# Survey of the Noctis Volcano on Mars in Search of Stratigraphic Exposures and Caves Accessible for Exploration

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We are currently on the verge of sending the first crewed mission to Mars to expedite the search for signs of Martian life. Pre-planning and site evaluation are crucial in ensuring mission safety and success. The Noctis Landing site has been proposed for a future crewed mission because of its proximity to various target features, such as the recently discovered Noctis Volcano. Since volcanoes have environments most probable to harbor life, this study aimed to identify stratigraphy and pits/caves within the Noctis Volcano perimeter and determine if identified areas of interest are accessible for future crewed missions. To accomplish this, a mapping site, marsquickmap.io, was used because it utilizes high-resolution imaging of the Martian surface and provides slope and terrain roughness data layers. A search grid covering the volcano spanning ~250,000 km was applied to survey the terrain for stratigraphy and pits/caves. Once identified, traverse paths were designed and evaluated to reduce risk, ensure safety, and maximize efficiency. Ultimately, three areas of complex stratigraphy were identified within the search zone, and no pits/caves were found. One continuous traverse path with moderate slopes and relatively smooth terrain was designed to access the three regions of stratigraphy. Ultimately, the methodology developed in this project can be applied to this and other proposed landing sites to ensure mission safety and success. If Noctis Landing is chosen for the human mission to Mars, these paths will guide future astronauts to potentially life-holding destinations, laying the foundation for Martian exploration.

**Awards Won:**