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Geologic fieldwork in support of Ma_MISS spectrometer onboard ExoMars 2020 rover Rosalind Franklin

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Introduction

Meaningful spectroscopic interpretation of remote sensing data implies comparing the observed spectra with data collected in the laboratory. This is the concept at the base of analog studies for planetary exploration, where we study the evolution of distant bodies through the analogy with materials and processes we can directly access.

Ma_MISS (Mars Multispectral Imager for Subsurface Studies) is the spectrometer integrated within the drill on board the ExoMars 2020 rover Rosalind Franklin, which will explore the geological setting at the landing site and search for signs of past and present life[1]. The spectrometer will investigate the borehole wall rocks in the spectral range of 0.5-2.3 micrometers to a depth up to 2 meters [2].

The scientific team of Ma_MISS is based at the IAPS-INAF in Rome, Italy and is currently involved in the preparation of procedures to maximize scientific outcomes from the project.

Among the various activities, we are including fieldwork activities to optimize synergies with other ExoMars instruments [3] and to collect analog materials to be studied in the laboratory with instruments which return data similar to the one we are expecting to retrieve from Ma_MISS.

Geologic sampling campaigns

Catalogs and databases of spectra from rocks are already available from various sources and are available as references for the interpretation of remotely sensed spectra. With our fieldwork activity, we collect and bring back to the laboratory both samples and their geologic context. The spatial relationship between the rocks found in the exposures suggests the sequence of processes that put in place the deposits.

In May 2019 we held a sampling campaign in the area of the Colli Albani volcano, located south of Rome. Fig. 1 shows one of the outcrops where we have sampled volcanic materials, from lavas to pyroclastic materials. The map of Fig. 2 illustrates the lithologies on the study area and the locations of the samples of volcanic rocks sampled in the north-western sector of the Colli Albani volcano near Rome, Italy.

Summary and future work

With our geologic fieldwork within the scientific activities of Ma_Miss we are building experiences which will turn useful once the actual data from Mars will be available, and the interpretation of Ma_MISS data will be critical to the geologic characterization of the survey area. Our activity will continue on environments similar to those observed from orbit at the ExoMars 2020 landing site Oxia Planum on Mars, in particular we will focus our attention on fluvio-lacustrine sedimentary environments.

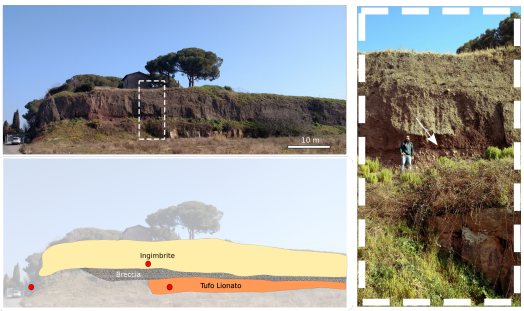

Figure 1: Exposures of sequences of rocks emplaced by volcanoclastic processes. Red dots on top panel show the location of sample. White arrow indicates the contact between breccias (bottom) and ingimbrites (top).

Acknowledgements

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References

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[3] Frigeri, A. et al., EPSC2018-297, 2018

[4] Ferrari, M. et al., this conference

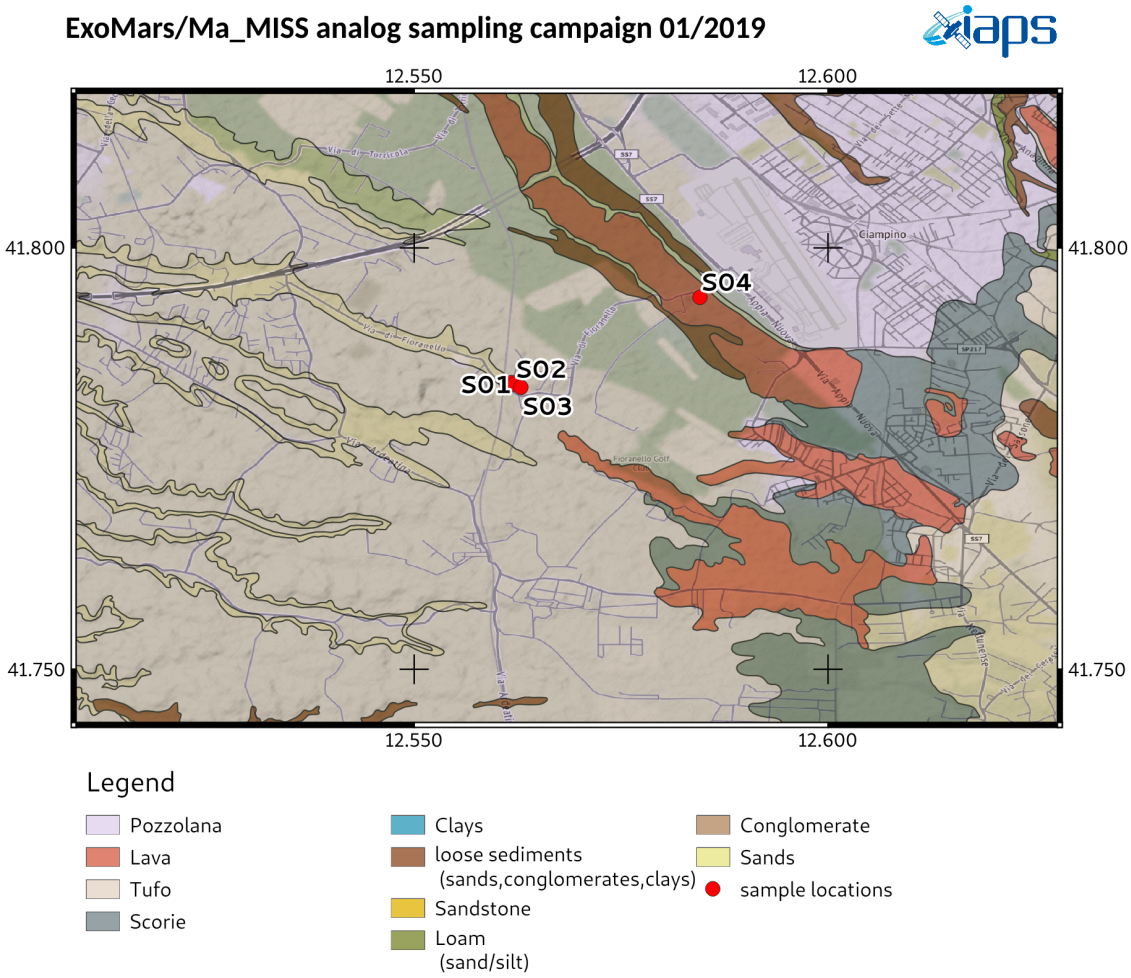

Figure 2: Lithologic map of the deposits northwest of the Colli Albani volcano next to Rome, Italy. Red dots indicate the locations where we have sampled ignimbrites and tuffs from units emplaced by pyroclastic events (S01-S03) and basalts (S04) from lava flows. See [4] for the description of laboratory analyses of the samples. Geologic data on lithologic units comes from from Regione Lazio OGC web services and basemap from OpenStreetmap project.