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Resistivity model for the Colima Volcanic Complex from magnetotelluric observations

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The Colima Volcanic Complex is located within the central portion of the Colima Rift in the occidental part of Mexico. This volcanic structure is composed of two stratovolcanoes; the extinct Nevado de Colima and Volcán de Fuego. The latter is considered the most active volcano in the country which volcanism is related to the subduction of two oceanic plates with different slab angles that cause a gap between them just beneath the complex. Different methodologies have been carried out in this zone; seismic tomography and potential field data modelling to constraint a geophysical model that contributes the better understanding of the magmatic system and the geothermal energy potential.

To reduce non-uniqueness of the previous models, a campaign was realized in September 2019 where 10 broadband magnetotelluric soundings were acquired and further process and inversion in conjunction with previous data was done. The distortion analysis for the data set presented a 1D behavior for the first kilometers and 2D and 3D behavior at higher depths suggesting the need of a 2D or 3D approach for the inversion. The electric strike calculation suggests the rotation of the impedance tensor so that the non-linear conjugated gradients algorithm of Rodi & Mackie (2001) was applied along three profiles perpendicular to the principal structures to obtain 2D resistivity models.

The inversion results range from 3.4 to 5.6 RMS error and show for all the profiles good correlation for the surface lithology, the principal normal faults which define the graben structures filled with pyroclastic deposits and alluvial sediments and a high resistive basement. For major depths, the northern profile shows a vertical extensive conductive body which connect to an upper conductive layer. So do the central profile, south the Volcán de Fuego vent but the superficial body is more conductive which can correlate with previous models as a magma reservoir approximately at a 2 km depth.