SPATIAL PATTERNS OF EROSION IN THE BOLIVIAN ANDES FROM IN SITU ^{10}BE

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The Eastern Cordillera of the Bolivian Andes comprises some of the world's most rugged topography and serves as the major sediment source for the Amazon Basin. The upper Beni River basin drains a large portion of the range north of the Bolivian orocline, including most of the highest peaks. Erosion rates have been measured or modeled in these mountains using a variety of approaches, but measurements reported to date are too sparse to document in much detail spatial patterns of erosion rate throughout the basin. Here, we present concentrations of ^{10}Be in quartz from alluvium at 48 sites sampling the montane tributaries of the upper Beni River. The ^{10}Be concentration in our samples, derived from drainage areas between 1 and 70,000 km^2, ranges from 20,000 to 150,000 atoms/gram. Variations in ^{10}Be concentration and thus model erosion rates are most pronounced among basins with drainage areas $< 10^3$ km^2. To interpret erosion rates from ^{10}Be concentrations, we account for the non-uniform distribution of quartz in polylithologic basins as well as for the effects of the rugged basin hypsometry on ^{10}Be production rates. The resulting erosion rates are on the order of 0.1 to 1 mm/yr, similar to those derived from apatite fission track analyses. The cosmogenic radionuclides average erosion rates over thousands of years, long enough to smooth decadal-scale variations in sediment output but short enough to reflect valley-scale variations in erosion rate due to location in the network, dominant geomorphic process, and lithology.