

# On the role of sulfur in explaining different degassing patterns in volcano-hydrothermal systems

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Understanding the solubility behaviour of sulfur in silicate melts is complex due to its multiple valence states and the possible occurrence of non-volatile S-rich phases. The assessment of the total mass fraction of S dissolved in the pre-eruptive gas-phase has always been a critical topic in an attempt, among other issues, to forecast the amount of SO<sub>2</sub> released by explosive eruptions and its impact on the climate. Several eruptions released SO<sub>2</sub> amounts orders of magnitude greater than those possibly dissolved in melts, unearthing the “excess-S” problem. The source of anomalous SO<sub>2</sub> emissions could be instead explained with a contribution from S stored in hydrothermal systems, without needing evidences for a gas saturation of magmas. In fact, S-layers have been reported at several active volcanoes hosting hydrothermal systems (i.e. Ruapehu, Poás, Kusatsu Shirane and recently inferred at El Chichón and Ilamatepec). S-layers may be more frequent than commonly thought. We are investigating the variations in S-viscosity at different T and P (in a range typical for hydrothermal systems), using a rheometer equipped with a pressure cell, substituting steel geometries with Pyrex ones.

This study will allow understanding if the behaviour of this element can explain the different passive degassing patterns observed at several active volcanoes.

The results expected would offer a tool to understand the role of such element in “modulating” passive emissions, and contribute to clarify controversial aspects related to anomalous high- SO<sub>2</sub> emissions in explosive eruptions.