Topography from Tectonics: Constraining Spatial and Temporal Landscape Response Rates to Teton Fault Activity Using Low-T Thermochronology and Limnogeologic Analyses

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ABSTRACT

Understanding how landscapes respond to changes in tectonic and climate forcing remains one of the most enigmatic challenges in tectonics and geomorphology. Specifically, the rates at which landscape erosion responds to transient changes in forcing (such as fault slip and subsequent tectonic uplift) remain poorly constrained. Erosion and sediment deposition serve as the primary means for mass efflux in orogens, making them critical components of the broader source-to-sink system. To better understand feedback relationships between tectonics, climate, and landscape response, it is necessary to separate the signals that define uplift, incision, and sediment flux rates at multiple time and length scales. The Teton Range serves as an ideal natural laboratory for filtering this complex interplay because it is a relatively small, simple system. Climate varies more consistently along-strike than in larger extensional regimes, so observed correlations between slip rates and landscape response time can be attributed to a first-order tectonic control. Additionally, recent bedrock thermochronologic studies have produced a refined understanding of the varied fault slip rates along strike. In order to utilize this compartmentalized system to examine variation in long and short-term landscape response times resulting from along-strike fault slip variation, I will use bedrock thermochronology methods to measure responses on the 107 year time scale and limnogeology for responses on the 102 and 104 year time scales. I suspect that the landscape response rates will scale spatially and temporally with measured fault slip rates and onset timing.

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