PDC2015
Frascati, Roma, Italy

X Planetary Defense – Recent Progress & Plans
☐ **NEO Discovery**
☐ **NEO Characterization**
☐ **Mitigation Techniques & Missions**
☐ **Impact Effects that Inform Warning, Mitigation & Costs**
☐ **Consequence Management & Education**

IAA-PDC-15-01-04

RECENT ENHANCEMENTS TO THE NEO OBSERVATIONS PROGRAM: IMPLICATIONS FOR PLANETARY DEFENSE

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Keywords: *NEO observations, survey, characterization*

ABSTRACT

Recent enhancements to NASA's near-Earth object (NEO) Observations Program have led to ~45% increase in the discovery rate of near-Earth asteroids (NEAs) over the past year. Since the program's inception in 1998, NASA has funded several universities and space institutes to upgrade and operate existing 1-meter class telescopes to conduct the search for NEOs. Of critical importance to the effort is the Minor Planet Center (MPC) of the Smithsonian Astrophysical Observatory, where automated systems process [in near real-time] observations produced by the search teams. The NEO Program Office at the Jet Propulsion Laboratory (JPL) determines precise orbits for the objects. Both JPL and the MPC utilize processes and procedures for NEO orbit determination and prediction that are sanctioned and monitored by the International Astronomical Union (IAU) and produce data catalogues on small bodies in the Solar System that are utilized world-wide by the astronomical community.

Today, NASA funds three primary ground-based capabilities: the Lincoln Near-Earth Asteroid Research (LINEAR) project, the Catalina Sky Survey (CSS), and the Panoramic Survey Telescope and Rapid Reporting System (Pan-STARRS). LINEAR is transitioning to a larger telescope. Pan-STARRS-1 is now dedicated to NEO efforts and its discovery rate is up 70% over the previous year. While the CSS discovery rate remains the same, its camera will be upgraded this year. These survey efforts are increasingly yielding close encounter predictions (i.e., < 0.001 AU)

and some small Earth impact events (e.g., 2008 TC_3 and 2014 AA). Such encounters provide opportunities for NASA's Infrared Telescope Facility (IRTF) to make spectral measurements; or, in the case of planetary radars at Arecibo and Goldstone, refine the orbit of the object with great precision and even "image" the small primitive body.

Most recently, the *Wide-field Infrared Survey Explorer* (*WISE*) was reactivated with an emphasis on detecting NEOs. *WISE* is in Sun-synchronous, near-polar inclination (97.5°) orbit around the Earth. The 'NEOWISE-R' project continues to utilize *WISE* in 'warm mode' (i.e., at 3.4 and 4.6 μm) and in conjunction with ground-based follow-up, this unique dataset has set limits on population statistics, orbital parameters, approximate sizes, and initial compositional knowledge of the asteroid population.

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