



# Planetary Defense Coordination Office

## What are near-Earth objects and why do we need to study them?

Near-Earth objects (NEOs) are asteroids and comets that have been nudged by the gravitational attraction of nearby planets into orbits that allow them to enter Earth's neighborhood. Like the planets, all asteroids and comets orbit the Sun. They are remnants of the formation of planetary bodies in our solar system.

Our solar system contains far more asteroids than comets, and thus far more near-Earth asteroids than near-Earth comets. Most asteroids orbit the Sun in a region called "the main belt" between Mars and Jupiter. The vast majority of near-Earth asteroids come from the inner part of the main belt, where their orbits were altered; some by mutual collisions but most by the gravitational influence of Jupiter and Mars.

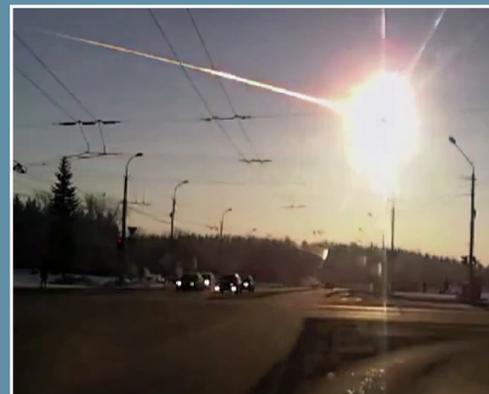
Most natural objects that impact Earth are the size of grains of sand, and they bombard the Earth at the rate of more than 100 tons a day and quickly disintegrate. Although the vast majority of near-Earth asteroids that enter Earth's atmosphere also disintegrate, larger asteroids could explode in the atmosphere or reach Earth's surface intact and cause damage in and around their impact sites. The hazard posed by possible impacts of asteroids with Earth's atmosphere or surface is the reason why we need to study near-Earth objects.

## What is NASA doing to protect Earth from asteroid impacts?

NASA's NEO Observations Program sponsors projects dedicated to finding, tracking, and characterizing near-Earth objects. All projects supported by this program are required to make their data available in a timely manner to the global scientific community. The global public archive for this data is the Minor Planet Center, which is sanctioned by the International Astronomical Union and supported by the NEO Observations Program.

The Center for Near-Earth Object Studies (CNEOS) computes high-precision orbit paths for NEOs from positions reported to the Minor Planet Center. CNEOS computes orbits for new asteroid discoveries and performs long-term analyses of possible future positions of hazardous asteroids relative to Earth to determine and warn of any impact hazard. CNEOS computes impact time and location in the event of a predicted impact. The Jet Propulsion Laboratory hosts CNEOS for the NEO Observations Program and its website makes all orbit computation public:

The current congressionally directed objective of the NEO Observations Program is to find, track, and characterize at least 90 percent of the predicted number of NEOs that are 140 meters and larger in size—larger than a small football stadium—and to characterize a subset representative of the entire population.



Meteor fireball Chelyabinsk



NEA 234061 (1999 HE1), detected by NEOWISE during the prime mission's fully cryogenic phase, NASA



NASA Infrared Telescope Facility

## How can we defend Earth from asteroid impacts?

We can defend Earth from asteroid impacts by planning for planetary defense which entails.

- Finding and tracking near-Earth objects;
- Characterizing NEOs to determine their orbit trajectories, size, shape, mass, composition, rotational dynamics and other parameters, so that experts can determine the severity of a potential impact event, warn of its timing and potential effects, and determine ways to mitigate the impact; and
- Designing and testing measures to deflect a NEO that is on an impact course with Earth, or to mitigate the effects of an impact that cannot be prevented. Mitigation measures can also include providing accurate prediction of the location and effects of the impact to aid in evacuation of the impact area and other preparation.

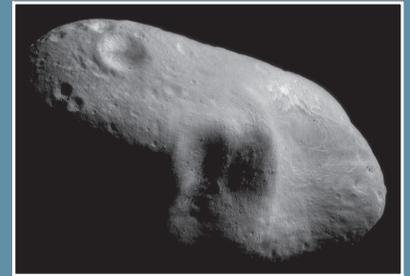
## What is NASA doing to prepare for planetary defense?

NASA has a Planetary Defense Coordination Office (PDCO) located at NASA Headquarters in Washington, D.C. Its responsibilities include:

- Ensuring the early detection of hazardous NEOs whose orbits are predicted to bring them within 5 million miles (8 million kilometers) of Earth; and of a size large enough to reach Earth's surface—that is, greater than around 30 to 50 meters.
- Tracking and characterizing NEOs and issuing warnings about potential impacts;
- Providing timely and accurate communications about NEOs; and
- Performing a lead coordination role in U.S. Government planning for response to an actual impact threat.

The PDCO relies on data from projects sponsored by NASA's Near-Earth Object (NEO) Observations Program.

For more information, visit:  
[www.nasa.gov/pdco](http://www.nasa.gov/pdco)  
[cneos.jpl.nasa.gov](http://cneos.jpl.nasa.gov)  
[www.minorplanetcenter.net](http://www.minorplanetcenter.net)



Near-Earth Asteroid Eros, NASA



Pan-STARRS Observatory,  
University of Hawaii



Near-Earth Asteroid Bennu, NASA



Comet ISON, NASA



[www.nasa.gov](http://www.nasa.gov)  
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