

Preliminary remote mapping reveals recent strike-slip motion along the southern Liquiñe-Ofqui Fault, Chile

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A first order structure controlling the geomorphology of Chilean Patagonia is the Liquiñe-Ofqui Fault Zone (LOFZ), a north northeast primarily dextral fault system affecting pre-Carboniferous to Neogene rocks between 38° and 47°S [1]. The recent activity of this fault could be an indicator of the potential seismic hazard it poses. The main objective of this study is to understand the recent tectonics and impact on the tectonic geomorphology along the LOFZ using remote sensing. The study is located between 46°33' and 46°40'S in Laguna San Rafael National Park, along the LOFZ. To characterize the Holocene deformation along the LOFZ, we worked with a 1m resolution airborne LiDAR-derived topographic dataset. Specifically, we generated a Digital Terrain Model (DTM) which was then used to obtain hillshade, slope and topographic position index maps. These maps were used for geomorphological and structural mapping. Additionally, topographic profiles using the DTM data facilitated the characterization of fault scarps and displaced units. Preliminary results indicate one onshore first order master fault that is north-northeast striking (N30°E) and extends at least 15 km (before heading offshore at either end). Between the Elephants Gulf and the San Rafael lake, the LiDAR-based DTM shows terminal and lateral moraines trending roughly along-strike with the fault trace (N20°E), following the long-axis Elephants Gulf orientation. Some of these moraines are displaced horizontally along this master fault. These displacements are between 90 to 125 m, showing dextral strike-slip motion. Elevation profiles across this clear fault scarp show vertical displacements with a minimum of 1 meter near the northern part of the Laguna San Rafael and at least 25 meters on the northernmost part of the study zone.

According to [2], the maximum age for the more consolidated terminal moraines is 9.7 ka and the minimum age is 5.7 ka, corresponding to the two Holocene important advances of the San Rafael Glacier. There are younger moraines associated with the retreat of the glacier, since the year 1870, and only one possible vertical displacement was identified on those ones.

The LOFZ shows important displacement at least from the last 10 ka and possible from 1870, as also shallow earthquakes associated to the main fault [3]. Future planned fieldwork here will permit validation of remote mapping and geochronology here.

*This project was funded by the Chilean FONDECYT Project 11160038.

[1] Cembrano, J., Hervé, F. & Lavenu, A. (1996). The Liquiñe Ofqui fault zone: a long-lived intra-arc fault system in southern Chile. *Tectonophysics*, 259, 55-66.

[2] Centro Sismológico Nacional. Registro de sismos. 2005 a noviembre 2018. Universidad de Chile, Santiago de Chile.

[3] Glasser, N.F., Jansson, K., Mitchell, W.A. & Harrison S. (2006). The geomorphology and sedimentology of the 'Témpanos' moraine at Laguna San Rafael, Chile. *Journal of Quaternary Science*, 21(6), 629-643.