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Regular Cosmogenic Nuclide Dosing of Sediment Moving Down Desert Piedmonts

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Low-gradient alluvial piedmonts are common in desert areas throughout the world; however, long-term rates of processes that modify these landscapes are poorly understood. Using cosmogenic 10Be and ^{26}Al, we attempt to quantify the long-term (>10^3 y) behavior of desert piedmonts in Southern California. We measured the activity of 10Be and 26Al in three samples of drainage basin alluvium and six amalgamated samples from transects spaced at 1-km intervals down a piedmont in Fort Irwin, Mojave Desert, California. Each transect sample consists of sediment from 21 collection sites spaced at 150 m intervals. Such sampling averages the variability of nuclide activity between sub-sample locations and thus gives a long-term dosing history of sediment as it is transported from uplands to the distal piedmont. The piedmont is

heavily used during military training exercises during which hundreds of wheeled and tracked vehicles traverse the surface. The piedmont surface is planar, and fan-head incision is minimal at the rangefront decreasing to zero between the first and second transects, 1.5 km from the rangefront. 10Be activity increases steadily from 5.87 X 10^5 atoms g^-1 at the rangefront to 1.02 X ^6 atoms g^-1 at the piedmont bottom. Nuclide activity and distance are well correlated (r^2 = 0.95) suggesting that sediment is dosed uniformly as it is transported down piedmont. We have measured similar increases in nuclide activity in transect samples collected from two other Mojave Desert piedmonts, those fringing the Iron and Granite Mountains (Nichols et al, in press, Geomorphology). These piedmonts have nuclide activities that also correlate well with distance (r^2 = 0.98 and 0.96, respectively) from their rangefronts, but nuclides increase at a lower rate down piedmont. Modeled sediment transport speeds for the Iron and Granite Mountain piedmonts are decimeters per year. The regular increase in nuclide activities down three different Mojave Desert piedmonts suggests that sediment is dosed and transported on these planar, minimally incised surfaces in a systematic fashion.

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