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On the occurrence of Quaternary upper-plate deformation in the Southern Central Andes (36°- 38°S): interaction between mantle dynamics and tectonics?

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The distribution of the Quaternary deformation of the Central Andes shows contrasting patterns along the retro-arc area. On the one hand, the Chilean-Pampean flat-slab region (27°-33°S) concentrates more than 90% of the Quaternary deformation documented over the eastern Argentinean Andes associated with independent structures (Costa et al. 2006). Continuing to the south (33°-36°S), the subduction of the Nazca plate becomes gradually-moderately steepened (30°E), and quaternary deformation concentrates in both sides of the Andes linked to the topographic breaks. Further south, between 36° and 38°S on the Argentinean Andean slope, the focus of this study, the active deformation front is considerably retracted to the west and loses continuity in short fault segments, determining markedly different pattern respect to the areas described to the north.

We present neotectonic evidence across this poorly studied segment of the Southern Central Andes (36° - 38°S), analyzing dimensions of the different neotectonic systems and defining their precise location. Besides, we consider the sublithospheric structure in the Southern Central Andes on the light of recent tomographic (Pesicek et al., 2012) and three-dimensional electrical conductivity models (Burd et al., 2014), relating them to the distribution of the described Quaternary structures. The quaternary structures that affect the Southern Central Andes have a distinctive spatial pattern. While part of these deformations are concentrated across the arc zone, discontinuous and short neotectonic systems are spread through the retro-arc zone. This evidence shows that mountain building processes are far from being absent through this segment. We have also shown a spatial relationship between the position of the Quaternary structures in the retro-arc zone of the Southern Central Andes and the areas where high resistivity asthenospheric anomalies are hosted in the lower lithosphere (Burd et al., 2014). The distribution of the Quaternary deformation systems across the Southern Central Andes retro-arc zone, characterized by short and disconnected fault arrays, could be related to the complex arrangement of the described asthenospheric anomalies. Therefore, these plume-like features could have facilitated the generation of Quaternary deformation, through the thermomechanical weakening of the lower crust.

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Costa, C., Gardini, C., Diederix, H., Cisneros, H., Ahumada, E. (2006). The Active Andean Orogenic Front at the Southernmost Pampean Flat-slab. Backbone of the Americas. Abstract with Programs 151.

Pesicek, J.D., Engdahl, E.R., Thurber, C.H., DeShon, H.R., Lange, D. (2012). Mantle subducting slab structure in the region of the 2010 M8.8 Maule earthquake (30°-40° S), Chile. Geophys. J. Int. 191, 317-324.