



Tectonic Geomorphology Reveals Areas of Active Transpression on the Island of Hispaniola (Haiti and the Dominican Republic)

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ABSTRACT

The island of Hispaniola is shared between the country of Haiti occupying the western third of the island and the Dominican Republic occupying the eastern two-thirds. Late Miocene to recent deformation is related to a 250 km-wide zone of active, left-lateral, seismogenic transpression between two major east-west strike-slip zones: the Septentrional-Oriente Fault Zone along the northern edge of the island and the Enriquillo-Plantain Garden Fault Zone (EPGFZ) along its southern edge. To better understand how active deformation is partitioned on strike-slip faults and large, en echelon folds across the 75,260 km² island, we use ArcGIS software and a high-resolution (30 m) ASTER GDEM to: (1) construct river longitudinal profiles of all major rivers on the island; (2) calculate both normalized steepness index (ksn) and stream length-gradient index (SL) along the rivers; and (3) to calculate relative surface roughness (SR) and hypsometric integral (HI) from the topography. The extracted knickpoints as well as high-ksn, high-SL segments reveal several areas in Haiti and western Dominican Republic where Neogene to recent uplift is occurring as a result of active transpressional folding and reverse faults: Chaine des Matheux-Sierra de Neiba and Sierra de Bahoruco-Massif de Selle. Low surface roughness and high HI values were also indicative of young landforms that were poorly incised due to recent uplift. In contrast, the topographically-lower area of eastern Hispaniola is characterized by much lower ksn and SL values that are consistent with less shortening and uplift. We interpret the abrupt variations in geomorphological indices to reflect the kinematic variation and along-strike transition from: (1) oblique subduction-collision, crustal thickening, and strain partitioning in western Hispaniola; to (2) oblique subduction with minimal strain partitioning and crustal thickening in eastern Hispaniola.