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Basement structure underneath the sourthern volcanic zone of the Andes: Linking tectonics and volcanism

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The Southern Volcanic Zone (SVZ) is located between 33°S and 46°S, showing a decrease in the thickness of the crust from north to south, associated to a decline of the average altitudes of the mountain range and decreasing age of the subducting Nazca plate at the trench. It includes around 60 active volcanoes, 3 calderas and several minor eruptive centers. Structurally, it's characterized by the intersection between the Liquiñe-Ofqui Fault Zone, a trench-parallel major intra-arc dextral strike-slip fault system, with NW-striking Andean Transverse Faults (ATF), inherited from the Paleozoic, and NE-lineament attributed to extension cracks, all this as a consequence of the oblique plate convergence. All of the above makes the ZVS an excellent study area to understand the relationship between the present structural features and the volcanic complexes, both respect to their locations and their compositions.

With this goal, about 1,000 striae (orientation and kinematics) were analyzed on faults recognized macroscopically in the basement rocks of 12 volcanic centers distributed along the ZVS, in addition to dykes and veinlets in each of them. Structural field data was collected in each volcanic center and analyzed at regional and local scales. Fault-slip data analysis allows to calculate stress and strain fields using the Multiple Inversion Method (MIM). Results of this kinematic and dynamic analysis show, altogether, a heterogeneous deformation along the ZVS, which varies from a predominantly transtensive regime for the northernmost part of the Central ZVS segment (ZVSC) to a more transpressive regime for the rest of that segment, and a more compressive regime for the Southern ZVS segment (ZVSS). The principal stress s1 is consistently NE-oriented in almost all volcanic centers and hence can be directly related to the stress field dictated by plate convergence during the dominantly interseismic phase of the megathrust interplate fault. However, a subordinate NW-oriented principal stress is observed in those volcanic centers where the presence of important lineaments with this prientation is distinguished, demonstrating a great influence of the inherited NW structures in the local control of the stress field. In addition, a marked partition of deformation is obtained given the differences in orientation of the forces prevailing in each of the areas studied. s1 Orientations for each volcanic complex and a model that summarize the structural variations of the area will be shown.