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Hydrothermal alteration minerals of Cerro Caliente (Deception Island, Antarctica). Analogies to several assemblages of Mars

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Abstract

We study the assemblage of minerals formed by hydrothermal alteration at Cerro Caliente, Deception Island, Antarctica. The alteration of the basaltic andesitic rock produces phyllosilicates associated with carbonates, which precipitate impregnating the porous volcanic strata from the fluids released by the fractures. Similar signatures have been observed at several places of Mars, so we use this terrestrial analog to determine the processes acting on Mars.

Introduction

Deception Island is an active stratovolcano located in the Bransfield strait, between the Antarctic Peninsula and the South Shetlands islands.

Hot and cold environments interact at some places of Deception Island producing particular features that are interesting for comparative planetology. Geothermal anomalies affect the permafrost and periglacial landforms of the island. In some places, gases such as CO_2 and H_2S release with water vapour from fractures, cutting the volcanic deposits, and altering them. Fluids like these occur at *Cerro Caliente*, a hill that is located at the west side of the island near the Argentinean base. At the top of the hill there is a narrow band of 40 m long in which the temperature may reach 100ºC. Particular biology is associated with this area, and is currently under study and will be compared to the communities that usually live in permafrost conditions [1].

Sampling and analysis

Samples of the volcanic rock on the top of *Cerro Caliente*, which are affected by warm fluids, were obtained at different depths by drilling. Four boreholes of 1-2 meters along the summit ridge were performed. Different surface temperature, from 100ºC to <0ºC, were measured at the surface of the borehole sites. Mineralogy and geochemistry analysis of the rock samples were done using several techniques, which include XRD, FTIR, ICP-MS, I-chromatography and TXRF.

Results

The analyses of the samples show a gradient on alteration from the hot centre of the fracture to the areas where the permafrost is maintained. Detailed study of the smectites and carbonates is already in progress.

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References

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