

SPACE EXPLORATION SYMPOSIUM (A3)

Mars Exploration – Part 1 (3A)

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MERLIN: MARS-MOON EXPLORATION, RECONNAISSANCE AND LANDED INVESTIGATION

Abstract

Mars' moons Phobos and Deimos are low-albedo, D-type bodies. Leading hypotheses for the moons' origins are capture of primitive asteroids that preserve samples of organics and volatiles incorporated into the accreting terrestrial planets, and formation from material like that constituting Mars that has subsequently been altered by space weathering. Determining the moons' compositions and origins will provide fundamental insights into formation of the terrestrial planets and an assessment of in situ resources for future human exploration of the Mars system. A Discovery-class mission concept, the Mars-Moon Exploration, Reconnaissance and Landed Investigation (MERLIN), will investigate Deimos from orbit and in situ to test models for this moon's composition and origin. The scientific measurement objectives of MERLIN are to determine Deimos' elemental and mineralogical composition, to investigate its volatile and organic content, and to characterize processes that modify its surface. Following Mars orbit insertion, the MERLIN spacecraft flies in formation with Deimos, and uses small changes in its orbit around Mars to investigate Deimos from a range of altitudes and illuminations over 4 months. An orbital payload will acquire global imaging, putting the landing site in context by characterizing Deimos' geology. Data taken during low altitude flyovers will certify a landing site. The spacecraft will land on a fresh regolith exposed on an albedo streamer. A landed payload will provide stereo imaging and measurements of elemental and mineralogical composition and interior structure.