NEO Threat Detection and Warning: Plans for an International Asteroid Warning Network

Presentation to
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Scientific & Technical Subcommittee

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Functions of International Asteroid Warning Network (IAWN)

- ✓ (a) To discover, monitor, and physically characterize the potentially hazardous NEO population using optical and radar facilities and other assets based in both the northern and southern hemispheres and in space;
- ✓ (b) To provide and maintain an internationally recognized clearing house function for the receipt, acknowledgement and processing of all NEO observations;
- ✓ (c) To act as a global portal, serving as the international focal point for accurate and validated information on the NEO population;
- ✓ (d) To coordinate campaigns for the observation of potentially hazardous objects;
- ❑ (e) To recommend policies regarding criteria and thresholds for notification of an emerging impact threat;
- ❑ (f) To develop a database of potential impact consequences, depending on geography, geology, population distribution and other related factors;
- ❑ (g) To assess hazard analysis results and communicate them to entities that should be identified by Member States as being responsible for the receipt of notification of an impact threat in accordance with established policies;
- ❑ (h) To assist Governments in the analysis of impact consequences and in the planning of mitigation responses.

Existing Critical Element of the IAWN
The Minor Planet Center (MPC)

The MPC is the world's center for receiving and distributing asteroid data

Rapid (near real-time) automated turnaround of orbit determination and object classification, including NEOs (special handling on the web):

http://www.minorplanetcenter.net

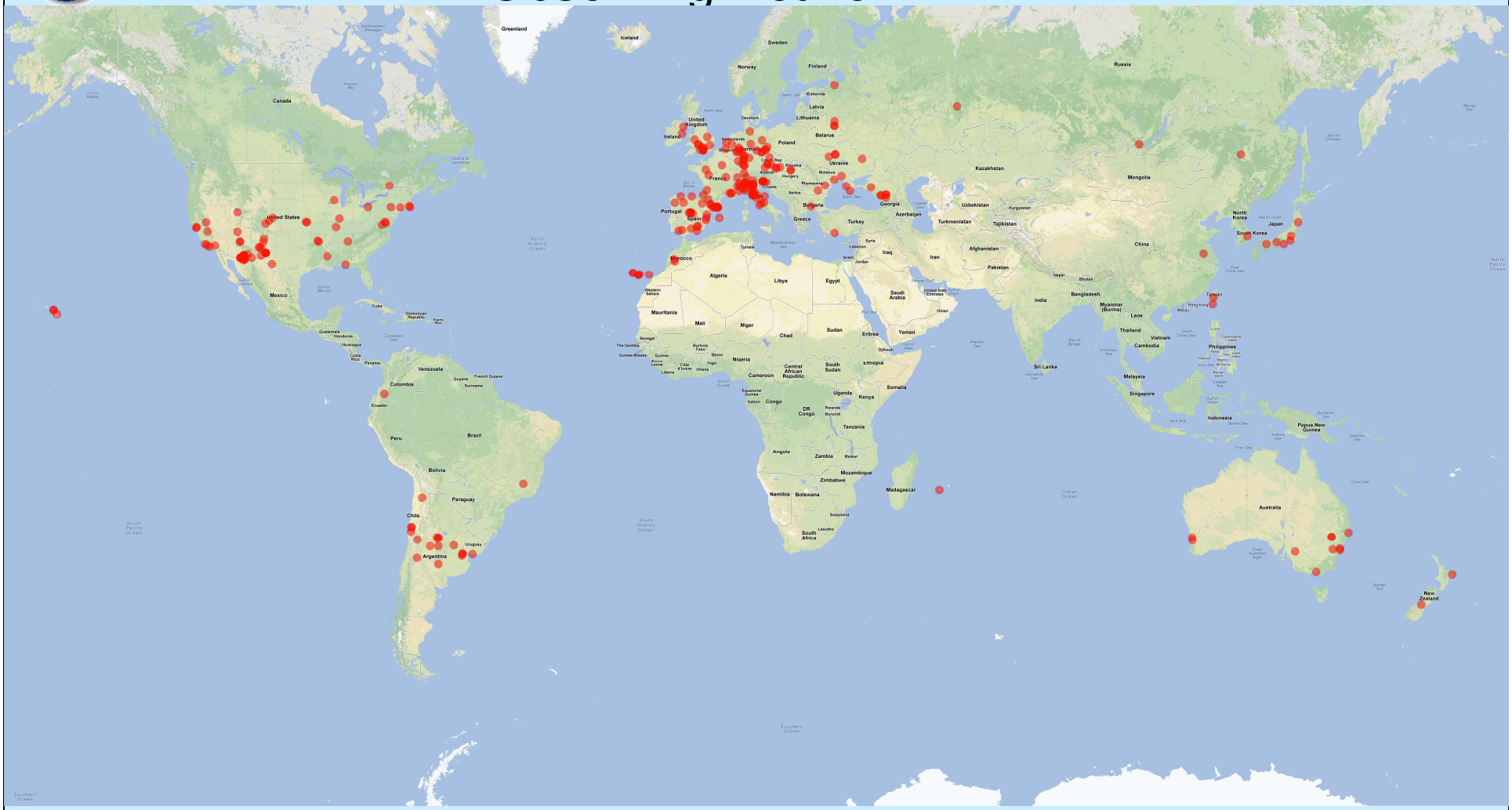
Warn of detected short-term impact threats (2008 TC3); report possible impacts to NASA HQ immediately

