

Hydrous alteration of lava flows on Mauna Loa (Hawaii) compared to Martian volcanic soils

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Over the past decades, the knowledge about planet Mars experienced an enormous growth. Therefore, Mars has become a central object of interest for geology studies [1]. To learn more about the geological processes on Mars and other planetary bodies, comparisons with samples from Earth are frequently made. For those reasons, this research focuses on the weathering processes on Mars by looking at samples from Earth.



Photograph of the HI-SEAS habitat by night.

Picture by Josh Burstein

RESEARCH

- ◆ What is the effect of hydrous alteration on volcanic rocks, in particular frost and lacustrine alteration?
- ◆ What similarities can be observed between contrasting lava flows from Mauna Loa with various ages that have been exposed to hydrous alteration over different times and underwent changes in color and spectral signatures?
- ◆ What comparisons can be found between the samples from Hawaii and measurements from the Mars Exploration Rovers (MER) and the Curiosity Rover on Mars?



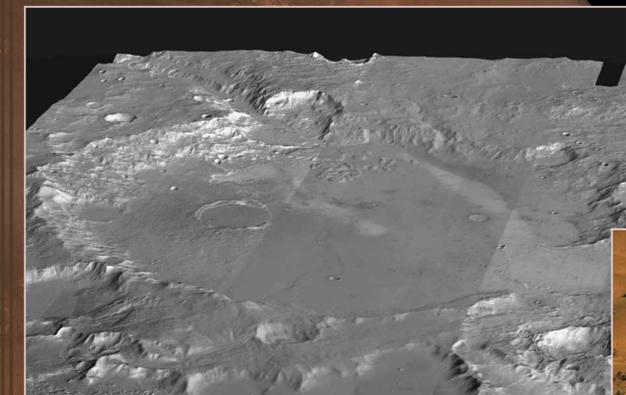
Left: alteration of a young lava flow (410 ± 60 years old). Right: alteration of an older lava flow (1838 ± 94 years old) [2].

HI-SEAS

The sample collection for this research was done during the EuroMoonMars Hawaii Space Exploration Analog and Simulation (HI-SEAS) campaign of February 2019. The HI-SEAS habitat is located on the north-east flank of Mauna Loa, Hawaii, in an isolated area where the geology is Mars-like [3, 4]. The research and technological experiments conducted at HI-SEAS are going to be used to help build a Moonbase in Hawaii, and ultimately to create an actual Moonbase on the Moon.

METHODS

- ◆ Drone imaging
- ◆ Geological fieldwork
- ◆ XRD measurements
- ◆ Petrographic microscopy
- ◆ EMPA measurements



Above: mosaic of daytime infrared images of Gustev Crater, made by the Mars Odyssey spacecraft. Right: basaltic rocks (named FuYi) found by the Spirit rover in Gustav Crater. [5]



HYPOTHESES

The research:

- ◆ will contribute to the understanding of the surface processes on Mars and how the surface of Mars evolved.
- ◆ will give a better understanding of the influence of water on the basaltic rocks on Mars.
- ◆ will provide information about the time-scale of weathering on Mars.
- ◆ will test doing geological field under simulated conditions.

[1] Ehrenfreund, P., et al. (2011), International Journal of Astrobiology, 10, 239-253.
[2] Trusdell, F.A. & Lockwood, J.P., (2017), U.S. Geological Survey Scientific Investigations Map 2932-A.
[3] <http://www.hi-seas.org>
[4] Blake, D., et al. (2012), Space Science Reviews, 170, 1-4.
[5] <https://www.nasa.gov>