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

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ANALOG-1: A TOUCH REMOTE

Abstract

The METERON project (Multipurpose End-To-End Robotics Operations Network) was implemented by the European Space Agency as an initiative to prepare Europe for future human-robotic exploration scenarios that in particular, focused on examination of the human-robotic partnership, and how this partnership could be optimised through an evaluation of the tools and methodologies utilised in the experiments in the domains of operations, communications and robotics (specifically with respect to control strategies). Implemented through series of experiments of gradually increasing complexity, the project was origi- nally conceived to culminate in the control of a rover-robot located at a terrestrial analogue site. Being operated by a geology-trained astronaut from the International Space Station (ISS), such a test would enable a reasonably high-fidelity examination of how crew on an orbiting vehicle around the Moon or Mars could remotely perform exploration tasks in an unstructured environment. In early 2019, Lanzarote was selected as the terrestrial analogue site due to its lunar-like terrain coupled with the fact that the Tinguaton area had been used by the European Astronaut Centre's PANGAE astronaut training course in 2017. Alignment of ISS planning with the logistics planning needed to get all the required infrastructure to Lanzarote in a timely manner eventually drove the team to decide to split ANALOG-1 into two segments: control of the rover/robot from the ISS, together with a more extensive testing at a different site - Mt. Etna. The Mt. Etna test will be performed in cooperation with the DLR ARCHES campaign in June-July 2022 through implementation of a joint 'space demo mission' – described in a companion paper in this Congress – addressing geology and radio astronomy. The first part of ANALOG-1 was successfully accomplished in November 2019 by Luca Parmitano who drove the rover at an 'indoor' analogue site in the Netherlands and operated the rover's robotic arm using a novel haptic control station (Sigma-7) that allowed Luca to 'feel' the forces experienced by the robotic arm as he collected selected samples. This paper will report on the results of the Mt. Etna 2022 campaign and contrast with the results from the ISS experiment obtained in 2019, with a particular focus on the interaction between the 'Science Backroom' and Thomas Reiter - who has also (like Luca) undergone ESA's PANGAEA geology training – the advantage of which will be clearly demonstrated.