Status of Planetary Defense

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Planetary Defense Coordination Office
Planetary Science Division
NASA Headquarters
Washington, DC

26 January 2022


IAU
Minor Planet Center
ASSESS
[CENTER FOR NEAR EARTH OBJECT STUDIES]
SEARCH, DETECT & TRACK
[SPACE-BASED & GROUND-BASED OBSERVATIONS, IAWN]
PLANETARY
DEFENSE
MITIGATE
[DART, FEMA EXERCISES]
CHARACTERIZE
[NEOWISE, GOLDSTONE, IRTF]
PLAN &
COORDINATE
[SMPAG, PIERWG, NITEP IWG]

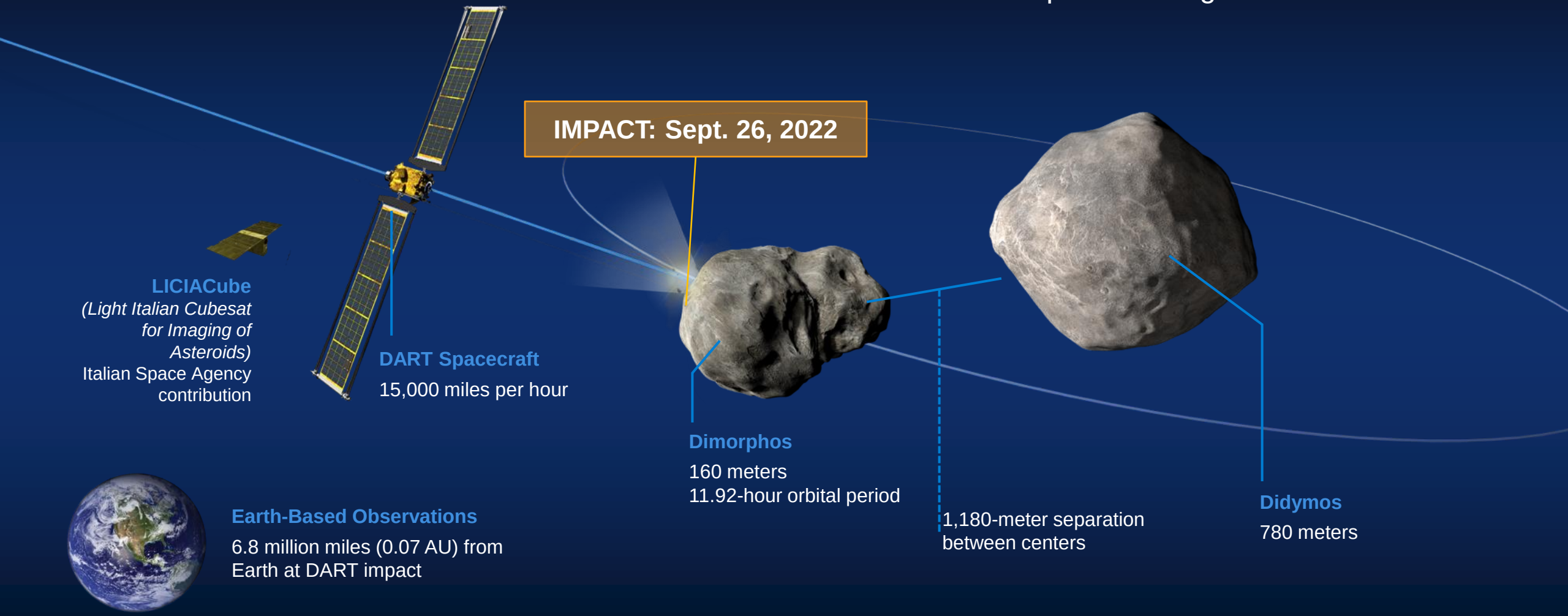
DART Launch – November 23, 2021 PST (24 EST)
Vandenberg Space Force Base, California


T+00:55:46
NASA
LIVE

Launched on Nov. 24 EST

SpaceX Falcon 9
Vandenberg Space Force Base, CA

- Target the binary asteroid Didymos system
- Impact Dimorphos and change its orbital period
- Measure the period change from Earth

