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Ongoing and Upcoming Mission Highlights

STUDYING IMPACTORS WITH THE NEO SURVEYOR MISSION

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ABSTRACT

The Near-Earth Object Surveyor (NEOS) mission is a NASA observatory dedicated to finding, tracking, and characterizing potentially hazardous asteroids and comets. The mission's survey cadence is optimized for the detection of such objects, with a nominal plan of collecting four detections spanning roughly 6-10 hours, followed by a second set of four detections obtained approximately 12-13 days later.

It is important to be able to estimate the probability that a given NEOS survey plan will detect hazardous asteroids so that the survey plan can be further optimized as needed. Estimating the probability that a given NEOS survey plan will observe an asteroid can be split into two parts, the probability that an object with the specific orbital elements exists (Pe), and the probability that the object is detectable by NEOS (Pd). The product of these two values is then the probability that NEOS will detect an impactor.

Here we construct an artificial population of objects which tile the orbital parameters phase space of objects that all impact the earth on the same day at the end of the nominal 5-year mission of NEOS. The orbital elements sampled are not required in this case to be physically realistic but contain realistic orbital parameters as a subset. This population is then used to estimate the probability Pd that an object with the provided orbital elements is observable by NEOS. This is done using simulation tools developed by the NEOS mission that simulate the full 5 years of survey for each field of view captured by the telescope. Splitting the problem into two parts allows for different models of the NEO population to be analyzed, including various impactor population models. Once the probability Pd is known for a given survey plan, the probability of detection can then be applied to each impactor in a given population model by matching orbital elements.

The objective of this analysis is to understand the detectability of impactors, including their rates of motion and locations on the sky. By analyzing these synthetic impactor populations in comparison to other NEO subgroups and background objects, it may be possible to improve our ability to more rapidly discriminate between them.

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Comments:

Oral presentation is requested