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# Stress interaction at the Lazufre volcanic region, as constrained by InSAR, seismic tomography and boundary element modelling

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The Azufre-Lastarria volcanic complex in the central Andes has been recognized as a major region of magma intrusion. Both deep and shallow inflating reservoirs inferred through InSAR time series inversions, are the main sources of a multi-scale deformation accompanied by pronounced fumarolic activity. The possible interactions between these reservoirs, as well as the path of propagating fluids and the development of their pathways, however, have not been investigated. Results from recent seismic noise tomography in the area show localized zones of shear wave velocity anomalies, with a low shear wave velocity region at 1 km depth and another one at 4 km depth beneath Lastarria. Although the inferred shallow zone is in a good agreement with the location of the shallow deformation source, the deep zone does not correspond to any deformation source in the area.

Here, using the boundary element method (BEM), we have performed an in-depth continuum mechanical investigation of the available ascending and descending InSAR data. We modelled the deep source, taking into account the effect of topography and complex source geometry on the inversion. After calculating the stress field induced by this source, we apply Paul's criterion (a variation on Mohr-Coulomb failure) to recognize locations that are liable for failure. We show that the locations of tensile and shear failure almost perfectly coincide with the shallow and deep anomalies as identified by shear wave velocity, respectively. Based on the stress-change models we conjecture that the deep reservoir controls the development of shallower hydrothermal fluids; a hypothesis that can be tested and applied to other volcanoes.