

Planetary Defense Coordination Office Update

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Planetary Science Division
NASA Headquarters
Washington, DC

Planetary Science Advisory Committee
March 1, 2023





Planetary Defense Coordination Office



The Planetary Defense Coordination Office (PDCO) was established in January 2016 at NASA HQ to manage planetary defense related activities across NASA, and coordinate with both U.S. interagency and international efforts to study and plan response to the asteroid impact hazard.

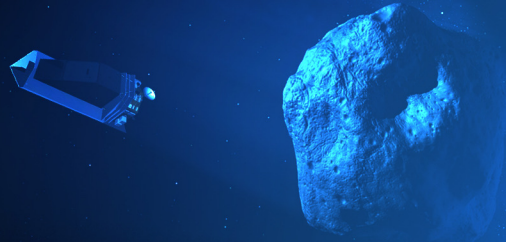
Mission Statement

Lead national and international efforts to:

- Detect any potential for significant impact of planet Earth by natural objects
- Appraise the range of potential effects by any possible impact
- Develop strategies to mitigate impact effects on human welfare

ASSESS

[CENTER FOR NEAR EARTH
OBJECT STUDIES]



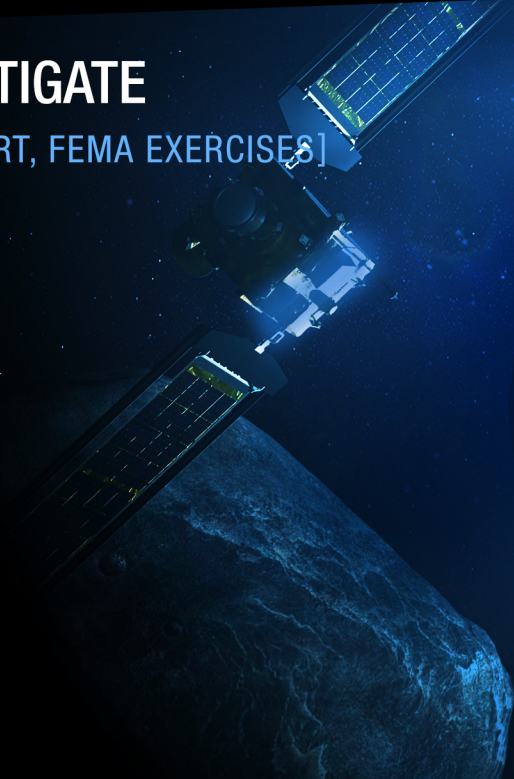
SEARCH, DETECT & TRACK

[SPACE-BASED & GROUND-BASED
OBSERVATIONS, IAWN]



MITIGATE

[DART, FEMA EXERCISES]



PLANETARY DEFENSE

CHARACTERIZE

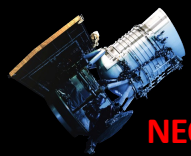
[NEOWISE, GOLDSTONE, IRTF]



PLAN & COORDINATE

[SMPAG, PIERWG, NITEP IWG]





NEOWISE

NASA-funded Near-Earth Object Survey (Discovery) Telescopes



Known Asteroid Close Approaches to Earth During 2022

123 known close approaches within 1 Lunar Distance

- **1** estimated to be as large as **53 meters** in size (Tunguska)
- **21** could be as large as the Chelyabinsk object

10 close approaches within the distance of the geosynchronous satellites, all less than 10 meters in size

2 known impactors!

