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Deep-Water Reservoir Facies Prediction Techniques: A Case Study in the Gulf of Mexico Basin

New technologies, such as trace shape facies analysis and volume interpretation using Voxel tracking and opacity visualization, were combined with traditional techniques including sequence stratigraphy, well log analysis, and seismic attribute interpretation into a work procedure for reservoir facies prediction. Firstly slope position, processes of deposition and structuration, and basin and stratal geometries are analyzed for regional depositional settings. Secondly combined structural and stratigraphic analyses are used to derive basin evolutionary history involving salt/shale movement, fault/fold formation, and basin infill processes. Thirdly sequence stratigraphic analysis is used to obtain sequence stratigraphic framework, seismic facies types, and mini-basin facies recognition. The next step is to extract seismic attributes with proper window sizes to generate interpretable attribute maps. Then seismic trace shape facies analysis is applied to potential objective intervals. Such facies maps usually show more details of depositional environments and reservoir heterogeneity than amplitude maps. Finally volume interpretation is carried out in 3-D seismic volume. Voxel-tracking is used to pick individual channels, lobes, and basin floor fans to quickly generate prospect area, thickness, and volume of an objective, and may be used to track sea floor, condensed sections, and others. Opacity visualization usually display more details of geological features than amplitude and other attribute maps, and is efficient for studying depositional environments and reservoir heterogeneity. Application of this procedure on US Grant reveals amalgamated channel complexes feeding a ponded basin from the NE through the Nansen area and channel/levee complexes from the NNW with sediments spilling over the Boomvang area.

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