SPACE EXPLORATION SYMPOSIUM (A3)
Space Exploration Overview (1)

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TERRESTRIAL ANALOG FIELD INVESTIGATIONS TO ENABLE SCIENCE AND EXPLORATION STUDIES OF IMPACTS AND VOLCANISM ON THE MOON, NEAS, AND MOONS OF MARS

Abstract

Terrestrial analog studies are a critical component for furthering our understanding of geologic processes on the Moon, near-Earth asteroids (NEAs), and the moons of Mars. Carefully chosen analog sites provide a unique natural laboratory with high relevance to the associated science on these solar system target bodies. Volcanism and impact cratering are fundamental processes on the Moon, NEAs, and Phobos and Deimos. The terrestrial volcanic and impact records remain invaluable for our understanding of these processes throughout our solar system, since these are our primary source of firsthand knowledge on volcanic landform formation and modification as well as the three-dimensional structural and lithological character of impact craters. Regarding impact cratering, terrestrial fieldwork can help us to understand the origin and emplacement of impactites, the history of impact bombardment in the inner Solar System, the formation of complex impact craters, and the effects of shock on planetary materials. Volcanism is another dominant geologic process that has significantly shaped the surface of planetary bodies and many asteroids. Through terrestrial field investigations we can study the processes, geomorphic features and rock types related to fissure eruptions, volcanic constructs, lava tubes, flows and pyroclastic deposits. Also, terrestrial analog studies have the advantage of enabling simultaneous robotic and/or human exploration testing in a low cost, low risk, high fidelity environment to test technologies and concepts of operations for future missions to the target bodies. Of particular interest is the importance and role of robotic precursor missions prior to human operations for which there is little to no actual mission experience to draw upon. Also critical to understanding new worlds is sample return, and analog studies enable us to develop the appropriate procedures for collecting samples in a manner that will best achieve the science objectives.