NEOCam / NEO Surveyor Survey Cadence: Discovery, Self-Follow-Up, and Orbital Quality. S. Sonnett[1], A. Mainzer[2], T. Grav[2], T. Spahr[3], J. Masiero[4], E. Lilly[1] [1]Planetary Science Institute (ssonnett@psi.edu), Tucson, AZ, [2]University of Arizona, Tucson, AZ, [3]NEO Sciences, LLC, Boston, MA, [4]NASA Jet Propulsion Laboratory, Pasadena, CA.

Introduction: The Near-Earth Object Camera (NEOCam) is a proposed space telescope with the capability to discover, track and characterize at least two-thirds of potentially hazardous asteroids (PHAs) with diameters larger than 140m. In 2020, NEOCam is planned to be renamed to the NEO Surveyor. These PHAs are large enough to cause significant regional damage, and the U.S. Congress has tasked NASA with finding at least 90% of them by 2020 [1]. NEOCam / NEO Surveyor is expected to detect thousands of comets, hundreds of thousands of Near-Earth Objects (NEOs) and millions of main belt asteroids. Since moving objects, in particular NEOs, are the main focus of the NEOCam / NEO Surveyor mission, the survey can be optimized for maximum discovery rate by adjusting the survey cadence to ensure efficient and reliable linking observations into tracklets, which are position-time sets of a minor planet. It is also important for the survey cadence to provide self-follow-up that yields orbits with quality similar to that of the known NEOs today.

The Survey Simulator for NEOCam / NEO Surveyor (NSS) is a set of tools being developed to support the efforts to optimize the survey and verify the ability of the designed mission to meet its scientific objectives. The NSS consists of a comprehensive representation of the mission performance, including the flight system hardware, mission operations, and ground data system processing. The NSS takes as its input a reference population of solar system bodies, the NEOCam / NEO Surveyor Reference Small Body Population Model (RSBPM), and performs a frame-by-frame simulation of the survey over the course of its entire operational lifetime.

Note that the RSBPM allows for performance to be evaluated as a function of diameter, rather than the traditional method of equating absolute magnitude H = 22 mag as a proxy for 140m. It has been shown that a completeness of 90% of objects with H < 23 mag is needed in order to ensure that 90% of objects larger than 140m are found [2].

We present here our ongoing work on mission architecture trades and the optimization of the survey cadence for NEO discovery and tracking [3,4]. We will present the latest NEOCam / NEO Surveyor survey cadence and its expected performance. Current best estimates yield a completeness rate of the NEOs > 140m of ~76% after the five-year nominal survey. This can be improved to ~82% after an additional 5-year extended survey. Studies have shown that the 90% goal can be achieved by a combination of a space mission like NEOCam / NEO Surveyor and a ground-based survey like LSST [5]. We will also present how the survey cadence provides self-follow-up of the NEO population and ensures orbital quality on par with the current NEO population (Figs. 1, 2).

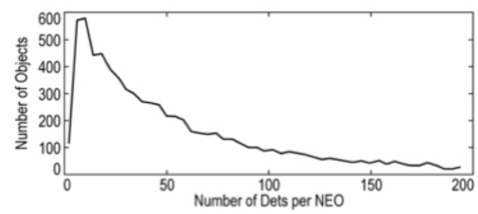

Figure 1: Histogram showing the number of detections expected for a set of NEOs during the five-year nominal mission lifetime. While most NEOs will get 12-16 observations, a significant fraction of NEOs will get 50+ observations over the prime mission lifetime.

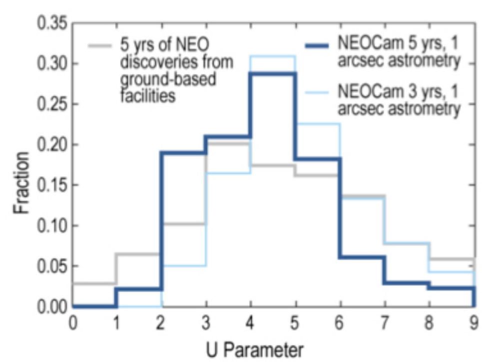

Figure 2: The NEO orbital quality from the NEOCam / NEO Surveyor baseline survey cadence is superior to the quality provided by the current surveys and reported to the Minor Planet Center over a similar 5-year time frame.

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