

Comparing impact probability results of NASA and ESA

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February 3, 2026

What are asteroids?



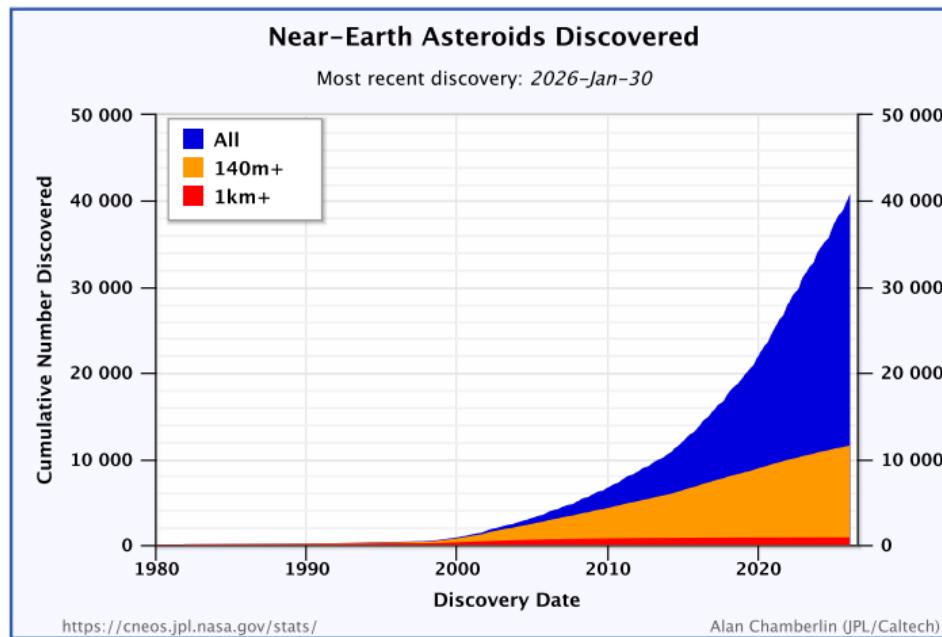
What are asteroids?



IAU: An asteroid is a small body that orbits around the Sun or another star or stellar remnant. Asteroids are solid bodies of various compositions: a number of them are rich in carbon, some contain more rocky material (silicates), and others are mainly composed of metals.

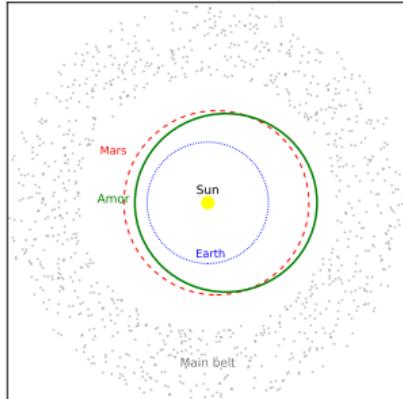
Asteroids

- There are \approx 1.5 million asteroids discovered!
- From which \approx 40,000 near-Earth asteroids (perihelion distance < 1.3 au)
- It is estimated that the number of NEAs with diameter > 140 m is about 25,000 – 30,000. Only 40% are discovered

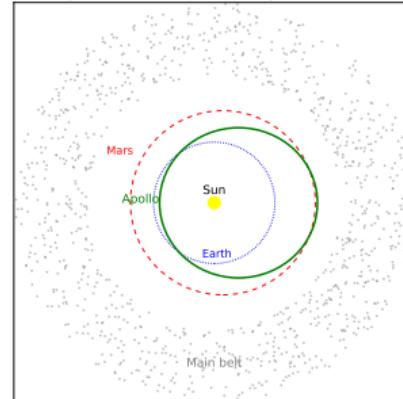


NEA classes

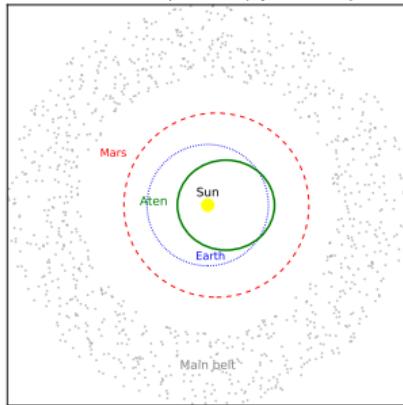
Amor asteroids ($1.0167 \text{ au} < q < 1.3 \text{ au}$)



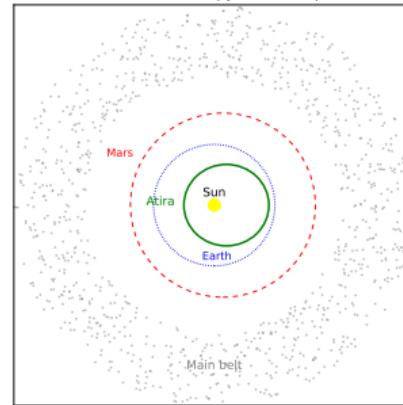
Apollo asteroids ($a > 1.0 \text{ au}, q < 1.0167 \text{ au}$)



