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The Sub-Kilometer Asteroid Diameter Survey II — The debiased size distribution of main belt asteroids.

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Abstract

The Sub-Kilometer Asteroid Diameter Survey (SKADS, [1]) imaged ∼8.6 square degrees of sky and detected 1277 main belt asteroids to a limiting magnitude of R∼23 (at which the efficiency is 50%). SKADS was performed in both V and R filters and allows a probabilistic assignment of an albedo, and therefore diameter, to each object. By planting synthetic objects directly into the images we have determined the moving object detection efficiency as a function of their rate and direction of motion and their apparent magnitude on each of the six survey nights. The surveying pattern was designed to provide recovery of the asteroids over intervals of >6 days and therefore provides a good orbit, distance and absolute magnitude for each of the objects. We have performed a high-resolution, high-accuracy simulation of the multi-night surveying procedure to compute the observational selection effects as a function of semi-major axis, eccentricity, inclination and absolute magnitude (see Figure 1). We will present the results of this simulation and provide the observationally corrected distributions of main belt objects as a function of their orbital parameters, absolute magnitude and diameter.

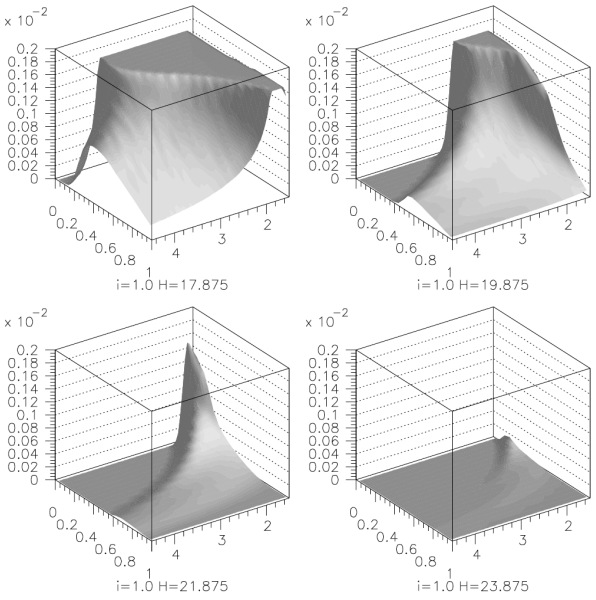

Figure 1: The four sub-figures show the absolute probability of detecting an asteroid in SKADS as a function of eccentricity ('left' axis) and semi-major ('right' axis in AU) for low inclination objects ($i = 1°$) and increasing absolute magnitude (H). SKADS finds all the objects for the range of values corresponding to the plateaus in the two top figures. The detection probability drops for larger semi-major axis, smaller eccentricity, and smaller objects (larger H).

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References

[1] B. J. Gladman, and 11 colleagues 2009. On the asteroid belt's orbital and size distribution. Icarus 202, 104-118.