SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

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FIRST RESULTS OF THE ROBEX ANALOG MISSION CAMPAIGN: A MODULAR SYSTEM ARCHITECTURE TO PERFORM SEISMIC EXPERIMENTS ON A VOLCANO AS TERRESTRIAL VALIDATION OF A LUNAR MISSION SCENARIO

Abstract

In the past four years, the ROBEX (Robotic exploration of extreme environments) alliance members have developed technologies to be used as key infrastructural elements supporting a lunar robotic surface exploration scenario consisting of modular landing systems, mobile elements and deployable instrument carriers equipped with seismic sensors. The systems have been developed along a lunar exploration scenario, called Active Seismic Network, supposed to investigate amongst others the subsurface layering on the moon. As flight opportunities and funding for real lunar missions are limited, analog field testing is one of the few possibilities to validate such a coherent science and mission scenario and all its required technologies including their interactions. Terrestrial analog testing is a widespread methodology in planetary science and exploration technology development serving several purposes ranging from knowledge increase regarding planetary processes, testing of methodologies and strategies including training of personnel and offering also the possibility of engaging the public by performing outreach activities.

A thorough investigation of terrestrial analog sites has revealed Mount Etna at Sicily Italy, in a region which is characterized by active volcanism, to comply best with the technical and programmatic requirements and constraints for the terrestrial analog field test in the ROBEX frame. The chosen region is characterized by a constant micro seismicity induced by volcanic activity and deep earthquakes that are localized in a similar depth range as expected in a lunar environment. This provides an excellent matching of the overall scientific and technological testing environment with the lunar one.

Based on the realistic lunar exploration scenario, a mission scenario has been derived for the field test, which is designed to not only demonstrate technology, but to also generate meaningful scientific data and validate measurement methodologies for future lunar applications. Furthermore some key elements of the architecture, for example the LSS (Locomotion sub system) of the rover shall also be tested against applicable technological requirements. First results of tests will be presented revealing insight into aspects related to the overall mission scenario, including automatic sequencing, autonomy requirements, scientist and control center interaction and measurement methods, all of which provide valuable input for future mission and system design.

Still, the terrestrial analog is by definition different from the lunar environment, leading to modifications and simplifications in the test equipment which shall also be covered in this paper exemplarily for the Instrument Carriers (Remote Units) and the lander surface explorations model (RODIN).