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Searching for Additional Kuiper Belt Object Flyby Targets for the New Horizons Pluto/KBO Misson

JOHN R. SPENCER[1], S. ALAN STERN[1], MARC W. BUIE[2], LARRY H. WASSERMAN[2], HIROSHI KAROJI[3], TETSUHARU FUSE[3], SATOSHI MIYAZAKI[3], TOSHIFUMI YANAGISAWA[4], DAVID J. THOLEN[5] and DAISUKE KINOSHITA[6]

[1]*Southwest Research Institute, Boulder, CO 80302, U.S.A.*
[2]*Lowell Observatory, Flagstaff, AZ 86001, U.S.A*
[3]*Subaru Telescope, National Astronomical Observatory of Japan, Hilo, HI 96720, U.S.A*
[4]*JAXA, Tokyo 182-8522, Japan*
[5]*Institute for Astronomy, University of Hawaii, Honolulu HI 96822, U.S.A.*
[6]*National Central University of Taiwan, Chung-Li 32054, Taiwan*

NASA's New Horizons mission to Pluto and the Kuiper Belt is due to launch towards Pluto in January 2006. While the Pluto/Charon system is its primary target, the mission plan also includes visits to one or more additional Kuiper Belt Objects (KBOs) after the Pluto flyby. However, no other known KBOs are accessible to the New Horizons spacecraft, so a dedicated search is required to find flyby targets. Unfortunately, the majority of potentially-accessible KBOs are currently located in front of the dense star clouds of the Milky Way in Ophiuchus and Sagittarius, complicating the search process. We estimate that the brightest KBO accessible to New Horizons will have a probable R magnitude of about 27 [1]. Searching to this depth is best done a few years before the 2015 Pluto flyby, when the search area is smaller and cameras will be larger than at present. However, in 2004 we conducted a relatively shallow search to R magnitude ~25.3, in the hope of finding a large KBO that would make it worthwhile to alter the Pluto flyby trajectory and date in order to reach it, something that can only be done before launch. The search was conducted by the SuprimeCam camera on the Subaru telescope, which currently offers the best available combination of wide-field coverage (0.25 deg^2) and large aperture (8 meters). Between June and August 2004 we obtained about 500 9-minute integrations on 55 fields covering 14 deg^2, visiting each field several times over 1 – 2 months to identify moving objects against the static star background. A preliminary analysis identified 21 potential KBOs in the June data set, but the technique used was not applicable to the dense star backgrounds found in many of our images. We are now adapting software developed for the SuperMACHO survey that subtracts fixed stars from pairs of frames by matching the PSFs in the two images in order to reveal moving KBOs even in crowded fields. Additional Subaru observations are planned for summer 2005 to obtain improved orbits for the KBOs detected in 2004. Since the survey was done, new concerns about spacecraft power have required us to get to Pluto as quickly as possible, so we cannot use the survey results to affect the launch trajectory, but we still hope that a large and interesting KBO target for New Horizons may be found by this survey.

References

[1] J. Spencer, M. Buie, L. Young, and A. Stern, *Earth Moon & Planets.* **92**, (2004).