Solicits follow-up observations automatically on NEOs

Coordinates with NASA NEO Program Office (JPL) and NEODys (Pisa) for precise orbits and long-term impact calculations

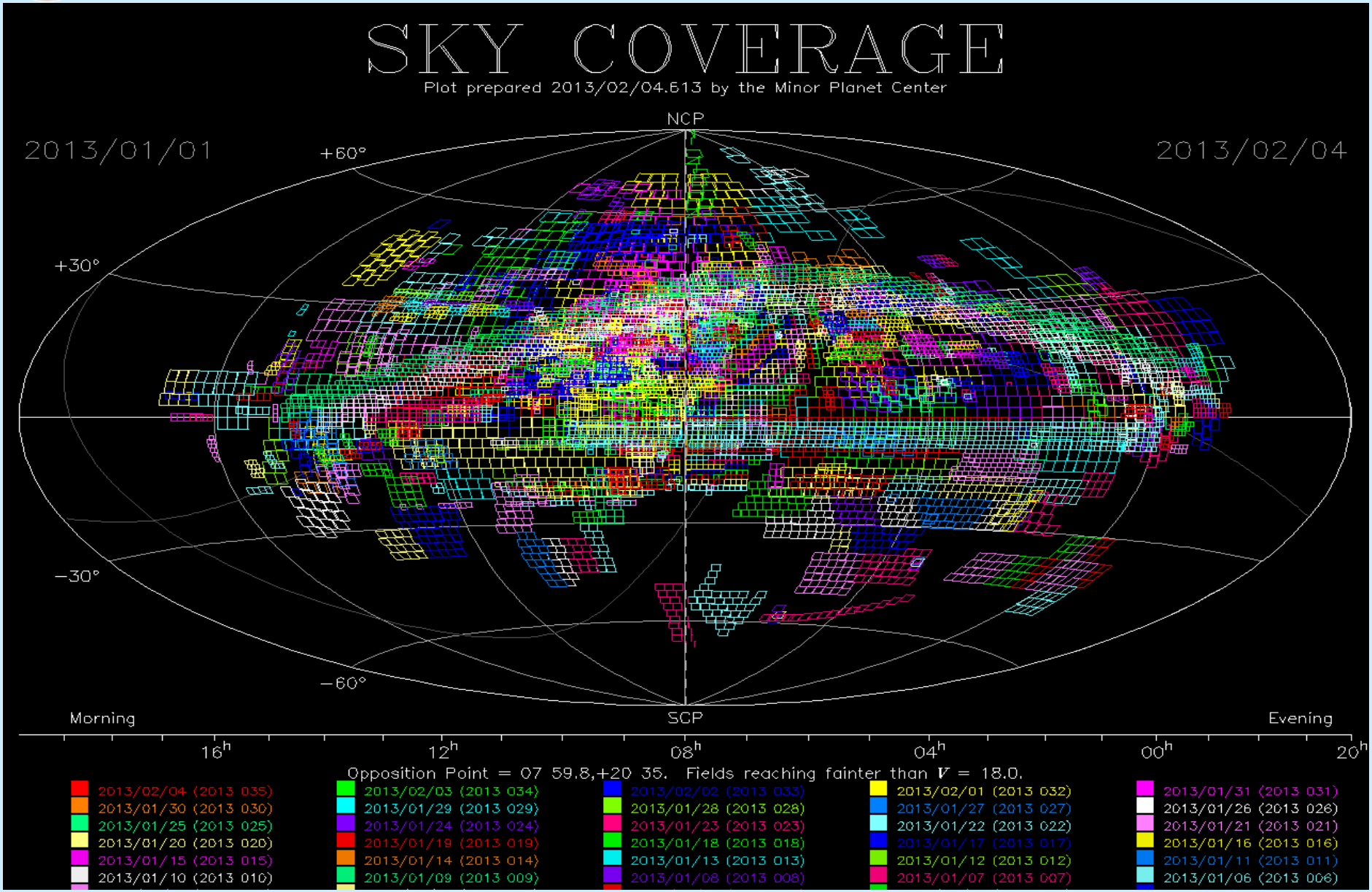
Entirely public operation! All products, data on the web

