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Volcano-tectonic model guide for the geothermal exploration of the Los Humeros Volcanic Complex, Mexico

Content

The Los Humeros Volcanic Complex (LHVC) is an important geothermal target in Mexico, hosting a geothermal field currently producing ca. 95 MW of electric power. The geothermal field is located in a Quaternary collapse caldera where resurgence occurs since ca. 50 ka. The analysis of the LHVC structure and its influence on secondary permeability and occurrence of thermal anomalies is important to get insights into the interplay between the volcano-tectonic setting and the characteristics of the geothermal resources in the area. In this study, we present a structural and morphostructural analysis of the caldera complex and geothermal field, integrated with thermal remote sensing and subsurface data, like well logs, seismological data and magnetotelluric imaging. The structural analysis suggests that volcanotectonic faulting and fluids-driven hydrofractures generated under a local radial stress field induced by the LHVC magmatic and hydrothermal systems. The volcanotectonic stress field and resurgence faults influence the distribution of secondary permeability, with the expected geometry of faults and fractures producing geothermal fluids varying with location and depth. The results of this study constitute a volcano-tectonic model guide useful to understand the structure of the Los Humeros geothermal field and support the exploration of deeper Super-Hot Geothermal Systems (SHGSs) and engineering of Enhanced Geothermal Systems (EGSs) in the LHVC and other active resurgent calderas. The research leading to these results has received funding from the GEMex Project, funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 727550. The research also received support by Comisión Federal de Electricidad (CFE) of Mexico.

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