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ASTROBIOLOGY FIELD RESEARCH IN MARS ANALOGUE ENVIRONMENTS

Abstract

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We deployed during ILEWG EuroGeoMars 2009 and EuroMoonMars/DOMMEX 2010-2012 campaigns a suite of instruments and techniques [1, 2, 9-11] relevant to habitability and astrobiology research in Mars analogue extreme environments (including sample collection, context imaging from remote to local and microscale, drilling, spectrometers and Polymerase Chain Reaction PCR) and to help in the interpretation of Mars missions measurements from orbit (MEX, MRO) or from the surface (MER, MSL, ExoMars).

We will discuss how geological and geochemical evolution affected local parameters (mineralogy, organics content, environment variations) and therefore the habitability and the signature of organics and biota. Among the important findings of these field research campaigns are the diversity in the composition of soil samples even when collected in close proximity, the low abundances of detectable polycyclic aromatic hydrocarbons and amino acids and the presence of biota of all three domains of life with significant heterogeneity. An extraordinary variety of putative extremophiles, mainly Bacteria but also Archaea and Eukarya was observed [3,4,9]. A dominant factor in measurable bacterial abundance seems to be soil porosity and lower clay-sized particle content [6-8]. We will discuss the protocol for sterile sampling, contamination issues, and the diagnostics of biodiversity via PCR and DGGE analysis in soils and rocks samples [10, 11]. We will compare the 2009 campaign published results [0-9] to new measurements from 2010-2012 campaigns relevant to the detection of organics and signs of life.

Keywords: astrobiology, habitability, life detection, field analog research, Earth-Mars, organics

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