



3D electrical resistivity model of La Palma island (Spain) from magnetotelluric data

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The goal of the present study is the evaluation of the geothermal resources of the volcanic island of La Palma. The island belongs to the Canary archipelago and it is longitudinal in shape with the highest point of 2426 m a.s.l. at Roque de los Muchachos.

La Palma is a well-studied island with a distinctive volcanological evolution from an older shield volcano in its northern part to the present active Cumbre Vieja rift zone in the southern part.

The eruptive history of La Palma can be divided into three major periods, each one associated to peculiar volcanic units: (1) the Basal Complex (c. 4 to 3 Ma) comprising a Pliocene seamount sequence and a plutonic complex, uplifted and tilted by intrusions coeval with the later subaerial activity (Staudigel & Schmincke, 1984); (2) an older volcanic series (1.7 Ma to 400 ka), which contains the Garafía volcano, the Taburiente shield volcano with Cumbre Nueva and the Bejenado edifice; (3) the Cumbre Vieja series (125 ka to present), which is restricted to the southern part of the island.

Between June and August 2018, 44 broadband magnetotelluric stations have been deployed on La Palma island to retrieve the electrical resistivity model of the subsoil. All measured stations presented a 3D behavior at depth, suggesting the need of a full 3D inversion to be performed. The 3D electrical resistivity model was obtained from the inversion of the off-diagonal tensor components using the ModEM code (Kelbert et al., 2014), with periods ranging from 0.0001 to 1000 seconds, depending on station quality. Topography and ocean effects have been included in the inversion procedure.

The overall RMS of the model is 1.1, using an error floor of 5% for the off-diagonal components of the impedance tensor. The most prominent feature of the final model is the imaging of the Caldera de Taburiente showing high resistivity values.

Staudigel, H., & Schmincke, H. U. (1984). The pliocene seamount series of la Palma/Canary islands. *Journal of Geophysical Research: Solid Earth*, 89(B13), 11195-11215.

Kelbert, A., Meqbel, N., Egbert, G. D., & Tandon, K. (2014). ModEM: A modular system for inversion of electromagnetic geophysical data. *Computers & Geosciences*, 66, 40-53.