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NEOSM Survey Cadence and Simulation

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The Near-Earth Object Surveillance Mission (NEOSM) is a planned space-based infrared mission that will nominally launch in 2025 and librate at the Earth-Sun L1 Lagrange point. The NEOSM Project was formulated to address the need to detect, catalog, and characterize near-Earth objects (NEOs) to support informed decision making for any potential mitigation activity. NEOSM detects NEOs, obtains high quality orbits for them, provides physical characterization of the NEOs and their source populations, and provides more detailed physical characterization for individual targets with significant impact probabilities. Specifically, NEOSM will detect, track, and characterize 2/3 of potentially hazardous asteroids (PHAs) larger than 140m - large enough to cause potentially significant regional damage. NEOSM is expected to detect thousands of comets, hundreds of thousands of NEOs and millions of main belt asteroids. Since moving objects, in particular NEOs, are the main focus of the NEOSM project, 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-followup that yields orbits with quality similar to that of the known NEOs today. The NEOSM Investigation Software Suite (NISS) 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 NISS 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 NEOSM 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 140 m are found. We present here our ongoing work on mission architecture trades and the optimization of the survey cadence for NEO discovery and tracking. We will present the latest NEOSM survey cadence and its expected performance. We will present the completeness rate after the baseline 5-year mission and a possible extended mission. Studies have previously shown that the 90% goal can be achieved by a combination of a space mission like NEOCam and a ground based survey like LSST. We will also present how the survey cadence provides self-followup of the NEOs population and ensures orbital quality on par with the current NEO population.