Life Sciences as Related to Space (F)
Astrobiology: Mars Analogue Sites on Earth and Experiments in Earth Orbit and Beyond (F3.2)
Consider for oral presentation.

THE ASTROBIOLOGICAL POTENTIAL OF HALOPHILIC ARCHAEA

Stefan Leuko, stefan.leuko@dlr.de
German Aerospace Center (DLR), Cologne, Germany
Petra Rettberg, petra.rettberg@dlr.de
DLR - Inst. of Aerospace Medicine, Koeln, Germany

The universe we know is a hostile place and currently we only know one planet that harbors life: Earth. Most of the extant life on Earth thrives in moderate environmental conditions, however, over the last decades extreme environments have been shown to harbor a great diversity of life. The quest to understand modern life in these extreme environments addresses some of the most profound questions of humankind. How can organisms survive and thrive in these environments and could they withstand other detrimental conditions such as outer space or conditions prevalent on a foreign planet such as Mars? In this presentation, we aim to elucidate the astrobiological potential of halophilic archaea and if there are possible extraterrestrial environments where this group of organisms may be able to survive and thrive. Recent studies have increased our confidence that liquid water exists in form of high saline brines on the surface of Mars. Such brines may be similar to high salinity environments here on Earth such as solar salterns or salt lakes in Antarctica. The predominant inhabitants of these environments on Earth are halophilic archaea. These organisms are not only adapted to high osmotic conditions, but also to high radiation and fluctuations in temperature. Numerous studies have shown that different representatives of this family can cope with a wide variety of stress factors such as changes in osmotic pressure, ionizing radiation, different regimes of UV, exposure to simulated microgravity, exposure to Low Earth Orbit (LEO) and a high resistance to prolonged desiccation. For example, *Halococcus morrhuae* and *Halobacterium salinarum* NRC-1 both have shown high resistance against simulated solar and ionizing radiation. The desiccation resistance is of particular interest for astrobiological studies as it has been previously shown that desiccation resistance and radioresistance are strongly linked. Although it is unlikely to find active life on Mars due to high radiation regimes, halophilic archaea are known for their ability to survive entrapped in halite for up to 250 million years. Even if they are not viable anymore, organic remnants such as carotenoids may still be detected by means of Raman Spectroscopy. Taken all this information into account, halophilic archaea are ideal terrestrial organism to study the limits of life and what conditions may support life on other planets.