Solid Earth Discussions

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# Comment on se-2020-218

Anonymous Referee #1

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Referee comment on "Reply to Norini and Groppelli's comment on “Estimating the depth and evolution of intrusions at resurgent calderas: Los Humeros (Mexico)” by Urbani et al. (2020)" by Stefano Urbani et al., Solid Earth Discuss., https://doi.org/10.5194/se-2020-218-RC1, 2021

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The reviewer agrees in principle with the arguments developed by Urbani et al in this manuscript in response to the points made by Norni and Groppelli (2020). The counterarguments made in this manuscript to the points made by Norni and Groppelli (2020) are reasonable and provide a clearer view of the authors' claims. However, some of the discussing points made by Urbani et al and Norni and Groppelli are derived from different observations and data set, Therefore, a more comprehensive examination, including field research, is needed to determine which claim is closer to the truth, which is beyond the scope of this peer review. As pointed by the authors, the further investigations in the Los Humeros caldera are necessary to confirm its structural evolution.Generally, formation of many shallow intrusions during “post-caldera stage” modifies the original structures and hides the signals from deep magma system. As develop the shallow intrusion system, investigation of the bottom structure of caldera (magma chamber) becomes difficult from the approach of structural geology from the ground surface. Therefore, the discussion of the presence/absence of magma chamber beneath a caldera system should be careful and should be based on the direct geophysical investigations (seismic, magnetotelluric, and gravity), not only from geological evidences.

L50-52: Basically I support this selection to highlight the first-order structure. To show the validity of this method, can you show the percentage that the sum of the displacements of the selected faults represents of the total displacements in a given section? This is to show that the contribution of the unselected faults is not important for the overall deformation structure.

L58-63: I agree that the outcrop on the Las Papas scarp shown in Fig. 1b shows no clear evidence of faulting. However, in general, we should recognize that the topographic displacement by faulting can be modified by the erosion and the location of present “topographic step” does not coincide the place of the underground structural fault. The reviewer is not sure if the location of this studied outcrop (shown in Fig. 2) is a critical

point for assessing the activity of Las Papas scarp. Anyway, if the structure is active, the place of structure is almost coinciding with the surface topographic relief.

L75-76; If these minor faults are non-tectonic and formed by the gravitational instability, their orientation and kinematics should be associating the local topography. Can you show it?

L96-98: Here, you should put a connecting logic between the activity of faults and the creation and maintenance of the pathway of hydrothermal fluid as not all geothermal field distribute along "active" fault, in general.

L137-141: Formation of "visible" apical depression at the top of uplift may be also controlled by many factors such as the intensity of horizontal extension at the top of bulge and mechanical properties of the materials at the bulge. You can put the comparison of the difference of these factors between the field and model, to show the reason why the model shows an apical depression whereas the fields not always.

L152-154: Can you show the orientation and kinematic of these reverse faults shown in Figure 2, to show the relationship between the formation of these bulges and reverse faults?

L165-168: Though I strongly agree the difficulty of the identification of shallow intrusion from subaerial lava only from well log, can you find any supporting description for intrusion, not normal lava flow, such as contact metamorphism and chilling texture at the upper boundary of these potential intrusion? If yes, it is a direct evidence for the presence of shallow intrusions.

L202-206 and Figure4(a): Though the temperature profile of Well H4 suggests the presence of heat source at around ~1000m depth, if you combine it with the stratigraphic description and interpretation of the well, you can show more strongly the possibility. Because the depth of temperature maximum in the well H4 is close to the lithostratigraphic boundary between pre-caldera group and QigX, the temperature profile may reflect the distribution of hydrothermal fluid at the boundary. Can you show the presence of potential intrusion on the lithostratigraphic column (like Figure 3)?

L216-219: I guess that the location of the dated sample HK-14-08 (U-Th age 44.8+-1.7ka) reported by Carrasco-Nunez et al.2018 corresponds the "Obsidian dome" indicate at the center of Figure 5. If so, the age of this dome is 44 ka, much older the Cuicuiltic member erupted 7.3 ka. If so, this "dome" is the uplifted block by faults. Instead, Qt1 and Qta2 are clearly younger than Cuicuiltic member, judging from the distribution shown in Figure 5 and ages reported by Carrasco-Nunez et al.2018. The eruption sources of these lavas are very close to the Maxtaloya-Los Humeros faults.