

A data-driven investigation of the 1669 Monti Rossi eruption (Mt Etna)

Contact persons

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Context

The 1669 Monti Rossi eruption is used as the worst-case scenario event at Mt Etna. This iconic eruption not only reached Catania but was also followed by an increase of the explosivity of eruptions at Mt Etna, and a variation of magma chemistry. Classic approaches to the study of the relationships between magma chemistry, pre-eruptive storage conditions and eruptive dynamic include the use of thermodynamic models (e.g. MELTS), which are calibrated on experimental data. Here we want to take a different approach and use the chemistry and mineralogy of magmas erupted during the 1669 event and after, in combination with machine learning to determine the architecture of the plumbing system of the 1669 eruption and the following ones.

Aims and Methods

The target of this study is to build a machine learning model that is able to simulate the phase equilibria and chemistry of minerals for basaltic alkaline magmas such as those of Mt Etna. We will collect samples of 3 eruptions: one before, the 1669 and a recent eruption, and measure whole rock and mineral chemistry. Additionally, the student will complement an existing dataset of experiments with data from more recent one and collaborate closely with Dr Prados to guide the construction of the model using constraints from magmatic petrology. The student will acquire knowledge in data science, petrology and volcanology

References

- Ghiorso, M.S., Sack, R.O., 1995. *Chemical Mass-Transfer in Magmatic Processes .4. a Revised and Internally Consistent Thermodynamic Model for the Interpolation and Extrapolation of Liquid-Solid Equilibria in Magmatic Systems at Elevated-Temperatures and Pressures. Contrib. to Mineral. Petrol.* 119, 197–212.
- Petrelli, M., Caricchi, L., Perugini, D., 2020. *Machine Learning Thermo-Barometry: Application to Clinopyroxene-Bearing Magmas. J. Geophys. Res. Solid Earth* 125. <https://doi.org/10.1029/2020JB020130>



Website

<https://www.unige.ch/sciences/terre/en/research/petrology-and-volcanology/>

<https://www.unige.ch/medecine/bioinformatics>

Prerequisite

Indicate if the student has to take some course or module: Module “Dynamic Earth”, “Introduction to R”