Dynamics and longevity of the magmatic system of Furnas volcano, São Miguel, Azores

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Furnas is the easternmost of the three active trachytic central volcanoes on the island of São Miguel, Azores. It is regarded as one of the most active and dangerous volcanoes in the Azores archipelago owing to a population of several thousand people living within the caldera and in the immediate vicinity of the volcanic complex. Throughout its history, volcanic activity at Furnas has been essentially explosive but eruptive styles have varied from mild effusive activity to at least two caldera-forming eruptions ~30,000 and 12,000-10,000 years BP [1].

During the past 5,000 years, ten explosive eruptions occurred at Furnas, which produced a total of ~0.9 km^3 (DRE) of fairly homogeneous trachytic magma. The deposits of these eruptions are collectively referred to as Furnas A-J members of the Upper Furnas Group [1,2]. The latest eruption (Furnas J) occurred after the settlement of the Azores archipelago in 1630 AD. Eruptions of the Upper Furnas Group were mainly characterised by alternating episodes of magmatic and phreatomagmatic activity producing deposits of interbedded ash and lapilli that overlie the widespread Fogo A deposit from adjacent Fogo volcano [3]. At least three of these eruptions, namely Furnas E, Furnas I and the 1630 AD event (Furnas J), were accompanied by trachyte dome extrusion in the final phases of the eruption [3].

To develop a fuller understanding of the underlying dynamics of the magma system of Furnas, we have investigated the whole-rock major and trace element geochemistry of the products of the Upper Furnas Group and the older caldera-forming events. These data are discussed together with U-Th-Ra isotopic disequilibria obtained on trachyte pumice clasts and lavas to place constraints on the dynamics and longevity of the magma system of Furnas.

References

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Designing a dissimilatory iron reducer. Reconstitution of the Fe(III)-reducing electron transport chain of *Shewanella oneidensis* MR-1 in *Escherichia coli*

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Shewanella oneidensis uses several electron acceptors to support anaerobic respiration including soluble species and remarkably insoluble species such as iron(III) and manganese(IV) oxides. The pathway of electron flow from the cytoplasmic membrane to the outer membrane remains elusive after years of research with different *Shewanella* species. We are pursuing a novel approach to identify the essential components of the electron transport chain by reconstituting the pathway for iron(III) reduction by *S. oneidensis* in *Escherichia coli*. We generated a suitable *E. coli* strain as a platform for this work and integrated the central electron transfer protein, CymA into the genome. CymA allows for electron transfer from the cytoplasmic membrane to the periplasmic space in *Shewanella* species. We showed (i) that the expressed CymA activity is growth supporting for *E. coli*, (ii) that CymA couples directly to the soluble fumarate reductase of *S. oneidensis*, and (iii) that CymA in vitro facilitates reduction of ferric citrate and the soluble quinone analog AQDS. Our generated *E. coli* strain is a dissimilatory iron reducer in that it can use ferric-NTA as a terminal electron acceptor during growth with glycerol as the sole carbon and electron source. We could furthermore show through in vitro assays that a direct interaction between CymA and the periplasmic decaheme cytochrome MtrA from *S. oneidensis* is possible.