Second IAWN Element: Existing Worldwide Observing Network

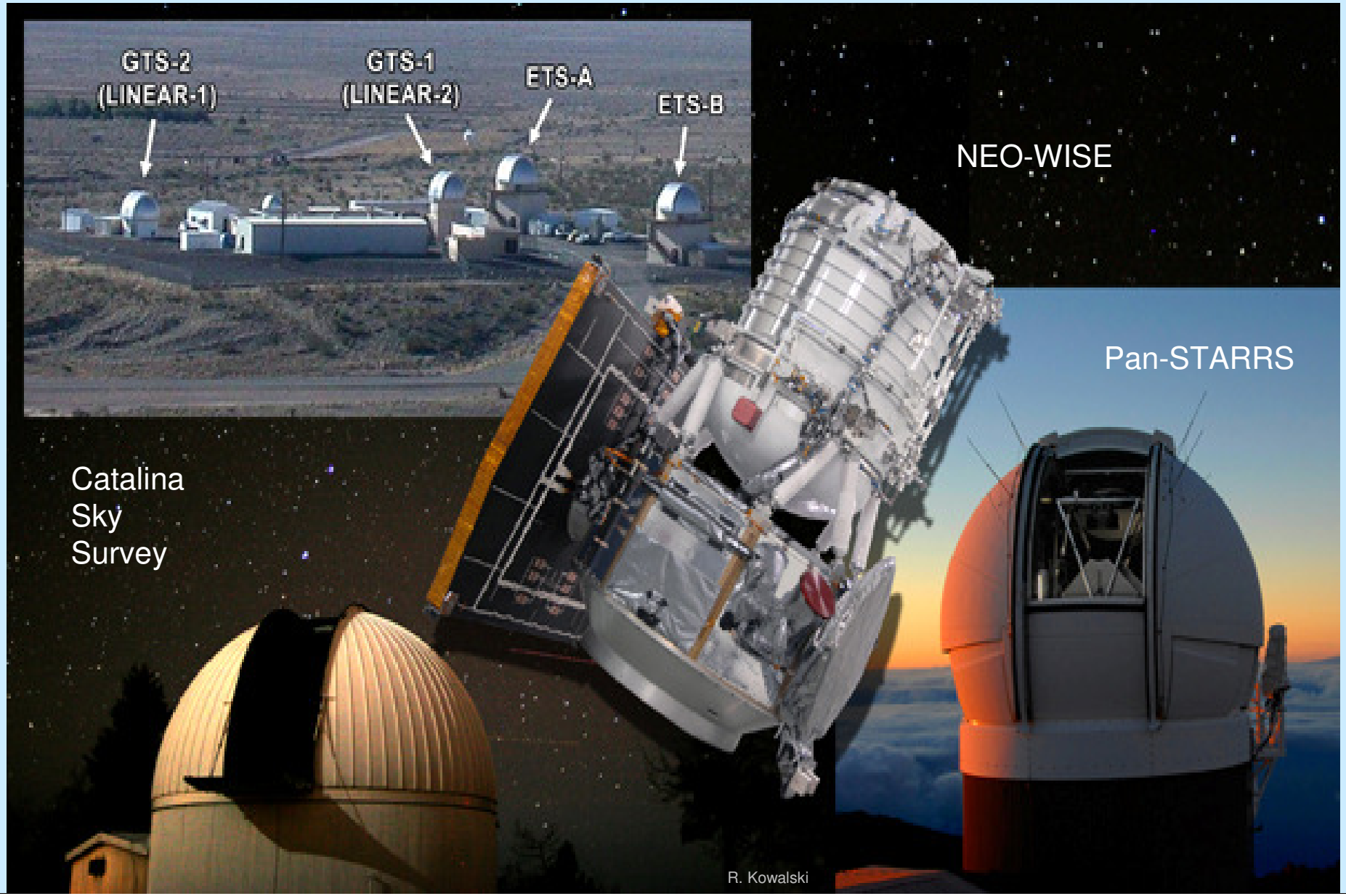


Received Data from 46 countries in 2012

Monthly Sky Coverage



Current/Past Operational Assets



The Minor Planet Center--capabilities

The MPC actively maintains a catalog of About 750,000 asteroids, of which some 10,000 are NEOs.

The MPC has excess computer capacity, and can handle 10X the current data rate quite easily (we have a supercomputer)

