

Evolution of the Kameni Islands volcanic centre (Greece) from chemical and textural studies.

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During the last 2000 years there have been 8 subaerial and at least 5 underwater largely effusive eruptions of dacites from the Kameni Islands volcanic centre, situated within the Thera (Santorini) Caldera. The lavas have a limited range in chemical composition ($\text{SiO}_2 = 64\text{--}68.5\%$) which contrasts with their wide range in textures (plagioclase = 3-22%).

The dacites are commonly glassy with abundant macrocrysts of plagioclase and minor pyroxenes and magnetite. Some macrocrysts occur in loose clusters with relatively fine-grained cores. Most plagioclase crystals have simple zoning and belong to the same population. Enclaves are present but do not appear to have contributed significantly to magmatic diversity.

Starting with the 46CE eruption SiO_2 initially rose until the explosive 726CE eruption and then descended until 1950CE. Plagioclase abundances mirror this variation and are broadly correlated with SiO_2 and Eu/Eu^* . Mass balance calculations show that most of the compositional diversity can be accommodated by addition of plagioclase macrocrysts to a slightly heterogeneous dacite liquid.

Crystal size distributions (CSD) are curved and have been modelled by adding two straight CSDs reflecting deep and shallow processes. Large crystal CSD components show relatively little temporal (?) variation, except for 4 early, low-plagioclase samples that have more large crystals. Small crystal CSDs become steeper with time and plagioclase content, suggesting progressively more rapid transport.

We propose that the compositional diversity was produced by dynamic processes, rather than the sampling of a static stratified magma chamber. Injection of hot mafic magma into the base of the chamber provoked degassing, followed by bubble formation on the silicate crystals. The buoyant crystals then rose to the top of the chamber. If eruption occurred shortly after the injection event then the magmas would be crystal rich, otherwise the magma chamber would become rehomogenised by convection and the crystal content of the magmas would be lower.