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Resistivity structure of the Furnas hydrothermal system (Azores archipelago, Portugal) from AMT and ERT imaging.

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The Furnas volcanic complex is located in the eastern part of the São Miguel Island and comprises a 5 km $\times$ 8 km summit depression filled by two nested calderas with several craters and a lake. Present-day volcanic activity of Furnas volcano is mostly located in the northern part of the caldera, within the Furnas village and north to Furnas Lake, where hydrothermal manifestations are mainly fumarolic fields, steam vents, thermal springs, and intense soil diffuse degassing. Considering the Furnas volcano as a whole, the total integrated CO_2 efflux is extremely high, with a total amount of CO_2 close to 1000 ton per day (Viveiros et al., 2009).

We present the first results of an electrical resistivity tomography (ERT), combined with audio-magneto-telluric (AMT) measurements aligned along two profiles inside the caldera. The purpose of this survey is to delimit the extent, the geometry, and the depth of the hydrothermal system and to correlate the deep resistivity structure with high resolution cartography of diffuse CO_2 flux (Viveiros et al, 2015). The ERT and AMT methods are complementary in terms of resolution and penetration depth: ERT can image the structural details of shallow hydrothermal system (down to 100 m in our study) while AMT can image at lower resolution deeper structures at the roots of a volcano (down to 4 km in our study).

Our first independent 2D inversions of the ERT-AMT data show a good agreement between the surficial and deeper features. Below the main fumarole area we observe a low resistivity body (less than 1 Ohmm) which corresponds well to the high CO_2 flux at the surface and is associated with an extended conductive body at larger depth. These results strongly suggest the presence of hydrothermal waters at depth or/and the presence of altered clay-rich material. On a larger scale however, the geometry of the conducting zones differs slightly from what was expected from earlier surface studies, and may not be directly related to fault zones mapped at the surface. These slight, but measurable discrepancies might have different origins but they stress the necessity of 3D modelling and the importance of the joint inversion of the data which we consider as a next step in our work.