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MADAGASCAR EROSION RATES AND INSIGHT INTO ANTHROPOGENIC EFFECTS FROM IN-SITU ^{10}BE ANALYSIS OF RIVER SEDIMENTS

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Cosmogenic isotope data provide a time-averaged look at landscape erosion rates in Madagascar, and comparison of samples from contemporary rivers with dated terrace deposits gives insight into the effects of recent human activities. Eighty analyses, from 64 watersheds representing 30% of Madagascar's total area, provide new perspective on the landscape evolution of this culturally and ecologically significant country.

Madagascar's relief is substantial (comparable to New Zealand) despite deeply weathered bedrock (saprolites commonly 10s of m thick). The preservation of such thick saprolite, in the face of regional elevation gradients and very steep (>50°) local slopes, implies that low erosion rates have characterised the region for some time. This is borne out by ^{10}Be data, which indicate rates ranging from 1.5-78 m My^{-1}, with median of only 16 m My^{-1} (much less than the global drainage-basin median of 54 m my^{-1}:tinyurl.com/lnh9fxt). Highest rates (40-78 m My^{-1}; n = 20) come from the arid lowlands of the west and southwest, and from the steep. forested eastern escarpment. Lowest rates (<10 m My^{-1}; n = 23) come from the rolling highlands of the central plateau.

We were able at 4 locations to sample both the modern river sand and ^{14}C datable older terrace deposits, to try and see through the time-averaged ^{10}Be window (approx. 10^4 yrs for slowly eroding terranes) and evaluate the extent to which anthropogenic effects have affected erosion rate in the more recent past. Terrace ages range from 0.76-13.6 ky. The younger part of the age range overlaps with human presence in Madagascar, but the upper end long pre-dates it. In two cases, the modern rates exceed the rates recorded in the terrace sands: a >0.76 ky terrace implies paleo-erosion of 11.4 m My^{-1} compared with 15.9 m My^{-1} in modern river sand, and a >1.9 ky terrace yields 24.8 m My^{-1} compared with 41.3 m My^{-1} in its modern equivalent. In one case (terrace ≈1 ky) the rates are identical within error (11.8 m My^{-1} and 13.0 m My^{-1} respectively). In the final case, the modern river rate of 6.7 m My^{-1} is exceeded by a 13.6 ky terrace rate of 9.6 m My^{-1}. The fact that rates measured from the terrace deposits exceed the modern values in some cases argues against a dramatic post-human-arrival increase in erosion rates.

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T45. Tracking Sediment Movement across Earth's Surface
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