The International Asteroid Warning Network and the Minor Planet Center

Presentation to
International Asteroid Warning Network
Steering Committee

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Background Information and Outline

---MPC staff, funding, authority, and responsibilities

---A review of Vienna 2013 presentation

--Existing MPC/IAWN functions

--Some notes on current survey capacity

--What we need and don't need going forward

--A few notes on communication

MPC Roles and Responsibilities

The MPC is the world's nerve center for minor planet and comet observations.

The MPC collects, processes, distributes all positional measurements, orbits, and discovery information for all minor planets and comets (and some satellites of planets as well)

We alert the world of impending impacts

We help coordinate worldwide observers

MPC Background Information

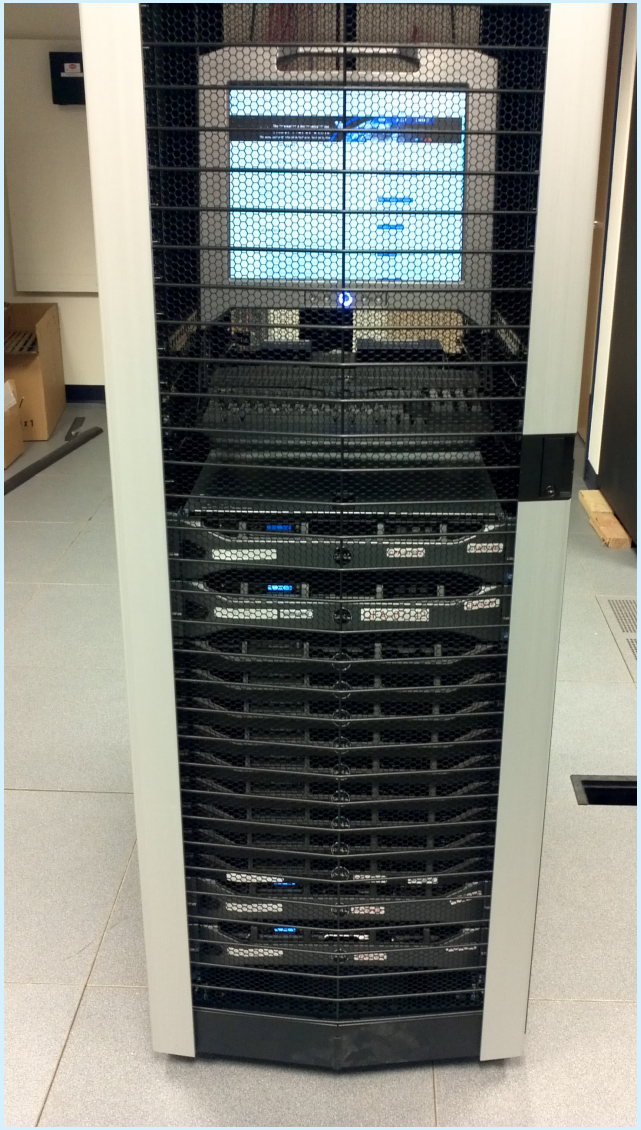
---The MPC is funded fully by NASA's NEO Observations Program. All data and derived products publicly available

--The MPC is operated at the CfA; MPC staff are all non-federal employees of the Smithsonian Astrophysical Observatory.

The MPC is granted authority by the IAU.

--6 Full time employees (bios on our web site). Distribution is 1 manager, ~3 information technology, ~1 algorithm/ development, ~1 day-to-day operations, ~1 communication, ~1 database/website. Grad student also.