Aten asteroids ($a < 1.0 \text{ au}, Q > 0.983 \text{ au}$)



Atira asteroids ($Q < 0.983 \text{ au}$)



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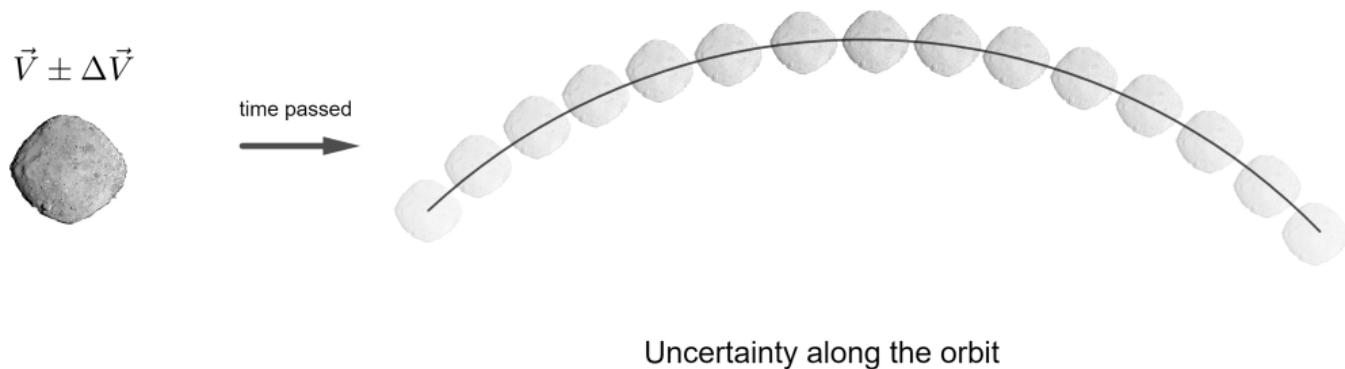
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- Why the probability of asteroid hitting the Earth apart not just 0% and 100%?
We don't know the precise orbit, we estimate an ensemble of possible orbits, some of which can hit the Earth

Asteroid's uncertainty position



Center for Near-Earth Object's (by NASA)

VPN cneos.jpl.nasa.gov/sentry/



Showing 1 to 100 of 2,060 entries

Search: Object Designation

Object Designation	Year Range	Potential Impacts	Impact Probability (cumulative)	V _{infinity} (km/s)	H (mag)	Estimated Diameter (km)	Palermo Scale (cum.)	Palermo Scale (max.)	Torino Scale (max.)
29075 (1950 DA)	2880-2880	1	3.8e-4	14.10	17.9	1.300	-0.93	-0.93	
101955 Bennu (1999 RQ36)	2178-2290	157	5.7e-4	5.99	20.6	0.490	-1.40	-1.58	
(2008 JL3)	2027-2122	44	1.7e-4	8.42	25.3	0.029	-2.68	-2.69	0
(1979 XB)	2056-2113	4	8.5e-7	23.76	18.5	0.660	-2.69	-2.99	0
(2000 SG344)	2069-2122	300	2.7e-3	1.36	24.8	0.037	-2.77	-3.11	0
(2010 RF12)	2095-2122	70	1.0e-1	5.10	28.4	0.007	-2.97	-2.97	0
(2015 JJ)	2111-2111	1	6.8e-5	10.69	22.1	0.130	-3.05	-3.05	0
(2007 FT3)	2030-2119	87	7.7e-7	17.05	20.0	0.341	-3.06	-3.46	0
(2022 PX1)	2040-2040	1	3.2e-6	35.11	22.3	0.120	-3.10	-3.10	0
(2005 QK76)	2030-2059	6	7.1e-5	19.67	25.2	0.031	-3.18	-3.28	0
(2021 GX9)	2032-2052	2	8.2e-5	16.79	25.3	0.029	-3.25	-3.25	0
620100 (2016 WJ1)	2124-2124	1	7.7e-6	14.85	21.4	0.180	-3.57	-3.57	0
(2023 DO)	2057-2092	25	4.5e-4	6.97	25.6	0.026	-3.57	-3.58	0
(2013 TP4)	2026-2026	1	3.5e-5	25.30	27.5	0.011	-3.60	-3.60	0
(2019 VB37)	2049-2067	5	5.7e-5	14.55	24.5	0.043	-3.61	-3.61	0
(2008 UB7)	2044-2101	50	3.4e-5	18.53	23.8	0.058	-3.61	-4.23	0



