

ABSTRACT FORM FOR 1997 GSA ANNUAL MEETING

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No 03097

RATES OF EROSION DETERMINED USING IN SITU PRODUCED COSMOGENIC ISOTOPES IN A SMALL ARROYO BASIN, NORTHWESTERN NEW MEXICO

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Arroyo cutting and filling sequences in southwestern United States are believed to be predominantly climate controlled. Quantifying long-term rates of arroyo processes can aid in understanding the impact of climate change throughout the Holocene and give a better understanding of present day controls on arroyo formation.

Twenty six sediment and bedrock samples have been collected from a small arroyo basin (Arroyo Chavez) north of Albuquerque, NM for in situ cosmogenic ^{10}Be and ^{26}Al analysis. The first twelve samples from the Arroyo Chavez Basin have normalized ^{10}Be and ^{26}Al abundances ranging from 1.6 ± 0.4 to 4.6 ± 0.2 (10^4 atoms/gm) and 9.1 ± 0.9 to 26.3 ± 2.8 (10^4 atoms/gm), respectively. Effective exposure ages of stream channel sediments are thus 4 to 7 ky, equivalent to basin-wide erosion rates of 80 to 150 meters per million years (m/My). Analysis of three samples, each divided into three size fractions, indicates that isotopic abundance does not vary with sediment grain size.

Sediments sampled from the hillslopes had lower nuclide abundances than sediments found in both the stream channels and the arroyo walls. Furthermore, samples collected from the walls of the main arroyo channel indicate an increase in normalized isotope abundance with depth:

Depth from surface(meters)	^{10}Be (10^4 atoms/gm)	^{26}Al (10^4 atoms/gm)
1.0	2.5 ± 0.4	18.0 ± 1.8
2.3	4.0 ± 0.3	24.5 ± 1.8
3.8	4.1 ± 0.5	26.2 ± 2.3

The difference between nuclide abundances of the hillslopes and those of the arroyo sediments could be attributed to dosing during transport and storage within the basin. The trend of increasing nuclide abundance with depth may indicate longer exposure times and thus slower basin-wide erosion rates for the older basal sediment layer than for the younger upper layer. Early Holocene stripping of older, more heavily dosed materials from the uplands could account for both of these observations.

erosion, arroyo, cosmogenic, isotope, sediments

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Arroyos: Hydroclimatology, Quaternary Geology, &
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