All close-approach data available at <https://cneos.jpl.nasa.gov/ca>

Known Asteroid Close Approaches to Earth So Far in 2023

11 known close approaches within 1 Lunar Distance

- **2** could be as large as the Chelyabinsk object

2 close approaches within the distance of the geosynchronous satellites, all less than 10 meters in size

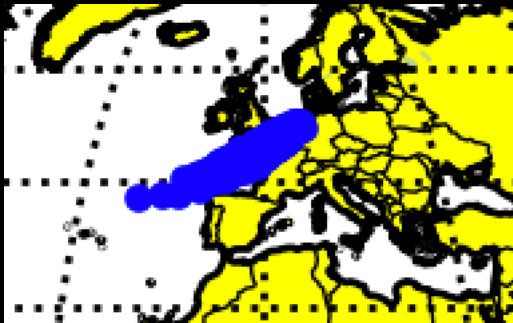
1 known impactor

All close-approach data available at <https://cneos.jpl.nasa.gov/ca>

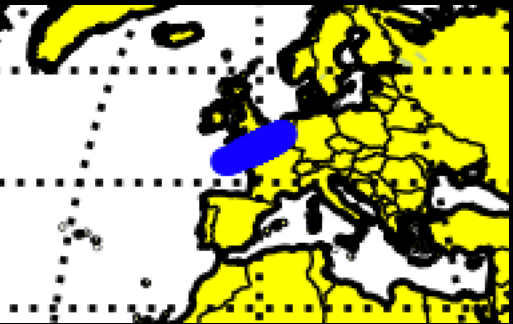
Impact of small asteroid 2023 CX1 on February 12, 2023

Evolution of JPL CNEOS impact solutions

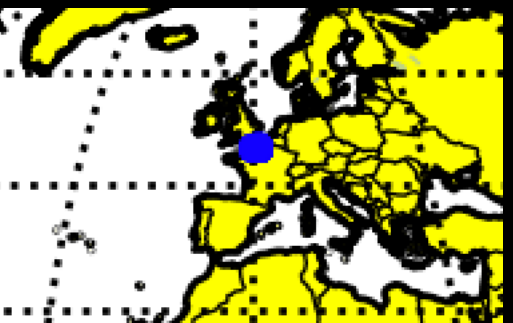
Impact minus 6 hours



Impact minus 5.5 hours

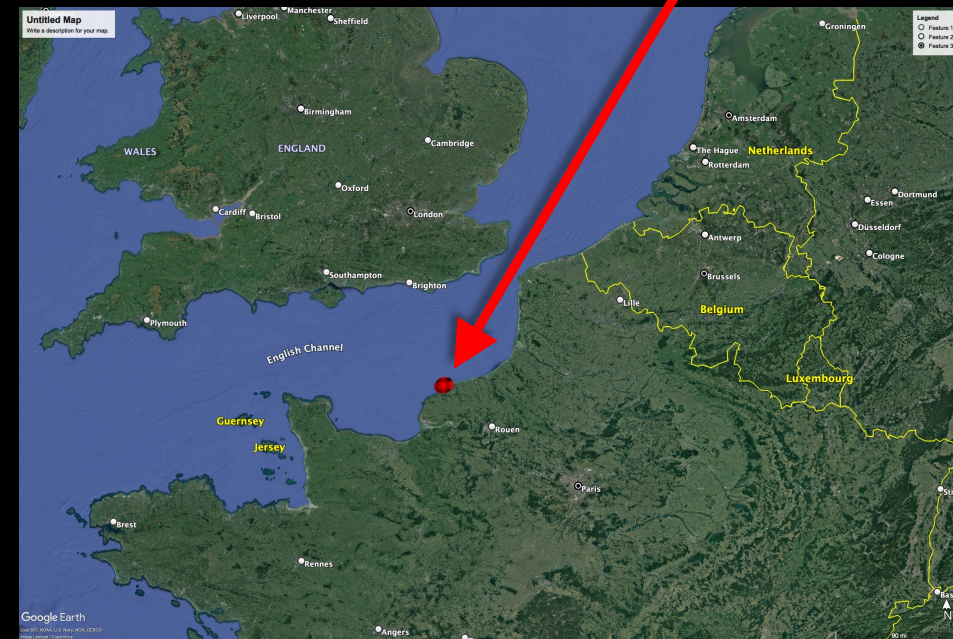


Impact minus 4 hours



- First observed by Hungarian observatory GINOP-KHK (K88) and reported to the Minor Planet Center (K88 also discovered impactor 2022 EB5)
- JPL's Center for NEO Studies (CNEOS) Scout system identified a potential impact and warned PDCO
- ESA's NEO Coordination Centre similarly identified a potential impact
- The uncertainty region for the impact narrowed as additional observations helped CNEOS and NEOCC refine their orbit calculations

