Plumbing system dynamics at Kolumbo submarine volcano, Greece, prior to the 1650 CE explosive eruption

F. MASTROIANNI[1,2,*], I. FANTOZZI[2], C.M. PETRONE[3], G.E. VOUGIOUKALAKIS[4], E. BRASCHI[5], L. FRANCALANCI[2]

[1]DST, University of Pisa, Via S. Maria 53, Pisa, IT (*correspondence: filippomastroianni91@gmail.com)
[2]DST, University of Florence, Via G. LaPira, 4, Florence, IT
[3]The Natural History Museum, Cromwell Road, London, UK
[4]HSGME, S. Lui 1, Olympic Village, Athens, GR
[5]CNR-IGG, Via G. LaPira, 4, Florence, IT

Kolumbo is the largest of twenty submarine volcanic cones tectonically aligned in the transtentional Anydros basin, NE of Santorini, representing one of the most seismically active zones in the South Aegean Volcanic Arc. Kolumbo explosively erupted in 1650 CE, causing the death of 70 people on Santorini. Explorative cruises employing ROVs showed the presence of a high temperature (220°C) hydrothermal field with CO_2-rich discharges and accumulation of acidic water at the bottom of the crater (505m bsl) [1], increasing the hazard of this active system. A possible magma chamber was recognized below the crater at depth 9-6 km by seismic data [2], which is separated from the storage system of Santorini, as suggested also for the mantle source by geochemical data [3].

We present new petrographic, geochemical and isotopic data (on whole-rock, minerals and glasses) of samples collected during the cruises. Most samples represent the juvenile products of the 1650 CE activity, characterizing the different magmas interacting before the eruption. They consist of white rhyolitic pumices with grey and black bands, also including centimetric to millimetric, basaltic-andesitic enclaves. Plagioclase, biotite, pyroxene and amphibole are the main mineral phases; olivine is found in the mafic enclaves. Minerals show quite complex zoning and a large compositional variability (e.g. $An_{15\text{-}90}$ for plagioclase). Our data suggest the presence of a complex storage system where the most evolved magma differentiated by assimilation and fractional crystallization, undergoing several inputs of mafic magmas. The early batches of new melts initially mixed with the resident ones, whereas the later arrivals only mingled with the rhyolitic magma, thus possibly representing the final trigger of the eruption.

[1]Carey et al. (2013) Geology **41**, 9, 955-958. [2]Dimitriadis et al. (2009) Tectonophysics **465**, 136–149. [3]Klaver et al. (2016) Geochem. Geophys. Geosyst. **17**, 3254–3273.