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NEO Characterization

Probing shape, spin, and absolute magnitude: A comprehensive study of thirteen asteroids with MOID less than 1 AU

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Asteroids with MOID less than 1 AU are of significant scientific interest due to their potential for close approaches to Earth's orbit. Characterizing their physical properties—size, shape, and spin state—provides essential insights into their evolution, taxonomic classification, and potential impact threat.

In this work, we present a thorough analysis of the absolute magnitude and slope parameters G_1 and G_2 , rotation period, shape and pole direction of thirteen asteroids with MOID less than 1 AU, including: 2789, 2817, 3173, 3392, 2459, 3473 and 3716. We have obtained their rotation period with high precision with an error of less than 0.5% error with light curve analysis (Pravec et al. 2000). From phase curve analysis, we obtain absolute magnitude and slope parameter measurements (Muinonen et al. 2010), where we integrate observations from multiple observatories and wavelength bands, correcting for biases introduced by each source. For most of the asteroids, we also obtain their first models of the shape and pole direction from light curve inversion (Kaasalainen et al. 2001).

These parameters provide vital insights into object size, taxonomic classification, mass distribution, and angular momentum balance. Such knowledge is essential for developing effective strategies to alter an NEO's trajectory, should the need arise (Sánchez & Scheeres, 2012). The obtained methods and results can be further extended to NEO and Potentially Hazardous Asteroids (PHAs), which can improve planning for potential mitigation missions.

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