CNEOS impact solutions converge



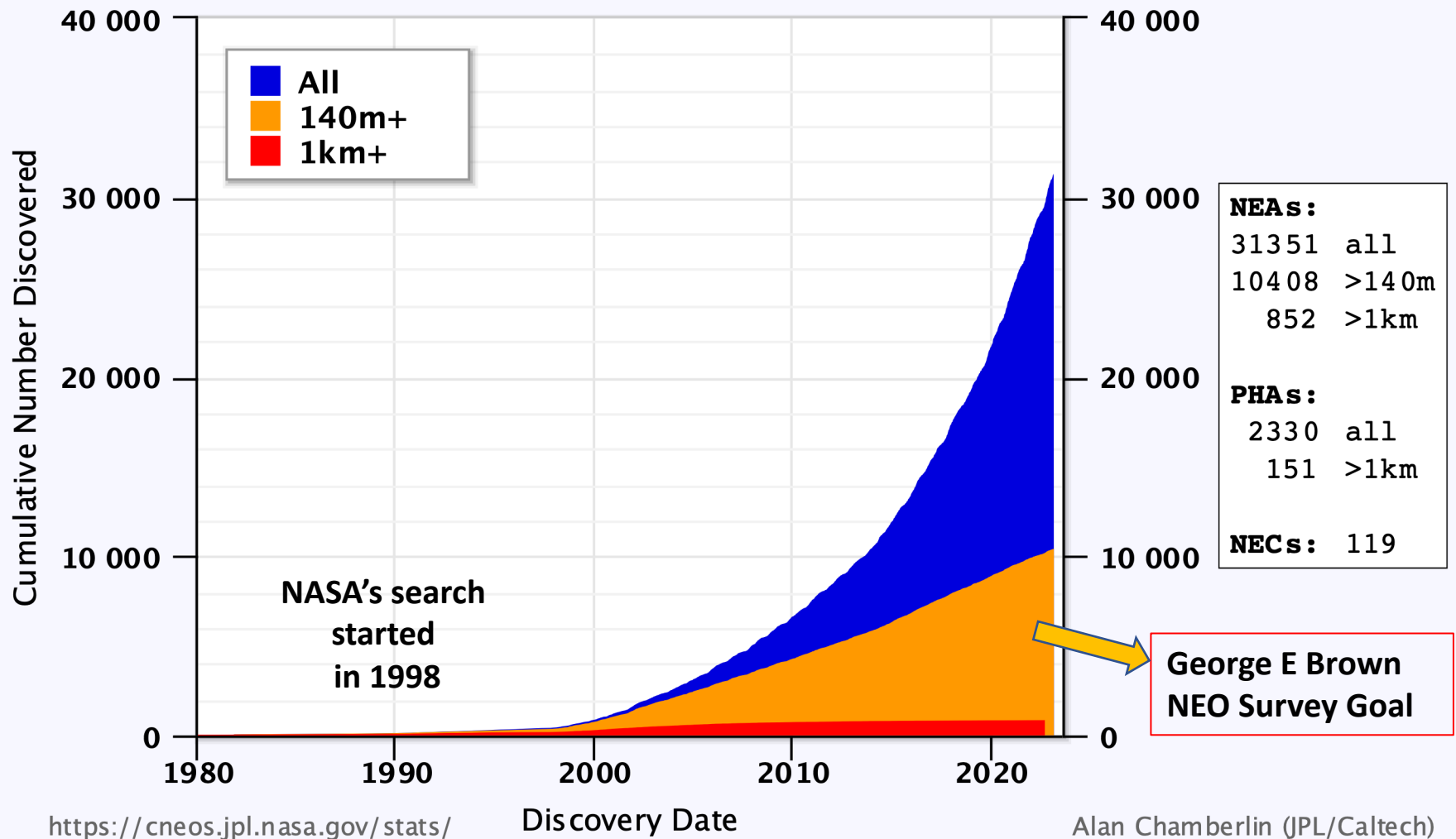
- ESA and NASA notified the public, and many watched the impact as it happened
- The asteroid posed no threat since it was so small (~1 m) but it was an excellent test of planetary defense capabilities to find and track and to accurately predict an impact location



