NASA's Near-Earth Object Observations Program

Presentation to UN COPUOS
Scientific & Technical Subcommittee

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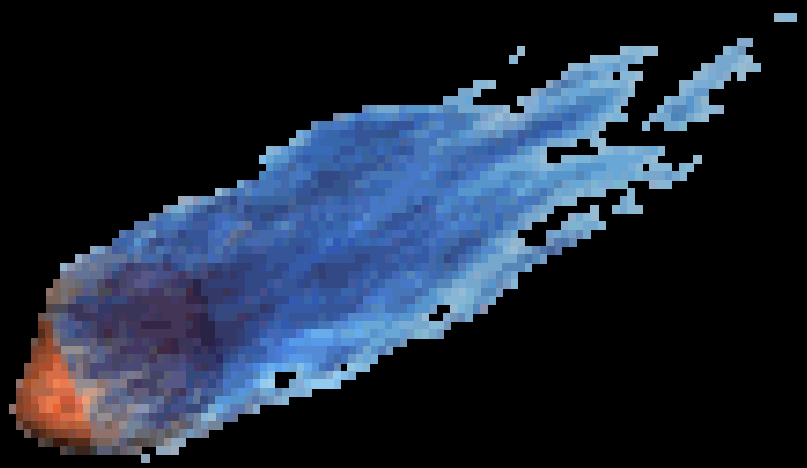
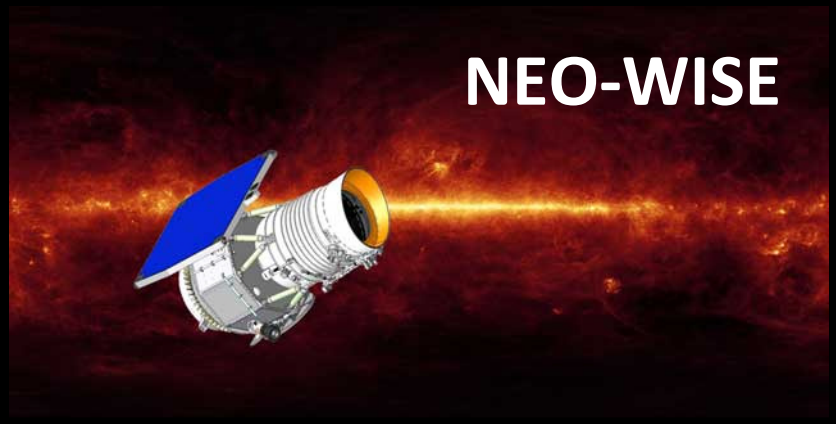
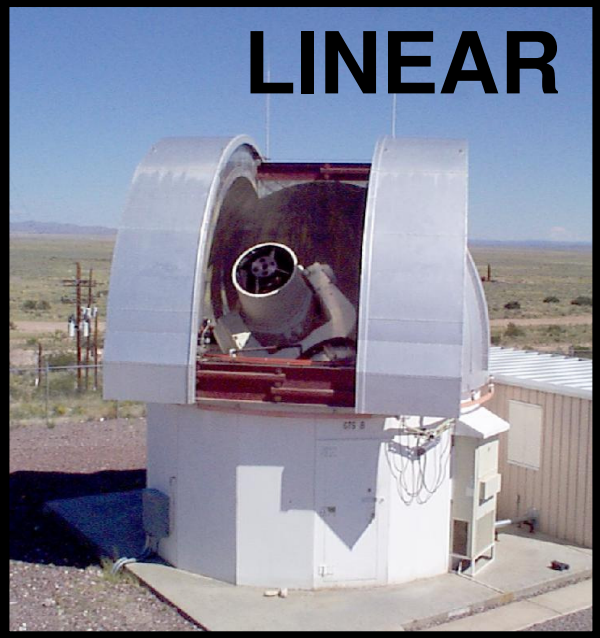
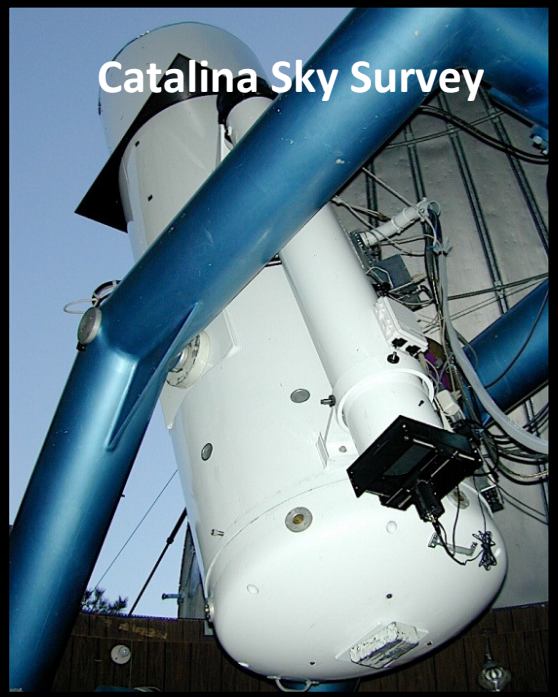


