



Volcano-tectonical analysis at the northern terminus of the Liquiñe-Ofqui Fault Zone: The Copahue Volcano and the associated Agrio Caldera, Argentina (37.5°S)

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The Copahue volcano is one of the most active volcanoes in the Southern Andean Volcanic Zone (SAVZ) and is spatially associated with a number of prominent structural discontinuities. The volcano is hereby located close to the northern terminus of one of the most prominent intra-arc fault zones on Earth, the Liquiñe-Ofqui Fault Zone (LOFZ). Moreover, Copahue is situated at the western margin of the 20 x 15 km Agrio Caldera, which is part of the 90 km long Callaqui-Copahue-Mandolegüe volcanic zone, a prominent NW-SE-trending volcanic zone in the SAVZ. The Agrio Caldera is spatially also associated with the NE-striking Lomín Fault, considered a secondary dextral strike-slip fault of the LOFZ, and the N-striking Antiñir-Copahue thrust system. Thus, the Copahue volcano may be an ideal target to study the interaction between deformation and volcanism at the South Chilean convergent plate margin.

A key objective of our study is to find out to what extent any of the mentioned structural discontinuities have influenced volcanic activity of Copahue. Previous studies concluded that the Agrio Caldera, and thus, Copahue formed under transtension. This is at variance with the dextral transpressive character of the LOFZ recognized throughout the entire SAVZ. We, therefore, aim at elucidating to which deformation regime volcano-tectonic structures of Copahue adhere to. We addressed this issue by lithological and structural mapping of the Agrio Caldera and the associated NE and SE flanks of the Copahue volcano. Here, the towns of Caviahue and Copahue are, due to the presence of hot springs and winter tourism, of increasing economic importance, but are also exposed to potentially severe volcanic hazards. This should not be underestimated as Copahue erupted 17 times in the last 270 years, 10 of which happened over the past 27 years.

Volcano-sedimentary data found at the base of Copahue lavas, which postdate the last glaciation (ca. 30 ka), are moderately inclined towards the volcano. We interpret these strata as volcano-tectonic products filling half grabens separated by normal faults and possibly generated as a consequence of upper-crustal doming at an early stage of the volcano formation in Pliocene time. We were unable to confirm the presence of normal faults apparently affecting Copahue lavas. Instead, we interpret prominent escarpments, disposed radially with regard to the volcano center, to have formed by glacial activity. We, thus, cannot confirm structural evidence by other workers suggesting that Copahue volcano formed under upper-crustal transtension. Mapping the Copahue lavas revealed that these lavas advanced close to where the town of Caviahue is located, highlighting the vulnerability of Caviahue to potential volcanic hazards.