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THE SPACE EXPERIMENTS BOSS AND BIOMEX ON THE EXPOSE R-2 MISSION: FIRST RESULTS ON DESERT CYANOBACTERIA UNDER SPACE AND MARTIAN SIMULATIONS

Abstract

In the proposed space experiments BOSS (Biofilm Organisms Surfing Space) and BIOMEX (BIOlogy and Mars experiment) will take place on the space exposure facility EXPOSE-R2 on the International Space Station (ISS), which will be launched in 2013. In BOSS the hypothesis is tested that microorganisms grown as biofilms, hence characterized by cells embedded and aggregated in their EPS matrix, are more tolerant to space and Martian conditions compared to their planktonic counterparts. Different microbial biofilms have been developed including those obtained by using strains of the cyanobacterium Chroococcidiopsis isolated from hot and cold deserts. The prime objective of BIOMEX is to measure to what extent biomolecules, such as pigments and cellular components, are resistant to and can maintain their stability under space and Mars-like conditions. The investigated samples consist of a variety of pigments, cell wall components, lichens, archaea, bacteria, cyanobacteria, snow and permafrost algae, black fungi and bryophytes. Results will be relevant for the formation of a biosignature data base (e.g. the proposed creation of an international Raman spectral library to be used when searching for extraterrestrial life- biosignatures. The secondary objective is to investigate the endurance of extremophiles under space and Mars-like conditions, focusing on their interactions with Moon and Mars analogues. Ground-based studies are currently carried out in the frame of EVTs (experiment verification test) by exposing the selected samples to space and Martian simulations (e.g. temperatures, UV dosage and Mars-like CO2 atmosphere). Results from the EVTs carried out in the frame of BOSS and BIOMEX which have been performed on desert strains of Chroococcidiopsis will be presented. Experimental data suggest the endurance of Chroococcidiopsis biofilms under simulated space and Martian conditions and support the employment of this cyanobacterium as model phototroph to identify biosignatures for life detection.