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NEOCam Survey Cadence and Simulation

Tommy Grav⁽¹⁾, A. Mainzer⁽²⁾, T. Spahr⁽³⁾, J. Masiero⁽²⁾, J.M. Bauer⁽⁴⁾, R. M. Cutri⁽⁵⁾, E. Kramer⁽²⁾, S. Sonnett⁽¹⁾, E.L. Wright⁽⁶⁾

⁽¹⁾ *Planetary Science Institute, 1700 East Fort Lowell, Suite 106, Tucson, AZ 85719,
tgrav@psi.edu*

⁽²⁾ *NASA Jet Propulsion Laboratory/Caltech, Pasadena, CA 91109*

⁽³⁾ *NEO Sciences LLC, Eastham, MA 02642*

⁽⁴⁾ *University of Maryland, College Park, MD 20742*

⁽⁵⁾ *IPAC, MS 100-22, Caltech, 1200 E California Blvd, Pasadena, CA 91125*

⁽⁶⁾ *University of California, Los Angeles, Los Angeles, CA 90095*

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ABSTRACT

The Near-Earth Object Camera (NEOCam) is a space mission that is designed to discover, track, and characterize at least two-thirds of potentially hazardous asteroids (PHAs) that are larger than 140 m and therefore capable of causing significant regional damage. NEOCam will also detect more than 2000 comets, more than 100,000 smaller NEOs, and millions of more distant main belt asteroids and other solar system bodies.

The NEOCam Survey Simulator (NSS) is a set of tools that are being developed to verify NEOCam's ability to meet the mission's scientific objectives. The NSS consists of a comprehensive representation of the mission's performance, including the flight system hardware, mission operations, and ground data system processing. The NSS

takes as its input a reference population of small solar system bodies, the NEOCam Reference Small Body Population Model (RSBPM), and performs a frame-by-frame simulation of the survey over the course of its entire operational lifetime. The ground data system's ability to extract detections, and link detections into tracklets and tracks is also modeled.

The NSS has been used as a tool to investigate mission architecture trades as well as to determine a cadence suitable for PHA discovery and tracking. In addition, the NSS is being used as a project systems engineering tool to verify and validate performance against the mission's scientific objectives and flow down detailed requirements on each of the flight and ground subsystems. Here, we will report on the use of the NSS to optimize the survey cadence for PHAs, which requires a delicate balance between the ability to perform intra- and inter-night linking of detections, provide secure orbits, and maximize overall discovery numbers.