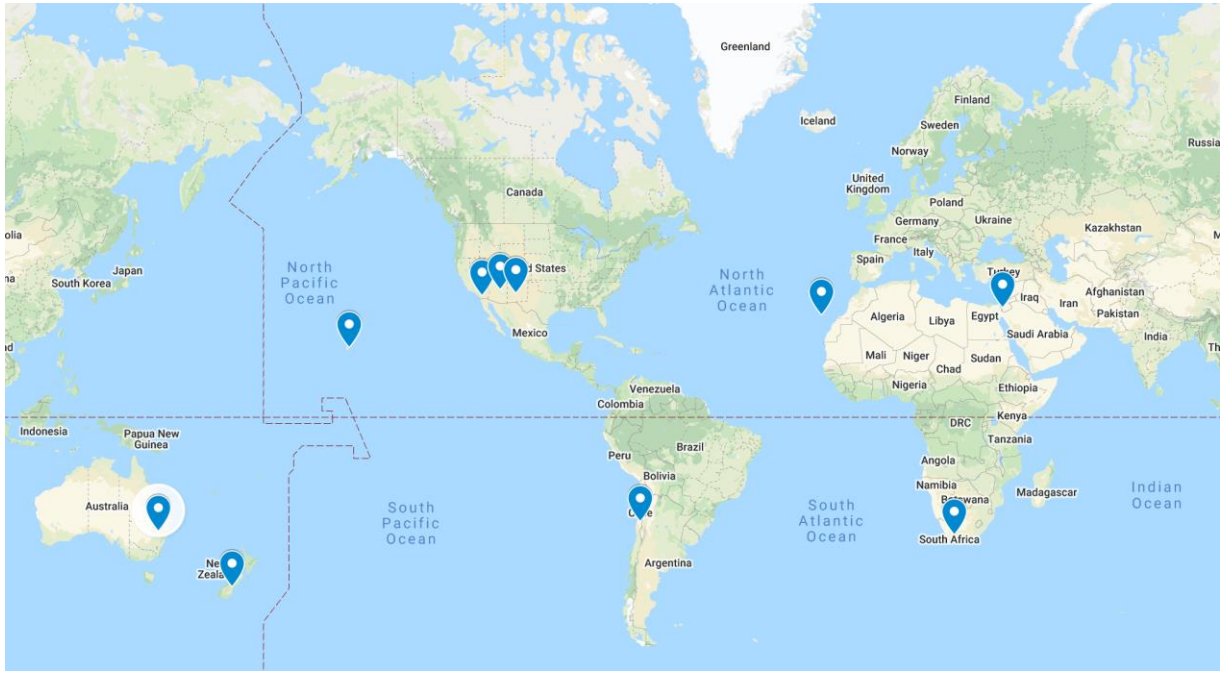


Plan for Pre-Impact and Post-Impact Observations

- Plan will begin observations during 22 Jun—6 July 2022 dark time, end during 15—28 March 2023 dark time

1. Contracted Observatories to obtain required data
   - Lowell Observatory
   - Magdalena Ridge Observatory
   - Las Cumbres Global Observatory Network
   - Las Campanas Observatory
2. Competed time already successfully in hand
   - JWST, HST, Goldstone planetary radar
3. To-be competed time via proposals
   - US and non-US facilities
4. Telescopes operated by team members
   - Mt. John (New Zealand), a few others

- Observatory schedules typically not formally set until a few weeks prior to observations, but planning to observe near new moon each month



Sites of contracted/participating ground-based telescopes

Combined Observation plans provide assurance that required data will be obtained, some margin in case of bad weather/equipment issues, flexibility as needed

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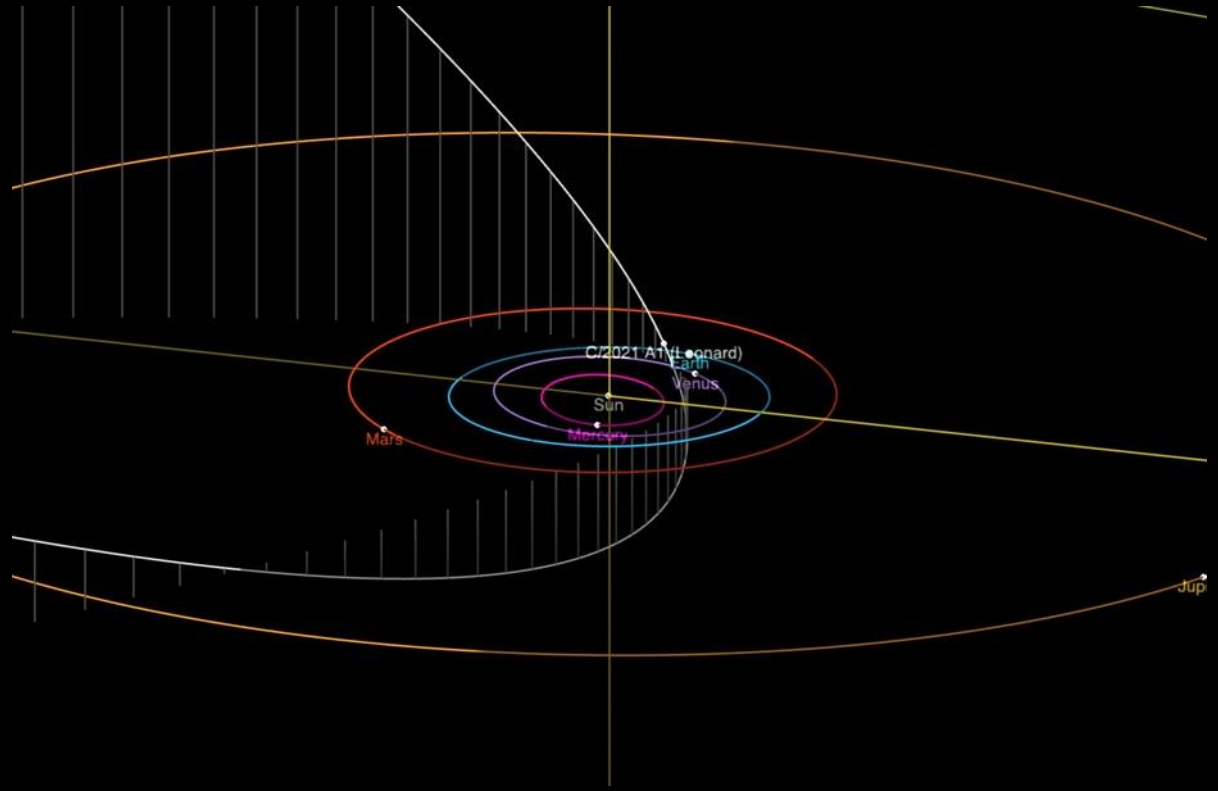
Comet C/2021 A1 (Leonard)

