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Main Belt science in the era of NEOCam

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Abstract

The Near-Earth Object Camera (NEOCam) is a proposed NASA Planetary Defense mission that would conduct a space-based survey in the thermal infrared to find and characterize asteroids and comets that may pose a threat to Earth. During the course of this survey, NEOCam would also detect asteroids in the Main Belt, providing us an unparalleled view of their orbits and physical properties. We will review what was learned about the Main Belt asteroids (MBAs) from the precursor NEOWISE mission, and what we can expect to learn using that data that NEOCam would provide.

Results from NEOWISE

The design of NEOCam has been informed by the lessons and results learned from the Near-Earth Object Wide-field Infrared Survey Explorer (NEOWISE) mission. Using data from its thermal infrared survey of the entire sky, NEOWISE provided astrometric and radiometric information for over 150,000 MBAs. These data have shown us: asteroid families have highly uniform albedos; the non-family asteroids in the inner Main Belt are roughly evenly split between S-complex and C-complex while the outer Belt is almost entirely C-complex; 3.4 micron albedos can be used distinguish objects of unique composition and history; and have revealed a variety of other facets of this population. We show in Figure 1 the distribution of MBA albedos compared to orbital semimajor axis and inclination based on NEOWISE data from PDS.

NEOCam's Sensitivity to MBAs

Based on the current proposed instrument design, Main Belt asteroids would be predominantly detected in NEOCam's NC2 channel. Survey simulations using cadences and sensitivities optimized for the near-Earth object search indicate that NEOCam would achieve 90% completeness down to diameters of 1.5 km throughout the Main Belt, and in the inner Main Belt be complete to 90% at 500m. In total, NEOCam would detect and determine sizes for 2-8 million MBAs (depending on the size-distribution of the population), and constrain albedos for all objects that also have optical measurements (e.g. from LSST).

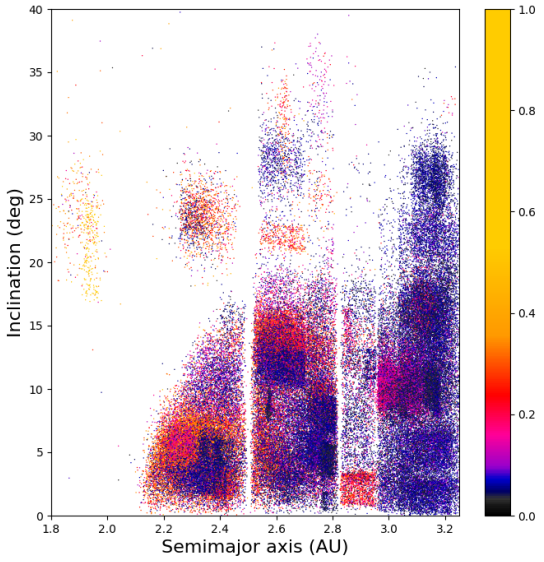

Figure 1- Main Belt asteroids seen by NEOWISE. Color shows the geometric optical albedo as indicated by the colorbar.

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