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SIZE AND ALBEDO DISTRIBUTIONS OF NEAR-EARTH ASTEROIDS OBSERVED BY NEOWISE

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ABSTRACT

The Near-Earth Object population — objects with a perihelion distance of less than or equal to 1.3 AU — consists of asteroids and comets with a diverse range of chemical and geological histories. Of these, the study of Near-Earth Asteroids (NEA) is of particular interest for practical concerns as well as curiosity-driven research. Investigating the physical properties, numbers, and orbital element distributions of NEAs is essential to quantifying the impact flux on Earth. NEAs are understood to be a dynamically young population with lifetimes of ~10^7 years (Morbidelli & Gladman 1998). While their origin and evolution have been extensively studied (e.g., Bottke et al. 2007 and Tricarico 2017), efforts to better understand the dynamical history and population characteristics of NEAs have been hampered by the difficulty of obtaining radiometric data.

Recent efforts by asteroid surveys such as the Wide Field Infrared Survey (WISE; Wright et al. 2010) have expanded the number of objects for which size and albedo distributions can be computed. For instance, Mainzer et al. (2011) debiased and characterized WISE-observed NEAs using the Near-Earth Asteroid Thermal Model (NEATM; Harris 1998) and made predictions on the cumulative size distribution law. Mainzer et al. (2012) furthered this study and presented an analysis of NEA subpopulations, their physical characteristics, and constraints on the number of potentially hazardous asteroids.

Here, we analyze and characterize the most updated set of NEAs observed by the Near-Earth Object Wide Field Infrared Survey Explorer (NEOWISE; Mainzer et al. 2014). The WISE mission completed its baseline science objectives in 2010 and is now in extended operations as the NEOWISE mission. NEOWISE has discovered more than 40,000 new solar system objects,[1] most of which are in the main belt. Since NEOWISE observes objects based on their thermal emission, observations are largely insensitive to albedo, making them ideal for the assessment of the albedo distribution. Here, we use the NEATM on thermally dominated observations of over ~1600 different NEAs to compute their diameters and albedos. We examine the distribution of albedos as a function of size and orbital elements. This sample represents an improvement in the number of objects selected based on their thermal emission

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[1] https://wise2.ipac.caltech.edu/docs/release/neowise/

and will help us construct synthetic NEO populations for the NEO Surveyor mission (Mainzer et al. 2015). Any correlations between albedos and orbital elements could further be used to test predictions about the sources and sinks of NEOs (e.g., Granvik et al. 2018).

Comments:
Oral presentation preferred.

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