Discovered by Greg Leonard of the Catalina Sky Survey, University of Arizona

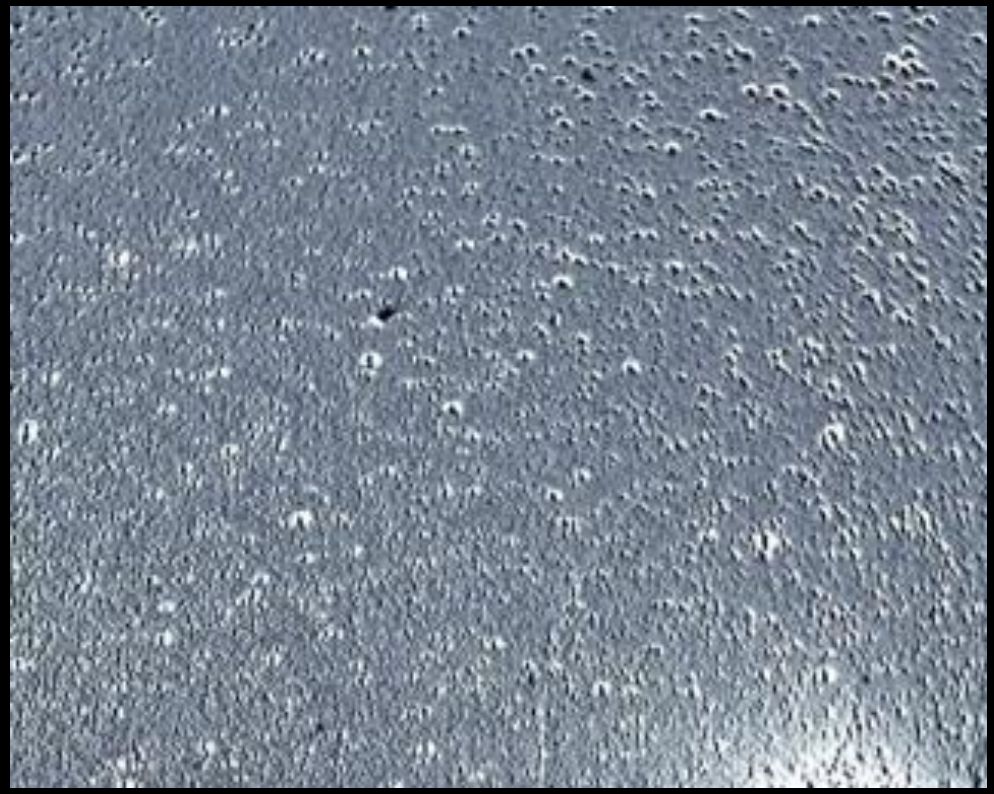
NASA



Comet C/2021 A1 (Leonard)

Discovered by Greg Leonard of the Catalina Sky Survey, University of Arizona

Difference image, which highlights subtle changes in comet Leonard's tail over two frames, captured by the HI-2 telescope aboard NASA's STEREO-A spacecraft.
Credits: NASA/NRL/Karl Battams



https://www.nasa.gov/image-feature/goddard/2021/views-of-comet-leonard-from-two-sun-watching-spacecraft

Signatories to the International Asteroid Warning Network (IAWN)

Currently 38 signatories

https://iawn.net/about/members.shtml

Newest Signatories to IAWN:

