



Uplift rates from topography: Experimental research on river profiles in Oriente, Cuba

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The thrusting of the Cuban Oriente block onto the Bahamas platform and the transform movement between the Caribbean and North American plate cause oscillating uplift in the east of Cuba, manifesting itself in tilted blocks, coral reef terraces and rivers cutting deep into the bedrock. Objectives of this work are to identify active tectonic boundaries and derive relative uplift rates in Oriente using power-law scaling relation between channel slope and contributing drainage area to obtain a more detailed picture of the tectonic processes of the study area.

Topographic data is provided in form of a SRTM and an ASTER DEM of the working area. Data is cross-checked with topographic maps and GPS measurements in the field. Further analysis comprises automatic extraction of the drainage network and catchment area after eliminating spurious pits and flats using the D8 method. The obtained longitudinal river profiles are evaluated with respect to breaks in scaling permitting the mapping of associated active tectonic boundaries. Shaded relief models are calculated and are used as basis for an interactive visual interpretation of terrain models with respect to lineaments. Lineaments are also digitized on screen from slope and aspect. Finally, they are compared to the results of the longitudinal profile analysis.

Data analysis shows an inhomogeneous distribution of relative uplift rates within the Cuban Oriente block. Detection and mapping of active tectonic boundaries can be achieved at low cost and results are available rapidly. The results are in accordance with lineaments derived from geomorphological interpretation and seismicity. This method allows for the estimation of deformation over large areas, the localization, and the quantification of vertical displacements.