Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.12145

Anatomy of a back-arc ridge system: the Marsili seamount

EMANUELA M. GENNARO[1], GIANLUCA IEZZI[2], LUCA COCCHI[3] AND GUIDO VENTURA[3]

[1]Università G. d'Annunzio, Chieti-Pescara
[2]Università G. d'Annunzio
[3]Istituto Nazionale di Geofisica e Vulcanologia
Presenting Author: emanuelagennaro@live.it

The knowledge of the plumbing systems of volcanoes is critical to interpret the processes modulating the formation of reservoirs, migration of magmas and eruption styles. The Marsili ridge (MR; 800 ka-2.7 ka) is located in the Tyrrhenian Sea back-arc and shows active degassing, hydrothermal activity and shallow seismicity indicating that it is still active [1, 2]. The MR lavas and tephras range in compositions from basalts to trachytes and their evolution is consistent with the fractionation of olivine, pyroxene, plagioclase and alkali-feldspar.

Since the architecture of the MR plumbing system is lacked, here we merge petrological and geophysical data to decipher its geometry. We perform phase-melt *equilibrium* thermobaric, oxy- and hygrometric models to estimate the temperature and pressure of crystallization, the H_2O content in pre-eruptive conditions, and oxygen fugacity (fO_2). With these data as constraints, we infer the geometry of the MR inner structure by direct modeling of gravimetric and magnetic data. The calculated crystallization temperature of clinopyroxenes roughly decreases with increasing degree of evolution from about 1190 °C in basalts to 1000° C in basaltic andesites and trachytes. On the contrary, pressure is lower than 400 MPa for basalts and basaltic andesites and 200 MPa to 500 MPa in the more evolved magmas. H_2O and fO_2 are in the ranges of 0-4 wt% and 0-3 log units above the FMQ buffer and do not correlate with the rock composition.

The *P*-*T*-depth data are consistent with a plumbing system consisting of vertically superimposed reservoirs at different depths between 17 km and the sea bottom. The geophysical modeling shows a large storage zone filled with SiO_2-rich melts at the crust/mantle transition, plus smaller and diffuse reservoirs across this depth and the surface. It is possible that the dynamics and connections of both deep and shallow storage zones, infilled with SiO_2-rich and -poor magmas, respectively, modulated the eruption styles of the MR that are both effusive and explosive.

References

[1] D'Alessandro et al., 2009. *Journal of Volcanology and Geothermal Research 183, 17–29*. [2] Lupton et al., 2011. *Journal of Geophysical Research: Solid Earth 116*.