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## MA\_MISS and WISDOM on ExoMars: building synergies through fieldwork

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### Abstract

The 2020 ESA-Roscosmos ExoMars Rover mission will focus on finding evidences for signs of present or past life on Mars. The WISDOM radar and the spectrometer inside the drill of ExoMars [1] will explore the place where traces of life is most likely to be found: the subsurface of Mars. Data integration between these two instruments is critical, and the two teams are building the experience that will maximize data integration once the actual data will be acquired.

### 1. Introduction

The Mars Multispectral Imager for Subsurface Studies (MA\_MISS) is the spectrometer which will deliver hyperspectral data from the hole drilled in the Martian ground by the ExoMars Drilling system [2, 3]. The experiment has been funded by the Italian Space Agency (ASI) and developed in Italy by SELEX Galileo, a Leonardo Company, Florence. The Water Ice Subsurface Deposit Observation on Mars (WISDOM) is a ground penetrating radar to study and characterize the structure of the Martian underground. It has been funded by the french Centre National d'Etudes Spatiales (CNES) and german DLR and developed at the Laboratoire Atmosphères, Milieux, Observations Spatiales (LATMOS) in Paris, France [4, 5].

### 2. MA\_MISS / WISDOM synergy

The organization of the digital data delivered from MA\_MISS and WISDOM is related to the characteristics of the instruments, the timing and the geometry of acquisition. Integrating these data means locating a common spatial reference frame where we will be able to compare the observations.

Before the actual mission we are planning fieldwork

which will build up experience on data integration between these two different instruments.

### 3. Fieldwork in a quarry

We planned a first fieldwork experiment in Italy on May 2018. This first experiment consists in the acquisition of radar data in the field and returning the rocks back to the spectroscopy lab. We choose to do the test in a quarry as it offers exposed rock walls and interesting data acquisition geometries. The geometry of the first experiment is reported in Figure 1. WISDOM signals will investigate a layered limestone outcrop which is covered by gravel (Figure 1c). The thickness of the gravel layer varies from 0 to about 1.8 meters (see outcrop in Figure 1 from left to right). The limestone layers are 20 to 50 cm thick, interleaved by 5 to 10 cm-thick marly layers (Figure 1d). The layers are dipping about 8 degrees in the direction of the radar survey. This particular geometry creates a variable depth of the gravel-to-bedrock interface which represents an analogue of the martian regolith-to-bedrock contact.

### 4. Summary and Conclusions

At the time of writing this abstract we are just back from the field and both radar and rock samples are being analyzed. We expect to produce a 1-d subsurface model correlating radar reflections with the subsurface structures exposed in the outcrop. Rock samples have been sent to two different laboratories. Mineralogy of the samples will be analyzed by the spectroscopy lab at the Istituto di Astrofisica e Planetologia Spaziali (IAPS) in Rome, while the dielectric characteristics will be extracted at the Technische Universität of Dresden.

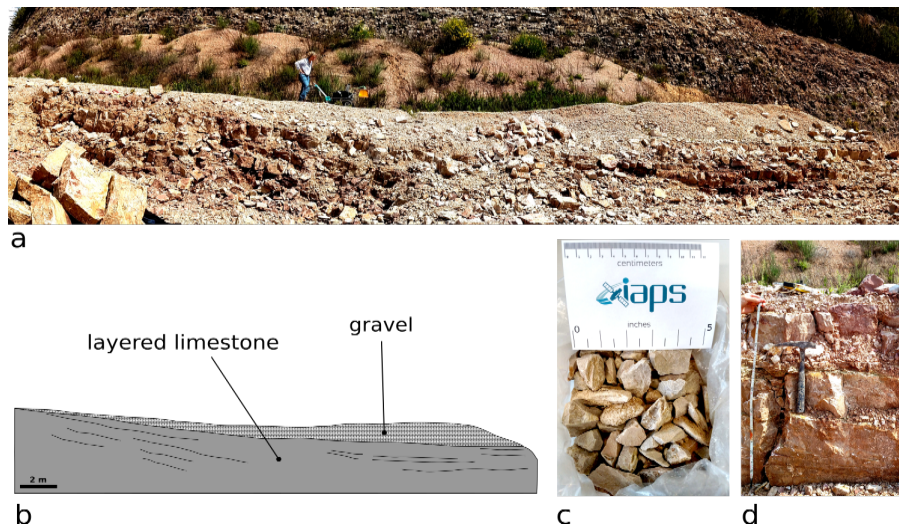


Figure 1: Figure 1: a) A picture of the experiment setup: the radar signals are impinged into a limestone terrain. b) the outcrop shows that we are investigating layered limestones overlayed by a variable thickness limestone gravel. c) the limestone gravel: angular shape in 1 to 5 cm size. d) The layered limestones (hammer height is 33 cm)

The results of this fieldwork will be useful to build a solid base of experience on the data/procedures integration which will result extremely useful during the mission, when quick planning decisions will be made on the basis of data available.

The results of this our first fieldwork experiment will be presented at the EPSC 2018 in Berlin, Germany.

## cknowledgements

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## References

- [1] Vago, J. L., et al.: Habitability on Early Mars and the Search for Biosignatures with the ExoMars Rover. *Astrobiology*, 17, 2017
- [2] Coradini, A., et al.: MAMISS: Mars multispectral imager for subsurface studies, *Advances in Space Research*, Volume 28, Issue 8, p. 1203-1208, 10.1016/S0273-1177(01)00283-6, 2001.
- [3] De Sanctis, M. C., et al. MaMISS on ExoMars: Mineralogical Characterization of the Martian Subsurface. *Astrobiology*, 17, 612-620, 2017
- [4] Ciarletti V. et al., *PIEEE*, 0023-SIP-2010-PIEEE, 2010.
- [5] Ciarletti V. et al.: The WISDOM Radar: Unveiling the Subsurface Beneath the ExoMars Rover and Identifying the Best Locations for Drilling. *Astrobiology*, 17, 565-584, 2017