We run an automated, continuous operation, scanning for possible impacts almost instantaneously

International Asteroid Warning Network (IAWN) "Needs List"

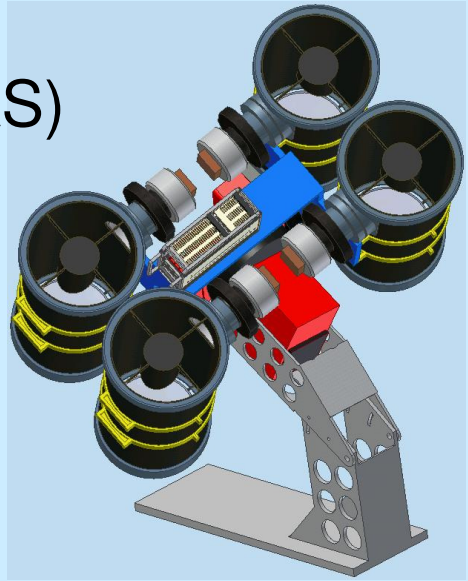
International rapid all-sky search capacity, aimed at discovering small, imminent impactors (note Chelyabinsk Event on Friday) is greatly needed

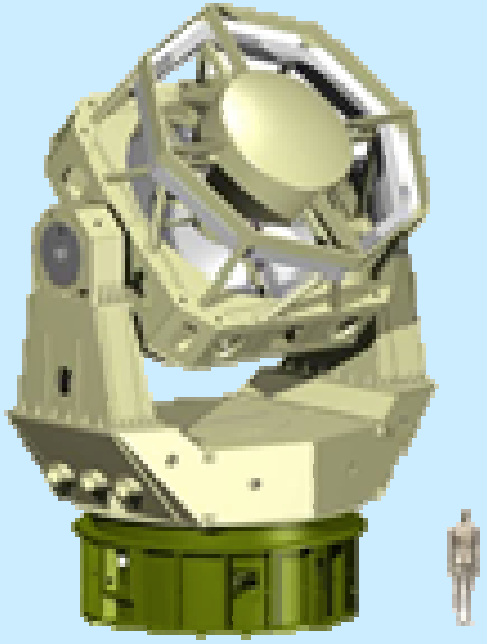
A well positioned space-based infrared survey would discover objects much faster than the current rate

