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# WISDOM GPR subsurface investigations in the Atacama desert during the SAFER rover operation simulation

Sophie Dorizon (1,2), Valérie Ciarletti (1,2), André-Jean Vieau (1), Dirk Plettemeier (3), Wolf-Stefan Benedix (3), Marco Mütze (3), Rafik Hassen-Kodja (1), and Olivier Humeau (1)

(1) LATMOS, GUYANCOURT, France (sophie.dorizon@latmos.ipsl.fr), (2) UVSQ, Versailles, France, (3) TU Dresden, Dresden, Germany

SAFER (Sample Acquisition Field Experiment with a Rover) is a field trial that occured from 7th to 13th October 2013 in the Atacama desert, Chile. This trial was designed to gather together scientists and engineers in a context of a real spatial mission with a rover. This is ESA's opportunity to validate operations procedures for the ExoMars 2018 mission, since a rover, provided by Astrium, was equipped with three ExoMars payload instruments, namely the WISDOM (Water Ice Subsurface Deposits Observations on Mars) Ground Penetrating Radar, PANCAM (Panoramic Camera) and CLUPI (Close-UP Imager), and was used to experiment the real context of a Martian rover mission. The test site was located close to the Paranal ESO's Observatory (European Southern Observatorys) while the operations were conducted in the Satellite Applications Catapult remote Center in Harwell, UK. The location was chosen for its well-known resemblance with Mars' surface and its arid dryness. To provide the best from this trial, geologists, engineers and instrumentation scientists teams collaborated by processing and analyzing the data, planning in real time the next trajectories for the Bridget rover, as well as the sites of interest for WISDOM subsurface investigations.

This WISDOM GPR has been designed to define the geological context of the ExoMars 2018 landing site by characterizing the shallow subsurface in terms of electromagnetic properties and structures. It will allow to lead the drill to locations of potential exobiologocal interest. WISDOM is a polarimetric step frequency radar operating from 0.5GHz to 3GHz, which allows a vertical resolution of a few centimeters over a few meters depth. Provided with a DEM (Digital Elevation Model) and a low-resolution map to assist the team with the rover's operations, several soudings with WISDOM were done over the area. The WISDOM data allowed, in collaboration with the SCISCYS team, to map the electromagnetic contrasts into the subsurface underneath the rover path and to get a 3D representation. WISDOM data were also used to assess the most promising locations for drilling operations by identifying the interfaces and the scatterers embedded in the subsurface and retrieving their depths.

We present the results derived from WISDOM data acquired over the SAFER trial site to characterize the shallow subsurface of the area in terms of geology and electromagnetic properties. The quantitative results are compared with the characteristics of the samples removed from the site during drilling operations. The SAFER team carries on the cooperation in order to take the best from all instruments put together.