

## space situational awareness

### → NEAR-EARTH OBJECTS

#### Current NEO statistics

The first four months of 2016 saw an increase of 25% in the discovery rate, compared with the same period of 2015.

- Known NEOs: 14 243 asteroids and 106 comets
- NEOs in risk list\*: 543
- New NEO discoveries since last month: 141
- NEOs discovered since 1 January 2016: 721

#### Focus on

On 9 May the planet Mercury will transit the Sun as seen from Earth. Although not an asteroid event, this gives us a chance to talk about how transits have been used in the past to probe the population of small asteroids extremely close to the Sun (the so-called Vulcanoids). In the 19th century various astronomers claimed to have observed inner planets or asteroids transiting the Sun, and attributed to them the anomaly on the perihelion precession rate of Mercury found by Le Verrier. All of these observations were subsequently disproved and attributed to sunspots or other phenomena.

No known asteroid has ever been seen transiting the Sun, because even in the rare occurrences when they have been predicted, the angular diameter of the asteroid as seen from Earth was too small. For example (30825) 1990 TG<sub>1</sub> transited the Sun on 14 April 2005 with an apparent diameter of 0.05", too small to effectively detect.

#### Upcoming interesting close approaches

A few moderately large asteroids are expected to come close in May.

- 2016 GS<sub>2</sub> is a ~100-metre object discovered by Pan-STARRS on 1 April, which would come to a bit more than 3 lunar distances on 18 May.
- Three known objects in the 200–400 metres range, 2009 DL<sub>46</sub>, (388945) 2008 TZ<sub>3</sub> and (444584) 2006 UK, will come close, at 6, 13 and 18 lunar distances respectively.

#### Recent interesting close approaches

Only one tiny object came extremely close to Earth in April.

- 2016 GN<sub>134</sub> is a tiny 5-metre object that came to about 50 000 km from the Earth surface on 4 April. It only reached magnitude 15 due to its extremely small size.
- 2016 FY<sub>3</sub> is a ~200 m NEO that came at ~6 lunar distances on 25 April, at V~14.

#### News from the risk list

The 9th-rated possible impactor of our risk list has been successfully removed.

- 1994 WR<sub>12</sub> has been successfully recovered by our team in collaboration with Richard Wainscoat at the University of Hawaii. We used the 3.6-meter Canada-France-Hawaii Telescope on Mauna Kea, Hawaii, to cover its large uncertainty on 12 March 2016, and then confirmed a candidate detection with the same telescope on 1 April. Our observations were sufficient to remove all impact possibilities for this object, which was originally ranked 9th on our risk list.

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

## In other news

- The NEOWISE mission has released the survey data from their second year of operation after the restart. A total of 439 NEOs have been physically characterized so far, and some of them are NEOWISE's own discoveries.

## Upcoming events

The dates and venue of the 2017 edition of the Asteroids, Comets and Meteors conference have been officially announced.

- AIDA International Workshop, 1–3 June 2016, Nice, France  
<https://www-n.oca.eu/michel/AIDAWorkshop2016/>
- International Meteor Conference (IMC 2016), 2–5 June 2016, Egmond aan Zee, The Netherlands, followed by the Meteoroids 2016 conference, 6–10 June 2016, ESTEC, Noordwijk, The Netherlands  
<http://imc2016.imo.net>, <http://www.cosmos.esa.int/web/meteoroids2016>
- AAS Division for Planetary Sciences Meeting (joint with EPSC), 16–21 October 2016, Pasadena, USA  
<http://dps.aas.org/meetings/current>
- IAUS 330: Astrometry and Astrophysics in the Gaia sky, 5–9 December 2016, Nice, France  
<http://www.iau.org/science/meetings/future/symposia/1163/>
- Asteroids, Comets and Meteors (ACM 2017) Conference, 10–14 April 2017, Montevideo, Uruguay  
<http://acm2017.uy/>
- IAA Planetary Defense Conference, 15–19 May 2017, Tokyo, Japan  
<http://pdc.iaaweb.org/>

## Top-10 table of risky objects

The top part of the new risk list without 1994 WR12.

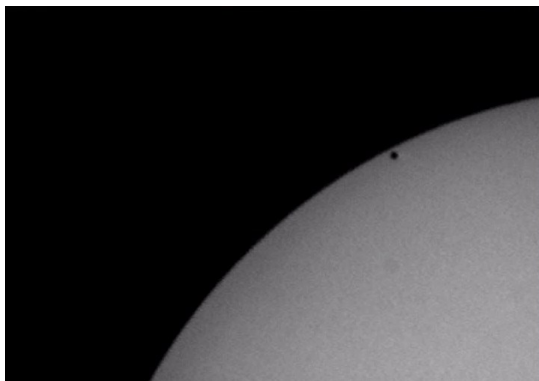
Object name	Size in m	Date/Time of possible impact (UTC)	Impact probability	Palermo Scale	Torino Scale	Velocity in km/s	In list since (days)
(29075) 1950 DA	1300	2880-03-16 23:48	1/7000	-1.36	n/a	17.99	115
(410777) 2009 FD	90	2185-03-29 18:06	1/700	-1.83	n/a	19.41	1973
(101955) Benu	484	2196-09-24 07:55	1/10600	-2.32	n/a	12.68	2523
2010 RF12	~ 9	2095-09-05 23:50	1/16	-3.26	0	12.45	2037
1979 XB	~ 860	2113-12-14 18:01	1/2000000	-3.31	0	26.04	13260
2000 SG344	~ 50	2072-09-13 16:41	1/1900	-3.61	0	11.26	5662
(99942) Apophis	375	2068-04-12 15:13	1/532000	-3.67	0	12.62	4014
2009 JF1	~ 15	2022-05-06 08:12	1/4500	-3.75	0	26.41	2523
2006 QV89	~ 40	2019-09-09 07:03	1/12000	-3.81	0	12.32	3501
2008 UB7	~ 70	2060-10-31 18:24	1/36000	-3.83	0	21.57	2713

## Links for more information

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

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

Risk List: <http://neo.ssa.esa.int/web/guest/risk-page> or <http://bit.ly/neorisklist>



The transit of Mercury as seen on 7 May 2003.

During a Mercury transit in May like the upcoming one the planet is only 12" wide, and it is already not too easy to spot.

The diameter of asteroid (30825) 1990 TG1 when it transited the Sun on 14 April 2015 would have been at least 200 times smaller, making it effectively undetectable with any ground-based telescope.

Image credit: D. Koschny

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

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