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3D electrical resistivity model of Gran Canaria island(Spain) from magnetotelluric data

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The magnetotelluric method has been applied worldwide for the characterization of geothermal fields. During the summer of 2017, 100 broad band magnetotelluric stations were acquired on the Gran Canaria volcanic island to obtain a 3D electrical resistivity model. This study was performed in order to evaluate the geothermal resources of the island for both, hydrothermal and unconventional systems. Gran Canaria island belongs to the Canary archipelago. The island is circular in shape, with 45 km of diameter and rises to an altitude of 1949 m.a.s.l. The Gran Canaria island presents a combination of basaltic shield volcanism and caldera-forming felsic eruptions, with abundant intracaldera and extracaldera ignimbrites (Carracedo and Troll, 2016). Morphologically, the island is divided into two parts by an NE-SW Pliocene rift zone. The SW older part of the island is formed by the Miocene volcanic, whereas the younger NE contains the rejuvenation and recent Plio-Quaternary volcanism. The central part of the island is occupied by the most distinctive geological feature of the island, the Miocene Tejeda collapse caldera. All soundings displayed a 3D behavior at depth, so a 3D inversion has been performed. The 3D electrical resistivity model was obtained from the inversion of the full impedance tensor using the ModEM code (Kelbert et al., 2014), with periods ranging from 0.0005 to 1000 seconds, depending on stations quality. Topography and sea have been included in the inversion procedure. The overall rms of the model is 1.9, using an error floor of 5% and 10% for the off-diagonal and diagonal components of the impedance tensor respectively. The final model allows to interpret the first kilometers in depth of the Gran Canaria island. The most prominent feature of the final model is the imaging of the Tejeda caldera at depth, showing high resistivity values.

Kelbert, A., Meqbel, N., Egbert, G. D., & Tandon, K. ModEM: A Modular System for Inversion of Electromagnetic Geophysical Data. Computers & Geosciences. 2014
Troll, V. and Carracedo, J.C., The Geology of the Canary Islands, pp 636, Elsevier, 2016. ISBN: 9780128096635.