MAP, San Pedro De Atacama, Chile

Hampshire Astronomical Group, United Kingdom

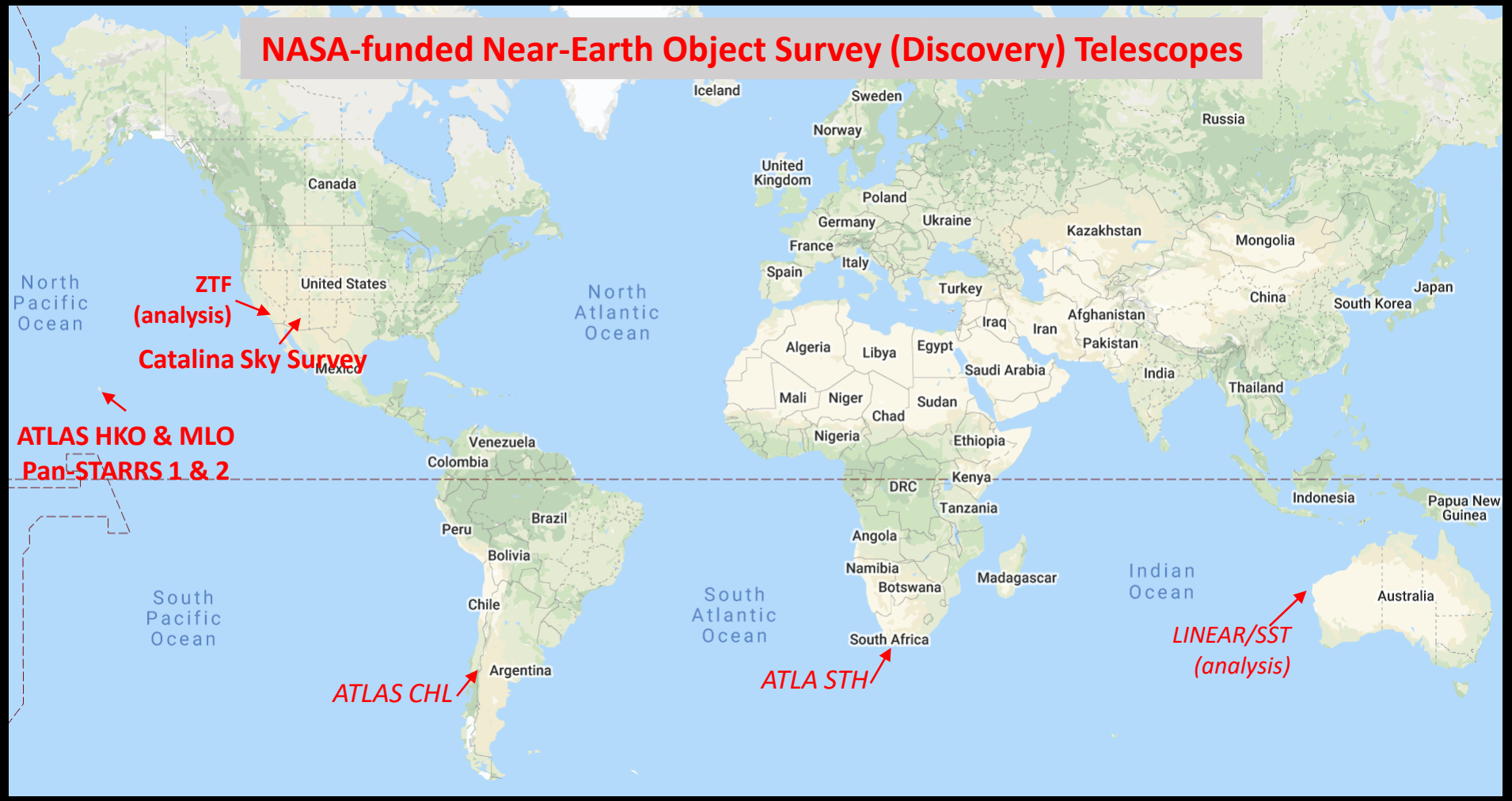
NOAK Observatory, Ionia, Greece

For more on IAWN, see IAWN.net

Brazil	Southern Observatory for Near Earth Asteroids Research, Brazil
Canada	Golden Ears Observtory U55
Canada	Spaceguard Consulting, Canada
Chile	San Pedro de Atacama Celestial Explorations W94 W95
China	Chinese National Space Administration, China
China	Xingming Observatory (IAU Code C42/N88/N89)
Colombia	Unversity of Narino, Colombia
Crimea	Mobil Astronomical Robotics Genon Observatory
Croatia	Visnjan Observatory, Croatia
Europe	European Space Agency, Head NEO Segment, SSA Programme Office
Europe	European Southern Observatory
France	Observatoire de la Côte d'Azur, Nice, France
Greece	NOAK Observatory, Ionia, Greece L02
Israel	Israel Space Agency
Italy	Agenzia Spaziale Italiana
Italy	Fondazione GAL Hassin
Italy	G.V. Schiaparelli 204, Italy
Italy	Sormano Observatory, Italy
Korea, Republic of	Korean Astronomy and Space Sciences Institutde, Republic of Korea
Latvia	Baldone Observatory 069, Latvia
Mexico	National Institute of Astrophysics, Optics, and Electronics, Mexico
Poland	6ROADS Company
Romania	Astronomical Institute of the Romanian Academy
Russia	Crimean Astrophysical Observatory, Russia
Russia	Russian Academy of Sciences, Institute of Astronomy, Russia
Russia	Institute of Solar-Terrestrial Physics, Russian Academy of Sciences, Russia
Russia	Kourovka Astronomical Observatory, Ural Federal University, Russia
Russia	Keldysh Institute of Applied Mathematics, Russian Academy of Sciences, Russia
Russia	Special Astrophysical Observatory, Russian Academy of Sciences, Russia
Spain	The Paus B49 Observatory
Spain	Insituto de Astrofisica de Canarias
United Kingdom	Peter Birtwhistle, Great Shefford Observatory, England
United Kingdom	David Briggs, Hampshire Astronomical Group, England
United Kingdom	Northolt Branch Observatories, England
United States	National Aeronautics and Space Administration
United States	Squrrel Valley Observatory W34
United States	Patrick Wiggins, Tooele Observatory, Utah, United States
United States	Zwicky Transient Facility, Caltech, United States

