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SEDIMENT GENERATION AND EXPORT RATES IN THE NAHAL YAEL DRAINAGE BASIN, DETERMINED FROM COSOMOGENIC 10BE AND 26AL, NEGEV DESERT, SOUTHERN ISRAEL

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Sediment flux from Nahal Yael, a small (0.6 km^2) mountainous drainage basin in the Negev Desert has been monitored for 3 decades, an abundance of data replicated in few other basins. We measured 10Be and 26Al in 16 sediment and 8 bedrock samples representing sediment sources and sinks. We use these data to determine long-term, time-integrated (10^4 years) rates of sediment generation, identify sediment source areas and sediment generation processes, and compare rates of bedrock erosion for different lithologies. We calculated a basin-wide bedrock-equivalent lowering rate of 29 +/- 6 m/My and, assuming steady-state, a long-term sediment export rate of 79 +/- 17 tons/km^2/yr from channel sediment collected near the outlet of Nahal Yael. Our data yield erosion rate estimates slightly lower (36%) than sediment export rates calculated using the historical sediment loading data. Measurement of cosmogenic nuclides in geomorphic features provides insight into processes shaping desert environments. Throughout most of the basin (excluding the uppermost highlands), average 10Be concentrations measured in the bedrock samples (2.4 +/- 0.63 x10^5 atoms/g) were significantly greater than those measured in the channel sediment (1.25 +/- 0.04 x10^5 atoms/g), hillslope colluvium (1.25 +/- 0.05 x10^5 atoms/g), and basin alluvium stored in terraces (1.56 +/- 0.15 x10^5 atoms/g). These data suggest that most sediment is generated on the hillslopes under colluvial cover rather than from weathering of exposed bedrock. The slightly higher nuclide concentrations measured in basin alluvium as compared to channel sediment and hillslope colluvium indicate sediment storage for a minimum of 5 ky. Additionally, nuclide data suggests differences in rates of erosion for different lithologies. From our data, we find that gneissic granite erodes more slowly (13.8 +/- 3.4 m/My), than pelitic schist (28.0 +/- 19.6 m/My) or amphibolite (16.5 +/- 5.4 m/My).

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