Used with permission

Near-Earth Asteroids Discovered

Most recent discovery: 2023-Feb-19

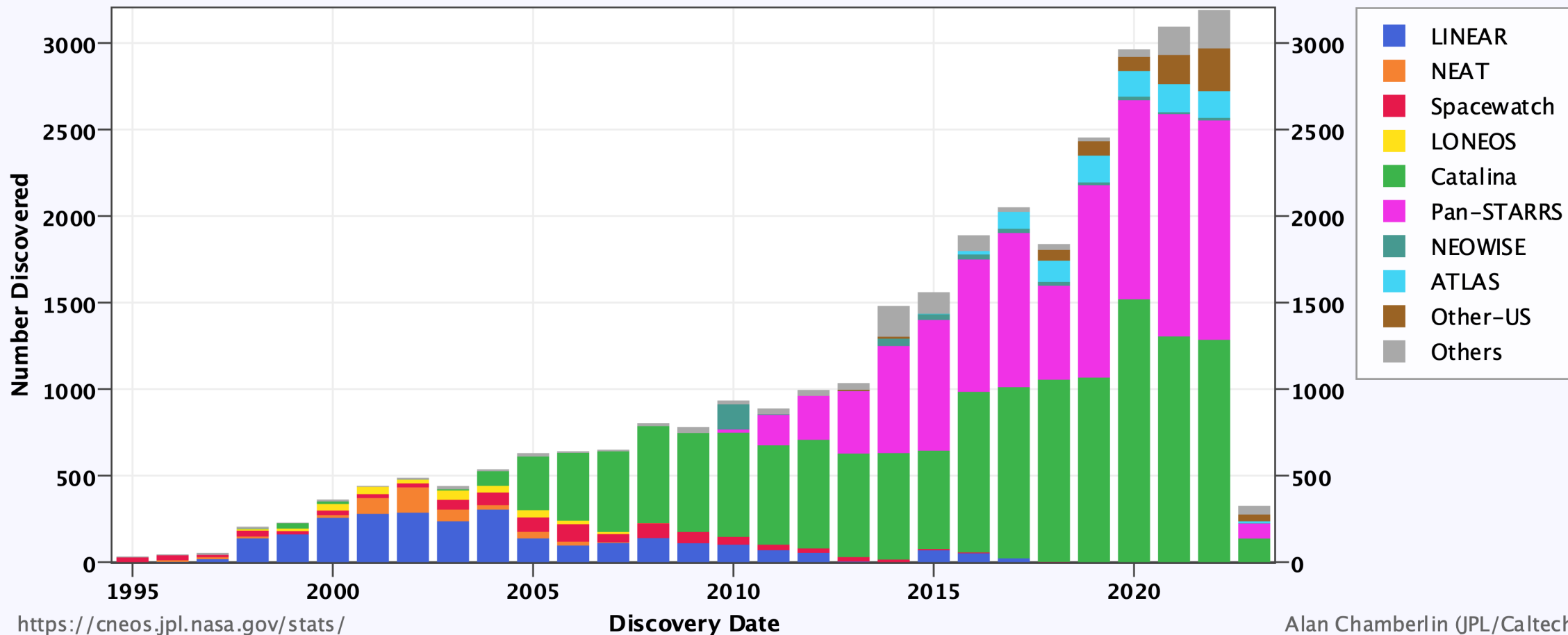


*Potentially Hazardous Asteroids come within 7.5 million km of Earth orbit

Near-Earth Asteroid Discoveries by Survey

All NEAs (as of 2023-Feb-22)

