Geophysical Research Abstracts
Vol. 21, EGU2019-14395, 2019
EGU General Assembly 2019

A 3-D Resistivity Model of the Ceboruco Volcano from Magnetotelluric Observations

Philip Hering (1), Lourdes González-Castillo (2), Andreas Junge (1), Colin Brown (3), Victor H. Márquez-Ramírez (4), Juan I. Pinzón López (5), and Quiriat J. Gurierrez (6)

(1) Goethe University Frankfurt, Institute of Geosciences, Frankfurt, Germany (phhering@geophysik.uni-frankfurt.de), (2) Dpto. de Geodinámica, Universidad de Granada, Granada, Spain, (3) Ryan Institute, National University of Ireland, Galway, Ireland, (4) Centro de Geociencias, UNAM-Juriquilla, Queretaro, México, (5) Falcutade de Ciencias, Universidad de Lisboa, Portugal, (6) Centro de Investigación Científica y de Educación Superior de Ensenada, Mexico

In November 2016, magnetotelluric (MT) data were collected at the Ceboruco Volcano in cooperation with the Centro de Sismología y Volcanología de Occidente (SisVoc, Universidad de Guadalajara, Mexico). The Ceboruco is a 2280 m high stratovolcano, located in Nayarit State, Mexico. It is placed in the central part of the Tepic-Zacoalco Rift (TZR), which constitutes the north-western end of the Trans-Mexican Volcanic Belt. Together with Chapala and Colima (in the Jalisco Block), they form the triple rift system developed as a consequence of the ongoing subduction of the Rivera and Cocos oceanic plates beneath the North American continental crust. Although its last eruption occurred in 1870, it is the most active volcano in the area, showing volcanic-earthquake activity together with ongoing vapor emissions. The survey was part of a geothermal project (CeMIEGeo-P24) and focused on the determination of electrical conductivity properties to characterize the deep structure and the geothermal potential of the Volcano.

Frequency dependent magnetotelluric response functions were calculated from 25 broadband MT stations, which covered an area of 10 x 10 km2 including its crater, calderas and foreland. The results were interpreted using anisotropic 3-D forward modelling and isotropic 3-D inversion approaches, considering strong topographical effects. The final resistivity model implies a highly conductive layer, reaching from near-surface to approximately 2 km depth, which might be related to a hydrothermal system. Here, mineralized fluids and clay minerals can cause high conductivities around 1 S/m. For longer periods, the principal axes of the MT response tensors (phase tensor, apparent resistivity tensor) are in good agreement with the strike direction of the underlying rift system. However, they are not rendered by the isotropic inversion. Thus the data suggest an anisotropic electrical conductivity at greater depth with its principal axis determined by the response tensors.