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« First post: purpose and caveat.
Introducing the Active tectonics, quantitative structural geology and geomorphology research group at ASU »

Research and teaching in active tectonics, quantitative structural geology and geomorphology

Introduction

Understanding the processes by which plate tectonics operates and the landscape is sculpted are important contributions from my research and teaching. Such understanding can be applied to natural hazards such as earthquakes, landslides, and flooding. These efforts are focused discipline-wise on structural geology and geomorphology. Studies of active deformation of the earth's crust necessarily use the tools of structural geology (to answer the questions related to the geometry and causes of deformation) and those of geomorphology (to further constrain geometry of deformation, and determine the rates of that deformation). The geomorphic investigations also emphasize the interactions between humans and their environment, especially in the context of historic and active urbanization.

I try to take a deductive approach in which observations from exceptional field localities illustrate the general properties of earth processes. Knowledge of process rates is critical, so geochronology is a part of most studies. If possible, generalizations using solid mechanics principles are employed. Not only do I try to balance field observations with theoretical analyses, but also basic investigations with applied studies. Such an attitude embeds one's research in the community and produces useful knowledge.

Teaching is a friendly collaboration between student and teacher. I lead by example, working hard and setting high standards. I nurture and push rather than demand and pull. I am pleased to see the personal and intellectual growth in my students and stunned by the challenges they have handed me. The collaborations that I have built have borne fruit with published papers coming from many student theses, and all of the students with good jobs or continuing study. Our research group web site (http://activetectonics.la.asu.edu) is known as a source of important and varied content on the web and receives more than 5000 meaningful hits per month. We openly contribute useful tutorials, software, and data to the earth science community.

Research topics

I am fascinated by the study of the earth's surface, particularly when it is possible to understand and "see'' the effect of tectonic or surface processes that have occurred over a period longer than a human lifetime, but shorter than the deep time recorded by hard, consolidated rocks. Areas of research in which we work to produce such understanding include fault systems, active tectonics, and geomorphology. Outstanding research questions include:

- What are spatial and temporal scales of continental lithospheric deformation? What are the roles of faulting

and distributed deformation?

- What are the spatial and temporal distributions of earthquakes in a region over the Holocene and how do they reflect the regime and the modulation of deformation?
- How do surficial processes respond to deformation (and what are the possible feedbacks between them)? How can we use the signal of deformation in the landscape to bridge the gap between annual and Myr timescales?
- How does human engineering of the landscape influence surface processes in unanticipated ways? Given than urban and natural systems can be complex, what are the patterns of energy and mass transfer that emerge from their sustained action?

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