PDC2017
Tokyo, Japan

IAA-PDC-17-02-P11

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MODELING THE JOINED PERFORMANCE OF THE PAN-STARRS1 AND PAN-STARRS2 TELESCOPES

E. Lilly (Schunová) [(1)], Richard J. Wainscoat[(1)], Peter Vereš[(2)], and Robert Weryk[(1)]

[(1)]*Institute for Astronomy University of Hawaii, 2680 Woodlawn Drive, Honolulu, HI 96822, USA, +1-808- 956-3903, schunova@hawaii.edu*

[(2)]*Jet Propulsion Laboratory, California Institute for Technology, 4800 Oak Grove Dr., Pasadena, CA 91109, USA, +1-818-354-0919, Peter.Veres@jpl.nasa.gov*

Keywords: *Near Earth Object, discovery, surveys*

ABSTRACT

We have performed detailed simulations of the 1st and the 2nd telescope of the Panoramatic Survey Telescope And Rapid Response System (Pan-STARRS, Morgan et al. 2012, SPIE Conference Series, Vol. 8444; Chambers et al. 2016, arXiv e-prints #1612.05560) in order to assess their combined performance and to optimize survey strategy for discovery and follow-up observations of near-Earth asteroids (NEAs).

Pan-STARRS1 (PS1) is situated near the summit of Haleakala, Maui (observatory code F51) and has been operated by the University of Hawaii since the spring of 2010. PS1 has a 1.8 m diameter primary mirror with a ~7 deg^2 field of view and can survey over 1000 deg^2/night for moving objects. Pan-STARRS2 (PS2 with observatory code F52) is located adjacent to PS1, and is similar, but benefits from many improvements coming from our experience with PS1. PS2 will be operational very soon.

We have generated 50 million synthetic NEAs according to the Greenstreet model (Greenstreet, S. et al. (2012), Icarus 217, 355–366) with absolute magnitudes $13<H<30$ and injected them into a simulated survey using the Moving Object Processing System – MOPS (Denneau, L. et al. (2013), PASP 125, 357–395).

We show how the best and the worst case scenarios of observing conditions (i.e., regarding the weather and the position of the Galactic plane) affect the NEA detection efficiency during a 1-year long survey. We assess multiple observing strategies for PS1 and PS2, including: (1) a follow-up pattern, where PS2 images the same fields as PS1 with one and two night delays, and (2) a parallel pattern, where PS1 and PS2 observe simultaneosly two halves of the visible sky divided by $\delta=0°$ to maximize the nightly coverage.

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