IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

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THE MARTIAN QUADRANGULAR: ANALOG SPACE LABORATORY FOR THE SURFACE MOBILITY MARTIAN EXPLORATION TESTS

Abstract

The largest and most spectacular canyon system in the Solar System: Valles Marineris. Not all experiments can be performed in space: there is not enough time, funding, equipment and manpower. Analog missions play an important role in solving problems in space flight research. This IAC 2025 is for us the stage to announce the first **analog space laboratory for the surface mobility Martian exploration tests in Costa Rica**.

We are focusing on possible landing zones on Mars. The design of the Costa Rican Mars Yard will have reference to the Arcadia quadrangle, which is one of the geographical divisions of Mars used by the Astrogeology Research Program of the United States Geological Survey (USGS). From there, it has been chosen to recreate elevations and depressions like those that exist in Tractus Catena.

It has been chosen with the support of private alliances, to create the scenario in a windy environment like the one that sculpts the Martian terrain: the Tilarán mountain range in our country. It is a terrain where wind energy projects are developed, a site with great contrasts from flat valleys to mountainous and rocky areas surrounded by volcanoes.

Our non-profit fraternity, Descubre Robótica, has created a multidisciplinary team called **Wonder Mercury**, which has participated remotely in the European Rover Challenge since 2023. This is how the need to recreate our own Martian playground in Central America was born to raise the bar on the subject of Martian exploration and promote human talent in problem solving in simulated environments.

The terrain platform will have the capacity to test our rovers' traction and excavation capabilities. To this end, a multidisciplinary sub-team has also been created for the construction of mobile laboratories for geological and astrobiological analysis.

The Costa Rican Mars Yard will have an area of approximately of 90 m x 90 m, mostly filled with the

MGS-1 simulator. This laboratory will be used to test and develop excavation tools and techniques for planetary robotic and human surface operations in granular simulated regoliths. To our current knowledge, Mars is cold and dry, and most of the water is located below the surface. Understanding how much water is stored offers critical information for energy exploration as well as for the sustainability of life on the planet.

The secret of endurance is to remember that projects are achieved with endeavour.