Long-term sediment dynamics of the Iron and Granite Mountain piedmonts, Mojave Desert, California, U.S.A.

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Landscape evolution in arid regions occurs largely during rare, episodic events. Human timescales are usually too short to quantify accurately sediment generation, deposition, and transport rates over the long-term in such environments. We used cosmogenic ^{10}Be and ^{26}Al, measured in sediment and collected from two Mojave Desert piedmont surfaces, to quantify these rates over the 10^3 to 10^4 year time scale.

We collected and analyzed three types of sediment samples to quantify large-scale piedmont dynamics. 1) Valley samples collected from channels at the rangefront were used to determine average source basin lowering rates and calculate sediment generation rates in the uplands. 2) Soil pit profile samples were used to determine whether the long-term history of the piedmont was a surface of deposition, erosion, or transport; such samples along with B-horizon depths and maximum channel depths constrain the thickness of sediment currently in transport across the piedmont. 3) Integrated transect samples (20 sub-samples collected over 4 km, each collected at 1 km intervals parallel to the rangefront) were used to determine average isotope abundances contained in piedmont sediment as a function of distance away from the rangefront.

Source basin sediment generation rates are ~ 0.01 g cm^{-2} y^{-1} for the Iron and Granite Mountains. Isotopic analysis of soil pit profile samples suggests that the piedmonts were once depositional surfaces but are now surfaces of transport. Pit profiles, B-horizon data, and channel depth data all suggest that the present thickness of sediment in transport is between 20 and 30 cm. Transect samples have linearly increasing abundances of ^{10}Be and ^{26}Al as a function of distance away from the Iron and Granite Mountains. Average sediment transport velocities across the Iron Mountain piedmont are less than 50 cm y^{-1}.