



Three-dimensional electrical conductivity characterisation of Furnas and Fogo Volcanoes, São Miguel Island (Azores archipelago, Portugal), by magnetotelluric data

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Accurate geophysical imaging of shallow subsurface features provides crucial constraints on understanding the dynamics of volcanic systems. The island of São Miguel, Azores (Portugal) is dominated by volcanic systems and can pose a threat to human populations in terms of elevated CO₂ and radon degassing, and also seismic swarm activity. At Furnas Volcano, intense circulation of volcanic fluids at depth leading to high CO₂ outgassing and flank destabilisation poses considerable threat to the local population. Presented is a novel 3-D electrical resistivity model developed from 39 magnetotelluric soundings that images the hydrothermal system of the Furnas Volcano to a depth of 1 km. The resistivity model delineated two enhanced conductive zones, one at 100 m and another at 500 m depth, separated by a resistive layer. The shallow conductor has conductivity less than 1 S/m, which can be explained by clay mineral surface conduction with a mass fraction of at least 20% smectite. The deeper conductor extends across the majority of the survey area and is located at depths where smectite is generally replaced by chlorite and being interpreted as aqueous fluids near the boiling point and infer temperatures of at least 240 °C. The less conductive layer found between these conductors is probably steam-dominated and coincides within the mixed-clay zone found in many volcanic hydrothermal systems. A new extended study, following a recent field campaign aimed at providing insights into deep electrical conductivity structure of Furnas Volcano will be presented together with broad-band magnetotelluric data from over 50 stations across the central volcanic system of São Miguel, Fogo Volcano, where seismic swarm activity has been centred.