Geophysical Research Abstracts
Vol. 17, EGU2015-13520, 2015
EGU General Assembly 2015

Methanogens in the Solar System

Ruth-Sophie Taubner (1,2), Christa Schleper (3), Maria G. Firneis (1,2), and Simon Rittmann (3)

(1) University of Vienna, Research Plattform ExoLife, Vienna, Austria (ruth-sophie.taubner@univie.ac.at), (2) Institute of Astrophysics, University of Vienna, Vienna, Austria, (3) Archaea Biology and Ecogenomics Division, Department of Ecogenomics and Systems Biology, University of Vienna, Austria

The last decade of space science revealed that potential habitats in the Solar System may not be limited to the classical habitable zone supporting life as we know it. These microorganisms were shown to thrive under extremophilic growth conditions. Here, we outline the main eco-physiological characteristics of methanogens like their response on temperature, pressure, or pH changes or their resistance against radiation or desiccation. They can withstand extreme environmental conditions which makes them intriguing organisms for astrobiological studies. On Earth, they are found for example in wetlands, in arctic and antarctic subglacial environments, in ruminants, and even in the environment surrounding the Mars Desert Research Station in Utah. These obligate anaerobic chemolithoautotrophs or chemolithoheterotrophs are able to use e.g. hydrogen and C1 compounds like CO_2, formate, or methanol as energy source and carbon source, respectively.

We point out their capability to be able to habitat potential extraterrestrial biospheres all over the planetary system. We will give an overview about these possible environments on Mars, icy moons like Europa or Enceladus, and minor planets. We present an overview about studies of methanogens with an astrobiological relevance and we show our conclusions about the role of methanogens for the search for extraterrestrial life in the Solar System. We will present first results of our study about the possibility to cultivate methanogens under Enceladus-like conditions. For that, based on the observations obtained by the Cassini spacecraft concerning the plume compounds, we produce a medium with a composition similar to the ocean composition of this icy moon which is far more Enceladus-like than in any (published) experiment before.

Eventually, we give an outlook on the feasibility and the necessity of future astrobiological studies with these microbes. We point out the importance of future in-situ or even sample and return missions to the mentioned potential habitats.