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Magnetotelluric data acquisition and processing on the volcanic island of La Palma (Canary Islands, Spain)

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The magnetotelluric method (MT) is a geophysical technique successfully applied to map the presence of fluids or image significant structural contrasts in the subsoil. Obtaining magnetotelluric data in a volcanic island environment might be a challenging task due to the complicated topography and the rough terrain. The goal of this study is to infer the major conductive structures related to the geothermal system of La Palma island (Spain).
In the presented work, a dataset of 44 new magnetotelluric soundings distributed around the island has been acquired from June to August 2018. The instrumentation consisted of four Metronix ADU-08e, equipped with EPF-06 electrodes and MFS-06e magnetic coils. Only horizontal electric (Ex, Ey) and magnetic (Hx, Hy) fields have been recorded, acquired along NS and EW magnetic directions. Two remote stations were installed.
Data processing was carried out by employing the robust remote-reference scheme of Egbert and Booker (1986). We obtained the magnetotelluric response functions for periods in the range of 0.001s - 1000s, depending on the stations quality. Dimensionality and strike analysis has been performed based on the phase tensor (Caldwell et al., 2004) and the WALDIM (Martí et al., 2009) decomposition, showing a 3D behavior of the resistivity distribution over the island.

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