# THE INFLUENCE OF MECHANICAL STRATIGRAPHY ON THRUST TYPE EARTHQUAKES WITH IMPLICATIONS FOR SEISMIC INTERPRETATION AND RESERVOIR RESPONSE TO HYDRAULIC FRACTURING, SOUTHERN CALIFORNIA

**Sarah Wigginton**
***Utah State University, Geology, Logan, UT, USA***
sarahwigginton92@gmail.com

## ABSTRACT

The main objective of this project is to examine an alternate model of thrust fault nucleation which takes into account vertical variation in mechanical strength of sedimentary rocks. This model maintains that thrust ramps nucleate in structurally strong units then propagate both upward and downward into weaker units. Evidence for ramp-first style of faulting is in both seismic and small scale outcrop data, but there is a crucial need to study large scale structures and the basic mechanics of the problem. Questions about the ramp-first model include: 1) What changes in stress state or material properties cause failure at ramps, and 2) what governs the continued propagation or arrest of thrust-type earthquakes? We hypothesize that the mechanical stratigraphy of faulted rocks may create a significant stress heterogeneity within the system and exert a first-order control on these factors. Methods for this project include the study of large-scale examples of ramp-first faulting and examination of the fundamental mechanics of thrust fault ramps with numerical modeling. The intended results for this project include 1) a suite of outcrop data collected from a large ramp-first style thrust (cross sections, stratigraphy, mechanical data), and 2) models in finite element modeling program ABAQUS in which we alter rheology, geometry, and spacing of thrust ramps. Shedding light on this faulting style will influence how structures are interpreted in seismic, how wells are planned, and it also informs how mechanically layered rocks will respond to stimulation from hydraulic fracturing.

AAPG Search and Discovery Article #90298  2016 Grants-in-Aid Projects