Understanding 3-D Stratigraphy and Porosity Distribution of Upper Miocene Carbonates, SE Spain: An Integrated Approach using GPR and Geophysical Modeling

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This study will resolve 3-D patterns of porosity distribution by combining field and high-resolution ground-penetrating radar (GPR) data from an exceptionally exposed reservoir analog, and evaluate the sedimentologic, geometric, and diagenetic processes that control these patterns.

Carbonate reservoirs are inherently complex, and include both depositional and diagenetic components, distributed in three dimensions. Accurate 3-D models of carbonate reservoirs remain poorly constrained, as most models are created from interpolation of 2-D data. This limits effective extraction of hydrocarbons. As a step toward improving models for carbonate porosity in the subsurface, this study explores the distribution of heterogeneities within the Terminal Carbonate Complex (TCC) of southeastern Spain. Models of reservoir analogs are being created from the integration of GPR data , outcrop descriptions, and already collected porosity and permeability measurements. These data will be used to refine 3-D models constructed in Petrel.

The microbialite-oolite-reef sequences of the TCC are of great interest because many highly productive reservoirs are composed of microbialites and oolites deposited in similar settings. Understanding the stratigraphic architecture and distribution of porosity in 3-D will aid in the will aid in the development of similar carbonate systems, including preexisting and recent discoveries such as the Tupi oil field of the Santos Basin.

GPR is an underutilized tool for determining porosity distribution in carbonates. GPR data coupled with reservoir analog modeling, however, has great potential to improve our understanding of porosity distribution within carbonate reservoirs. The 3-D reservoir analog models developed should improve production of hydrocarbons in analogous reservoirs.