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HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
Enablers for the Future Human Missions (7)

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TESTING GEOLOGICAL SAMPLING PROCEDURES FOR SPACE EXPLORATION IN ANALOGUE ENVIRONMENTS

Abstract

Space agencies worldwide are preparing for human exploration missions to the Moon, Mars, and potentially asteroids to be launched in the next decades. Finding and using in situ resources would lower overall mission costs. To this end, astronauts must be able to recognize geological features and to take samples for a variety of purposes. Simulations help researchers identify potential problems and test equipment and procedures.

Preliminary tests have been done in the Eiffel volcanic park, where the basaltic rocks represented the Moon's surface. The Mars Desert Research Station (MDRS) is situated in a red-coloured desert in Utah of sandstone with great gullies, meandering streams, big plains, endolithic bacteria colonies, and some volcanic areas, which is all very similar to the Martian landscape.

For a period of two weeks, from the 20th of February 2010 to the 6th of March 2010, crew 91 worked and lived together in a closed-system habitat at the MDRS. Each member completed a personal research, such as optimizing the visibility of the NASA Ames rover and far-field communication, facilitating data exchanges between the base and the rover or astronaut by focusing on well-developed timelines and effective communication, documenting and testing best practices for dust reduction inside and outside the habitat, testing performance and habitability with creative sensory stimulation, and developing exploration protocols for different environments and mission objectives, with specific attention to geological sampling procedures. The team and each crewmember individually were supported from "Earth" by mission control.

In order to determine what is necessary in terms of knowledge and equipment for successful future planetary exploration, to perform planetary geological fieldwork efficiently, sampling procedures were tested during Extra-Vehicle Activities (EVA's) in full spacesuit. Traverses and time lines were prepared in ArcGIS. This resulted in a three dimensional dynamic map, in which sample locations and attributes, such as local measurements, could be visualized.