Critical Zones and Decaying Mountains: A Simple Model for Post-Orogenic Landscape Evolution in a Range and its Basin

Gregory E. Tucker1, Peter van der Beek2, Abby Langston1, Robert S. Anderson1, and Suzanne P. Anderson*

Abstract

Mountain ranges that have been pronounced "tectonically dead" are often surprisingly lively. The four examples below illustrate how sedimentary basins adjacent to decaying mountain ranges reveal alternating, widespread episodes of regional erosion and sedimentation. Evidence from geomorphology, stratigraphy, and thermochronology suggests that these episodes are accompanied by variations in relief and sedimentation rates. If the Colorado Front Range Basins, for example, show recent exhumation of both basins seems to have created today's sharp relief along the mountain front and triggered the propagation of knickpoints along streams such as Boulder Creek. We want to understand what conditions are necessary and sufficient to produce these regional changes in mountain relief and basin sediment mass balance.

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Mass Balance Model: Erosion, Deposition, and Flexure

What happens as the system approaches steady state? What happens as it decays? What happens during decay either in the basin, the range, or both? We experience a change in "erodibility," as represented by $b_0$ and $b_1$. Such changes are meant to highlight the influence of changing climate or lithology.