

Detection of Yarkovsky Acceleration of (99942) Apophis. D. J. Tholen¹ and D. Farnocchia², ¹Institute for Astronomy, University of Hawaii, 2680 Woodlawn Drive, Honolulu, HI 96822, tholen@ifh.hawaii.edu, ²Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109, davide.farnocchia@jpl.nasa.gov.

Introduction: We acquired new observations of the potentially hazardous asteroid (99942) Apophis with the Subaru telescope on three nights in January and one night in March of this year. The asteroid was in the 19th to 20th magnitude range and high in the sky during evening twilight, which enabled us to take short exposures that minimized trailing of the reference stars, while also being filtered to minimize chromatic effects on the astrometry. The signal-to-noise ratios are high enough to produce positions with formal uncertainties of less than 10 milliarcseconds, and the orbit solution residuals are consistent with this level of noise in the data. After combining these new observations with radar tracking data and older observations that have been remeasured with respect to the Gaia DR2 catalog, we now see a clear detection of the Yarkovsky acceleration on this asteroid corresponding to a semimajor axis drift of about -170 meters per year. This detection is significant at the many sigma level (the actual value depending on just how strongly the new data are weighted) and consistent with the value expected from the size and rotational model of the asteroid [1]. These new results will enable better computations of the impact probability for this asteroid in 2068.

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References: [1] Vokrouhlicky, D. et al. (2015) *Icarus*, 252, 277-283.