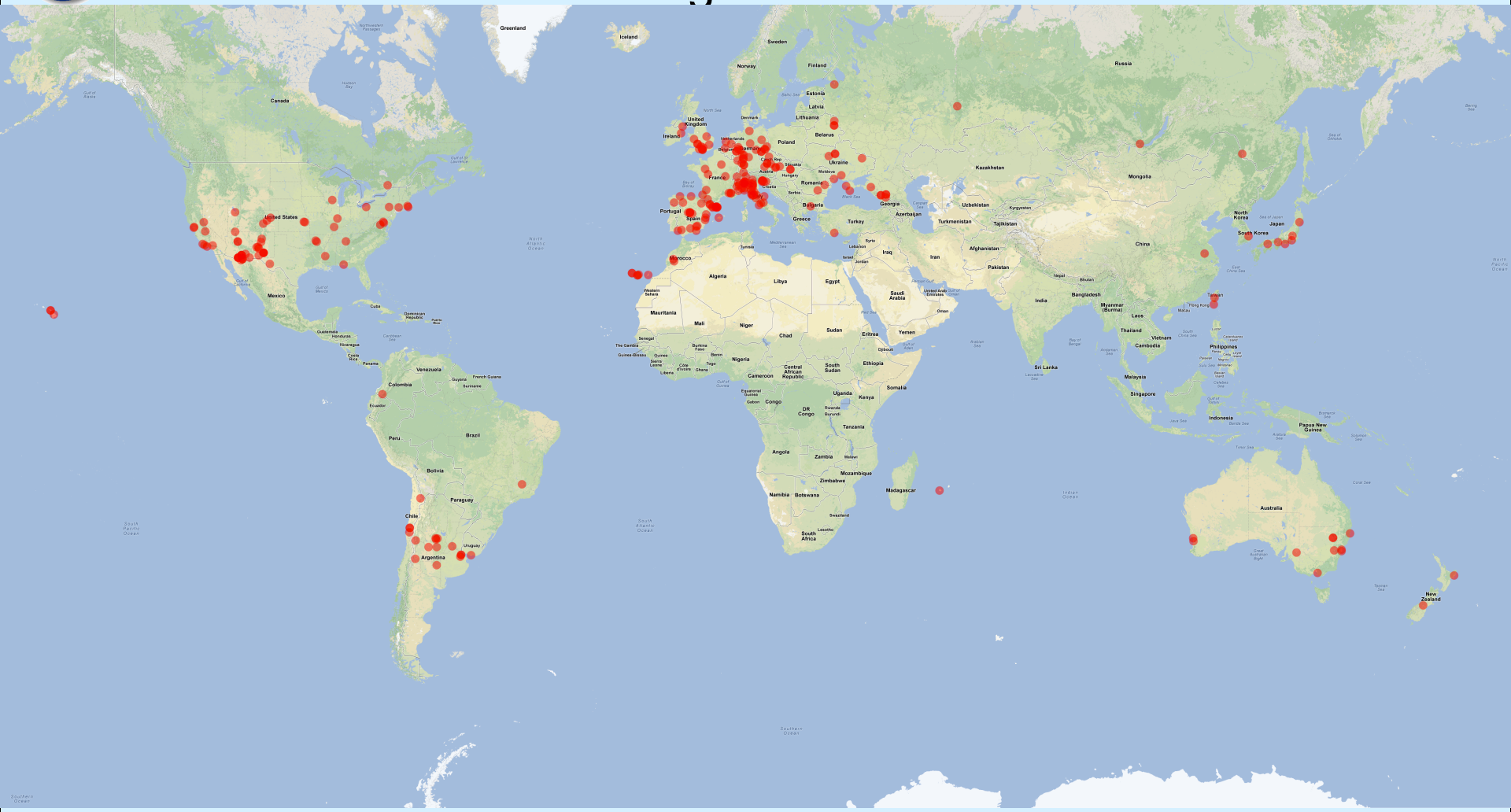
The “Real” MPC



Functions of International Asteroid Warning Network (IAWN)

