

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 2 (2B)

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LUNEX EUROMOONMARS EARTH SPACE INNOVATION HIGHLIGHTS

**Abstract**

EuroMoonMars is an ILEWG/LUNEX programme in collaboration with space agencies, academia, universities and research institutions and industries. The programme includes research activities for data analysis, instruments tests and development, field tests in MoonMars analogue, pilot projects, training and hands-on workshops, and outreach activities. Extreme environments on Earth often provide similar terrain conditions to sites on the Moon and Mars. In order to maximize scientific return it becomes more important to rehearse mission operations in the field and through simulations. EuroMoonMars field campaigns have then been organised in specific locations of technical, scientific and exploration interest. Field tests have been conducted in ESTEC, EAC, at Utah MDRS station, Eifel, Rio Tinto, Iceland, La Reunion, LunAres AATC bases in Poland, and at Hawaii.

Latest campaigns have been conducted jointly between EuroMoonMars –International Moon Base Alliance –HI-SEAS (EMMIHS) at Mauna Loa Hawaii since 2018. Samples of different lava flows from Mauna Loa have been compared to measurements of the Mars Exploration Rovers (MER) in order to provide more insight in the similarities of the effects of hydrous alteration on volcanic rocks on Mars. In lava tubes accessible from HI-SEAS, Hawaii, there are several minerals present that appear to form from the surrounding basaltic rock by hydrological and microbial processes. The purpose of this study is to research the secondary mineralization in lava tubes to understand the characteristics and formation processes of the mineral precipitates as analogue for the presence of secondary minerals in lava tubes on other terrestrial bodies in the solar system.

We supported telerobotic campaigns at Etna in 2017 (DLR/ROBEX), and one planned for June 2022 (ARCHES collaboration) and organized EMM-Etna in July 2021.

We performed in 2019-2020 scouting analogue campaigns in Iceland. The EuroMoonMars CHILL-ICE mission in July-August 2021, was set in the Surtshellir-Stefanshellir cave system in the Hallmundarhraun lava flow located in Western Iceland. We tested instruments and equipment (rovers, drones) in a lunar-analogue field terrain. 2x3 astronauts in EVA deployed ECHO emergency shelter in a lavatube where they stayed for 2x3 days.

In Chile, the Atacama Desert and the neighboring Arid Central Andes (Puna) represent a geographical site whose particular environmental conditions make it a potential Mars analogue. A scout Chile MoonMars campaign was organized in February 2021, and a large Atacama Ojos del Salado campaign was conducted 21 Feb-6 March 2022.