Traversing Mars: The Noctis Landing Human Exploration Zone

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NASA aims to send humans to Mars by the 2030s-2040s. A leading scientific goal will be the search for signs of indigenous life, past or present, which if found, would have major implications for science and the possibility of other life in the universe. "Noctis Landing", at 7.4°S, 93°W in the Noctis Labyrinthus region is a candidate landing site for this mission. The area around Noctis Landing presents several targets of interest for astrobiology, in particular: 1) a relict glacier, 2) a lava flow, 3) the giant Noctis volcano, and 4) the 'Pink Panther Pit', a possible thermokarst depression. This study aimed to identify viable paths for astronauts traveling in a pressurized rover to access these four targets of interest. Traverse planning was carried out using the Mars QuickMap data visualization and mapping tool, a NASA-supported computer program allowing different data sets from various Mars orbital missions to be displayed and examined. CTX visible imaging and MOLA laser altimetry data were used to identify paths with less than 20° slopes. CTX imaging data and THEMIS rock abundance data then helped refine paths to avoid major obstacles and minimize rough terrain, respectively. Viable traverse paths ranging between 0° and 17° in slope, avoiding major obstacles and minimizing rough terrain, were successfully identified for all four destinations. This study strengthens the case for Noctis Landing as a promising human landing site on Mars, and also validates a traverse planning approach that may be applied to other candidate landing sites.

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