NASA's NEO Observation Program







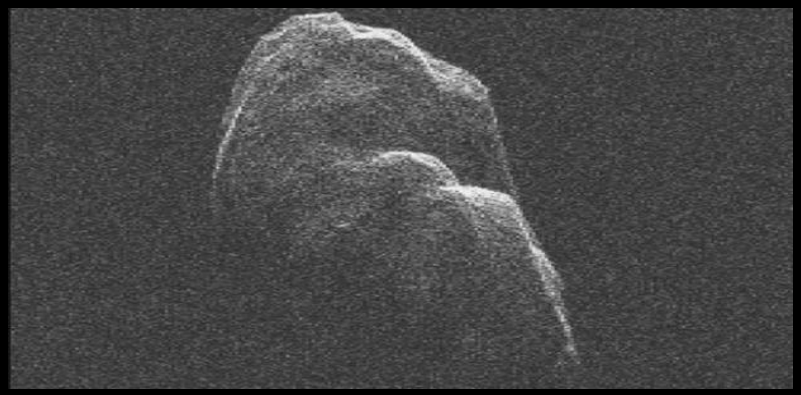
The Minor Planet Center

- World's collection and distribution center for asteroid and comet observations and orbits
- Coordinates follow-up observations for NEO orbit refinements
- Maintains the master file of asteroid and comet orbits
- Pays special attention to objects that might impact the Earth
- Computes the impact probability for each discovery out to a few weeks from discovery
- Received 7.7 million observations from 46 different nations in 2012

Radar Studies

Goldstone, CA

Arecibo, Puerto Rico



Shape of Toutatis – Dec. 2012

Study of Shape, Size, Motion and mass of near-Earth object 66391 (1999 KW4)

NASA's NEO Program Office at JPL

- NEO Program Office: http://neo.jpl.nasa.gov/
- Introduction to near-Earth objects
- Progress on NEO discoveries
- Potential NEO impact threats
- Interactive orbital illustrations
- NEO deflection strategy studies
- Most accessible mission targets

- Information to your smartphone

http://www.jpl.nasa.gov/asteroidwatch/

Widget available giving next 5 Earth close approaches

970,000 followers on Twitter

Small Body Database

* Download orbits for all asteroids and comets
* Magnitude (size) parameters for all
* Physical parameters (e.g., albedo) for a some objects

The definitive source for NEO orbit information

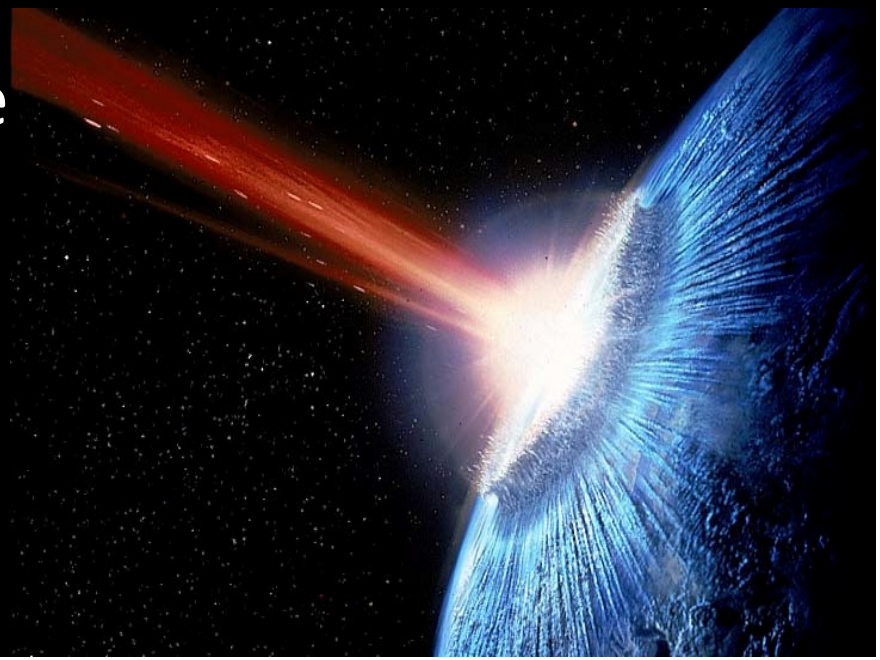
* Supports the near-Earth object impact risk process (SENTRY), small-body spacecraft mission design and researchers
* New/updated orbits are available within an hour of new data arrival

