

## space situational awareness

### → NEAR-EARTH OBJECTS

#### Current NEO statistics

Thanks to a NEODyS major upgrade, 36 objects have been removed from the risk list.

- Known NEOs: 13 501 asteroids and 104 comets
- NEOs in risk list\*: 505
- New NEO discoveries since last month: 172
- NEOs discovered since 1 January 2015: 1544

#### Focus on

In the month of December, (29075) 1950 DA, an old NEA, entered the risk list in a peculiar way: the addition is not based on new observations but it is the combined result of an already existing good observational coverage for this object, together with a newly implemented dynamical model now available at NEODyS. Thanks to this, it is possible to reliably compute the impact probability for this specific object until the year 3000. As a result, it entered the list at the second position with a non-negligible probability of impacting the Earth in March 2880 and a Palermo Scale of about -1.36. The reason for this high ranking is the very large diameter of about 1300 meters which pushes up its Palermo Scale value.

#### Upcoming interesting close approaches

A large asteroid is known to have a bright close approach to Earth in January.

- (85990) 1999 JV6 is a large 450-meter object that has a fly-by on 6 January, reaching a peak brightness of about magnitude 15.
- Among the new discoveries, the closest approach known as of today is that of 2015 YC2, at 5 lunar distances and reaching a maximum brightness of about 17 magnitude.

#### Recent interesting close approaches

A large object became especially bright during a close approach in early December.

- (33342) 1998 WT24 is a large 400-meter object that had a fly-by on 11 December at 11 lunar distances, reaching a peak brightness of about magnitude 11.
- 2015 YJ and 2015 XY261 came within a lunar distance in December, and were both smaller than 15 meters. In particular, the first object passed at 0.2 lunar distances and reached a maximum brightness of about magnitude 14.

#### News from the risk list

In the month of December two new objects entered in the top ten of the risk list: (29075) 1950 DA and 2015 XJ351; the latter has been already removed again thanks to recent observations.

- 2015 XJ351, a 140 meter object discovered in the last month, had entered the risk list in late December with an impact possibility in June 2039. It has now been removed from the list after additional follow-up observations have been promptly carried out.

\* 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 NEODyS data are now computed with the upgraded software OrbFit 5.0 that includes:
  - performing the orbit determination by including non-gravitational perturbation parameters with their covariance matrix;
  - a new observational error model including debiasing and taking into account effects of proper motions on star catalogues, plus a novel weighing scheme based on the number of observations per tracklet, recently appeared in the scientific literature;
  - the JPL planetary ephemerides DE431, thus enabling to extend the impact monitoring up to year 3000;
  - a higher number of asteroidal perturbers.

## Upcoming events

The international IEEE Aerospace Conference is upcoming, in Montana, USA.

- Planetary Defense session at the 2016 IEEE Aerospace Conference, 5–12 March 2016, Big Sky, USA  
<http://www.aeroconf.org/>
- IAA Planetary Defense Conference, 15–19 May 2017, Tokyo, Japan  
<http://pdc.iaaweb.org/>
- Meteoroids 2016 conference, 6–10 June 2016, ESTEC, The Netherlands  
<http://www.cosmos.esa.int/web/meteoroids2016>

## Top-10 table of risky objects

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)
(410777) 2009 FD	472	2185-03-29 18:06	1/370	-0.43	n/a	19.41	1823
(29075) 1950 DA	1300	2880-03-16 23:48	1/7000	-1.36	n/a	17.99	20
(101955) Benu	484	2196-09-24 07:55	1/10600	-2.32	n/a	12.68	2428
2010 RF12	~ 9	2095-09-05 23:50	1/16	-3.26	0	12.45	1942
1979 XB	~ 860	2113-12-14 18:01	1/2000000	-3.31	0	26.04	13165
2000 SG344	~ 46	2072-09-13 16:41	1/1900	-3.61	0	11.26	5567
(99942) Apophis	375	2068-04-12 15:13	1/532000	-3.67	0	12.62	3919
2009 JF1	~ 16	2022-05-06 08:12	1/4500	-3.75	0	26.41	2428
1994 WR12	~ 140	2072-11-24 02:59	1/65000	-3.78	0	14.91	7668
2006 QV89	~ 37	2019-09-09 07:03	1/12000	-3.81	0	12.32	3406

## 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>



Arecibo radar image of 1950 DA on 4 March 2001, from a distance of 0.052 au (22 lunar distances).

Image credit: NASA/JPL.

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

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