NEOWISE: The distribution of the large primitive asteroids

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The Wide-field Infrared Survey Explorer (WISE) is a NASA Medium-class Explorer mission that surveyed the entire sky in four infrared wavelengths at 3.4, 4.6, 12, and 22 microns (denoted W1, W2, W3, and W4, respectively) [1,2]. The solar-system specific portion of the WISE project, known as NEOWISE, collected more than 2 million observations of more than 158,000 asteroids, including near-Earth objects, main-belt asteroids, comets, Hildas, Jovian Trojans, Centaurs, and scattered-disk objects [3]. The methods used for data extraction and thermal modeling have been extensively detailed in [3–6]. The resulting physical properties have been reported in a series of papers [3–13]. In [6] and [9], it was shown that the visible albedo in the V band and the near-infrared albedo in the W1 and W2 bands can be used to taxonomically classify a significant number of the largest members of the Hilda and Jovian Trojan populations (see Figure 1). This allows for the study of the distribution of primitive asteroids in the region between the main asteroid and the giant planets, down to sizes where the populations are completely sampled. Figure 2 shows that for the Hilda population, where the sample is observationally complete to about 40 km, the C/P types dominated over the D types at the larger sizes. However, for the smaller sizes, the D types become significantly more numerous. For the Jovian Trojan population, for which the sample is observationally complete to about 50 km, the D types are slightly more numerous at the largest sizes. As smaller sizes are included, the D types become more dominant, with more than 80 % of the objects larger than 50 km having this taxonomic type. We have now extended the study to include thermal fits and taxonomic classification of the outer main belt, Cybeles, irregular satellites of Jupiter and Saturn, and the Centaur population [13], and will present the results of this work. The distribution of primitive asteroids in the different populations from the outer main belt outwards to the region of the giant planets is key in understanding and testing current theories of how the early solar system formed and evolved.

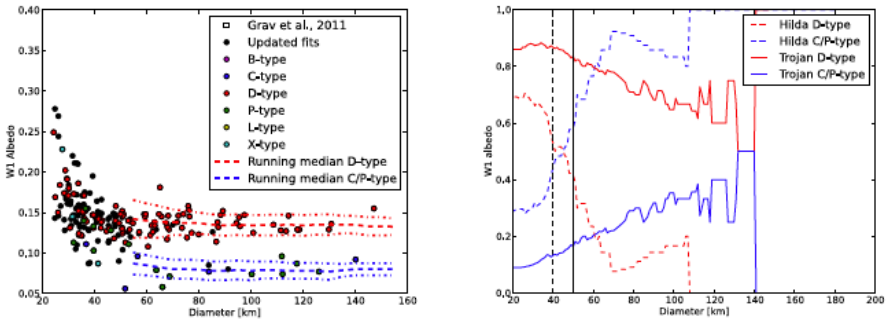

Figure: Left: Diameter vs. W1 band albedo for the thermal fits of the observed Jupiter Trojan population. A distinct separation between the red-sloped D types and the flatter C/P types is apparent among the objects larger than ∼50 km; Right: Fraction of C/P type vs. D type for objects larger than a diameter for the Hilda and Jovian Trojan populations. The dashed and solid vertical lines show the diameter for which the taxonomic classification of the Hilda and Jovian Trojan populations, respectively, are thought to be complete.

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