Used worldwide

* Contains over 600,000 asteroids and 3,000 comets currently
* Serves over 1,000 data requests per hour

SENTRY

- Automatically computes and posts Earth impact probabilities and impact energies for potentially hazardous objects through next 100 years
- Efforts are coordinated with independent ESA-supported computational center in Pisa Italy
- The “Torino” and “Palermo” scale values are published to allow assessment of relative hazard



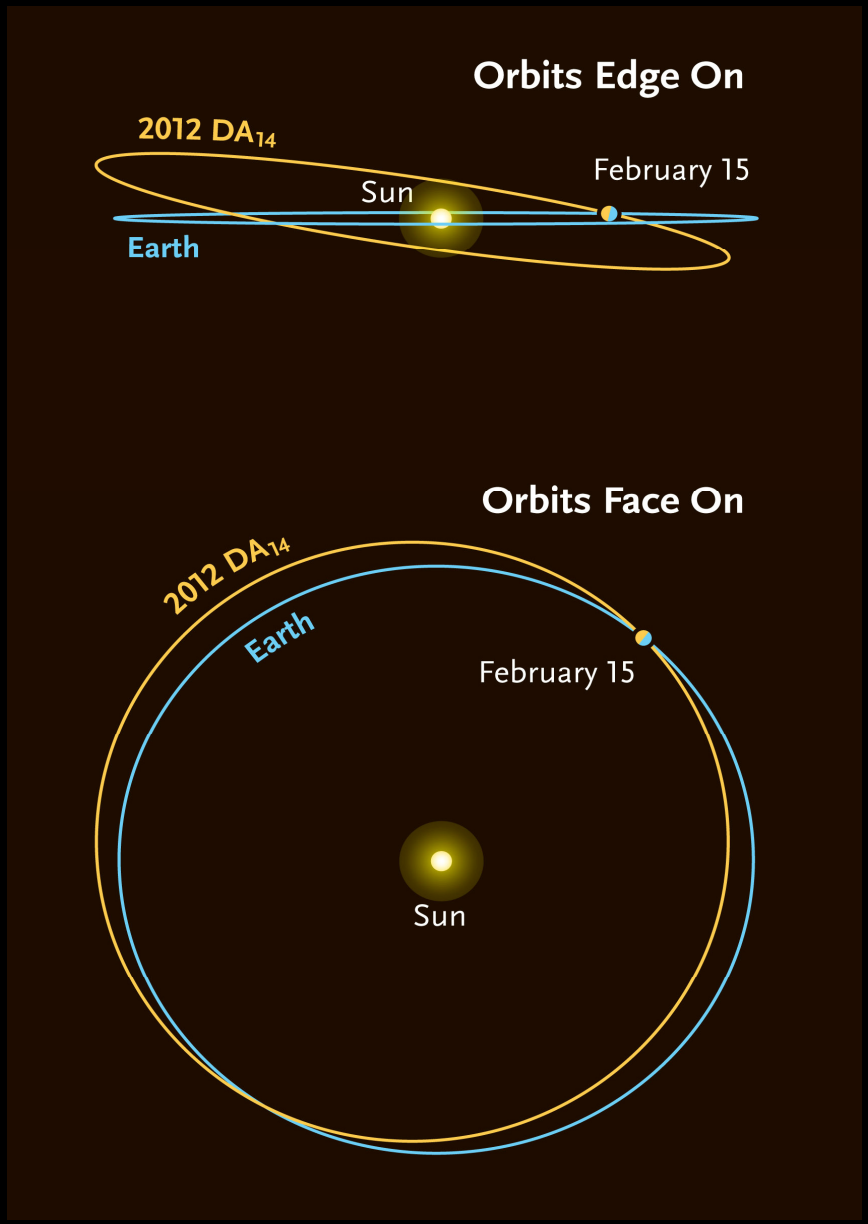
Recent Observations Allowed Retirement of Two "Threats"

