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New data on active tectonics and earthquake geology of the Pallatanga Fault, Central Andes of Ecuador

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Based on new geological data and analysis of Digital Elevation Model, we update the active fault mapping and determine earthquake geology hints of a section of a major crustal active fault system of continental Ecuador, namely the Pallatanga Fault to its junction with the Cosanga Fault, a part of the continental-scale dextral shear zone between the North Andean Sliver and the South America Plate. We focus this contribution on the NE-SW Pallatanga strike-slip fault zone and related contractional features that extends to the north in the Inter-andean valley. A detailed analysis of the 4m-spatial resolution DEM available for the whole country allowed mapping a series of lineaments at the regional scale all along the fault system. Field studies on key areas show morphological anomalies, such as valley deflections or aligned and elongated hills in Tertiary/Quaternary sediments and in some places faulted recent deposits and even preserved coseismic free-face ruptures, which strongly suggest that those landscape traces represent long-living earthquake faults (Holocene to historical times). Put together, all this new data confirm that very large earthquake (M~7.5) could be generated during multiple segment ruptures. This result is reinforced by the occurrence in post-Spaniards to modern times of several large earthquakes (1694, 1797 and 1949) in the vicinity of the fault trace (Beauval et al., 2010), which effects on environmental and cultural features were catastrophic. Thanks to newly dated soils and volcanic series (Bablon et al., 2019), we could infer that the Pallatanga fault slip at rates ranging from 2.5 (southern section; Baize et al., 2015) to 5-6 (Igualata volcano section) and ~4 mm/year (northern section). Further north, the fault map becomes less constrained and there seems to be partitioning of deformation between sub-meridian folds (with a cumulative of ~2.5 mm/y according to geodetical data) and NE-SW strike-slip fault(s), including the ~1 mm/y Pisayambo Fault that ruptured the surface in 2010 (Champenois et al., 2017).

All this information offers the opportunity to size the potential earthquake sources. Supported by those observations and by additional geological and geodynamic information, this new effort will feed further fault-based models for Seismic Hazard assessments in Ecuador, after the recent release presented by (Beauval et al., 2018).

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