

## space situational awareness

### → NEAR-EARTH OBJECTS

#### Current NEO statistics

During the month of November we crossed the threshold of 19 000 known NEAs.

- Known NEOs: 19 122 asteroids and 107 comets
- NEOs in risk list\*: 794
- Number of NEOs designated during last month: 202
- NEOs discovered since 1 January 2018: 1670

#### Focus on

The month of December this year marks the fifth anniversary of the launch of ESA's Gaia spacecraft. The mission, now operating continuously near the Earth-Sun L2 Lagrangian point, has already revolutionised many fields of astronomy, thanks to the broad and exquisite quality of the data it is producing. Solar System science has also benefited tremendously. The first thousands of detections of minor bodies have been published earlier this year, providing direct evidence of the astrometric precision that can be reached. Indirectly, the Gaia astrometric catalog, in its current Data Release 2 version, has been a game changer in asteroid astrometry, allowing us to measure the position of asteroids with greatly improved precision. Even more indirectly, Gaia has now mapped the solar vicinity with such an accuracy that it is becoming possible to investigate the influence of nearby stars on our planetary system, including their role as source of interstellar objects like the recently found 1I/Oumuamua.

#### Upcoming interesting close approaches

- 2018 WV1 was just discovered (on 29 November), and is a small object with a diameter 2-6 m. It will pass just below 26 700 km over the surface of Earth on December 2, peaking at magnitude 17.
- (163899) 2003 SD220 is a large and well-known kilometre-sized object that will have a distant close approach on 22 December, reaching magnitude 13.

#### Recent interesting close approaches

A dozen of very close approachers were discovered last month.

- 2018 WG came to less than 25 000 km from the Earth surface on 16 November, making it the 5th closest known approach of the year. It was also possibly the largest, with a diameter between 3 and 8 m.
- Eleven additional objects came closer than the Moon during the month, with 2018 WE1, the largest one measuring between 16 and 35 m, reaching magnitude 12.

#### News from the risk list

The highest-rated impactor for the next century has been removed.

- The highest-rated impactor for the next century, 2017 RH16, was successfully recovered by our team in collaboration with people at the University of Hawaii. The recovery was made possible by precovery images from 2017 we found in archival data. The combined data led to the complete removal of all impact solutions for the next century.

\* 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

- Andrea Milani, professor of mathematics at the University of Pisa, unexpectedly passed away on Wednesday the 28th. He will be remembered for many outstanding initiatives within the asteroid dynamics and planetary defence fields. NEOCC owes its deepest and most sincere recognition to the memory of professor Milani. Without his work and vision NEOCC would have not been possible. Ciao Andrea.
- NASA's OSIRIS-REx spacecraft will begin its operations around asteroid (101955) Bennu during this month.
- In the meantime, JAXA's Hayabusa2 activities are slowing down while (162173) Ryugu will be in solar conjunction as seen from Earth, making communications more difficult. Normal operations should resume early next year.

## Upcoming events

Relevant international meetings over the next months.

- NEO and Debris Detection Conference, 22–24 January 2019, Darmstadt, Germany  
<https://neo-sst-conference.sdo.esoc.esa.int/>
- IAA Planetary Defense Conference, 29 April–3 May 2019, College Park, USA  
<http://pdc.iaaweb.org/>

## List of future closest approaches with Mercury

List of the ten future closest approaches of known NEAs to planet Mercury, ordered by distance to planet's centre.

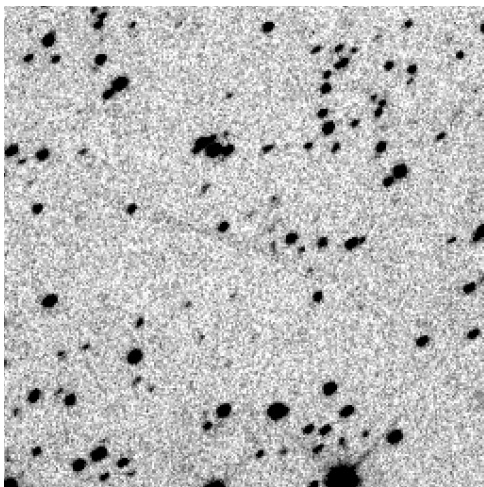
Object name	Close approach date	Miss distance in au	Miss distance in km	Size range in m	H magnitude
2018 VB1	2021-03-17	0.00142	210 000	50 – 110	23.7
2012 XS111	2047-12-23	0.00175	260 000	110 – 240	22.0
2006 KZ86	2038-09-08	0.00252	380 000	700 – 1500	18.0
2012 DK31	2087-07-09	0.00254	380 000	120 – 260	21.8
(303250) 2004 RU10	2079-11-16	0.00272	410 000	600 – 1400	18.1
2001 CP36	2027-12-23	0.00272	410 000	60	23.7
(289227) 2004 XY60	2026-08-24	0.00289	430 000	470	19.0
(509352) 2007 AG	2064-10-18	0.00295	440 000	250 – 600	20.1
(252399) 2001 TX44	2033-03-26	0.00297	440 000	200	19.0
2012 XS111	2036-05-31	0.00348	520 000	110 – 240	22.0

## 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>



The very faint long trail at the center of this image is a predisccovery detection of asteroid 2017 RH16 found in archival images by our observer Marco Micheli. The image was exposed on 2 September 2017 at the Polonia Observatory in San Pedro de Atacama, Chile.

Despite its faintness, the identification of this trail allowed our team to improve the current uncertainty of the position of the asteroid by more than an order of magnitude, making its recovery possible.

The image shown here is a stack of three separate exposures, each 10 minutes long, aligned on the motion of the asteroid.

[Credit: Polonia Observatory, M. Kusiak, R. Reszelewski, M. Zolnowski, M. Gedek / ESA-NEOCC]

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