3188

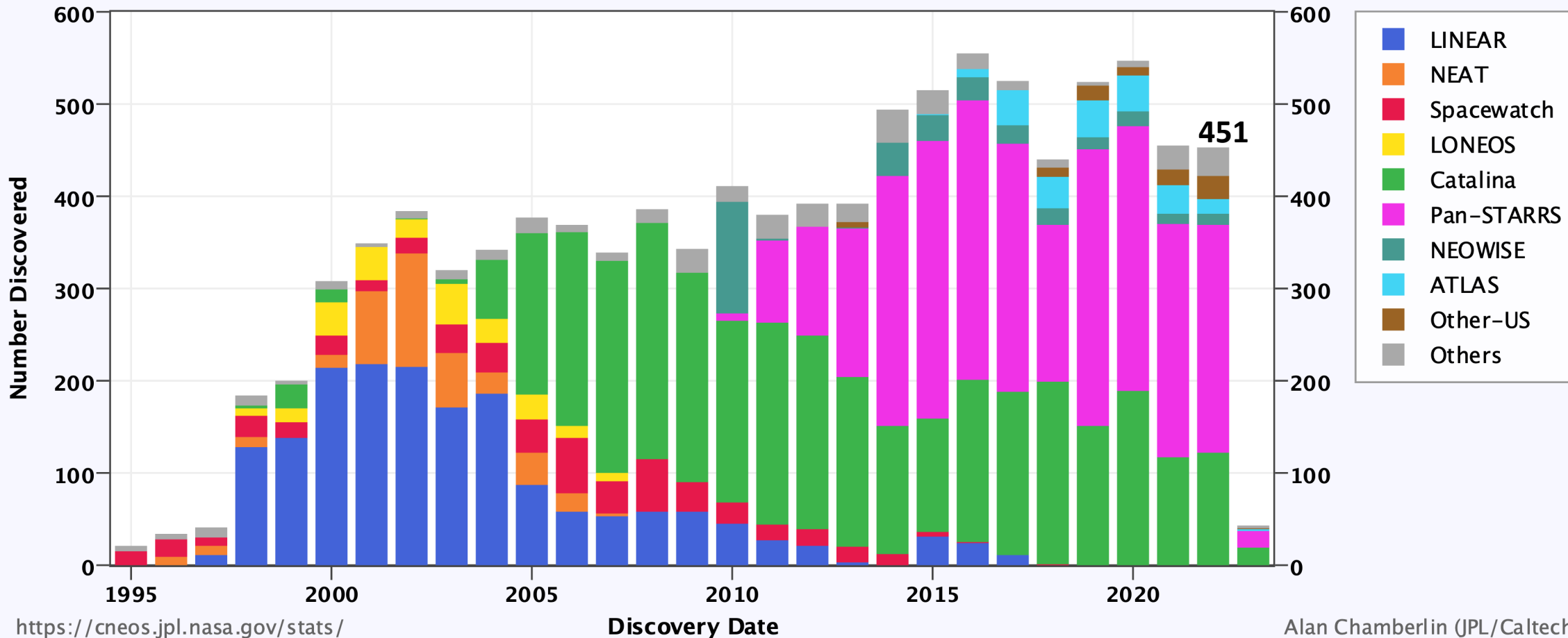


<https://cneos.jpl.nasa.gov/stats/>

Alan Chamberlin (JPL/Caltech)

Near-Earth Asteroid Discoveries by Survey

~140m and larger NEAs (as of 2023-Feb-22)



