DIPARTIMENTO
DI SCIENZE DELLA TERRA
SAPIENZA
UNIVERSITÀ DI ROMA

DOTTORATO DI RICERCA
IN SCIENZE DELLA TERRA

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1. Research activity

Mt. Etna and Stromboli volcanoes in Sicily (Italy) are ones of the most studied and monitored volcanoes in the world. Nevertheless, the link between sub-surficial magma movement and surficial manifestations (seismic, ground deformation, gas geochemistry) is yet to be understood. There is an exceptional record of monitoring data and a collection of rock samples of the recent eruptions, making those volcanoes valuable templates for open-conduit basaltic systems worldwide. Despite the recent literature has provided scientific advances, several key questions remain unanswered. In particular, the identification of nature and timescales of key controlling parameters modulating frequency and energy of explosive events as opposed or associated to effusive activity and mechanisms of eruption from the summit or from the flank of the volcanic edifices. Moreover, the understanding of how magma is stored, migrates and feeds eruptions is not a trivial task, requiring for constant improvements over the years. Beneath Mt. Etna and Stromboli volcanoes there are complex networks of melt, mush and crystals that extend throughout the crust and into the uppermost mantle. These networks play an integral role in eruption dynamics where influx of fresh, hot deeper magmas into a shallower reservoir accompanied by mixing may trigger volcanic eruptions. Abundant volatile exsolution and degassing are the key mechanisms controlling mineral and melt compositions, degree of crystallization, magma ascent velocity, and eruptive style.

Mafic alkaline magmas are characterized by the ubiquitous stability of clinopyroxene from mantle depths to shallow crustal level. More evolved magmas are saturated with plagioclase, especially at lower H_2O contents and pressures. Textural and compositional changes of clinopyroxene and

plagioclase crystals from mafic alkaline magmas are unequivocally related to specific dynamic processes, which extend over a broad range of spatial and temporal scales.

My research focuses on understanding mechanism and timescale of pre-eruptive magmatic processes at Mt. Etna and Stromboli volcanoes by means of experimental petrology. I approach these problems performing textural and chemical analyses (major/trace elements) in natural/synthetic clinopyroxene, plagioclase and coexisting glasses. My activity objectives are to unlock timescales of pre-eruptive processes (e.g., magma ascent rates) by focusing on crystal growth kinetics and diffusion chronometry, and to provide new tools for interpreting polybaric-polythermal changes in plumbing systems.

2. Research products

a) Publications (ISI journals):

- Bini, G., Chiodini, G., Lucchetti, C., Moschini, P., Caliro, S., Mollo, S., Selva, J., Tuccimei, P., Galli, G., Bachmann, O., 2020. Deep versus shallow sources of CO2 and Rn from a multi-parametric approach: the case of the Nisyros caldera (Aegean Arc, Greece). Sci Rep 10.

- Moschini, P., Mollo, S., Gaeta, M., Fanara, S., Nazzari, M., Petrone, C.M., Scarlato, P., 2021. Parameterization of clinopyroxene growth kinetics via crystal size distribution (CSD) analysis: Insights into the temporal scales of magma dynamics at Mt. Etna volcano. Lithos 396–397, 106225.

- Mollo, S., Moschini, P., Galli, G., Tuccimei, P., Lucchetti, C., Iezzi, G., Scarlato, P., 2021. Carrier and dilution effects of CO2 on thoron emissions from a zeolitized tuff exposed to subvolcanic temperatures. R. Soc. open sci. 8.

b) Publications (NON ISI journals)

c) Manuscripts (submitted, in press):

d) Abstracts