Rotation Rates of Near-Earth Asteroids

Desireé Cotto-Figueroa, Ian Díaz-Vachier, Alberto Rosado-Marín, Omar Reyes-Díaz, and Yashira Rodríguez-Del-Valle. Department of Physics and Electronics, University of Puerto Rico at Humacao, Humacao, P.R., USA. (desiree.cotto@upr.edu)

Introduction: It is widely accepted that Near-Earth Asteroids (NEAs) represent a global hazard for human civilization [1]. They have impacted many bodies in the Solar System, including the Earth. Due to the possible devastating consequences of such impacts, in 2005 Congress assigned NASA the task of finding 90% of all of the asteroids with sizes greater than 140 meters by 2020. Today we are nowhere near that goal, it is only with efforts such as the NEO Surveillance Mission (NEOSM), an infrared space telescope formerly known as NEOCam [2], that we would meet the congressional mandate within the next decade. While is of vital importance and priority to detect these objects, it is also of vital importance to characterize them in order to develop a correct deflection strategy in case of an imminent impact. An asteroid photometry campaign has been initiated with the intent of obtaining light curves of NEAs in order to determine their rotation periods and lower limits. The rotation rate distribution of NEAs can give us important information about their material strength and composition.

Observations: NASAcam, a 2K x 2K thermoelectrically cooled CCD camera, is used on the 31-inch National Undergraduate Research Observatory (NURO) telescope at the Lowell Observatory in Flagstaff, Arizona to obtain the photometric data. NEAs are observed using an R-band for at least four hours per night. The exposure time is typically 30 seconds and random time delays are inserted in order to avoid problems with aliasing.

Methods and Preliminary Results: The data reduction and analysis is conducted using the Image Reduction and Analysis Facility (IRAF) and the Minor Planet Observer (MPO) Canopus program in order to obtain the light curves of the observed NEAs and derive their rotation periods and lower limits. Rotation periods have been previously reported for five of the observed NEAs [3-4].

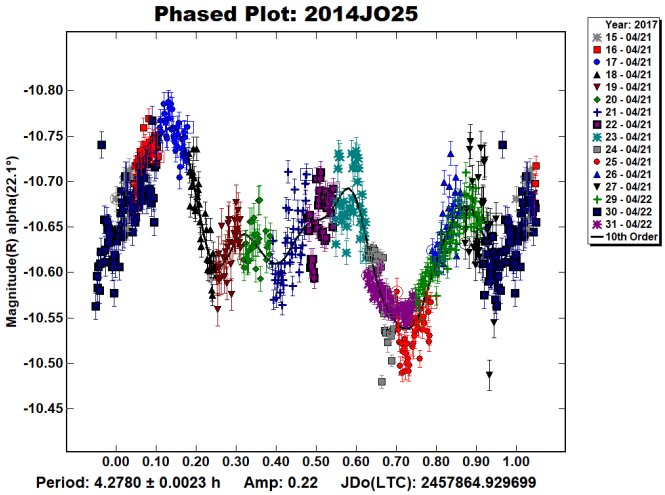

Figure 1. The light curve and period obtained for the NEA 2014 JO25, which has a diameter of 0.818 km.

References: [1] Sagan, C. and Ostro, S.J. (1994), *Na- ture*, 368, 501. [2] Mainzer et al., 2019, EPSC-DPS Joint Meeting, #1049 [3] Warner, B.D. (2019) *Minor Planet Bul.* 46, 4, 204-205. [4] Warner, B.D. (2017) *Minor Planet Bul.* 46, 4, 190-191.

Acknowledgements: This research is funded by the NASA Puerto Rico Space Grant Consortium (NASA Grant Núm. NNX15AI11H).