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METHODS FOR SIMULATING COMET POPULATIONS IN PREPARATION FOR THE NEAR-EARTH OBJECT SURVEYOR MISSION

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Keywords: comets, comae, infrared imaging, simulations

We present here an update to the methods of incorporating comets into the Near-Earth Object Surveyor (NEO Surveyor; PDC presentation Mainzer et al. (2021)) mission's Reference Small Body Population Model (RSBPM; [1]), with particular focus on accurately incorporating dust and $CO+CO_2$ gas comae activity behaviors so as to reproduce how they influence the morphological and photometric properties of the comets NEO Surveyor will observe. A better understanding of these physical characteristics are relevant for planetary defense since a comet's extended emission can complicate the measurement of its nucleus's diameter. The NEO Surveyor will provide unprecedented detection, tracking, and characterization of Near-Earth Objects (NEOs) – including near-Earth comets – using high-cadence imaging from a space-based infrared telescope. Planning for the NEO Surveyor requires

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an accurate model of the Solar System's small body populations in order to develop efficient operational survey strategies and to assess survey performance once in-flight operations have commenced. The NEO Surveyor Investigation Team is currently developing the RSBPM that will contain the current best estimates of the dynamical and physical properties of the Solar System's small body populations. Development of the RSBPM will be completed before the NEO Surveyor launch, and the finished product will be peer-reviewed to ensure accuracy. Once the survey begins, we will compare predictions based on the RSBPM to actual observational measurements to calculate the efficiency of the survey, and thus de-bias the survey to properly characterize each population in order to assess Earth impact risks. We are currently focusing on developing methods of modeling cometary activity behaviors utilizing derived (1) orbital elements distributions, (2) nuclei size frequency distributions, (3) accurate cometary solar phase and photometric functions, (4) dust activity behaviors as characterized by empirical trends of the $\epsilon f \rho$ parameter, and (5) CO and CO_2 gas comae trends based on past and ongoing surveys. Future efforts by the NEO Surveyor Investigation Team will focus on incorporation of other characteristic cometary phenomena (e.g., dust tails and trails) to help refine expected detection efficiencies and coma and/or tail flux removal for robust nucleus size estimation.

NEO Surveyor is a project sponsored by NASA's Planetary Defense Coordination Office, a division of NASA's Planetary Science Directorate.

Comments:
(Poster presentation requested.)

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