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T31D-0264: Integration of Tectonic Geomorphology and Crustal Structure across the Bahamas-Hispaniola Collisional Zone, Northeastern Caribbean

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The island of Hispaniola is shared by Haiti, occupying the western third, and the Dominican Republic, occupying the eastern two-thirds. Late Miocene to recent tectonic deformation and related seismicity define a 250-km-wide collision zone between three crustal provinces: 1) the Bahamas carbonate platform in the north that is bounded to the east by Cretaceous oceanic crust of the central Atlantic Ocean; 2) a Cretaceous island arc of central Hispaniola; and 3) the Late Cretaceous, Caribbean Large Igneous Province (CLIP) to the south. To establish how active deformation is partitioned on two major strike-slip faults, and large en echelon folds across the 75,260 km2 island, we first measured and calculated geomorphological indices including: normalized steepness indices (ksn), stream length-gradient indices (SL) along the longitudinal profiles of all major rivers, relative surface roughness (SR), and hypsometric integral (HI) of the topography. These indices indicate recent uplift in the area of crustal collision between the three provinces in western Hispaniola, but crustal stability east of the collisional area in eastern Hispaniola. We then performed regional 2D gravity modeling along three 700-800-km-long profiles, and a 3D gravity inversion to map the Moho topography and crustal thickness across the three crustal provinces. The inversion suggests that the crustal thickness of the Bahamas platform is about 12–20 km, the Atlantic oceanic crust is 5-6 km thick, the island arc thickens to over 40 km, and that the CLIP thins from 30 km at the contact with island arc to less than 10 km southward to the Caribbean Sea. Oblique convergence of the thick Bahamas platform with central and western Hispaniola is interpreted to produce active geomorphic uplift, shortening, and crustal thickening. The Atlantic Oceanic crust is subducted under eastern Hispaniola without significant crustal thickening and geomorphic uplift.