Paper ID: 40040
oral

SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations (IP)

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FIRST RESULTS FROM THE ROBEX DEMONSTRATION MISSION ON MT. ETNA: ROBOTIC DEPLOYMENT OF SEISMIC NETWORKS FOR FUTURE LUNAR MISSIONS

Abstract

This paper presents the first results of the analog mission campaign which will be performed between June and July 2017 on Mount Etna in Europe, Italy. The aim of the ROBEX demonstration mission is to test and validate a complex robotic mission including highly autonomous tasks mixed with interrupts caused by scientists or due to operational needs to guarantee the measurement of real and scientifically relevant data. The main scientific objective of the ROBEX mission, the detailed analysis of the lunar crust layers that is replaced by the analysis of Etna lava layers in the demo mission has been leading the developments of the last four years.

As key missions, a seismic network will be deployed and a seismic profile measurement will be conducted using only robots on the landing site. Further experiments will allow long term autonomous navigation, exploration of craters as well as robot cooperation tasks with the aim of geological analysis and probe selection. During this one month (analog) campaign, a realistic mission scenario will be built up, including a control station 30km away from the remote site. Key components of the scenario have already been validated during a test campaign in September 2016 on Mt. Etna.

The Mt. Etna site has mainly been chosen due to the high equivalence of its seismic activity to moon quakes. Earth quakes in this region have a focal depth of approximately 600 km, a value similar to what has also been considered for moon quakes. Furthermore, the region is seismically highly active, probably three to four events per day, which means that scientifically relevant data will be acquired within the one month duration of the mission. In addition, the site fulfills important criteria for an analog mission such as:

- The site shall be of volcanic origin and reveal natural seismic activity
- It has to be Moon-analog regarding the geologic context and shape
- Its topography and morphology shall be representative to planetary surfaces
- It has to enable building up the necessary logistic and operational infrastructure

We also describe the Light Weight Rover Unit (LRU) and the complex perception and action handling software that have been developed in order to drive, navigate and operate highly autonomously in the scenario.