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DEEP SPACE TELESCOPE: AN SLS LAUNCHED SPACE TELESCOPE LANDED ON THE NORTH POLE OF PHOBOS

Abstract

This paper explores the capability of the NASA Space Launch System (SLS) to deliver a lander with a space telescope to the north pole of Phobos. Space-based astronomical telescopes are in great demand typically observing objects beyond the solar system. Therefore, synaptic observations of solar system bodies are limited by the availability of telescope time and resolution. The need for a high-resolution, multi-wavelength space telescope for dedicated planetary science is especially acute with the impending end of the Hubble Space Telescope. Such a telescope would be used to routinely observe, within the framework of long-term monitoring, solar system objects such as volcanically active bodies, the giant planets, and their satellites. The telescope would have access to critical wavelengths in the ultraviolet, near- and mid-infrared, which has been precluded by the Earth's atmosphere, in addition to the visible spectrum. The necessity for a dedicated solar system telescope also stems from the limitations of ground-based telescopes and planned space telescopes in obtaining the temporal coverage and observational fidelity. The solar system telescope must have superior spatial and spectral resolution and offers an unparalleled opportunity for extensive time-domain observations. A telescope which resides on the north or south pole of Phobos would provide a significant number of advantages for observing solar system objects and Mars in addition to providing significant support for human exploration of the Red Planet. As an example, the following are just some of the planetary processes that can be studied. Active plumes and volcanism investigations on Venus, Titan, and icy bodies beyond Saturn can be accomplished. Questions include determining if Venus and Titan are volcanically active today, understanding the drivers of variability in volcanic activity, and analyzing the composition of magma and cryomagma reservoirs. An outer solar system minor body and irregular satellite survey can focus on understanding the composition and migration history of Jupiter Trojans, irregular satellites, Centaurs, and Kuiper Belt Objects [5]. Together, the lander and its telescope could exceed 20 mt at launch, making SLS the preferred candidate for launch due to its heavy-lift capability. A feasible time period for the mission is 2030-2035. Three low energy Earth-Mars (E-M) transfer opportunities exist in this time period – one associated with each of the E-M opportunitys 2031, 2033, and 2035. This work is being done by the Boeing Exploration Launch Systems and the Boeing Advanced Space Systems Groups in Huntsville and Houston.