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A New Program for Rotational Characterization of Near-Earth Objects

Adam Battle[(1)]**, Vishnu Reddy**[(2)]
[(1)]*Lunar and Planetary Laboratory, University of Arizona, 1629 E University Blvd., Tucson, AZ 85721, United States, adambattle@arizona.edu*
[(2)]*Lunar and Planetary Laboratory, University of Arizona, 1629 E University Blvd., Tucson, AZ 85721, United States, vishnureddy@arizona.edu*

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Ground-based asteroid surveys have excelled at finding new near-Earth objects (NEOs) over the last three decades. However, the characterization of those bodies often lags due to the increased observation time needed to determine physical properties. With the Vera Rubin Observatory coming online later this year, this problem will only become more apparent. We present a newly funded NASA PDCO observational project tasked with physically characterizing hundreds of NEOs over the next four years to help keep up pace with the rate of discovery.

This research will focus on measurements of asteroid lightcurves and aims to be complementary to existing lightcurve efforts (e.g., Warner, Pravec, MRO and MANOS, LCO). The primary goal of our observations is to determine rotation state information for NEOs that are the targets of radar observations. Radar measurements are improved and can be performed more quickly with the inclusion of known spin information, but this information is sometimes not available at the time of radar

observations. Optical telescopes can observe incoming NEOs at farther geocentric distances and provide this information to radar observers in advance. The rotation rate of the asteroid must be known for radar observations to accurately estimate the size and volume of the asteroid, which would be critical in the event of an impending impactor. We will also use this project to continue supporting International Asteroid Warning Network (IAWN) observation campaigns, especially for lightcurve observations and collaboration with radar teams.

In addition to supporting radar observations and IAWN campaigns, this work will identify new binary asteroid systems. Among NEOs with diameters greater than 300 m, 15±4% of objects have been found to be binary systems (Pravec et al. 2006). Our observations will focus on NEOs with diameters less than 300 m to determine if the binarity fraction extends to this smaller size range. Understanding this will improve our understanding of binary asteroid formation mechanisms in the solar system.

References:
Pravec, P., 56 colleagues, 2006. Photometric Survey of Binary Near-Earth Asteroids. Icarus 181, 63- 93. DOI: 10.1016/j.icarus.2005.10.014

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Comments:

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