European Space Agency web-site

NEOCC Observing Facilities

MAIN SERVICES

Risk List

Close Approaches List

Removed from Risk List

Past Impactors

Imminent Impactors

Newsletters Archive

CAFS Archive

News Archive

SEARCH

Asteroids

Comets

Image Archive

Fireballs

TOOLS

NEO Toolkit

NEO Population Generator

OUTREACH

Discovery Statistics

Gallery

Media Entries

Public Outreach

Definitions & Assumptions

EXTERNAL LINKS

Last update: 2026-02-02 13:24 UTC

The Risk List is a catalogue of all objects for which a non-zero impact probability has been computed. Each entry contains details on the particular Earth approach which poses the highest risk of impact (as expressed by the Palermo Scale). It includes its date, size, velocity and probability. Impact history data can be selected in tabular and graphical form. Links to the impactor table are also given. In most cases, the size presented in the table is estimated indirectly from the absolute magnitude, and flagged with an asterisk (*). In this case the size uncertainty could be large. When a better measurement is available in the literature, it replaces the estimated value. By default, entries are sorted by the maximum Palermo Scale value; the sorting can be changed by clicking on the table headers.



Current number of NEAs in risk list:

1905

+ OPEN INTERACTIVE RISK PLOT

Risk List

No.	Object designation ↗	Diameter in m ↗	Impact date in UTC ↗	IP max ↑	PS max ↓	TS ↑	Years ↑	IP cum ↑	PS cum ↑	Vel. in km/s ↑	In list since in d ↑	History data	History plot	IT	LOVV
1	Q 2023VD3	11 - 24*	2034-11-08	1/425	-2.67	0	2034-2039	1/425	-2.67	21.01	817				
2	Q 2008JL3	23 - 50*	2027-05-01	1/6711	-2.73	0	2027-2122	1/6211	-2.73	14.01	6320				
3	Q 1979XB	400 - 900*	2056-12-12	1/4.27E6	-2.82	0	2056-2113	1/1.36E6	-2.70	27.54	6320				
4	Q 2000SG344	27 - 60*	2071-09-16	1/1117	-3.18	0	2069-2122	1/354	-2.77	11.27	6320				
5	Q 2005QK76	27 - 60*	2030-02-26	1/33222	-3.39	0	2030-2108	1/15576	-3.26	22.66	6320				
6	Q 2007KE4	24 - 50*	2029-05-26	1/23419	-3.47	0	2026-2115	1/22883	-3.47	15.03	6320				
7	Q 2021GX9	24 - 50*	2032-04-16	1/19880	-3.49	0	2032	1/19880	-3.49	20.17	1754				
8	Q 2023DO	21 - 50*	2057-03-23	1/2044	-3.50	0	2057-2073	1/2000	-3.49	13.18	1073				

- Different centers have different results. Number of asteroids in the risk lists:

NASA	2060
ESA	1905

- One asteroid can have possible collisions on different dates.
- Even for the same date there could be several different possible collisions (completely separated sets of collisional orbits)
- How can we compare it?

Results for asteroid 2023 DO

Date (yyyy-mm-dd.dd)	Sigma VI	Impact Probability				
			Date in UTC ↑↓	MJD ↑↓	σ ↑↓	IP ↑↓
2057-03-23.82	0.6930	4.4e-4	2057-03-23.822	72445.822	1.056	4.89E-4
2058-03-24.20	2.5547	4.8e-7				
2059-03-24.02	0.7168	8.4e-6	2059-03-24.020	73176.020	1.084	6.96E-6
2062-03-23.87	0.6873	2.1e-7	2062-03-23.868	74271.868	1.046	1.92E-7
2062-03-24.05	2.8029	6.9e-7				
2064-03-23.30	0.7063	7.9e-8				
2064-03-23.43	0.6801	5.9e-7				
2065-03-23.89	1.7853	4.8e-6				
2065-03-23.94	2.2453	7.3e-8				
2066-03-23.88	0.7023	1.9e-7	2062-03-24.047	74272.047	3.670	1.05E-10
2066-03-23.91	0.6745	1.1e-6				
2066-03-24.05	2.3876	1.5e-9	2065-03-23.902	75367.902	2.408	1.36E-6
2066-03-24.15	1.4169	2.0e-8	2066-03-23.909	75732.909	1.033	1.37E-6
2067-03-24.32	2.5534	2.0e-8				
2067-03-24.39	2.1535	1.3e-7	2068-03-23.424	76463.424	1.022	7.99E-7
2068-03-23.43	0.6701	8.6e-7				
2069-03-23.87	2.1330	7.0e-8	2073-03-23.839	78289.839	3.507	3.92E-10
2072-03-23.60	2.4160	6.8e-8				
2073-03-23.84	2.6715	2.9e-7				
2077-03-23.47	0.6674	3.4e-8				



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- For each asteroid compare IP for same dates
- Make nice plots :)

Good luck!