Structural characterization of the western flank of Domuyo volcano and its relationship with Neogene to Quaternary magmatic activity (Neuquén, Argentina)

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This study covers the structural analysis of the western flank of Domuyo volcano, located in the northwestern sector of the Chos Malal fold and thrust belt (36°38'15.10"S; 70°25'55.37"W) (Fig. 1). Based on detailed fracture analysis and kinematic study of mesoscale faults, combined with pre-existing geological, structural, and geophysical data, the structural configuration of this region is interpreted as directly conditioned by pre-existing basement structures (Galetto et al., 2018; Galetto, 2019). Late Triassic-Early Jurassic normal faulting conditioned the geometry of the sedimentary sequences of the Neuquén Basin, the location of compressive deformation during the Andean orogeny, and the emplacement of the Neogene to Quaternary magmatism. The Manchana Covunco N-S fault is the main partially inverted normal fault interpreted on the western flank of Domuyo volcano (Galetto et al., 2018). Unpublished thermo-chronological data obtained from samples of the structural basement, the Mesozoic sedimentary sequence, and the Neogene to Quaternary units, suggest that a compressive tectonic regime have taken place from Late Cretaceous to Paleogene times (Galetto, 2019; Galetto et al., in prep). This regime would have triggered the reactivation and partial inversion of the normal faults, together with the development of conjugated fractures sets (NW-SE/NE-SW) (Galetto et al., 2018; Galetto, 2019; Galetto et al., in prep). Evidences about the continuation of the compressive deformation during Middle Miocene to Late Miocene times are documented in numerous areas of the Chos Malal fold and thrust belt (Folguera et al., 2007; Sagripanti et al., 2011, 2012; Gürer et al., 2015; Sánchez et al., 2018; among others); nevertheless no evidence have been found in Domuyo area. The magmatic activity of Domuyo Volcanic Complex started between Late Miocene to Pliocene times, according to unpublished thermochronological data (Galetto, 2019; Galetto et al., in prep) and to observations made by Llambías et al. (1978). The intrusive phase of the Domuyo Volcanic Complex crops out in the southern flank of Domuyo volcano and in the core of a broad N-S anticline, developed during the Late Cretaceous-Paleogene compressive stage (Llambías et al., 1978; Galetto et al., 2018; Galetto, 2019). The stress regime identified through the measurement of normal kinematic indicators in mesoscale faults affecting Late Miocene to Pleistocene units, suggests that the emplacement of the Domuyo Volcanic Complex could have occurred under an extensional regime (Galetto et al., 2018). However, this not necessarily rejects the possibility of its emplacement during the lasting effects of the Middle-Late Miocene compression documented in the Chos Malal fold and thrust belt (Folguera et al., 2007; Sagripanti et al., 2011, 2012; Gürer et al., 2015; Sánchez et al., 2018; among others).

During Pleistocene times, the Magmatismo Dómico (Brousse and Pesce, 1982) is registered in the western flank of Cerro Domuyo. The location of the magmatism during this period could have been conditioned by the presence of the Manchana Covunco fault, as its distribution coincides with the interpreted trace of this structure at surface. Kinematic analyses carried out on Pleistocene units indicate that its activity could be related with a Pleistocene extensional regime (Galetto et al., 2018). The uncertainty regarding to the tectonic regime that conditioned the emplacement of the Domuyo Volcanic Complex, has encouraged the development of further studies. Therefore, analogue models simulating magmatic emplacement under contrasting structural and dynamic regimes are being performed in order to evaluate the possible scenarios, and compare the resulting experimental vs. natural geometries. This studies will not only shed light on the structural evolution of Domuyo area, but also contribute on the understanding of the relationships between volcanism within both compressive and extensional tectonic settings, when both are controlled by previous structures.

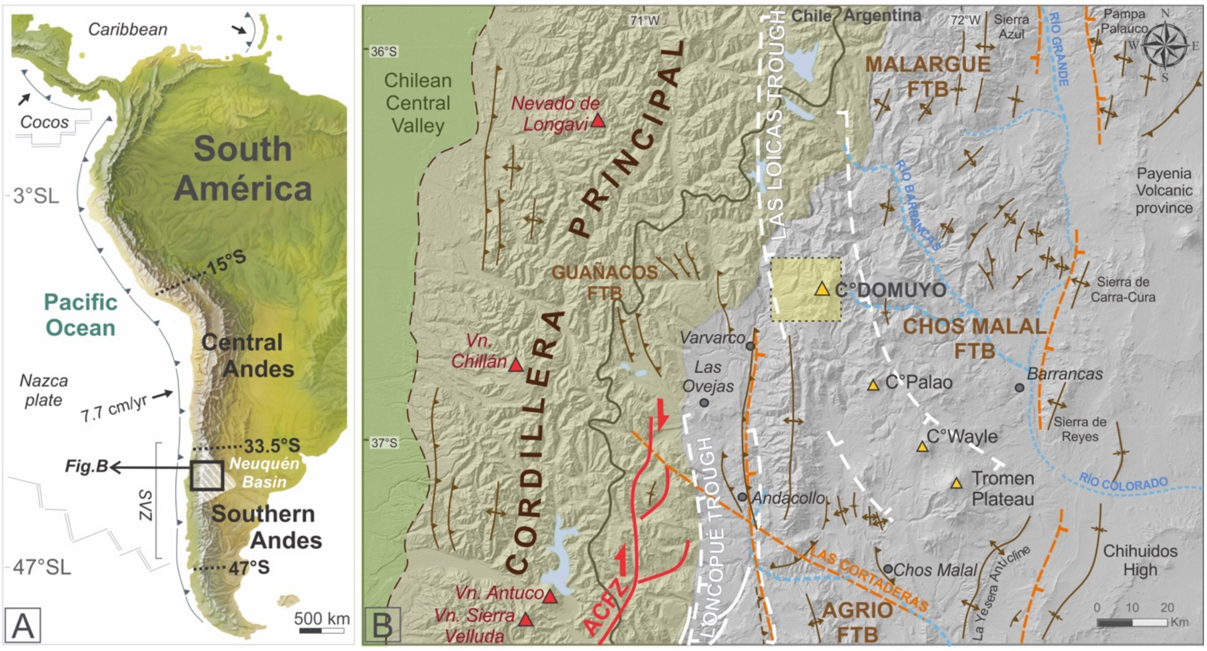

Fig. 1 – (A) Location of the Southern Andes between 33°30′ and 47°SL (Tassara and Yañez, 2003). The regional map of Fig. B is indicated with a box. The limit of the Neuquén basin is marked with a white dashed line. Southern Volcanic Zone (SVZ). (B) Regional map between 36° and 37°30′SL with the main morphostructural units present in the area, and the study area indicated with a yellow box. Upper Cretaceous-to-Miocene fold-and-thrust belts in brown (FTB); Plio-Pleistocene extensional basins (troughs) in white; active volcanoes (red triangles); and Antiñir-Copahue Fault Zone (ACFZ) in red. Upper Triassic to Lower Jurassic regional lineaments that conditioned the Precuyano depocenters are represented by orange dashed lines. Taken and modified from Galetto et al. (2018).

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