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Pyrolysis-GC-MS analysis of samples collected during AMASE11

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The NASA/ESA-lead Mars rover ExoMars (launch in 2018) will carry a suite of instruments, one of the instruments is the Mars Organic Molecule Analyzer MOMA. Organic material in the Martian soil will be either pyrolyzed at temperatures of up to 1000°C and separated by gas chromatography (GC) or volatilized by a UV-laser. A mass spectrometer (MS) will be the detector for both methods.
The high temperatures during pyrolysis alters the organic molecules in the sample and creates smaller molecules suitable for the anylsis with the GC-MS. The analysis of terrestrial samples with pyrolysis-GC-MS is necessary to improve the ability to interprete the data from Martian samples. Extreme environments are a favored place to search for life forms similar to those expected on other planets. During the Arctic Mars Analog Svalbard Expedition 2011 gave access to several sample sites one was the Coletthödga.[1]

Pyrolysis-GC-MS Analysis: The pyrolysis was conducted with a Pyrola 2000 connected to a Varian 3800 GC and a Varian 4000 ion trap MS. The sample was heated to 900°C within 15 ms and staid at that temperature for 2 s. The generated volatile compounds were directly injected into the GC. The GC-MS plots showed organic material strongly depending on the sample location. On top a layer of bioherm showed a evenly distributed patern of long chain hydrocarbon. In the sediment layer below only four long chain hydrocarbons are present. The hydrocarbon with 11 carbons is nearly absent, while the hydrocarbons with 10 and 12 carbons show large peaks in the GC-MS-plot.

References: [1] Steele, A. et al. (2010), LPS XLI, Abstract #2398.

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