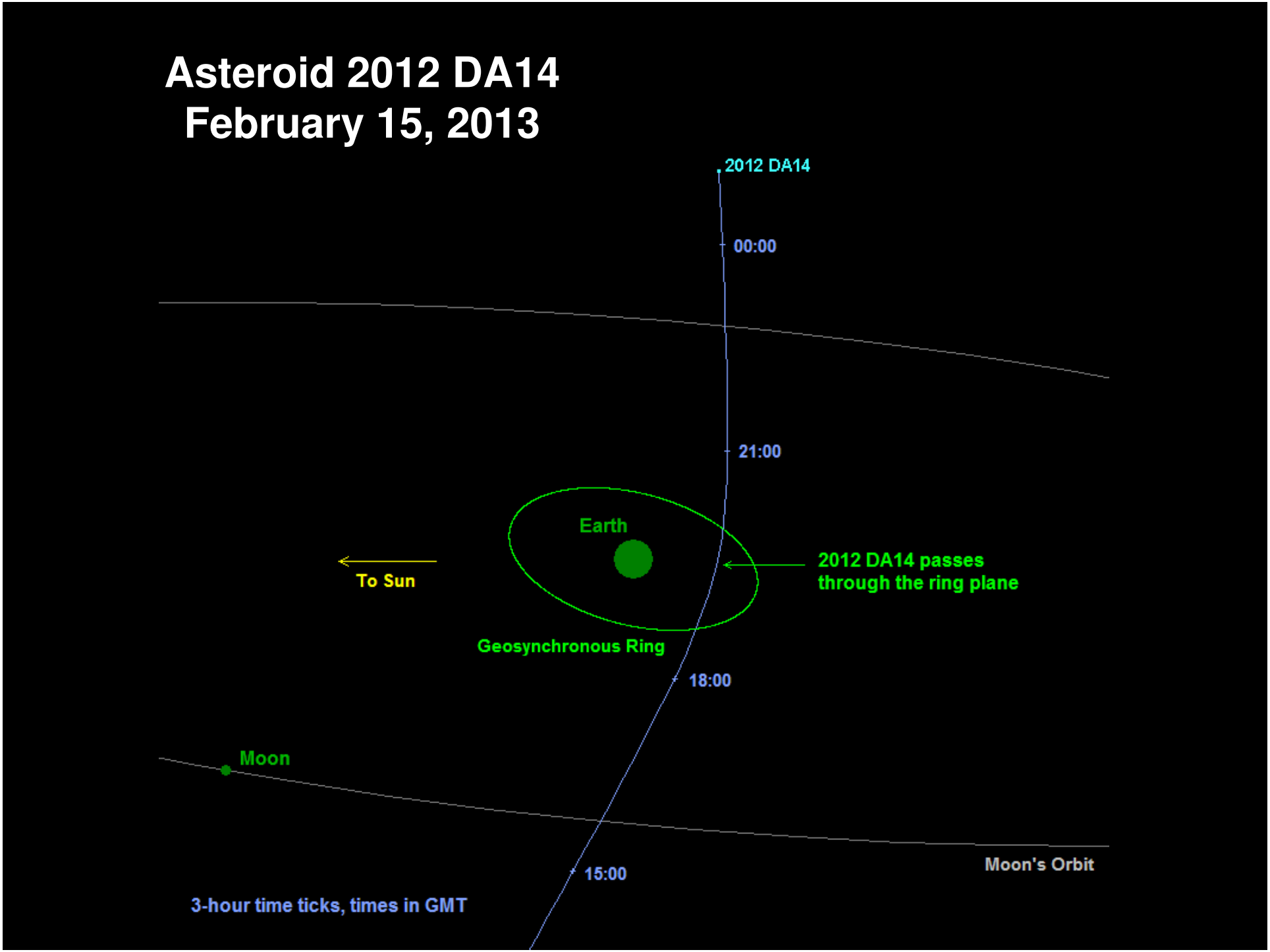
- 2011 AG5 (140 meters in size)
  - Impact probability was 1/500 for Feb. 5, 2040
  - Observations in Oct. 2012 allowed refined orbit and eliminated 2040 impact threat
- 2004 MN4 "Apophis" (325 meters in size)
  - Earth impact was once thought possible for April 13, 2036
  - Optical data in late 2012 and radar data in early 2013 refined orbit and eliminated the 2036 impact threat

Very Close Earth Approach Today at 19:24 GMT

- 2012 DA14 (45 meters in size)
  - ✧Will pass at about 27,000 kilometers from Earth's surface
  - ✧Well inside orbit of geosynchronous satellites
  - ✧Orbit known very well – no chance for Earth impact and almost no chance of satellite impact

Near-Earth Asteroid 2012 DA14 in Feb. 2013




Asteroid 2012 DA14
February 15, 2013
2012 DA14
00:00
21:00
Earth
To Sun
2012 DA14 passes
through the ring plane
Geosynchronous Ring
18:00
Moon
Moon's Orbit
15:00
3-hour time ticks, times in GMT

Summary

- NASA supported surveys, follow-up observations and research are successfully assessing the risk of near-Earth object impacts
- The observing community, the Minor Planet Center, the NEO Program Office and the computational center in Pisa Italy are well coordinated
- Recent successes include detection and elimination of threats – the process works well