

Influences on Mechanical Properties of the Upper Wolfcamp (XY) of the Delaware Basin, West Texas, and their Relationship with Facies and Facies Architecture

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Abstract

Accurate evaluation of rock mechanical properties is critical for predicting the fracture behavior of rocks during hydraulic stimulation. Submarine-lobe deposits are major targets for the exploration and production of hydrocarbons in the X and Y intervals of the Upper Wolfcamp (XY). Event-beds (e.g., mass-transport deposits, debrites, turbidites, and hybrid event beds) are the building blocks of these submarine fans, yet, very few studies have performed rock mechanical analysis or examined the mechanical stratigraphy of these deposits at the event-bed scale. Schmidt hammer rock strength evaluation of event beds in core has been integrated with core-derived facies and key surface analysis, and petrophysical log analysis to assess relationships between sedimentary characteristics and rock fracture behavior. The objectives of this research are to identify key stratigraphic compositional factors controlling mechanical properties in the XY intervals, document the vertical scales at which these properties vary, and consider the impact of these properties on the development of hydraulic fractures. Five primary facies defined by mud content in the XY have been identified and numerous subfacies are decided based on secondary variables (ie., mud clast percentages, degree of bioturbation, dolomitization, etc.). Results will be discussed and modeled to predict the mechanical properties, and hydraulic stimulation potential of the XY reservoir facies will be put forth.

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