New Techniques Reveal the Exploration Opportunities in the Louisiana Coastal and Shelf Areas

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Abstract

Regional studies indicate that the Louisiana coastal and shelf areas have significant remaining hydrocarbon potential. The productive sand zones are typically stacked and nearly 20,000 feet thick from 2,000 feet to 22,000 feet. This productive section is divided vertically into two distinct domains. Little structural deformation and coastal-shelf sediments characterize the shallower section whereas the deeper section is characterized by strong structural deformation and slope sedimentation. The deeper section contains the major remaining potential. The deep plays are analogous in many respects to the stratigraphically younger deep-water plays in the present-day Gulf of Mexico, which have been the recent exploration focus of the industry. New deep discoveries have proved high productivity of the deep targets. Below the existing infrastructure, various undrilled deep plays provide very economic targets for production. But exploration of the high potential deep section is associated with high risk. The deep structures are complex with various fault systems and subtle salt/shale bodies. The reservoir existence is intricate due to highly variable deep-water sand distribution and quality. Hydrocarbon prediction is difficult because of relatively poor data quantity and quality.

Due to the high potential and high risk of the deep opportunities, special tactics are needed to meet the challenge. Sand-rich sequence identification, accurate fault mapping, hydrocarbon-bearing prediction and multi-target penetration will significantly minimize the risk and maximize the potential and hence are key tactics for successful deep exploration and production. Figure 1 is a seismic interpretation workflow to execute these tactics for screening regional prospectivity to final well-path design. It takes advantage of regional studies and available new techniques to provide viable approaches for more effectively interpreting and managing the risk.

The workflow begins with a rapid seismic screening approach (QuickSEIS) to identify the most prospective areas through comprehension of seismic attributes, well and production data and regional studies. Then the 3D seismic classification approach (ClassCube) is applied to predict the 3D distribution of pore fluid and lithologies through a well calibrated and multi-seismic attribute classified direct hydrocarbon indicator. The artificial intelligence fault extraction approach (FaultTrack) will be applied to reveal and map fault systems in complex faulted areas through enhancing the spatial discontinuities and suppressing noise and remains of non-faulting events in the seismic data. The spectrum decomposition approach (SpecEvent) will be applied to reveal subtle variations in lithology that may indicate a stratigraphic trap for hydrocarbons through extracting frequency information from the seismic volume. Finally, the virtual reality approach (WellPath) is applied to design drillable well paths for multiple target penetration through viewing multi-discipline data. This workflow provides very cost-effective approaches to systematically define prospective targets for recompletion, infill drilling and exploration. They not only optimize E&P activities but also help asset transactions.

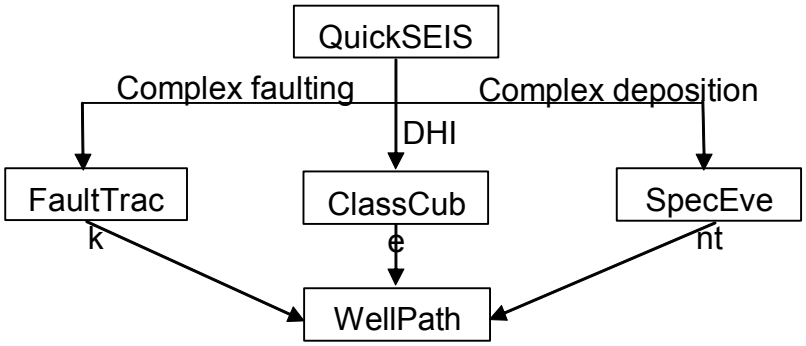

Figure 1. Seismic interpretation workflow.

References

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