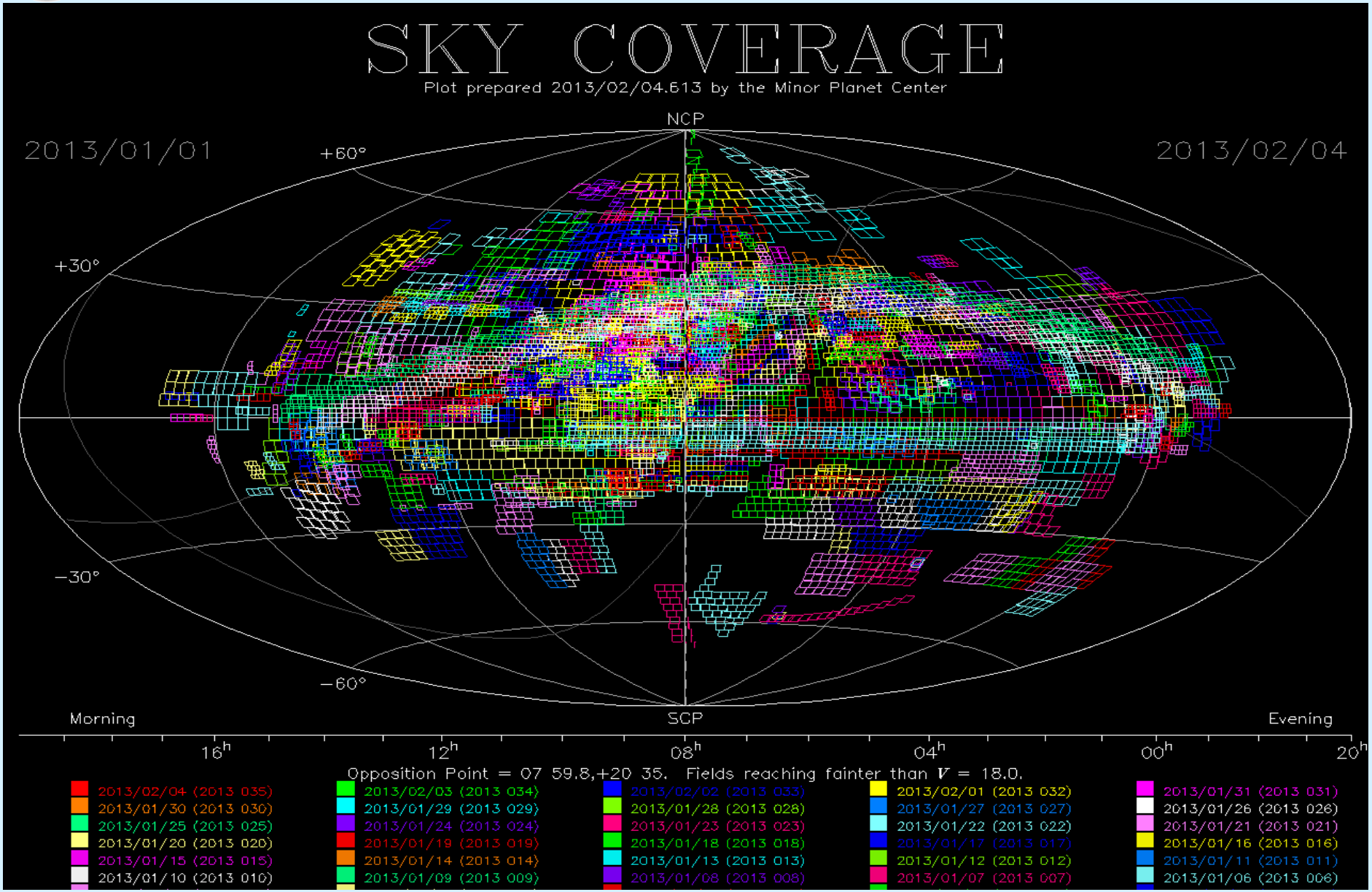
- ✓ (a) To discover, monitor, and physically characterize the potentially hazardous NEO population using optical and radar facilities and other assets based in both the northern and southern hemispheres and in space;
- ✓ (b) To provide and maintain an internationally recognized clearing house function 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.

