Leveraging seismic attributes to understand the “frac-able” limits and reservoir performance in the Eagle Ford Shale, South Texas, USA

Kit Clemons, Robert Bodziak, Andy Stephens, and Robert Meek

Acknowledgments: Chris Yokoyama

There are numerous criteria commonly used to characterize low-permeability shale reservoirs and associated resource potential; these include some measure of organic richness, thermal maturity, lithologic heterogeneity and brittleness. The latter, a descriptor of the geo-mechanical rock properties, plays a significant role in overall well performance and may be a key productivity driver; an understanding of this mechanical stratigraphy is also fundamental for well placement design and hydraulic stimulation effectiveness.

Observation of geomechanical attributes extracted from seismic data in the Eagle Ford Shale capture changing mechanical properties indicative of strike-oriented facies changes. Using acoustic logs, core, and 3D seismic data, we assess the mechanical contrast between facies units and their affect on well performance. We use 3D seismic data to map the structure and facies distribution in an area where identification of reservoir facies is a major challenge to plan delineation and development drilling. The Young’s Modulus (YM) and Density rock properties inverted from 3D seismic data prove as effective discriminators for the purpose of identifying facies changes and the “frac-able” limits in areas where proppant embedment is a major concern. The result is an interpretation where we identify mechanical changes from 3D seismic data attributes associated with brittle carbonate prone Eagle Ford facies and use these attributes to predict both the "frac-able" limits and variability in well performance associated with proppant embedment. These changes in mechanical properties of Eagle Ford facies have possibly been unrecognized are important in high grading productive intervals and associated well performance in ultra-low permeability rocks.