

QUANTIFYING THE GEOMORPHIC IMPORTANCE OF PREEXISTING FRACTURES TO RATES OF LANDSCAPE EVOLUTION

Richard Becker

Department of Geoscience, University of Wisconsin-Madison, Madison, Wisconsin
rabecker2@wisc.edu

Abstract

My goal is to quantify the geomorphic importance of fractures via a well-calibrated field study. We have known for 140 yr that preexisting fractures are important to landscape development; what remains unknown is how important fractures are. In other words, all else being equal, how much are erosion rates increased by a doubling in the fracture concentration? To find out, I am comparing two landscapes in California that form a natural experiment in this regard: Tuolumne Meadows in Yosemite National Park and the Mono Recesses in the Sierra National Forest. The landscapes were selected based on their excellent exposures, nearly identical lithologies and climates, close proximity (70 km), and their discordant fracture concentrations; Tuolumne Meadows is much more fractured and hosts a linear array of profound, north-south fractures. I have measured fracture concentrations in twelve outcrops, distributed in these landscapes, and collected samples for beryllium-10 analysis. Long-term, average erosion rates can be calculated from the beryllium-10 concentrations. These erosion rate estimates will be correlated against the fracture concentrations; the slope of the best-fit line will tell us how important preexisting fractures are to geomorphology while the standard error of the slope will tell us how much confidence we can have in that assessment.