Near-Earth asteroid lightcurves from the Center for Solar System Studies

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According to the asteroid lightcurve database (LCDB; Warner et al. [1]) as of 2014 February, of the more than 10 000 known near-Earth asteroids, there are 633 objects with statistically useful rotation rates, 45 known or suspected binary or multiple systems, 47 with approximate or known spin orientations, and 36 confirmed tumblers (non-principal axis rotation). In addition, 132 objects have a rotation period of P $<$ 2 h, and 118 with P $<$ 1 h. While the total count is sufficient to make reasonable inferences about rotation rate statistics, the significantly smaller sampling of binaries, tumblers, and known spin orientations often leads to more questions than answers regarding their statistics within the NEAs or in comparison to the general population.

Starting in mid-2013, we began a concentrated campaign using up to seven robotic telescopes to find reliable rotation periods for as many NEAs as possible. In addition, if the viewing aspect changed significantly over an apparition, we obtained multiple dense lightcurve sets to be used in lightcurve inversion modeling. If circumstances allowed, we also found absolute magnitudes (H) using an assumed or newly-determined phase parameter (G).

We worked closely with the radar teams at Arecibo and Goldstone so that we could supplement their radar observations with dense lightcurves, which can lead to a successful determination of the spin orientation in less time than by either method alone.

We report on the results from the initial eight months of our efforts, which includes lightcurves for 73 NEAs, including six confirmed or suspected tumblers and three objects with P $<$ 0.12 h.

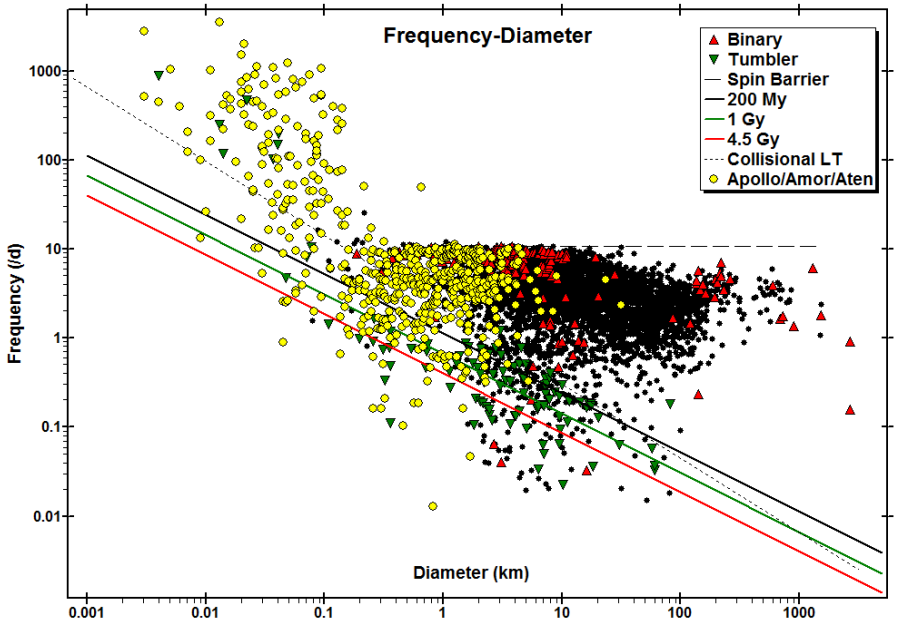

Figure: Frequency-diameter plot showing NEAs as yellow dots. The three solid lines reflect tumbling damping times.Warner et al., LCDB, 2014 Feb 7.

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References: [1] Warner, B.D. et al. (2009) Icarus 202, 134-146.