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Application of Low-Temperature Thermochronology in Deciphering the Denudation Pattern of a Linked Normal Fault Array

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Range-scale denudation results from the complex interaction between tectonics and erosion. Before we can fully investigate the processes, forcings, and responses involved in landform evolution, it is first necessary to consider spatial and temporal variations in denudation. Estimates of range-scale denudation are commonly obtained by subtracting topographic relief from a measure of fault displacement. Unfortunately, fault displacement is variable, and often poorly constrained, over the entire length of a range. In the case of linked fault arrays, the interactions of multiple fault segments cause spatial variations in both the magnitude and rate of displacement. This variability should have a direct impact on the distribution, magnitude, and timing of denudation, however, existing measures of fault displacement do not provide enough resolution to fully address this question. Low-temperature thermochronology can be used to produce a better estimate of fault displacement patterns, as well as, place constraints on range-scale denudation.

We use low-temperature thermochronology to provide information about the range-scale denudation pattern along the Wassuk Range of west-central Nevada, USA. Located on the western margin of the Basin and Range, the Wassuk Range is a 95 km long footwall uplifted along the east-dipping normal-slip Wassuk fault array. The Wassuk fault consists of distinct fault segments that are identified by changes in fault trend, the presence and quality of Quaternary scarps, and changes in footwall morphology. Multiple Jurassic and Early Cretaceous plutons are present along the length of the footwall and allow for apatite fission track analysis. The results of this analysis should place better constraints on the shape of the displacement profile, as well as, the range-scale pattern of denudation.