Depositional Processes and Impact on Reservoir Quality in Deepwater Paleogene Reservoirs, US Gulf of Mexico

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ABSTRACT

Reservoir deliverability is a critical risk for deep-water Paleogene reservoirs in the Gulf of Mexico. Permeability can vary two orders of magnitude (1's to 100's of mD) for a given porosity within a single lithofacies. The objective of this paper is to frame reservoir quality within the architectural elements of submarine gravity flows in a deep-water Paleogene field. Around 380 metres of core was described from a lower and upper reservoir, and core descriptions were integrated with routine core analysis, petrography, and laser grain size analysis data. We distinguished specific rock property suites, textural, and mineralogical characteristics for channel, lobe, and lobe margin depositional environments. Channel architectural elements have the best reservoir quality because they are generally fine-grained, and have a relatively low abundance of silt-sized particles (average 24 %) and ductile grains (average 17%) dispersed among framework grains. Lobe architectural elements in the lower reservoir display moderate reservoir quality, and are composed of fine- to very fine-grained sand-stone, with an average of 34% silt and 18% ductile grains. Upper reservoir lobes contain more silt (average 40%) and ductile grains (average 29%), and lower reservoir quality. Reservoir quality is overall poor in the lobe margins where silt-sized particles and ductile grains are most abundant. The observed textural and mineralogical differences from the channel, lobe, to lobe margin environments are the result of grain segregations during transport within submarine gravity flows. As a best practice, reservoir quality should be examined in a depositional environment context.