UN Office of Outer Space Affairs Committee on Peaceful Uses of Outer Space

Overview for NEO Threat Response

Last Meetings
7-9 Feb at
UN COPUOS
S&T SC

*Inform in case of
credible threat*

United Nations
COPUOS/OOSA



Parent Government Delegates

Determine Impact time,
location and severity

International Asteroid
Warning Network
(IAWN)
www.iawn.net

Coordinated
by NASA

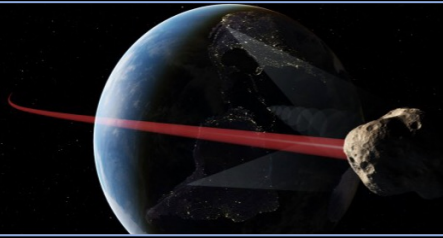
Observers, analysts, modelers...

Potential deflection
mission plans

Space Missions Planning
Advisory Group
(SMPAG)
www.smpag.net

Chaired
by ESA

Space agencies and offices



International
Asteroid
Warning
Network

International Asteroid Warning Network (IAWN)

A worldwide collaboration of asteroid
observers and modelers that was
recommended by the United Nations

**Currently 50 signatories from
over 20 countries**
January 2023

For details and for and IAWN observing
campaign information, see:
<https://iawn.net/>

Southern Observatory for Near Earth Asteroids Research
Golden Ears Observatory U55
Spaceguard Consulting
San Pedro de Atacama Celestial Explorations W94 W95
Chinese National Space Administration
Xingming Observatory (IAU Code C42/N88/N89)
University of Narino
Mobil Astronomical Robotics Genon Observatory
Visnjan Observatory
European Space Agency
European Southern Observatory
Observatoire de la Côte d'Azur
NOAK Observatory L02
Israel Space Agency
Agenzia Spaziale Italiana
Blessed Hermann Observatory L73
Fondazione GAL Hassin
Grupo Astrofili Montelupo (Gr.A.M.) "Beppe Forti" K83
G.V. Schiaparelli 204
K63 G. Pascioli Observatory
Sormano Observatory,
Korean Astronomy and Space Sciences Institute
Baldone Observatory 069
National Institute of Astrophysics, Optics, and Electronics, Mexico
6ROADS Company
Astronomical Institute of the Romanian Academy
Crimean Astrophysical Observatory
Russian Academy of Sciences, Institute of Astronomy
Institute of Solar-Terrestrial Physics, Russian Academy of Sciences
Kourouka Astronomical Observatory, Ural Federal University
Keldysh Institute of Applied Mathematics, Russian Academy of Sciences
Special Astrophysical Observatory, Russian Academy of Sciences
The Paus B49 Observatory
Insituto de Astrofísica de Canarias
Observatorio J87 La Cañada
Peter Birtwhistle, Great Shefford Observatory
David Briggs, Hampshire Astronomical Group
Northolt Branch Observatories
Farpoint Observatory H36
National Aeronautics and Space Administration
Squirrel Valley Observatory W34
Patrick Wiggins, Tooele Observatory
Zwicky Transient Facility, Caltech

Space Missions Planning Advisory Group (SMPAG)

SMPAG Member Space Agencies and Offices

Currently 18 Member Agencies

https://www.cosmos.esa.int/web/smpag/smpag_members

For more information see:
<https://smpag.net/>

MEMBERS - List of SMPAG Members as of 10 Feb 2022:

AEM (Mexico)
ASI (Italy)
BELSPO (Belgium)
Czech Republic
CNSA (China)
CNES (France)
DLR (Germany)
ESA (Current SMPAG Chair)
FFG - Austrian Research Promotion Agency (Austria)
ISA (Israel)
JAXA (Japan)
KASI (Korea)
NASA (USA)
ROSA (Romania)
ROSCOSMOS (Russian Federation)
SSAU (Ukraine)
SUPARCO (Pakistan)
UK Space Agency (UK)

Observer Status
UN Office of Outer Space Affairs (OOSA)
ASE (Association of Space Explorers)
COSPAR
ESO
IAA
IAU
IAWN (ex-officio)
SWF

