SPATIAL VARIATION IN $^{10}$Be EROSION RATES AND INCREASING RELIEF IN THE SOUTHERN ROCKY MOUNTAINS

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Measurements of cosmogenic $^{10}$Be in alluvium imply erosion rates on a $10^3$-$10^4$-year timescale for small (0.01-47 km$^2$), unglaciated basins in northern Colorado, southern Wyoming and adjacent western Nebraska. Basins that formed in Proterozoic cores of Laramide ranges are eroding more slowly (23 ± 7 mm kyr$^{-1}$, n = 20) than adjacent basins draining weakly lithified Cenozoic sedimentary rocks (69 ± 31 mm kyr$^{-1}$, n = 20). Erosion rates are correlated with rock resistance and, for a given rock type, to basin slope, but not to mean annual precipitation. We also estimated longer-term (> 10$^5$-year time scale) erosion rates for the granitic core of the Front Range by measuring the concentration of $^{10}$Be and $^{26}$Al produced mainly by muon interactions at depths 1.7 to 10 m below the surface. Concentrations imply erosion rates of 10-40 mm kyr$^{-1}$, similar to shorter-term erosion rates inferred from surface sediment. The spatial distribution of erosion rates taken with stratigraphic evidence imply that relief in the southern Rocky Mountains increased in the late Cenozoic; modern relief probably dates from post-middle Miocene time.

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