IAWN Element: Existing Worldwide Observing Network

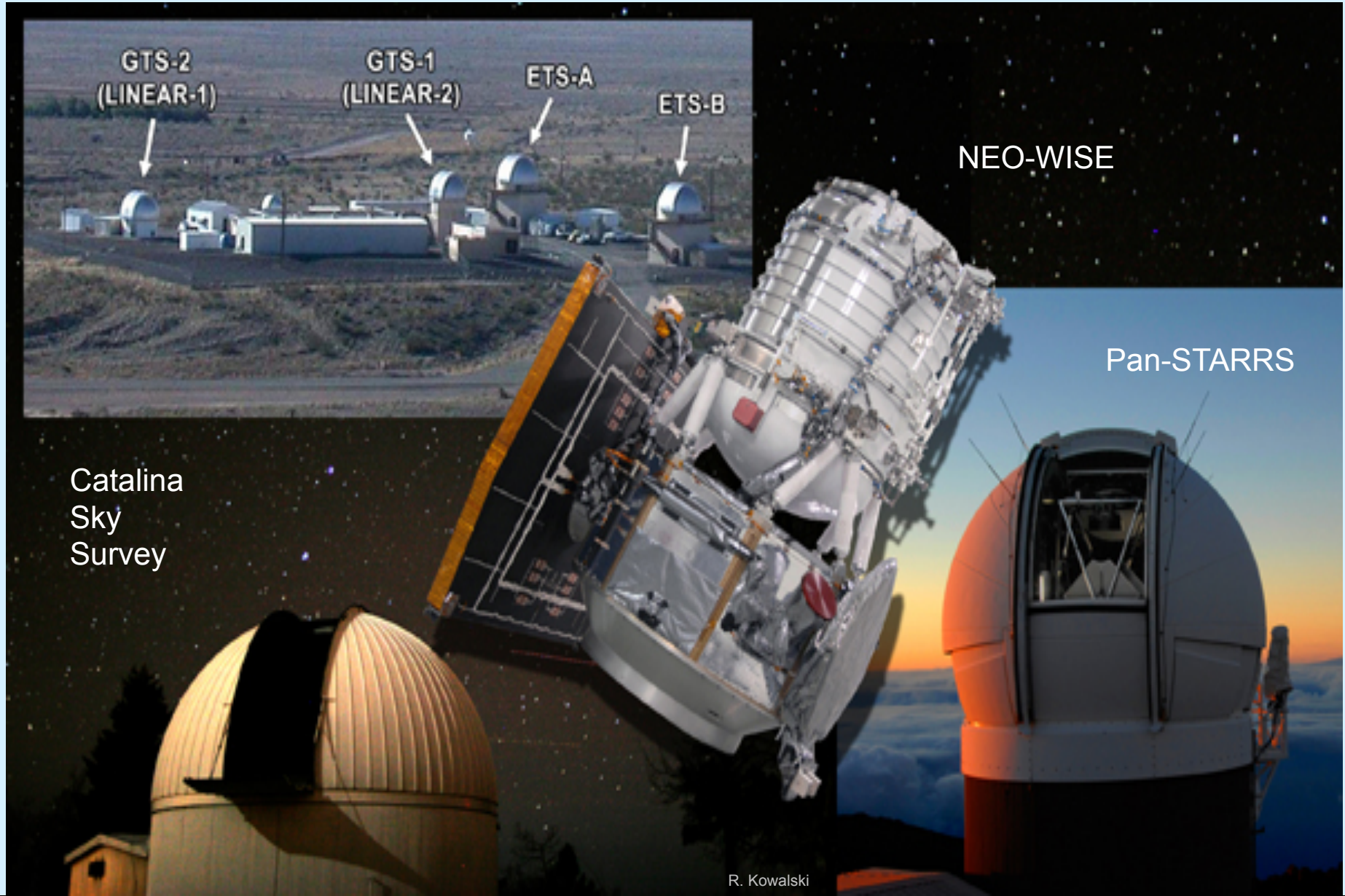


Received Data from 46 countries in 2012

Monthly Sky Coverage



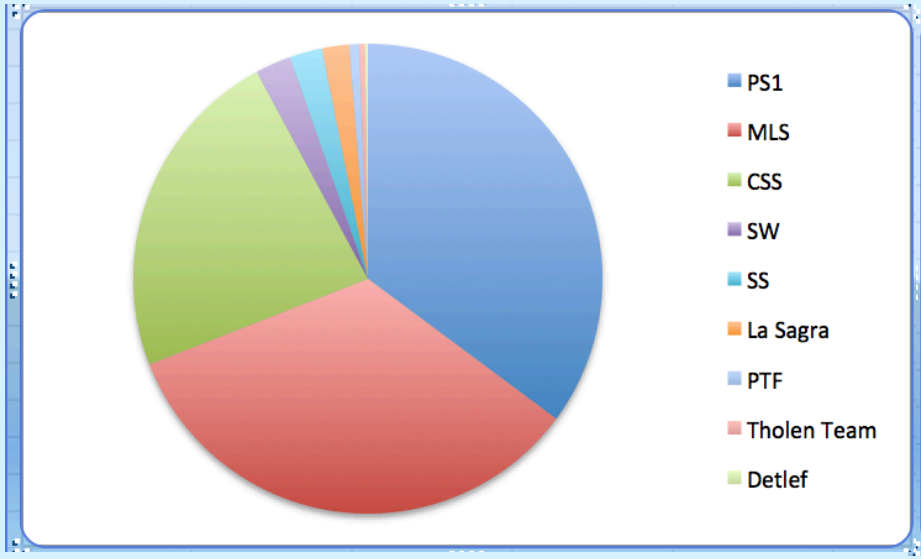
Current/Past Operational Assets

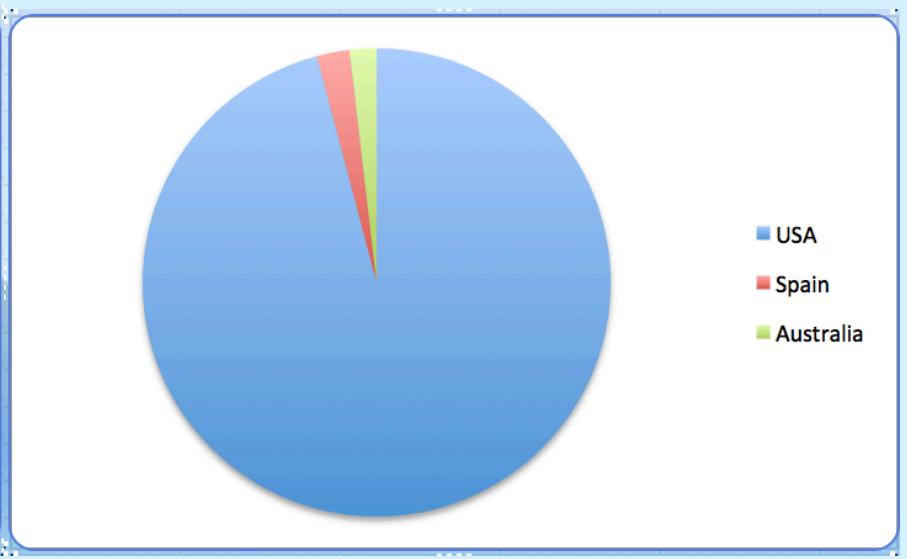


NEO Discovery Breakdown 2013

NASA-funded surveys responsible for > 96% of discoveries

< 2% of discoveries from unfunded (aka “amateur”) teams





The Minor Planet Center--capabilities

The MPC actively maintains a catalog of About 800,000 asteroids, of which some 10,500 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

The Minor Planet Center--communication

http://www.minorplanetcenter.net/
Near-Earth Object Confirmation Page
NEOCP Blog

Alert System (to MPC staff, JPL, NASA, then to public)

Relational Database
http://www.minorplanetcenter.net/db_search

Directed Communication (observation requests & pleas)