NEOWISE

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



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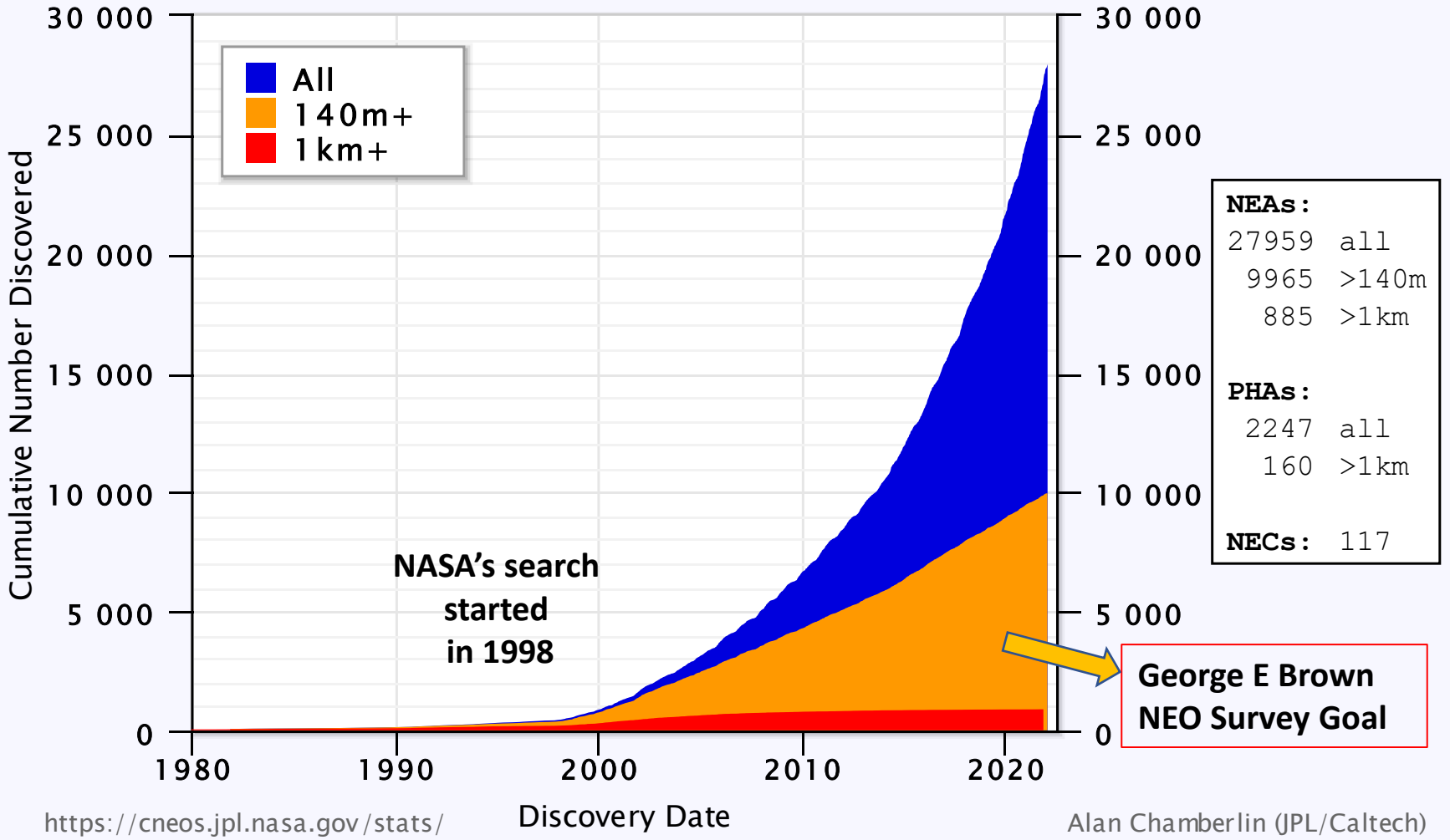
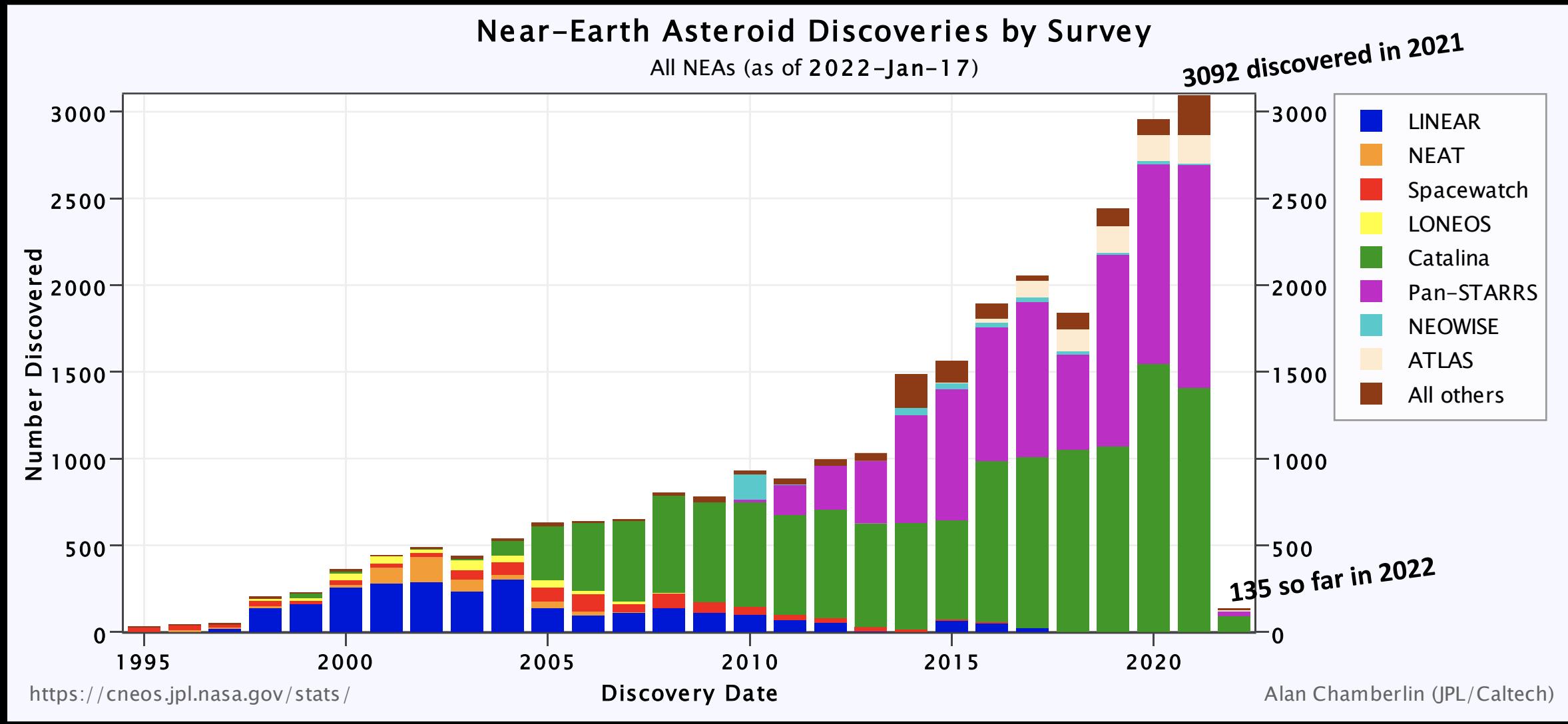
Near-Earth Asteroids Discovered

