2023 ARMA Future Leader Webinar Series

Every Two Weeks on Fridays 9-10 AM MT

18th lecture: November 17, 2023

Please reach out to shahrzad.roshankhah@utah.edu to get the Zoom meeting information.

Speaker: No'am Dvory

The Paradox Basin as a field lab for salt rock integrity studies

The Paradox Basin in Utah and Colorado presents a promising energy landscape, offering opportunities for carbon dioxide storage, hydrocarbon discovery, and enhanced recovery. This dynamic region features extensive salt formations and complex subsurface structures. However, it also experiences induced seismicity linked to fluid injection. Our research delves into geomechanics, focusing on the Paradox Gr. and the Cane Creek Play, to optimize processes like hydraulic fracturing. Understanding stress states, natural fractures, and the basin's unique geology is key to sustainable energy development. Our findings point towards the critical role of stress states in hydraulic fracturing, emphasizing the significance of understanding stress layering and fracture toughness for fracture propagation. Crucially, in the Paradox Formation, preventing fractures from entering thick salt formations, which result in costly well clogging due to brine backflow, is essential. Using advanced "planar fracture modeling," we simulated fracture propagation and formulated strategies to manage fracture lengths, while also analyzing the importance of fluid viscosity in hydraulic fracturing. Utilizing a comprehensive dataset from the State 16-2 vertical test well and the State 16-2 LN horizontal well, we determined the stress orientations and identified a strike-slip faulting regime. By evaluating the shear and normal effective stresses on various fracture planes and their distance to failure, we were able to predict the behavior of fractures under certain pressure conditions. Considering the potential influence of stress shadows, our analysis underscores the importance of accurately defining the stress state. We identified that modest pore pressure increases primarily induce slip in strike-slip faults in the Cane Creek Play. Furthermore, the study highlights the variability of the minimum principal stress with depth and its relationship to specific stratigraphic units, emphasizing the significance of understanding stress layering to optimize stimulation strategies. This research offers an in-depth analysis of the geomechanics of the Paradox Group and the Cane Creek Play, shedding light on fracture propagation into salt units. Understanding the intricate interplay between stress states, hydraulic fracturing, and the formation's unique geological attributes is essential for efficient and sustainable extraction in the future.

Biography:

No'am Z. Dvory is a Research Assistant Professor at the Energy & Geoscience Institute and the Department of Civil & Environmental Engineering at the University of Utah. With extensive experience spanning from 2000, his career began as a Geologist/Geophysicist at The Geophysical Institute of Israel, followed by roles in project management and chief geology. His academic journey has led him through rigorous education and training, culminating in a Ph.D. in Hydrology from Ben-Gurion University of the Negev. No'am's expertise lies in the intricate dance between geology

and geophysics, with a particular interest in the geomechanical responses from the nano to the reservoir scale due to pore pressure changes and thermo-chemical processes. As a Postdoctoral Scholar at Stanford University, No'am developed the latest version of the Fault Slip Potential (FSP) software, which integrates differential stress orientation. His current projects tackle challenges in geothermal and carbon storage, hydraulic fracturing under uniform stress conditions, and the prediction of geomechanical properties through advanced Bayesian analyses. Beyond the lab, No'am has led and collaborated on numerous projects, including the comprehensive study of groundwater contamination and aquifer storage capabilities. His dedication to research and development in the field of geomechanics is reflected in his role as a primary chair of the GeoEnergy Induced Seismicity sessions at AGU Fall Meetings, illustrating his commitment to advancing understanding and innovation in the geosciences.