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MASE AND MEXEM – FROM TERRESTRIAL MARS ANALOGUES SITES TO SPACE

Abstract

Assessing the habitability of Mars and detecting life, if it was ever there, depends on knowledge of whether the combined environmental stresses experienced on Mars are compatible with life and whether a record of that life could ever be detected. However, our current ability to make these assessments is hampered by a lack of knowledge of how the combined effect of different environmental stresses influence the survival and growth of organisms. In particular, many combinations of stress, such as high radiation conditions combined with an absence of water and /or the presence of perchlorates have not been investigated. Furthermore, a lack of experimental studies on how anaerobic microorganisms from extreme terrestrial (Mars analogues) environments, respond to such stresses undermine our knowledge of Mars as a location for life since the planet is essentially anoxic. Even if life can be shown to be potentially supported on Mars, there exist no systematic studies of how organisms would be preserved. The project MASE (Mars Analogues for Space Exploration) will give insights into the ability of organisms from Mars analogues sites to survive diverse and advance our ability to assess the habitability of Mars and detect (extinct) life. The project MEXEM (Mars EXposed Extremophiles Mixture, formerly called MASE-in-Space), will be the continuation of MASE and the launch of the passive exposure experiment on the outside of the ISS is planned for the year 2020. MEXEM, will test the hypothesis that organisms in oxygen depleted natural samples, artificial anaerobic communities and isolated strains including ciliates and viruses from Mars analogue sites and from the ISS (deriving from the current project EXTREMOphiles) are not only resistant to the specific environmental conditions from where they originate but also to the combined Mars relevant environmental stress factors due to their highly effective cellular and molecular adaptation and repair mechanisms. Additionally, artificially fossilized strains will be examined.

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