3-D Interpretation Using Seismic and Non-Seismic Data from a Regional to Prospect Scale

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Abstract

Experience obtained over a large number of project areas in the Gulf of Mexico has proven that the application of gravity and magnetic data assists exploration from the regional scale (e.g., crustal models and depth to basement) to the prospect scale (e.g., sub-salt seismic depth imaging enhancement). This is particularly true when there is tight integration between the interpretive information provided by the potential field, geologic, and seismic data sets.

We first present results derived from mega-scale regional data sets such as satellite-derived gravity and public domain magnetic data, where we determine crustal boundaries and overall tectonic features. We then focus on the northern Gulf of Mexico (U.S.) where large regional seismic, gravity and magnetic data sets have been modeled, using 2-D and 3-D methods, to understand the depth to magnetic basement, basement lithology, and regional character of top and base of allochthonous and autochthonous salt. With the regional context in place, we illustrate and discuss-prospect-level interpretation, using 3-D gravity inversion to help corroborate and refine salt structures only partially or poorly defined by seismic data.