Recent Major PDCO Milestones

9/26/2022 – DART impacts Dimorphos followed by deflection measurement

- *Orbit change now measured at –33 mins*

11/29/2022 – NEO Surveyor passed KDP-C, entered Phase C

- *Project ramping up for full instrument development*
- *Spacecraft development delayed until 2024*
- *LRD NLT June 2028*

Other PDCO Activities

Interagency study on future needs and capabilities for deep space/planetary radar is now underway in collaboration with NSF and other agencies



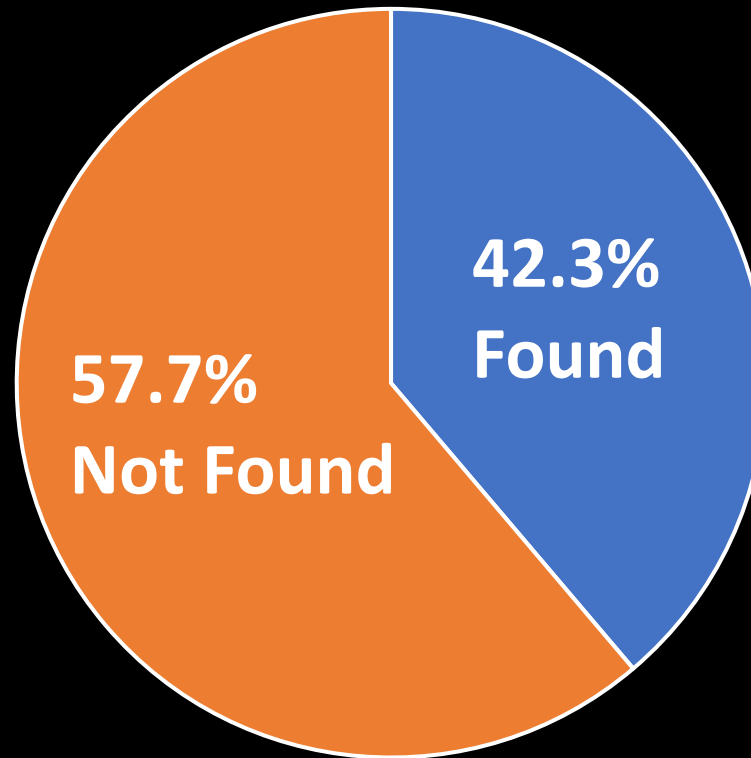
Progress: 140 Meters and Larger

Total Population estimated to be ~25,000

NEO Survey Status as of 31 Dec 2022

**George E Brown NEO Survey
Goal: (tasked in 2005)**

**Find at least 90% of NEOs
140 meter and larger
within 15 years**



**At the current assets' discovery rate, it will take more than 30 years to complete the survey.
NEO Surveyor will cut that time in half.**

An OSTP-led Planetary Defense Interagency Working Group is assessing progress on the actions in the 2018 plan and preparing to make updates.

<https://www.nasa.gov/sites/default/files/atoms/files/ostp-neo-strategy-action-plan-jun18.pdf>



NATIONAL NEAR-EARTH OBJECT
PREPAREDNESS STRATEGY AND
ACTION PLAN

A Report by the
INTERAGENCY WORKING GROUP FOR DETECTING AND MITIGATING
THE IMPACT OF EARTH-BOUND NEAR-EARTH OBJECTS

of the
NATIONAL SCIENCE & TECHNOLOGY COUNCIL

JUNE 2018



National NEO Preparedness Strategy and Action Plan



Goals in the 10-year Action Plan

- Enhance NEO detection, characterization, and tracking capabilities
- Improve modeling, predictions, and information integration
- Develop technologies for NEO deflection and disruption
- Increase international cooperation on NEO preparation
- Establish NEO impact emergency procedures and action protocols



