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Three-Dimensional interpretation of short-period magnetotelluric data at Furnas Volcano, Azores Islands.

Hogg Colin (1), Kiyan Duygu (1), Rath Volker (1), Byrdina Svetlana (2), Vandemeulebrouck Jean (2), Revil Andre (2), Viveiros Fatima (3,4), Carmo Rita (3,4), Silva Catarina (3,4), Ferreira Teresa (3,4)

(1) Dublin Institute for Advanced Studies, Geophysics Section, Dublin, Ireland (chogg@cp.dias.ie), (2) ISTerre - Universite Savoie Mont Blanc, CNRS, IRD, IFSTTAR, ISTerre, F-73000 Chambry, France, (3) IVAR - Instituto de Investigacao em Vulcanologia e Avaliacao de Riscos University of the Azores, Ponta Delgada, Sao Miguel, Azores, Portugal, (4) CIVISA - Centro de Informacao e Vigilancia Sismovulcanica dos Acores Universidade dos Acores, Ponta Delgada, Sao Miguel, Azores, Portugal

Accurate geophysical imaging of shallow subsurface features provides crucial constraints on understanding the dynamics of volcanic systems. At Furnas Volcano (Azores), intense circulation of volcanic fluids at depth leading to high carbon dioxide 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 images two 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. This deeper conductor is located at depths where smectite is generally replaced by chlorite and we interpret it as aqueous fluids near the boiling point and infer temperatures of at least 240 degrees Celsius. 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.