

ESA's NEO Coordination Centre

Current NEO statistics

A discovery rate around 200 NEOs per month is below average for winter months.

- Known NEOs: 34 400 asteroids and 122 comets
- NEOs in risk list*: 1596
- NEOs designated during last month: 230
- NEOs discovered since 1 January 2024: 401

Focus on

Asteroids in our Solar System can have all sorts of different orbits, but some specific situations can result in interesting dynamical behaviour. Among those are what we call co-orbital configurations. They occur when an asteroid happens to have an orbital period that is very close to that of a major planet, or what is technically called a 1:1 mean motion resonance. Depending on the relative orbital geometry of the asteroid and the planet, these objects are typically grouped into different classes. The best-known ones are probably the Trojan asteroids, located around the two stable Lagrangian points L_4 and L_5 . Earth has two known objects in this population, 2010 TK7 and 2020 XL5. A second type of co-orbital asteroids is sometimes called “quasi-satellites”: they don't truly orbit around the planet, but the geometry of their orbit makes them look like they are moving on a nearly circular orbit around the main body, although at a much larger distance than a real gravitationally bound moon. A third type of co-orbital motion is represented by what are commonly called “horseshoe orbits”, characterised by a complex motion that keeps the asteroid away from the Earth at all times. These regimes are not strictly constrained, and objects near 1:1 resonances can transition between one configuration and another during secular timescales. The motion peculiarities of these objects are well visualised in a reference system that is co-rotating with the resonating planet, which better displays the relative position of the two bodies.

Upcoming interesting close approaches

No object known at the end of February is expected to come close to the Earth in March. The closest known approacher will not even enter Earth's sphere of influence.

Recent interesting close approaches

Five objects were discovered while having close fly-bys with our planet.

- 2024 CF7, 2024 CH4, 2024 CY1, 2024 CM5 and 2024 DY all came closer than half the distance of the Moon during the month of February. They were all small, with a diameter of less than 20 metres, and as often happens for these small bodies they were only found around the time of their close approach.

News from the risk list

A small but dynamically interesting object entered our risk list last month.

- 2024 BY15, a small Chelyabinsk-sized asteroid in an Earth-like orbit, entered the top-10 of our risk list in February. Its low relative velocity with respect to the Earth creates frequent and dynamically complex encounters. As of early March, its impact probability is roughly 1 in 200, mostly due to a possible impact in 2070.

*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 new procedure to automatically recognise significant detections of the Yarkovsky effect has been [published](#) by our team, and is now implemented in our system.
- ESA's Hera mission is now being tested in the Thermal Vacuum Chamber (TVAC). Furthermore, the Guidance Navigation and Control subsystem (GNC) closed-loop tests were successful as well as the launch sequence rehearsal.
- NASA's Planetary Defense Coordination Office is organizing its fifth Planetary Defense USA Interagency Tabletop Exercise in April, to discuss and prepare how various agencies will respond to a hypothetical asteroid impact threat. This time, ESA's Planetary Defence Office has been invited, among other international players, to contribute to the exercise.

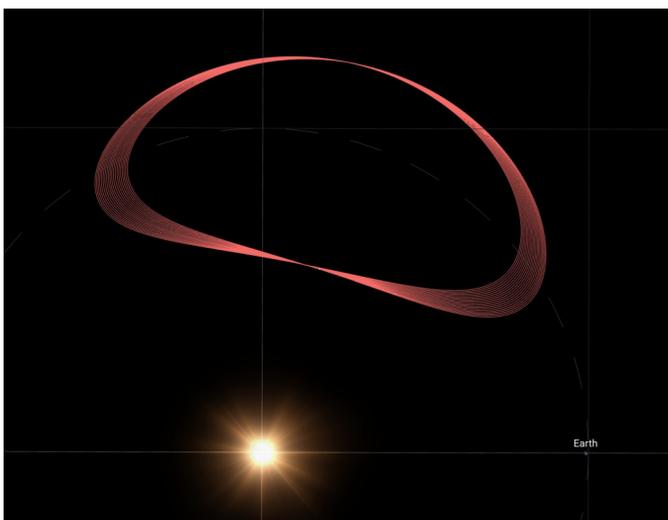
Upcoming events

- 55th Lunar and Planetary Science Conference (LPSC 2024), 11-15 March 2024, The Woodlands, USA
<https://www.hou.usra.edu/meetings/lpsc2024/>
- Apophis T-5 Years, 22-23 April 2024, ESTEC, Noordwijk, The Netherlands
<https://www.hou.usra.edu/meetings/apophis2024/>
- Follow-up Observations of Small Bodies in the Solar System in the Era of Large Discovery Surveys, 6 and 8 August 2024, Cape Town, South Africa
<https://sbss2024.sao.ac.za/>

List of “quasi-satellites”

The table presents the currently known quasi-satellites of our planet, with some properties. The orbital periods are all, as expected, very close to one year. The minimum approach distances are much larger than Earth's Hill sphere, confirming that the objects are not truly gravitationally bound to Earth.

Object name	Absolute magnitude	Size range in m	Orbit period in days	Minimum distance in au	Date of minimum distance
2014 OL339	22.7	58	364.5	0.202	2103-11-20
2023 FW13	25.9	18–40	365.0	0.065	2024-03-01
(469219) Kamo'oailewa	24.2	40–90	365.8	0.107	2029-11-06
(164207) 2004 GU9	21.1	163	365.9	0.151	2034-10-21
(277810) 2006 FV35	21.7	120–270	366.0	0.288	2085-01-25
2013 LX28	21.9	110–250	366.2	0.428	2041-12-10



An example of how a co-orbital object moves in a reference system co-rotating with the Earth.

The orange line in this figure is the path during 20 years of (614689) 2020 XL5, the second known Earth Trojan asteroid, circling around Earth's L_4 Lagrangian point.

[Credit: ESA / PDO]

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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