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Integration of Seismic Stratigraphy and Seismic Geomorphology for Prediction of Lithology; Applications and Workflows

Henry W.Posamentier[1], Simon C. Lang[3], Andrew Madof[2], Kenneth Ehman [2], Elaine Campbell[2], Ivana Bunting[2]

[1]Saudi Arabian Chevron, The Woodlands, Texas, UNITED STATES
[2]Chevron Energy Technology Center, Houston, Texas, UNITED STATES
[3]Chevron Australia, Perth, Western Australia, AUSTRALIA

ABSTRACT

As high-quality 3D seismic data have become widely available, our ability to predict the subsurface distribution of lithologies has significantly improved. Stratigraphic interpretation of seismic data involves the integration of stratigraphy and geomorphology, with integrated section and plan view images yielding robust interpretations of stratigraphic architecture and associated lithology. With the investment of billions of dollars in acquisition and processing of seismic data, maximizing the value of that investment by extracting as much information as possible from these data is business critical.

Seismically-derived geologic interpretations can have significant impact on exploration and production in the following ways:

Geology: 1) prediction of lithology, 2) prediction of compartmentalization, 3) development of depositional analogs, 4) Enhanced understanding of geologic processes. Through a variety of techniques, it is possible, in many instances, to image significant parts of depositional systems. Components of depositional systems such as channels and patch reefs, are then identified yielding insights as to the lithology of these deposits. Subsequently, further analysis can provide insights as to stratigraphic compartmentalization.

Geophysics: 1) provides depositional context for geophysical analyses (e.g., DHI analysis, reservoir properties from seismic), and 2) quality control for geophysical processing. Understanding geologic context can provide a "reality check" when evaluating geophysical data for rock and fluid properties. In addition, iteratively evaluating the effects of geophysical reprocessing on stratigraphic and geomorphologic) features so that they are not processed out of the data, is critical to maximizing the value of seismic data.
Examples, will be shown that illustrate key aspects of successful application of seismic stratigraphic analysis, which are: 1) integrating section and plan views in an iterative workflow, 2) understanding and recognizing geologically- meaningful patterns in multiple domain including section and plan views, temporal views, animated views, and perspective views, 3) recognizing the context within which these patterns exist, and 4) having efficient and creative workflows to quickly analyze geophysical data.