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THE DETECTION RATE AND SIZE-FREQENCY DISTRIBUTION OF H>18 NEOS AND ARM TARGETS BY PAN-STARRS1 AND PAN-STARRS2 SURVEYS.

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ABSTRACT

We assess the performance of the 2nd telescope of the Panoramic Survey Telescope and Rapid Response System PS2 (e.g. Morgan et al. 2012) for detecting NEOs with absolute magnitudes (H) in the range 18<H<30 and targets for NASA's Asteroid Retrieval Mission (ARM) with 27<H<31 and compare it with its predecessor PS1. We conclude that PS2 will make a significant contribution to the discovery effort of NEOs and that our predicted detection rate for NEOs with 18<H<30 is within a factor of 2 of the number of actual detections by PS1. On the other hand, we found a 1-2 order-of-magnitude disparity between our predicted ARM target discovery rates and real candidates discovered by PS1. The difference implies that there are more small NEOs on Earth-like orbits (i.e. with low v_∞ and Δv) than predicted by current models and supports the works of Rabinowitz (1993b), Brown et al. (2013) and Ito & Malhotra (2010).

We show that there will be little time available for followup characterization of the ARM targets by existing ground-based facilities. The average object is only available for 4 days with SpeX on NASA's IRTF telescope and for 21 days with the Arecibo and Goldstone radar systems.

The debiased PS1 NEO absolute magnitude distribution exhibits a transition in the 21<H<23 interval from a shallow to steep slope consistent with other recent works. Our best fit yields $10^{(0.25\pm0.01)\,H}$ for NEOs with 18<H<22 and $10^{(0.59\pm0.01)\,H}$ for the smaller objects with 22<H<29. The 6 ARM target candidates detected by PS1 over 3.5 years of surveying have a corrected size-frequency distribution with a slope $\alpha = 0.38\ ^{+0.33}/_{-0.44}$ (i.e. $10^{\alpha H}$).

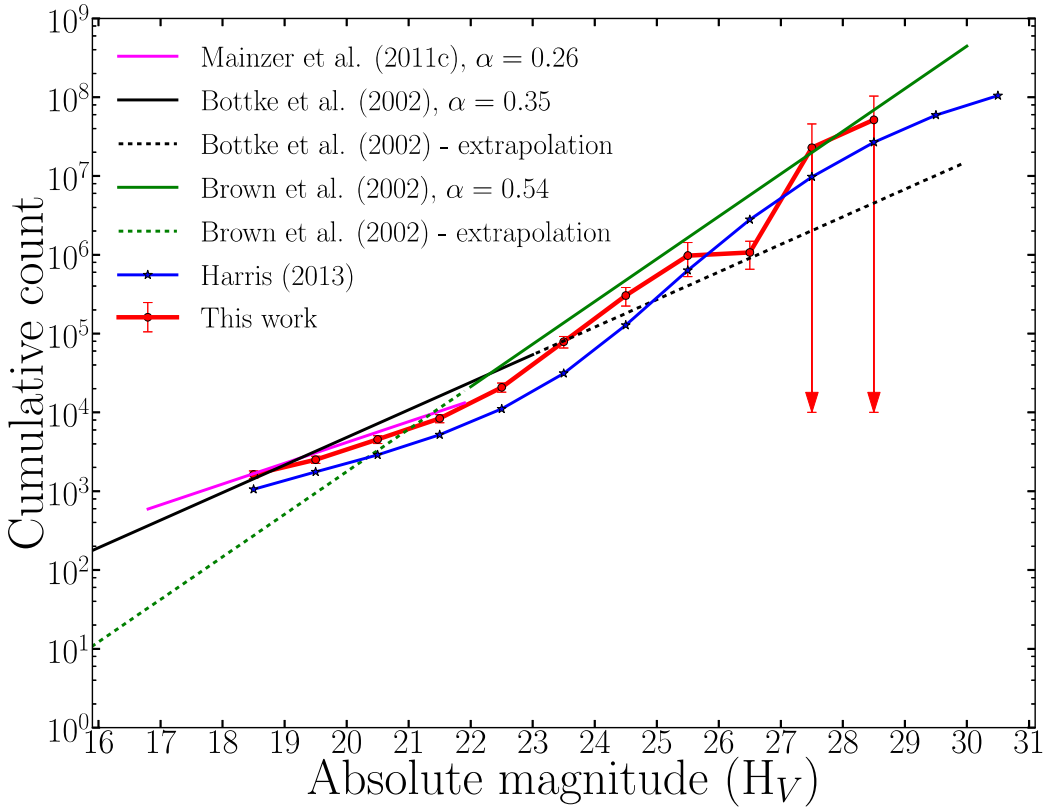

Figure 1: Our derived NEO size-frequency distribution from Pan-STARRS1 data in comparison to other contemporary models.

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