First chemical and isotopic denudation rate estimates for central Cuban drainage basins

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Cuba, the largest Caribbean Island, is underlain by diverse rock types. The rate at which it erodes over time is not well known. Such data, including rates of chemical and physical denudation, are critical for sustainable development and for understanding longer-term rates of landscape change.

To address this knowledge gap, a joint Cuban-American team collected water and sediment from 25 rivers in central Cuba. In water samples, conductivity was high (1380 to 130 uS/cm) and well correlated with dissolved load (117 to 785 mg/L).

Three different data sets indicate Cuba is eroding at a modest rate. Long-term, basin-scale erosion rates estimated from ^{10}Be concentrations in central Cuba stream sediment range from 1.4 to 60 m/My (μ=27±8 m/My, n=8). Summed cation, anion, and silica concentrations, considered along with annual discharge estimates, indicate chemical denudation rates of 42-302 tons km^{-2} yr^{-1} for central Cuba, the equivalent of erosion at 16-110 m/My (μ=62±5 m/My, n=25). Country-wide sediment yield estimates (from suspended sediment and flow data) across the island (n=32) imply erosion at rates of 4.6-133 m/My (μ=50±6 m/My). For central Cuba, both chemical denudation rates and ^{10}Be-based erosion rates are inversely correlated with mean basin slope suggesting that lithology and runoff may control basin-scale erosion rates. In most basins, chemical and physical denudation are positively correlated; in two basins, high dissolved loads and low ^{10}Be-inferred erosion rates (1.5-2.5 m/My) suggest that solutes and sediments likely originate from different parts of the landscape.

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