Absolute magnitudes and slope parameters of Pan-STARRS PS1 asteroids — preliminary results

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We present the study of absolute magnitude (H) and slope parameter (G) of 170,000 asteroids observed by the Pan-STARRS1 telescope during the period of 15 months within its 3-year all-sky survey mission. The exquisite photometry with photometric errors below 0.04 mag and well-defined filter and photometric system allowed to derive H and G with statistical and systematic errors. Our new approach lies in the Monte Carlo technique simulating rotation periods, amplitudes, and colors, and deriving most-likely H, G and their systematic errors. Comparison of H_M by Muinonen's phase function (Muinonen et al., 2010) with the Minor Planet Center database revealed a negative offset of 0.22 ± 0.29 meaning that Pan-STARRS1 asteroids are fainter. We showed that the absolute magnitude derived by Muinonen's function is systematically larger on average by 0.14 ± 0.29 and by 0.30 ± 0.16 when assuming fixed slope parameter (G=0.15, $G_{12} = 0.53$) than Bowell's absolute magnitude (Bowell et al., 1989). We also derived slope parameters of asteroids of known spectral types and showed a good agreement with the previous studies within the derived uncertainties. However, our systematic errors on G and G_{12} are significantly larger than in previous work, which is caused by poor temporal and phase coverage of vast majority of the detected asteroids. This disadvantage will vanish when full survey data will be available and ongoing extended and enhanced mission will provide new data.

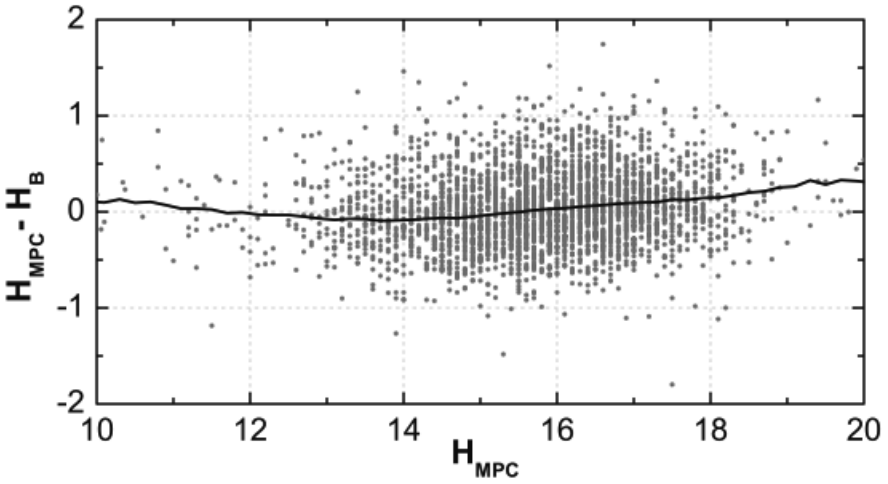

Figure: Difference between the absolute magnitude H_{MPC} reported by MPC (using the Bowell et al. (1989) technique) and this work's H_B value as a function of absolute magnitude. The solid line represents the moving average in 0.05 wide windows.

Acknowledgements: The Pan-STARRS Surveys have been made possible through contributions of the Institute for Astronomy, the University of Hawaii, the Pan-STARRS Project Office, the Max-Planck Society, and its participating institutes, the Max Planck Institute for Astronomy, Heidelberg, and the Max Planck Institute for Extraterrestrial Physics, Garching, The Johns Hopkins University, Durham University, the University of Edinburgh, Queen's University Belfast, the Harvard-Smithsonian Center for Astrophysics, and the Las Cumbres Observatory Global Telescope Network, Incorporated, the National Central University of Taiwan, and the National Aeronautics and Space Administration under Grant No. NNX08AR22G and No. NNX12AR65G issued through the Planetary Science Division of the NASA Science Mission Directorate.

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