019-06-22 21:30 | ~ 13                                       | ~ 15 N                 | ~ 70 W                  | 4–8             | 29.3        | 3.8                                     | ATLAS-MLO, Mauna Loa   |
| 2022 EB5    | 2022-03-11 21:22   | 2  | 70 N                   | 8 W                     | 1–3             | 31.4        | 0.3                                     | GINOP-KHK, Piszkesteto |



The last known image of 2022 EB5, obtained less than 6 minutes before impact by the San Marcello Pistoiese observatory in Italy.

The asteroid is the nearly vertical trail in the top half of the image. The picture covers 35 arcminutes in each direction of the camera.

The exposure time of this image was just 1 second: at the time of this observation, the asteroid was moving at an angular speed of more than 5 arcminutes per second in the sky, and was located 5843 km away from the observatory.

[Credit: P. Bacci, M. Maestriperieri, A. Carbognani]

## 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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