APOPHIS PLANETARY DEFENSE CAMPAIGN. V. Reddy[1] and 99 co-authors, [1]Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721, USA.

Overview: Impacts due to near-Earth objects (~90% NEAs and ~10% comets) are one of the natural hazards that could cause the extinction of humans, but one that can potentially be mitigated if the threat is detected with sufficient lead-time. While the probability of such an impact is low, the outcome is so catastrophic that we are well justified in investing a modest effort to minimize this threat. NASA's Planetary Defense Coordination office (PDCO) was established with the goal of coordinating global planetary defense assets in the event such a threat is identified. Planetary defense campaigns test the readiness of observers, modelers, and decision makers worldwide to tackle a potential NEO impact hazard. Since 2017, we have conducted three such campaigns, each with a specific set of objectives. These campaigns were carried out under the auspices of the International Asteroid Warning Network (IAWN), which was established by the United Nations in 2013 to coordinate organizations involved in detecting, tracking, and characterizing NEOs. In this abstract we summarize the results of the campaign focused on Apophis as the 2020-2021 apparition was the last opportunity to observe the target before the close flyby in 2029.

Summary: The campaign goal was to recover, track, and characterize Apophis as a potential impactor to exercise the global planetary defense coalition including observations, hypothetical risk assessment and risk prediction, and hazard communication. Using the campaign results, we present lessons learned about our capability to observe and model Apophis as a potential impactor. We astrometric data products for our risk assessment model almost immediately, allowing real-time updates to the impact probability calculation and possible impact locations. Thermal IR diameter measurement provided a significant improvement in the uncertainty on the range of hypothetical impact outcomes. The availability of different characterization methods such as photometry, spectroscopy, and radar provided robustness to our ability to assess the potential impact risk.

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