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Near-Earth Object (NEO) Discovery

Detection of small, hazardous asteroids by ATLAS and contemporaneous NEO surveys in the era of LSST

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ABSTRACT

With the addition of two telescopes in the southern hemisphere, the Asteroid Terrestrial-impact Last Alert System (ATLAS) is now able to observe nearly the entire sky four times each night to a sensitivity of V=19.5 per exposure. This capability allows ATLAS to detect a 50 m asteroid one week prior to impact or close approach. Besides ATLAS, existing surveys such as Pan-STARRS, Catalina Sky Survey, and Zwicky Transient Facility continue to improve their sky coverage and performance, and ESA's NEOSTEL ("fly-eye") is nearing operations. Advances in commercial optics, detectors and software are leading to construction of even more small telescopes scanning the sky for asteroids nightly.

The Vera Rubin Observatory's Legacy Survey of Space and Time (LSST) will by a factor of ~6 increase the distance (and therefore warning time) at which hazardous asteroids can be detected. However, this capability comes with the requirement of needing multiple "tracklet" observations over a time span greater than a week, meaning that some small objects may go undetected if there are weather losses or "picket fence" effects during their short observability window. Relatively large asteroids (> 140 m) will usually be visible to Rubin long enough to overcome observing losses, but smaller, still-hazardous asteroids may "slip through the net".

In this talk, we describe the developing all-sky survey landscape and discuss size regimes and impact scenarios for which significant survey capability is still needed to complement LSST, not only improving the global capability to respond to smaller, still-dangerous impactors but also shortening the time to reach the 2005 George E. Brown mandate to track 90% of the 140 m hazardous asteroids.

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Comments:

Oral presentation requested