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Cosmogenic nuclides in buried sediments from the hyperarid Atacama Desert, Chile

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The evolution of Terrestrial Cosmogenic Nuclides (TCN) from an alluvial section in the Atacama Desert is examined. We reconstruct a burial history for the last ∼10 Ma using 40Ar/39Ar dating of volcanic ash layers interbedded with alluvial sediments; this independent dating allows us to distinguish between the effects of erosion, post-burial subsurface production, and radioactive decay during burial on TCN concentrations.
Our TCN results show significant post-burial production, which is the result of the extremely slow sedimentation rate (∼3 m/Ma) and the old age of the sediments. Although distinct differences in TCN concentrations are apparent between the lower and upper parts of the sedimentary section, we show that these differences are most likely related to post-burial production and age, and not to changes in bedrock erosion rates or changes in elevation due to tectonic activity. Our approach provides a test to the applicability of the two-isotope cosmogenic burial dating system (26Al/10Be) in regions of extremely slow sedimentation rates. Our results reveal geomorphic stability in terms of erosion and sedimentation rates for the late Miocene/Pliocene in the Atacama Desert.