

Capture geological heterogeneity at different levels in reservoir modeling – Methodology with case studies from deep water turbidite systems

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ABSTRACT

Reservoir heterogeneity exists at different levels and can play a critical role in hydrocarbon exploitation. This heterogeneity can be observed in the stratigraphic framework, facies architecture and petrophysical variability within each facies. During the process of reservoir characterization and modeling, efforts need to be made to identify these geological features and select the appropriate techniques to preserve them. This paper demonstrates different workflows and methods used to capture reservoir depositional system, internal facies and petrophysical variation through deep water case studies from Gulf of Mexico and West Africa. The techniques applied in these case studies include stochastic and deterministic approaches. Both object-based and pixel-based algorithms are used to preserve the various features. In a prograding turbidite system, object-based techniques with various constraints (including flowlines and source points, as well as lateral and vertical trends) can be used to realistically model the lobe and channel levee system. In another case, turbidite facies bodies can be deterministically extracted from a seismic attribute volume. Pixel-based techniques are used to capture the petrophysical heterogeneity within the different facies. During this process, various geostatistical techniques are selected to capture petrophysical distributions, spatial variations and trends.