International Asteroid Warning Network (IAWN) "Needs List"

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

This requires the entire observable sky covered every few days to V ~20

A well positioned space-based infrared survey would discover objects much faster than the current rate, and discover objects that have unfavorable geometry with respect to Earth

(IAWN) “Needs List” continued

Dedicated groundbased telescopes capable of surveying to V ~ 24

Dedicated groundbased telescopes for astrometric and physical observation follow-up to V ~ 24

Survey cooperation and collaboration

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

What we don't need…

More groundbased telescopes that can only observe small patches of sky to V < 20

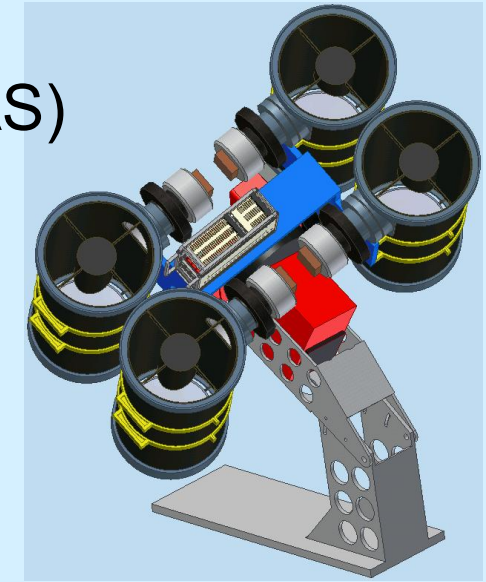
Poor-quality groundbased follow-up of NEOs to V ~ 19-20

