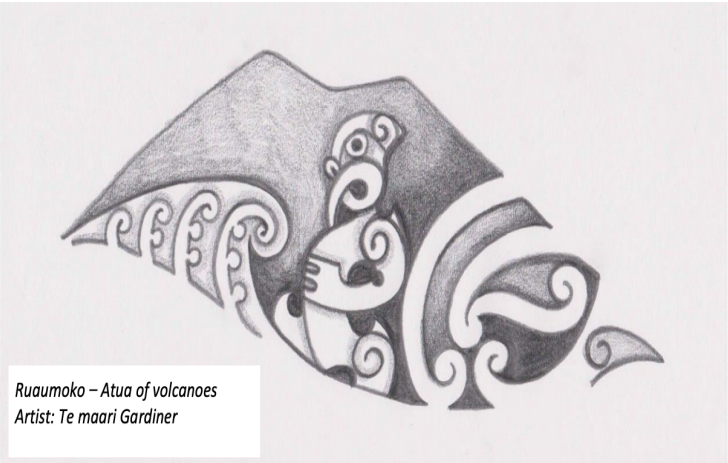

Ruaumoko – Atua of volcanoes
Artist: Te maari Gardiner

IAVCEI-Commission on Volcanic Lakes

Abstracts

CVL 10 Workshop, New Zealand
17-25 March 2019

Poás volcano: Significance of mobile trace elements in the hyperacid crater lake

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The hyper acid brines of Poás volcano crater lake in Costa Rica have been monitored in a nearly monthly basis for ca. 40 years for major aqueous anions (F^-, Cl^-, Br^-, SO_4^{2-}, SxO_6^{2-}, etc.) derived from the input and hydrolysis of magmatic volatiles (i.e. SO_2, H_2S, HCl, HF, HBr) in the hydrothermal fluids, due to their high abundance and the availability of laboratory facilities at OVSICORI-UNA.

Trace elements TE that are known to be highly mobile in volcanic environments but have rarely been investigated as yet, have been recently incorporated in the analytical routines to gain insights into the transport of chemical elements from deep to surface, and changes in the Poás´s lake water composition with time that can reflect dynamic volatile-water-rock processes in the subsurface magmatic-hydrothermal system. Ultimately, we are interested in assessing the potential of the TE as a monitoring tool to envisage transient subsurface processes and the occurrence of eruptive events. Based on previous and new TE analytical data obtained by ICP-MS and covering ca. 4 decades of geochemical monitoring of the hyper acid crater lake of Poás volcano, which has shown sharp fluctuations in the activity with frequent periods of phreatic eruptions, and rare phreatomagmatic eruptions, separated by time intervals of relative quiescence (between 1980 and 2018), we focus on the element transfer ratio behavior of B, Zn, As, Mo, Sn, Sb, Tl and Pb to identify possible sources in this volcanic lake system as well as to envisage the potential of the TE as a monitoring tool.

Time- series profiles of the TE in question indicate increased concentrations when the lake system was most active and vice-versa. There is a general correlation between concentration levels and lake temperature, and an inverse correlation with pH. These patterns point to an enhanced input of the elements during intervals of increased activity and phreatic to phreatomagmatic eruptions, in agreement with evidence for a stronger influx of magmatic gas. For most of these elements, the lake water show enrichment relative to magnesium and other rock-forming elements, which argues against congruent rock dissolution as main source but is consistent with preferential input of supercritical fluids via subaqueous fumarolic gas.
Preliminary results of this study demonstrate the potential of monitoring this group of mobile elements in crater lakes and associated surface manifestations since they provide insights into the nature and conditions of processes in magmatic-hydrothermal systems that can be different and complementary to those provided by more traditional monitored elements such as the anions.