
Denudation rates of carbonate coasts: insights from in situ cosmogenic ^{36}Cl from Cuban coastal terraces

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Abstract

Cuba’s rocky coasts are partly composed of carbonate rock derived from uplifted coral reefs. These coasts exhibit sequences of coastal terraces shaped by both marine and continental erosion, exacerbated by extreme events typical of tropical climates (hurricanes). Determining the coastal denudation rates on these coasts allows quantification of spatial variation in this erosion, providing valuable insights into landscape evolution and the interactions between geological processes and coastal environmental conditions. Here, we calculated denudation rates by combining the ^{36}Cl cosmogenic nuclide concentrations measured in 19 surface limestone samples and 11 new $^{230}\text{Th}/\text{U}$ dating results obtained from living-growth position corals. Denudation rates are obtained for the distal and inner edges of the lowermost coastal terraces and along the long-lasting sequence of terraces at Cape Maisí. This approach enables discussion of the continental erosion occurring beyond areas directly influenced by marine erosion. Denudation rates on low-lying terraces range from $5 \pm 1 \text{ mm ka}^{-1}$ to 32 ± 10

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mm ka⁻¹, increasing near the coastline and reflecting the impact of wave breaking on coastal erosion. On the Cape Maisí sequence, the denudation rate increases from 0.2 ± 0.1 mm ka⁻¹ to 36 ± 11 mm ka⁻¹ with elevation. Our results highlight that the beaches protect the inner parts of the low-lying terrace from denudation. We also show that continental denudation increases with weathering duration. Overall, this study demonstrates that both marine and continental erosion processes play an important role in the morphological evolution of the coastline.

Keywords: ³⁶Cl cosmogenic nuclide, continental denudation, marine erosion, coral reef terrace, Cuba