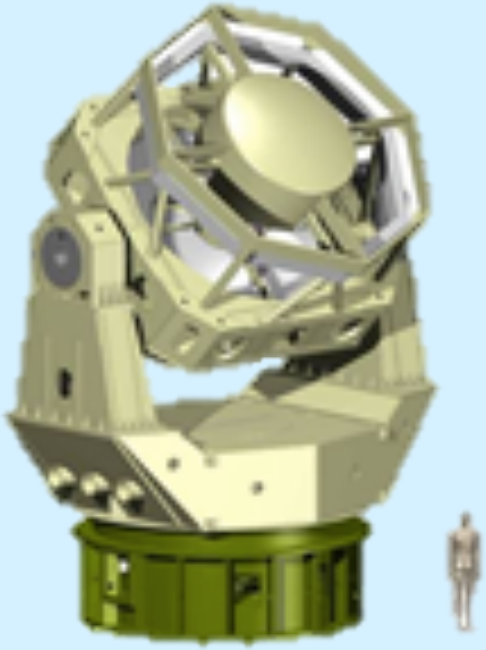
Insufficient or excessive communication regarding speculative or incorrect impact predictions

Excessive focus and communication regarding non-threatening impactors (aka "meteors")

Future Capabilities-funded by NASA NEOO

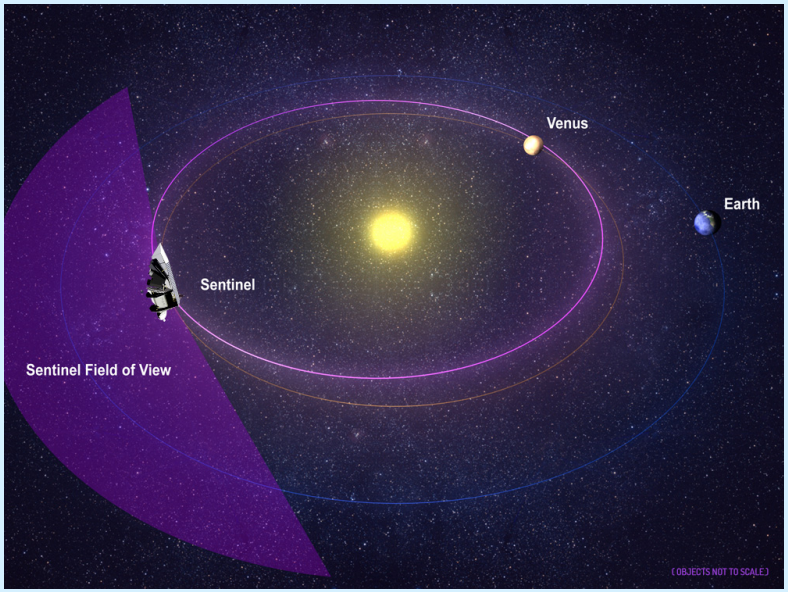
Asteroid Terrestrial Last Alert System (ATLAS)
University of Hawaii (PI John Tonry)
Daily coverage of complete sky – 4-6 sites
Find all near-term impactors



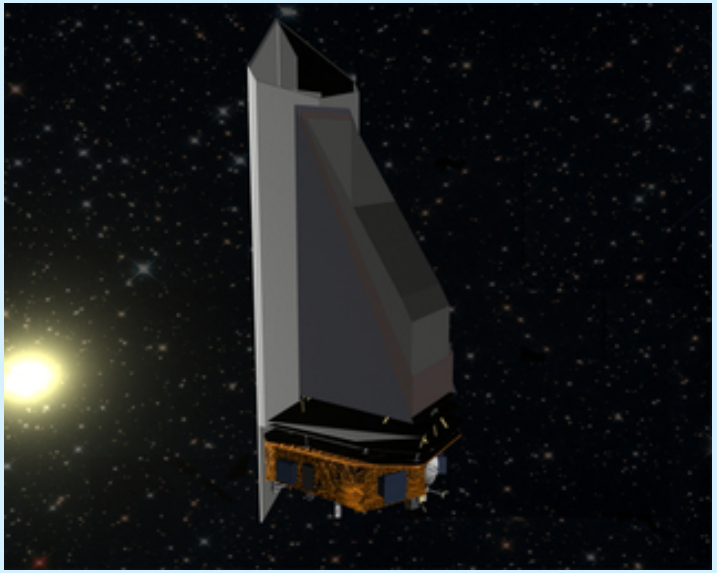


Space Surveillance Telescope (SST)
USAF and DARPA Project
Serendipitous detection of NEAs in space debris observations