Most recent discovery: *2022-Jan-13*



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

All Near-Earth Asteroids (NEAs)



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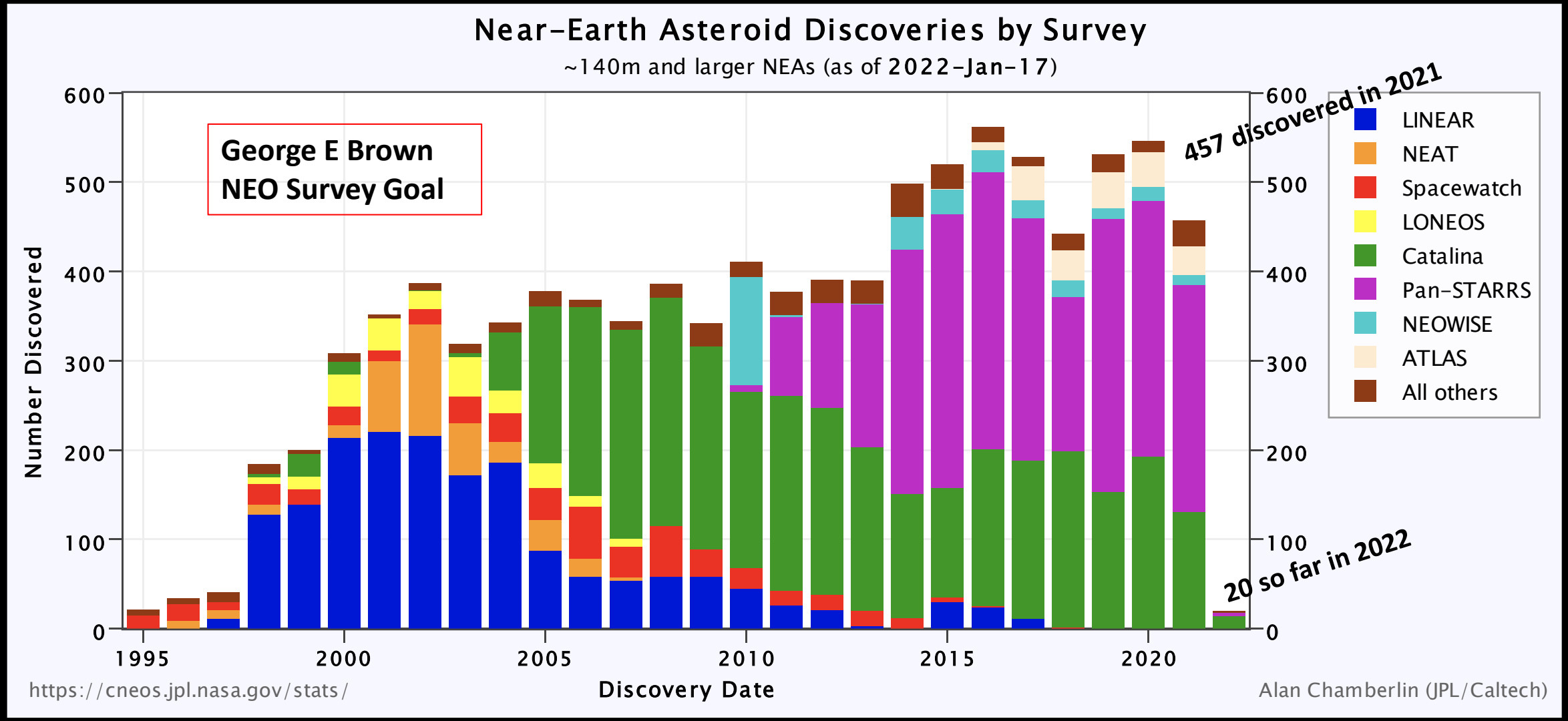
NEAs 140 Meters and Larger

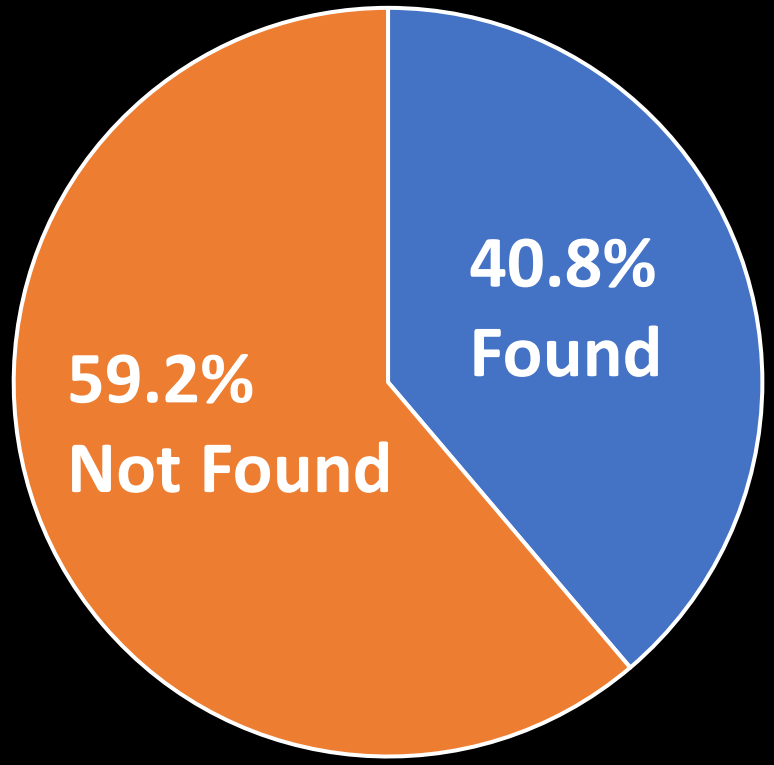


Progress: 140 Meters and Larger

Total Population estimated to be ~25,000

George E Brown
NEO Survey Goal

NEO Survey Status as of 31 Dec 2021



At current discovery rate, it will take more than 30 years to complete the survey.

