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Success! Using Seismic Attributes and Horizontal Drilling to Delineate and Exploit a Diagenetic Trap, Monterey Shale, San Joaquin Valley, California

The Miocene Monterey Formation of California's San Joaquin valley has long been recognized as a prolific source rock and underdeveloped resource. In this case study, the thick sequence of diatomaceous shales and hydrocarbon-rich sediments of the McLure Shale form a subtle diagenetic trap. As these sediments are buried to increasing depths, these siliceous shales convert from opal A to opal CT and finally to quartz-phase "chert", undergoing a significant change in porosity and other rock properties during this transition. Seismic data and modeling has been successfully utilized in the identification and mapping of these diagenetic facies.

North Shafter and Rose Oil Fields produce from a porous, hydrocarbon-charged reservoir that formed as a result of silica diagenesis and favorable timing of kerogen maturation in these sediments. The reservoir consists of fractured, porosity-enhanced, oil-saturated quartz-phase rocks. A trap is formed by the updip, opal CT-phase rocks that have no hydrocarbon saturation and poor porosity characteristics. The juxtaposition of these drastically different rock types is reflected by seismic amplitude anomalies that were used to determine the extent and shape of the fields.

Horizontal drilling technology and strategic placement of wells have been key in the viability of this program. Close to 60 horizontal wells have been drilled in North Shafter and Rose oil fields since 1998, when the first horizontal well was drilled.