INTERNATIONAL ACADEMY OF ASTRONAUTICS

- THE ACADEMY
- EVENTS
- RESEARCH
- PUBLICATIONS
- MEMBERS
- SHOP
- SIGN IN

VIENNA, AUSTRIA

IAA PLANETARY DEFENSE CONFERENCE 2023

3-7 APRIL 2023

38

DAYS

12

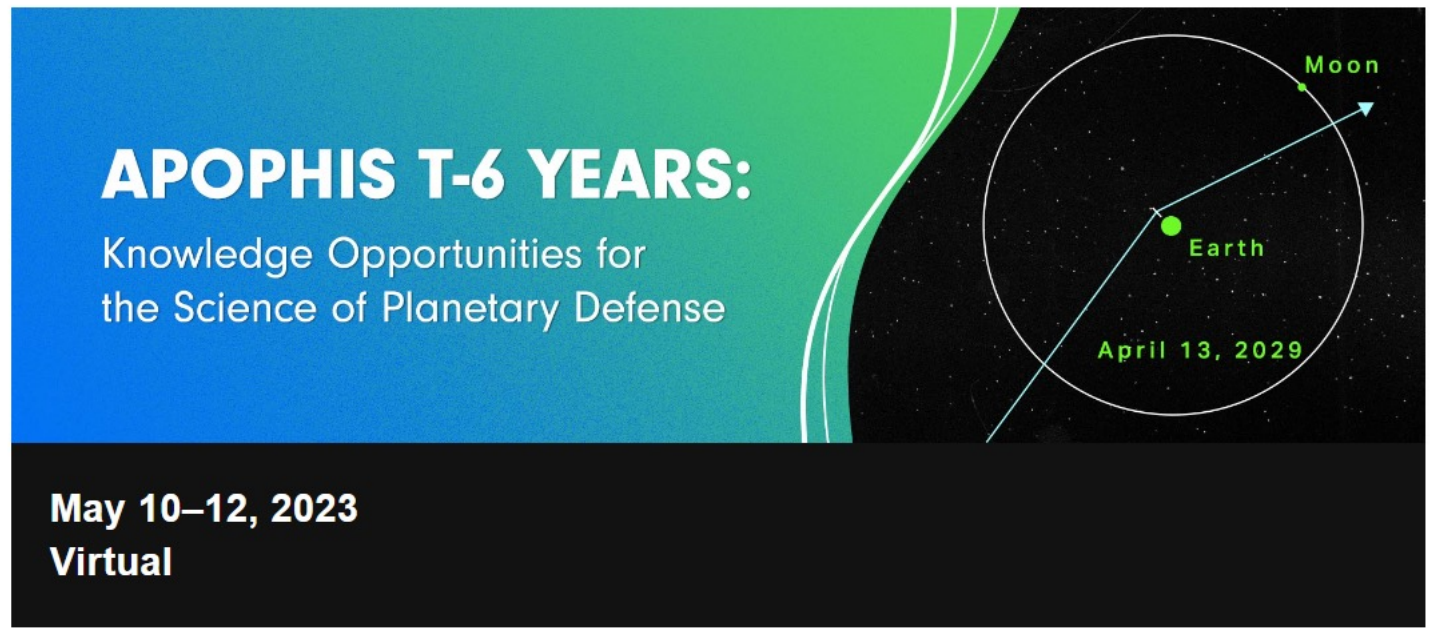
HOURS

08

MINUTES

20

SECONDS



Apophis T-6 Years: Knowledge Opportunities for the Science of Planetary Defense

Workshop Location and Dates

The Apophis T-6 Years: Knowledge Opportunities for the Science of Planetary Defense workshop is scheduled for May 10–12, 2023, as a virtual workshop.

#Apophis2023

- HOME
- ORGANIZERS
- INDICATION OF INTEREST
- CALL FOR ABSTRACTS
- REGISTRATION
- CONTACTS

Important Dates

Abstract deadline
February 23, 2023

