Fault slip and strain partitioning in Guatemala measured by SAR interferometry.

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Abstract

The zone of interaction between the Cocos (CO), Caribbean (CA) and North America (NA) plates in Guatemala is defined by the sub-parallel Motagua and Polochic strike-slip faults, a series of north-south-trending extensional grabens immediately south of the Motagua Fault, the Middle America trench, and faults within the Middle America volcanic arc. Historical earthquakes associated with these faults include the destructive 1976 Mw 7.5 earthquake along the Motagua fault and the 2012 Mw 7.5 Champerico thrust earthquake. The published GPS-based present-day kinematic models of the region show that strain accumulation from the NA/CA relative motion concentrates on the Motagua fault with no resolvable strain accumulation across the active Polochic fault, suggesting that slip varies with time as a result of mechanical interactions within the Motagua-Polochic fault system. As part of the efforts to quantify the present-day kinematics and slip behavior of these faults, we propose the use of radar interferometry to measure the strain rates across faults in Guatemala and to constrain slip partitioning among the different faults. We processed L-band radar images acquired by ALOS-1 in Strip Map mode, with ascendant orbits, spanning from 2006 to 2011. The images consist of three adjacent tracks covering the Polochic and Motagua faults, the

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Ipala and Guatemala City grabens, and part of the volcanic arc to the south. We present the preliminary results after applying the NSBAS processing chain and performing time-series analysis to extract the first InSAR-based maps of interseismic velocity for this region, which will contribute to the refinement of the estimates of the interseismic locking across the Motagua-Polochic fault system, the subduction zone, and other nearby faults. We also present the preliminary results our attempt to obtain a geodetically-derived coseismic slip distribution of the 1976 earthquake by means of optical image correlation, using air photos acquired before and after the earthquake, that will be ultimately compared to the coupling distribution along the Motagua fault.