Magmatic timescales using diffusion profiles in olivine from Nea Kameni, Santorini, Greece

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Mafic enclaves, interpreted as fragments of replenishing magma batches, are abundant in all the dacitic lava flows of Nea Kameni, Santorini. Periodic replenishment of shallow crustal magma chambers with batches of mafic magma has been widely accepted as a potential eruption trigger. Thus, developing an understanding of the evolution of shallow magma chambers after replenishment, and the duration of any delay between the triggering mechanism and subsequent eruption, represents a significant advance in our ability to predict volcanic activity.

Glomerocrysts and xenocrysts of gabbroic cumulate material are present in a number of the mafic enclaves. Isotopic and chemical disequilibrium between the cumulate crystals and the andesitic host enclaves indicate that these fragments are derived from pre-existing gabbroic crystal mush piles that were pervaded by the replenishing andesitic melts as they migrated to shallow levels, creating disequilibrium between the cumulate mineral cores and the replenishing melts.

High-resolution back-scattered electron (BSE) images reveal that when in contact with enclave magma groundmass, the xenocrystic olivine crystals display narrow (10-30 µm) Fe-Mg diffusion profiles. This diffusion must have occurred after entrainment of the crystals in the replenishing magma, and thus can be used to estimate the interval between entrainment, replenishment and eruption.

Initial modelling of diffusion profiles from more than 60 crystals suggests short timescales, ranging from 6 to 46 days, for the combined migration-replenishment-eruption cycle at Nea Kameni. Such information may prove useful in terms of volcanic hazard prediction and mitigation.

Biogeochemistry of metalliferous peat cores: Distribution of Zn, S, Mn, Fe and *dsr*AB genes and sulfur and zinc speciation

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Biogeochemical processes have resulted in the accumulation of elevated concentrations of Zn and S in soils of the Manning peatland region in western New York. Peat cores were collected during dry and wet seasons across a transect of variable Zn concentrations. Element distributions, Zn and S speciation and detection of *dsr*AB genes were independent of season but related to peat depth. The pH increased with depth. The highest levels of S and Zn occurred at intermediate depths, whereas Mn concentrations were highest in topmost soils. Iron showed relatively uniform vertical distribution profiles. These data indicated vertical redox stratification in peat cores where topsoils were typically acidic and oxidizing and deeper soils were typically circumneutral and reducing. Surface peats contained >50% of the total S in reduced forms while deep peats contained <5% of the total S in oxidized forms. *dsr*AB gene detection followed redox stratification chemistry in peat cores closely. Zn-EXAFS analyses of surface peats indicated Zn binds to O/N functional groups of soil organic matter. Zn-EXAFS analyses of deep peats identified ZnS minerals as the primary Zn specie while SEM, S isotopic analyses and synchrotron-based XRD showed that ZnS species occur as framboidal aggregates of biogenic nanocrystallites. We can therefore conclude that exposure to prolonged dry-wet cycles resulted in the formation of two redox stratified zones with distinct chemical and microbiological signatures.