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TITLE: Upper-Plate Earthquake Swarms Remotely Triggered by the 2012 Mw-7.6 Nicoya Earthquake, Costa Rica.

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ABSTRACT BODY: Remotely triggered seismicity that takes place at distances greater than 1–2 fault lengths appears to be a frequent phenomenon after large earthquakes, including damaging upper-plate 5.0-to-6.0 magnitude earthquakes in Costa Rica after the large (Mw greater than 7.0) inter-plate earthquakes in 1941, 1950, 1983, 1990, and 1991. On 5 of September 2012, an inter-plate 7.6-Mw earthquake struck the Nicoya Peninsula, triggering upper-plate seismicity in the interior of Costa Rica again. The number of upper plate-earthquakes outside the Nicoya source region that were recorded by the National Seismological Network (RSN: UCR-ICE) for the six-month period after the Nicoya event was two times higher than that number of upper plate-earthquakes during the six months before it happened. We analyze the three largest upper-plate earthquake swarms that took place during the first six months after the Nicoya event. We relocate the epicenters using a double difference algorithm with a 1D velocity model (HypoDD) and using a probabilistic method with a 3D velocity model (NonLinLoc). Additionally we compute first motion focal mechanisms for the largest events. The three swarms analyzed occurred at distances of 170 to 350 km from the Nicoya source region in three different tectonic settings: the Cartago area in the central part of Costa Rica near the active volcanic arc (approximately 170 km from the source region), the Calero Island near the Costa Rica-Nicaragua border in the backarc Caribbean region (approximately 220 km), and the San Vito area in the Costa Rica-Panama border region, at the southern flank of the Talamanca Cordillera, an inactive portion of the magmatic arc (approximately 300 km). The Cartago swarm with 95 1.8-to-4.1 Mw earthquakes occurred from September 5 to October 31, 2012. The location and left-lateral solution of the largest event suggest that the Aguacaliente fault, which caused the deadliest earthquake in Costa Rican history on May 4, 1910 (Ms 6.4), is the source of some of this triggered seismicity. Moreover, seismicity patterns suggest activity on the Navarro, Queveri, Rio Macho, and Ochomogo Faults. The Calero swarm with 70 2.5-to-4.2 Mw earthquakes took place from September 22 to October 2, 2012. The earthquake pattern suggests a possible extension of the Hess Escarpment inland. The San Vito earthquake swarm with 21 2.3-to-4.5 Mw earthquakes occurred between October 14, 2012 and January 28, 2013. These earthquakes occurred mainly in the region between the North-South oriented San Vito and Sereno-Alturas Faults, which are located along the inland projection of the Panama Fracture Zone. Documenting remotely triggered earthquakes may provide us with insights into the physics of the earthquake cycle, and may greatly improve seismic hazards assessment by illuminating active structures within the interior of Costa Rica and by pointing to where the next upper-plate earthquakes might be located.

KEYWORDS: 7200 SEISMOLOGY, 8100 TECTONOPHYSICS, 8170 TECTONOPHYSICS Subduction zone processes, 7230 SEISMOLOGY Seismicity and tectonics.

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