

## **Is it possible to perform a magnetotelluric characterization in a densely populated area? An example from Mexico City**

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### **SUMMARY**

Conurbation of more than 20 million inhabitants around the Mexico City makes it one of the densely populated areas in the world. The Mexico Basin hosts a significant portion of this area and it forms part of the Trans-Mexican Volcanic Belt (TMVB), with origin in subduction of the Cocos Plate beneath the North American Plate, thus exposing its inhabitants to important seismic and volcanic hazards. Apart from its proximity to the Popocatepetl Volcano and intense neotectonic activity at the trench, the increasing land subsidence from exhaustive exploitation of the aquifer is an additional phenomenon. It is manifested through the appearance of medium and large length cracks and fractures affecting the civil infrastructures such as pipes, buildings, bridges and roads. Even through the occurrence of local earthquakes is widely common, the events occurred in May and December 2023 (<4.0 Mw), with epicenters in western portion of the city and at a relative low depth (1-2 km), have alerted the population and authorities about the latent danger, involving old and poorly studied geological faults given the limitations of performing geological and geophysical exploration in this region. These seismic events have allowed the formulation of an innovative project (financially supported by the Ministry of Education, Science, Technology and Innovation of Mexico City) to comprehensively characterize the western portion of Mexico City for identifying the fragile geological structures that could be the generators of earthquakes, using geological and geophysical techniques, such as the models of electrical resistivity from magnetotelluric (MT) measurements along two profiles across the city and up to a depth of 4-5 km. The outcome might provide scientific evidence for implementing the construction regulations and adequate civil protection plans for mitigating the danger associated with these events. In this work, a short MT profile collected at SE portion of the city is presented to evaluate the feasibility of subsurface characterization. Surprisingly, the measured data show very good quality using the basic robust impedance estimation processing. Comparison of our resistivity model and data from a deep borehole drilled in the vicinity after the 1985 earthquake (8.1 Mw), showed a very good correlation. In this sense, we are confident that the application of more sophisticated robust algorithms and an optimal field acquisition technique would allow the generation of reliable electrical resistivity distribution model beneath the subsurface.

**Keywords:** Magnetotellurics, anthropogenic noise, Mexico basin, microseismicity

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