Future Capabilities in Technology Development



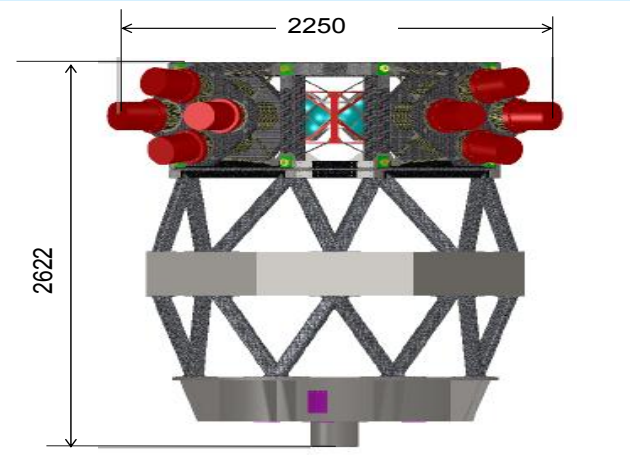
B612-Sentinel
Space Telescope
Private Endeavor

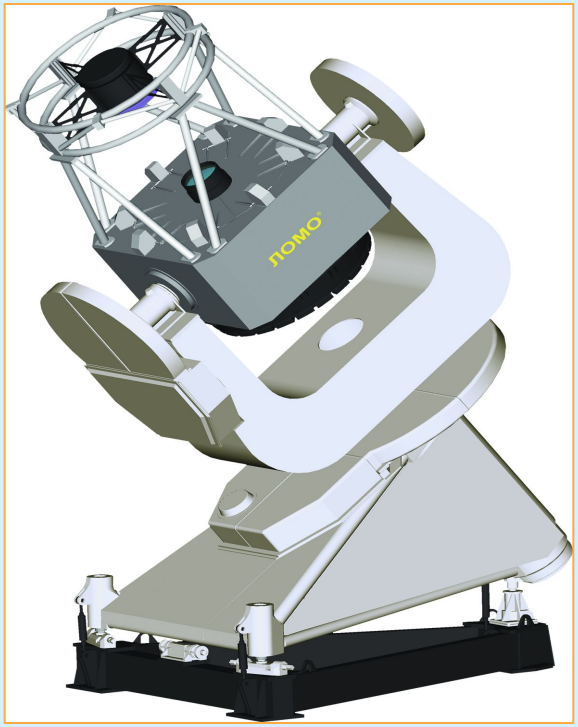


NEOCam
Space-based infrared survey from Earth L1 orbit, PI Amy Mainzer (JPL).
Proposed

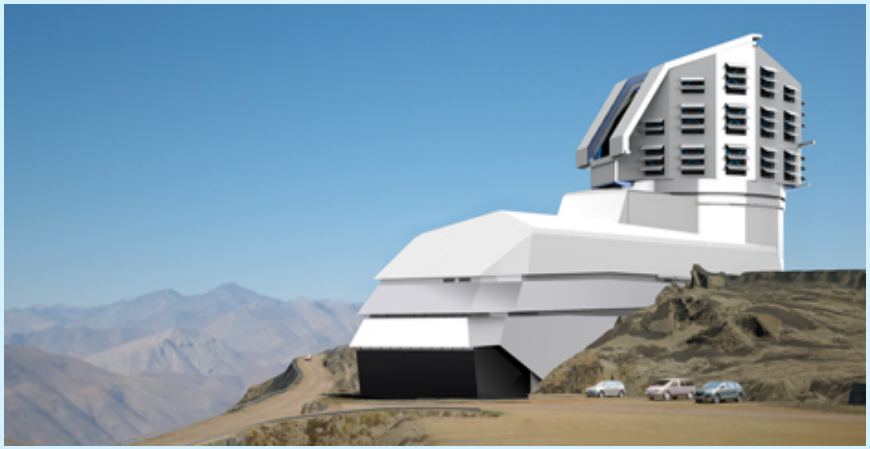
Future Capabilities – Planned or funded

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 and for extending surveys to much fainter limiting magnitudes

More effort is needed to coordinate international observing activities

Communicating goals and limitations with observers and public is essential to furthering efforts