



EuroGeoMars mission and techniques: First results for geology and geochemistry

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The EuroGeoMars expedition forms part of the European Space Agency's ExoGeoLab research project and is a test campaign at the MDRS (Mars Desert Research Station), which is operated by the Mars Society, in the Utah desert, US. MDRS has yet been used by research groups of various interest as an analogue site to the Martian environment. The goal of this expedition is to simulate the employment of various instruments and sample return under Martian conditions, while carrying out several geological and biological investigations. In this paper we present our methods and first results for the geological and geochemistry investigations. Two main geological investigations have been carried out, of which one includes mapping of the sequence stratigraphy and internal structure of Quaternary alluvial fan deposits, 5 km South-West of the MDRS. Alluvial fans are formed when a stream gradient decreases over a relatively small area and therefore coarse-grained sediments are being deposited. Alluvial fans on Mars are of particular interest because they may have formed, as they do on Earth, a niche for life at deposition time. If any was present, the sediments may contain detritus that was transported by the river from the hinterland. Furthermore, the internal structure and lithology represent the depositional environment, water activity, and climatological perturbations. These three factors provide main implications for the conditions and possibilities of maintaining life. Mineralogical variations represent changes in the source area of the sediments and hence possible tectonic activity. The fan that we investigated measures 1.5 x 1.5 km and is made up of several stratigraphic sequences that we defined by classic geological methods. We followed the sedimentary sequences laterally using a Ground Penetrating Radar system (GPR) and taking samples for ground truth by drilling. All samples were analyzed on mineral content using Raman spectroscopy and XRF (X-Ray Fluorescence) for mineralogical and elemental analysis respectively. We created lacquer peels from several sequences in order to sample and study sedimentary structures. The procedure to make lacquer peels is to pour lacquer over an outcrop and sticking the unconsolidated sediments to a piece of cloth, which is subsequently pasted upon a hardboard plank. Another investigation that was carried out focuses on the possibilities and restrictions to the geologist for future fieldwork on Mars. Hence the investigators did similar type of experiments as for the alluvial fan, wearing spacesuits and spending restricted time outside as they would on a Martian base. The EuroGeoMars expedition is the first in a series of manned planetary mission simulations.