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EARTH SCIENCE

SPEAKERS CLUB

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Topographic stress controls on bedrock fractures, surface processes, and landscape evolution

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The interactions between tectonics, climate, and surface processes on Earth drive landscape evolution. Characterizing these interactions is central to understanding past and future landscape change. In this talk, I show how tectonics and topography may influence the distribution of subsurface bedrock fractures and in turn influence surface processes and landscape evolution. Applying a model of three-dimensional topographic stresses to three sites with different tectonic regimes in USA, we find a strong correspondence between modeled stress and observed seismic velocities and electric resistivity. This suggests that topographic stresses influence near-surface bedrock fractures, which in turn alter patterns of weathering, erodibility, and groundwater flow. By exploring the predictions of three-dimensional stress model, we illustrate how topographic stresses could influence landscape evolution by altering the rates and spatial heterogeneity of surface processes.