International communication and public relations with respect to potential impacts and their consequences

Future Capabilities-funded by NASA NEOO

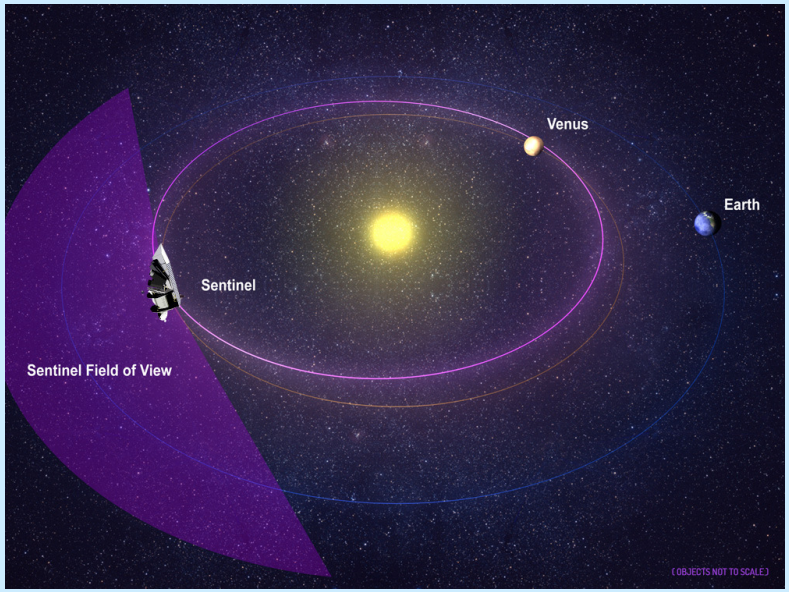
Asteroid Terrestrial Last Alert System (ATLAS)
University of Hawaii (PI John Tonry)
Daily coverage of complete sky – 4-6 sites
Find all near-term impactors



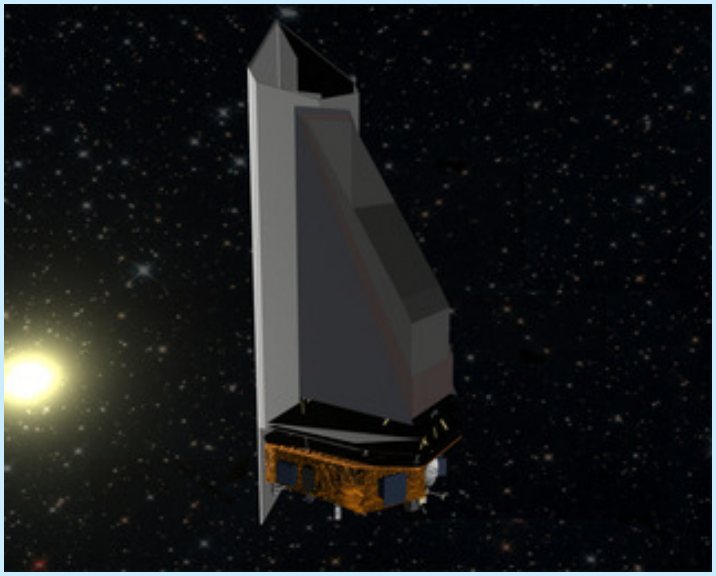


Space Surveillance Telescope (SST)
USAF and DARPA Project
Serendipitous detection of NEAs in space debris observations

Future Capabilities in Technology Development



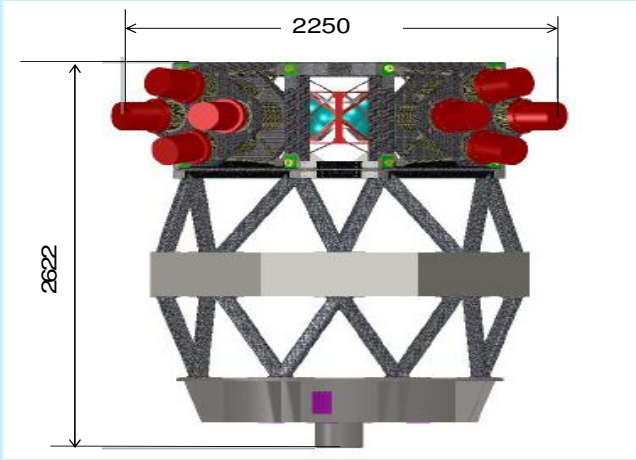
B612-Sentinel
Space Telescope
Private Endeavor

