

Depositional Environment and Sedimentary Facies of the Duvernay—Ireton Unconventional system: Developing a predictable mechanical facies framework

Ryan D. Wilson, Fabien Laugier, Ryan Macauley, Austin Springer

Summary

The Duvernay—Ireton Unconventional system is a self-sourced play with temporal and spatial variance in rock properties associated with depositional processes and diagenetic overprint. An integrated assessment of vertical and spatial heterogeneity in the Duvernay and surrounding units was applied to better characterize variance in this play and the potential impact on hydraulic fracture complexity and resulting stimulated rock volume (SRV)/drained rock volume (DRV). To investigate, a sequence stratigraphic framework was developed for the Duvernay and overlying Ireton system for prediction of rock properties away from well control. A facies framework was developed to subdivide rock types based on genetic shifts in facies tracts. This facies scheme was linked to a geomechanical heterogeneity framework and used as direct supervised input for e-facies classification to 100's of wells across the basin. Statistical validation of the mechanical facies' framework revealed significant organization of mechanical properties within a predictable depositional context across calciclastic and siliciclastic environments. Furthermore, diagenetic overprint of distinct facies has strong implications for mechanical properties. This mechanical facies workflow supports integration with future analytics and well-planning for optimization, with upscaling opportunities to 3D static modeling and forward fracture model simulation.