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Geophysical modeling of La Primavera caldera and its relation to volcanology activity based on 3D susceptibility inversion, magnetotelluric and potential data analysis

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La Primavera (LP) is a rhyolitic caldera located in the western sector of the Trans-Mexican Volcanic Belt (TMVB) a volcanic arc with more than 8000 structures. LP is located close to the triple point junction of the Chapala, Colima and Tepic-Zacoalco rifts. In the present paper, we examine the role of the main structures of this triple point junction inside the caldera structure owing to the LP location. According, ground gravity and magnetic surveys were performed inside the volcanic structure. Also satellite gravimetry as well as aeromagnetic and general semi-quantitative analysis of these data were archived. Residual gravity anomalies identified with medium values of density (22-15 mGal), on the entire volcanic structure are attributed to its silicic nature. Aeromagnetic anomalies [U+0334]125 nT occur on the south and western portions of LP. For a better understanding of the volcanic structure and its relation to regional tendencies, some lineaments were analyzed using Tilt Derivative Algorithm (TDR). The results show a regional area with a preference for two directions, that is, in less proportion W-E trends and abundant NW-SE lineaments (similar trends as those of the main faults of the TMVB and comparable with the Tequila Volcano regional path). Different analyses were used to identify structures, depths estimations, sources locations and their position at depth of material related to LP geological evolution. Modeling Werner anomalies, we identified the presence of numerous contacts and dikes, especially on important faults, such as Rio Caliente, La Gotera, Mesa Nejahuete and the caldera ring fracture. This result focuses on San Miguel and Las Planillas Volcano, consisting of higher proportions of intrusive dikes at different depths with a maximum value of 7.3 km. Similar results were obtained by using an Euler's solution map. Most of the values of the deepest parts are around 7.8 km south of Cerro Las Planillas and El Tajo. To develop a 3D smooth model of magnetic susceptibility isosurfaces, we interpreted up to five magnetized bodies beneath the LP structure. Depth and geometry of surface volcanic structures were determinate, thus providing a preliminary visualization of the main isosurface of 0.0343 SI located in the south area of the caldera. Additionally, the upper part of the magnetic source is 5.5 km in depth. The present study therefore reveals the presence of various intrusive bodies existing at different depths inside the caldera. Further, structures and lineaments within the caldera provide evidence for understanding the presence of intrusive bodies, geological structures associated with the caldera structure and geothermal activity.