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OH WHERE, OH WHERE DID THE SEDIMENT GO: TWO DECADES OF TRACKING DESERT SAND FROM SOURCE TO SINK WITH 10-BE

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It's been 18 years since the first two 10-Be measurements were made on Anza Borrego desert boulders by Nishiizumi and wow, have we learned a lot since. Workers the world over have used cosmogenic nuclides to examine arid bedrock highlands, ephemeral streams, and playa sinks. This talk will pull together these varied studies in order to consider what we have learned about the desert sediment generation and transport system.

Desert sediment starts as rock, weathered and poised to descend rocky or soil-mantled slopes. 10-Be, measured in dozens of outcrop samples from Australian and polar deserts, suggests stunningly low rates of sediment generation from these bare rock surfaces, on the order of only cm to m/My. Sediment generation rates from exposed rock in African deserts are somewhat higher, m/My, whereas sediment appears to be produced more rapidly (tens of m/My) in the tectonically active southwestern US drylands. This sediment moves downslope in overland flow events and into ephemeral washes where cosmogenic geomorphologists have collected sediment samples and calculated basin-scale rates of sediment generation ranging from m to tens of m/My.

Leaving high-gradient source basins, arid region sediment is stored for varying lengths of time on piedmonts, the lower-gradient landforms abutting highlands. In some areas, such as the arroyo country of New Mexico, this storage can be quite transitory. In other regions, such as California's Mojave, the storage can last for tens of thousands of years with sediment moving slowly down these gentle slopes or being stored for tens of thousands of years in fans and perhaps on desert pavements where 3-He has convincingly verified the 'born at the surface" hypothesis.

We've learned enough to begin considering desert slopes, channels and piedmonts as a continuum where cosmogenically crafted sediment budgets can be used to predict sediment transport speeds and the rates of mass transfer. Such an understanding is coming just in time as populations surge in arid regions and desert landforms are increasingly occupied by houses, Wal Marts, and Home Depots. Only by understanding the behavior of natural desert sediment generation and transport systems, will we have a chance of predicting how they will respond to human-induced perturbations including development and climate change.

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