# The size-frequency distribution of near-Earth objects with $H > 18$ mag and ARM targets detected by Pan-STARRS1

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We assess the performance of the Asteroid Terrestrial-impact Last Alert System – ATLAS [6] and the 2nd telescope of the Panoramic Survey Telescope and Rapid Response System (e.g. [4]) PanSTARRS2 for detecting NEOs with absolute magnitudes ($H$) in the range $18 < H < 30$ and targets for NASA's Asteroid Retrieval Mission (ARM) with $27 < H < 31$. Both surveys will make a significant contribution to the discovery effort and our predicted detection rate for NEOs with $27 < H < 30$ is within a factor of 2 of the number of actual detections by PanSTARRS1. 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 PanSTARRS1. The difference implies that there are more small NEOs on Earth-like orbits than predicted by current models and supports the work of [5] and [1]. 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 PanSTARRS1 NEO absolute magnitude distribution exhibits a transition in the $21 < H < 23$ interval from a shallow to steep slope consistent with other recent works (e.g. [1], [2], [3]). Our best fit yields $10^{(0.28\pm0.01)\,H}$ for NEOs with $18 < H < 22$ and $10^{(0.54\pm0.03)\,H}$ for the smaller objects with $22 < H < 29$. The 6 ARM target candidates detected by PanSTARRS1 have a corrected size- frequency distribution with a slope $\alpha = 0.26^{+0.23}_{-0.28}$ (i.e. $10^{\alpha\,H}$).

**References:** [1] Brown, P.G., Assink, J.D., Astiz, L., and 30 coauthors, Nature, Volume 503, Issue 7475, pp. 238–241 (2013). [2] Harris, A., IAA Planetary Defence Conference Abstracts, Volume 3 (2013). [3] Mainzer, A., Grav, T. Bauer, J., and 43 coauthors, ApJ, Volume 743, Issue 2, article id. 156, 17 pp. (2011). [4] Morgan, J.S., Kaiser, N., Moreau, V., Anderson, D. and Burgett, W., Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series 8444 (2012). [5] Rabinowitz, D.L, ApJ 407, 412–427 (1993). [6] Tonry, J.L., PASP 123,pp. 58–73 (2011).