EGU21-8094
https://doi.org/10.5194/egusphere-egu21-8094
EGU General Assembly 2021


# $CO_2$ favours the accumulation of excess fluids in felsic magmas

**Mattia Pistone**[1], Luca Caricchi[2], and Peter Ulmer[3]
[1]University of Georgia, Department of Geology, Athens, United States of America (samuraihito@gmail.com)
[2]University of Geneva, Department of Earth Sciences, Geneva, Switzerland
[3]ETH-Zurich, Department of Earth Sciences, Zurich, Switzerland

Volcano deformation and gas emissions provide insights into subsurface magmatic systems. Large discrepancies are observed between the volumes calculated from deformation data, mass of emitted gases, and volumes of erupted magmas. Such discrepancies hinder our capacity to predict the magnitude and intensity of imminent eruptions and are ascribed to the amount of excess fluids stored in magma reservoirs. High-pressure (1240 bar) and high-temperature (1200 °C) hot isostatic press experiments show that the amount of trapped excess fluids in haplogranitic magmas with variable crystal contents (30, 50, 60, and 70 vol.%) depends strongly on fluid composition. Magmas with $CO_2$ excess fluids become permeable at much larger porosities (44% higher) with respect to the $H_2O$-rich counterparts at equivalent crystallinity. Available excess gas geochemistry data calculated from volatile-saturated melt inclusion record, syn-eruptive $SO_2$ emission, and erupted juvenile porosity data collected for crystal-rich andesite and crystal-poor dacite/rhyolite volcanoes with known eruption magnitude and intensity (Mt St Helens 1980, Pinatubo 1991, Soufrière Hills 1996, and Merapi 2010) reveal that the discrepancy between erupted magma volume and $SO_2$ released during the eruption increases with $CO_2$ excess in magmas. In agreement with our experiments, these data highlight that $CO_2$-rich fluids enhance magma's capacity to store excess volatiles and shed light on the largest discrepancies between pre-eruptive deformation, gas emissions, and eruption intensity and magnitude.