Testing the habitability of distinct simulated martian environments

Conference or Workshop Item

MACEY, MICHAEL C.[1]; Ramkissoon, Nisha K.[1]; Pearson, Victoria K. [1], Schwenzer, Susanne P. [1], Karen Olsson-Francis[1]

[1]AstrobiologyOU, Open University, Milton Keynes, United Kingdom

Testing the habitability of distinct simulated martian environments

Habitability of martian waters would have been partially determined by the chemistry arising from interactions with martian lithologies. In this study, the habitability of groundwater chemistries (based on basaltic, iron- and sulfur-enriched lithologies) and the resulting variation in biosignatures was investigated, with microbes from anaerobic estuarine sediment used as an inoculum. The microbial community was monitored by cell counts and 16S rRNA gene profiling. Changes in fluid and precipitate chemistries were measured using ICP-OES and IC, with changes over geological timescales modelled using CHIM-XPT. The fluid chemistries were shown to be habitable, with distinct patterns in cell abundance and growth phases between the chemistries. However, the same genera dominated (*Acetobacterium*, *Desulfovibrio* and *Desulfosporomusa*) regardless of the initial fluid chemistry. In the biotic test group, changes in fluid chemistry were the same in the three chemistries, with an enhanced concentration of aluminium and iron and the removal of sulfate. However, geochemical modelling of the fluids under abiotic conditions over geological timescales revealed similar changes to those in the biotic test groups. Therefore, these samples require further analysis to assess whether we can identify any potentially unambiguous biosignatures that could develop between geologically distinct sites.