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POLARES MARS ANALOGUE RESEARCH PROGRAMME - USING FLUORESCENT MICROSPHERULES AS CONTAMINATION PROXIES

Abstract

There is considerable evidence that early Mars once had liquid water - in principle allowing a genesis of life. The search for extinct or extant life is focussing on the detection of diminutive traces of biological origin, such as cell wall fragments, biologically precipitated minerals or non-stochiastic distributions of life-specific amino-acides etc.. Hence, one of the major concerns for the exploration of Mars is the inadvert contamination of soil samples with bioloads introduced by both robotic and human explorers leading to a false positive detection of "life".

In order to investigate these contamination vectors, the Austrian Space Forum has initiated a multi-year interdisciplinary research programme ("PolAres") to study human-robotic interaction in a set of field tests culminating in an arctic expedition in 2011. The scientific focus of these field simulations is to assess bioload transfer issues during a human Mars surface sojourn.

In a realistic arctic simulation a carefully selected and trained crew will operate spacesuit simulators, a Mars analogue rover, a custom designed drilling rig and other complementary equipement. They will study subsurface ice deposists with geophysical methods, establish the drilling infrastructure and acquire a pristine subsurface soil core for sample-return. As the High Arctic does not offer a sterile environment, fluorescent microspherules have been selected as a microbiological proxy to emulate diminutive traces of life.

This paper reports on the first laboratory tests using these proxies on various surfaces and their adhesive behaviour compared to real biological substrata under simulated Martian conditions and explores its potential to ensure a pristine sample acquisition for future missions.