GRAND JUNCTION GEOLOGICAL SOCIETY

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SEPTEMBER MEETING

WEDNESDAY, OCTOBER 16, 2019
Joint meeting with the CMU Geology Students
7:30 PM
Saccomanno Lecture Hall
(In the Wubben-Science Building)

Dr. Elizabeth S. Petrie
Western Colorado University

Will Speak On

"Kinematics of deformation band formation and reactivation associated with a Laramide fault propagation fold"

Guests Are Always Welcome

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Abstract

The Jurassic Navajo Sandstone exposed in the eastern limb of the San Rafael Swell, Utah, hosts several deformation band sets that provide a record of strain accumulation during fault propagation folding. We group the deformation bands into two broad categories: cementation and cataclastic bands. Both categories occur as one of six different deformation band types that are organized into five orientation sets. The deformation band types include bedding parallel; conjugate shear; shear; en-echelon Riedel shear; ladder structures; and fragmentation bands. Cross-cutting relationships between band sets were used to determine relative timing, while kinematic restoration of the San Rafael Swell monocline was used to identify subtle changes in stress throughout folding to identify the relationships between folding and band formation. The kinematic analysis suggests that most band sets form early during folding (<30□ dip) and often take advantage of existing bands to propagate. Oblique-slip on steeply dipping shear bands and en-echelon Riedel shear bands suggest sinistral shear occurred early during folding (<10□ dip). Kink-bands are oriented subparallel to the fold axis and cut the cross-bedding parallel bands taking advantage of these pre-existing bands to propagate. Ladder structures and fragmentation bands are cataclastic in nature and occur in accommodation zones between bands. The latest deformation band sets are oriented nearly perpendicular to the fold axis and include both cementation bands with Mn and Fe-oxide, quartz, and calcite cement cut by quartz cemented cataclastic bands. The presence of oxides indicates fluid flow through permeable deformation band pathways prior to a final stage of cataclastic deformation. Understanding the timing of band formation and its relation to the expected band type and location within the fold structure is important for modeling reservoir compartmentalization in hydrocarbon production or CO_2 storage scenarios in comparable folds.

Bio-

Elizabeth S. Petrie is the Moncrief Chair in Petroleum Geology at Western Colorado University. She has B.S. degrees in earth and planetary science and biology from the University of New Mexico, a M.S. degree and the Ph.D. in geology from Utah State University, and worked as a petroleum geologist for 7 years based in Houston with ExxonMobil and later in Sydney, Australia with Drillsearch Energy. Her research focuses on structural geology, rock mechanics, and fracture development and fluid flow in the brittle crust.