Strategies for WFIRST Solar System Object Discovery

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Abstract: J. Bauer (JPL), A. Mainzer (JPL), R. Cutri (IPAC), & J. Dailey (IPAC) Wide-field space-based surveys have been shown to be an extremely effective means of detecting and discovering solar system objects (cf. Mainzer et al. 2011A). The NEOWISE program, the Near Earth Object detection program for the Wide-field Infrared Survey Explorer (WISE) mission (Wright et al. 2010) served as the demonstrative prototype. The survey discovered over 33,000 objects, including 21 comets, 6 Centaurs, and 135 NEOs, while detecting over 157,000 objects in the thermal IR (Mainzer et al. 2011B). Not all surveys, however, are created equal. Cadence strategies, wavelength band sensitivities and confusion limits, processing techniques, and follow-up strategies, amongst other factors, can make the difference between a practical implementation of a solar system object discovery program and a prohibitively inefficient one. We will explore the possibilities of implementing a solar system object detection and discovery program for WFIRST, adapting the moving object pipeline subsystem strategy that provided the rich set of solar system discoveries from the WISE mission. Our analysis will include an assessment of the unique small body science that the WFIRST data may provide, as well as the potential yield, and limitations for the discovery of various classes of objects. Finally, we will address recovery strategies that must be employed to ensure the proper orbital characterization for long-term follow-up.

References: Mainzer, A., et al. 2011a. Preliminary Results from NEOWISE: An Enhancement to the Wide-field Infrared Survey Explorer for Solar System Science. ApJ. 731, 53. Mainzer, A., et al. 2011b. NEOWISE observations of Near-Earth Objects: Preliminary Results ApJ. 743, 156. Wright, E. L., et al. 2010. The Wide-field Surve Explorer Mission (WISE): Mission Description and Initial On-orbit Performance. ApJ. 140. 1868.