

Integration of Stratigraphic and Structural Evolution Models for Play Concept Development - Eastern Niger Delta

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Fundamental to exploration in the Niger Delta is an understanding of the interplay of growth-faults, contractional structures and the sedimentary system. This complex interaction is important for controlling reservoir and seal distribution, traps, and migration pathways. A technology we are applying to support this effort is the forward stratigraphic modeling program Dionisos that also has basic structural capabilities. The technology is being used as a platform to rigorously test concepts in 2 and 3 dimensions and understand the complex behavior of the structural/stratigraphic system.

Early Dionisos runs were on 2D cross sections that attempted to reproduce the known stratigraphic section. Moderate adjustments to inputs yielded sections that were similar to large-scale facies patterns. Subsequent 3D tests compared favorably to known facies patterns and were then used to make predictions in the deeper sections. One key result is that even in this tectonically active setting, eustatic sea level is a primary control on facies stacking patterns and a key mechanism to produce thick sandy reservoirs overlain by thick sealing shales.

Future exploration efforts will likely focus on the higher risk, deeper, high-pressure and high-temperature section with less distinct DHIs. Drilling deeper prospects can be very expensive, hence the need to better understand the regional dynamics of the petroleum system at these depths. Forward models such as Dionisos can be a key component to developing new play concepts.