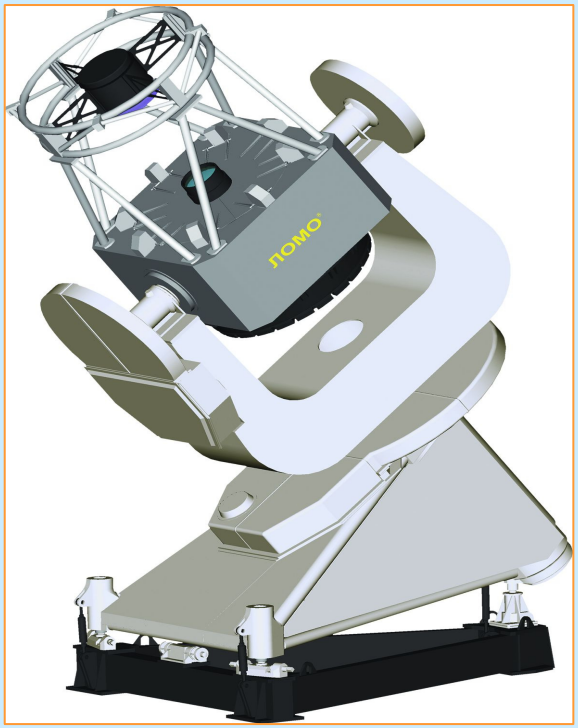


NEOCam
Space-based infrared survey from Earth L1 orbit, PI Amy Mainzer (JPL).
Proposed

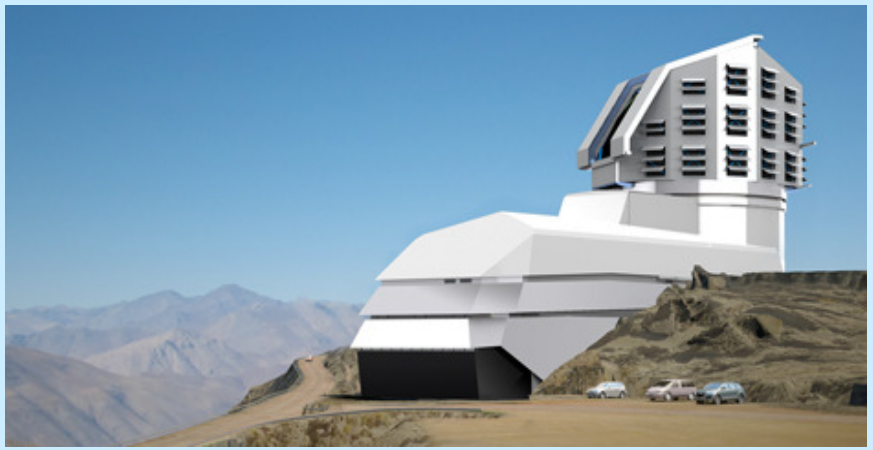
Future Capabilities – Planned or funded

ESA 1-m NEO survey telescope
~45 square degree field of view
(Fly-eye telescope)
Prototype funded





Russian Academy of Sciences 1.6-m telescope (under construction)



Large Synoptic Survey Telescope (LSST):
8m telescope, All-sky survey every 4 days
Operational in 2020

Summary

The NEO threat is a worldwide problem, and international cooperation is essential to solve it

While the MPC and existing surveys are providing a good start, there is much room for improvement, particularly in international search capacity for the smallest and most frequent impactors

More effort needed to coordinate international activities and collaboration on analysis of hazardous asteroid types and impact effects and maintain information databases

More effort needed to communicate activities and information in proper form to international community