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Paleoseismic evidence of the most destructive earthquake in Costa Rica history: 4th May 1910 Cartago earthquake.

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In 1910, the most destructive earthquake in the history of Costa Rica took place. A M 6.4 earthquake destroyed the city of Cartago, a major city located at the Central Valley of Costa Rica, causing more than 600 casualties, in a city with 12000 inhabitants at that time.The geological source of the Cartago earthquake remained unknown because of the difficulty to observe surface structures due to the dense vegetation cover, and the lack of paleoseismological studies on the active faults in this area. Several neotectonic studies based on historical intensity data and geomorphology proposed the Aguacaliente Fault (a left lateral strike-slip fault in Central Valley of Costa Rica) as the source of the earthquake (e.g. Montero & Morales, 1988).

We carried out a morphotectonic analysis of the landscape surrounding Cartago, and dig 2 trenches across two different strands of the Aguacaliente Fault (AF). The mapping of the Aguacaliente Fault reveal that this fault is at least 23.5 km length. The maximum potential magnitudes related to this length are Mw 6.7 and 7 following different empirical relationships. Three great events have been identified in the paleoseismic analysis: the event 1 aged 1000 $\pm$ 20 A.D., the event 2 aged 1580 $\pm$ 80 A.D. and the very recent event (event 3) aged 1800 $\pm$ 150 A.D. TThis latter event is consistent in age with the Cartago 1910 earthquake, providing direct evidence of the rupture of the Agucaliente Fault in this destructive earthquake. We have estimated slip rates of 1.75$\pm$0.35 mm/yr for the Aguacaliente Fault. These are the first paleoseismic data available to improve the seismic hazard assessment in Costa Rica.