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ASTROBIOLOGY ANALOGUE FIELD RESEARCH SUPPORTING SPACE MISSIONS

Abstract

We report on astrobiology field research from the Mars Desert Research Station (MDRS) in Utah Hanksville conducted during the EuroGeoMars 2009 campaign and during the EuroMoonMars campaigns in 2010-2011 (supported by ILEWG, NASA Ames, ESTEC, Ecole de l'Air and academic research collaborators).

Extreme environments on Earth often provide similar terrain conditions to landing/operation sites on the Moon and Mars. In order to maximize scientific return it becomes more important to rehearse mission operations in the field and through simulations. EuroGeoMars 2009 was an example of a Moon-Mars field research campaign dedicated to the demonstration of astrobiology instruments and a specific methodology of comprehensive measurements from selected sampling sites. Special emphasis was given to sample collection and pre-screening using in-situ portable instruments. In this paper we describe the protocol, in-situ and post-analysis of the astrobiology research campaign at MDRS.

We have investigated 10 selected samples from different geological formations (Mancos Shale, Morrison, and Dakota) and also chose a variety of locations (surface, subsurface and cliffs). We compiled the individual studies and try to establish correlations among environmental parameters, organics markers and biota. The results are interpreted in the context of future missions that target the identification of organic molecules and biomarkers on Mars. Results from the EuroGeoMars 2009 and DOMMEX november 2009 campaign show that samples in which microorganisms could be observed after PCR amplification, had significantly lower clay particle content than samples in which microorganisms were not detected. No significant correlation was observed between amino acids and DNA yield or positive PCR signals. Microbial numbers and diversity does not appear to be correlated with neither organic content nor mineralogy. Instead, the dominant factor in bacterial number may be soil porosity and lower clay particle content. Regions where organic material could be formed and at the same time be preserved over long time periods may be associated with minerals that resist efficient extraction of organics and biological material.

We shall also describe astrobiology results from follow-on research during the DOMMEX-ILEWG EuroMoonMars campaigns in 2010-2011.

References: Foing B.H., Stoker C., Ehrenfreund P. (editors), Field Astrobiology Research in Moon-Mars Analogue Environments (International Journal of Astrobiology 2011, 11 articles)

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