NEO Surveillance Mission

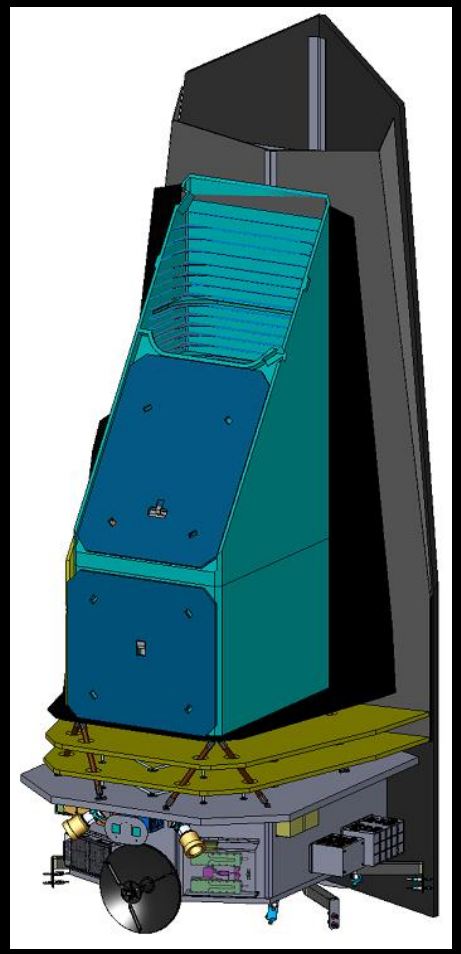
Objectives:

- **Find 65% of undiscovered Potentially Hazardous Asteroids (PHAs) >140 m in 5 years (goal: 90% in 10 years)**
- **Estimate sizes directly from IR signatures**
- **Compute cumulative chance of impact over next century for PHAs >50 m and for comets**
- **Deliver new tracklet data daily to the Minor Planet Center**

KDP-B approved 11 June 2021 for entry into Preliminary Design phase

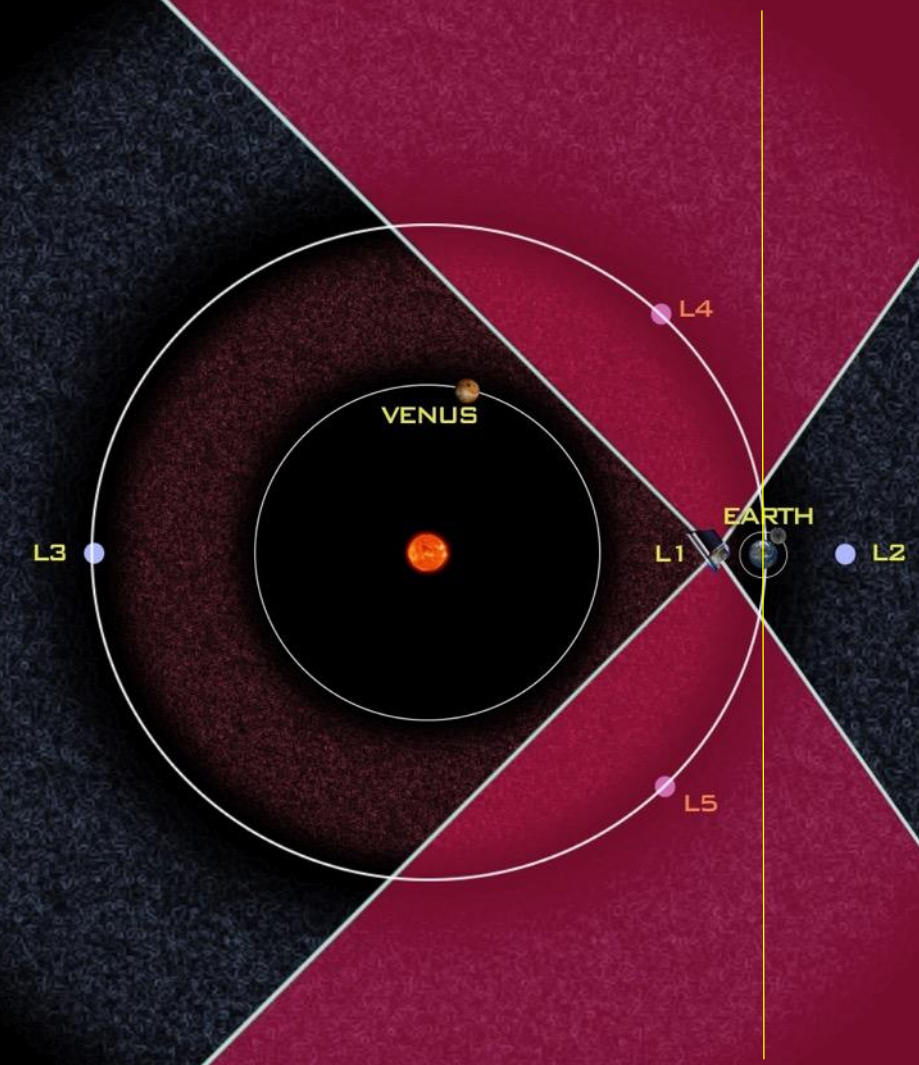
President's Budget Request for FY22 would fully fund NEO Surveyor for launch in 2026 if enacted

NEO Surveyor
Space-based IR
Observatory



PLANETARY DEF
COORDINATION C

NEOSM
field-of-regard



NEOWISE
field-of-regard

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nasa.gov/planetarydefense