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Testing Reservoir Sensitivity in Heterogeneities Shallow Marine Reservoirs

A key issue in understanding heterogeneous reservoirs is determining the relative importance of structural and sedimentological variability. The SAIGUP project aims to address this issue by building c. 20,000 reservoir models, each with a unique combination of sedimentology, structure and production-plan. All of these models have been flow simulated and the results interrogated to reveal the relative importance of the different sources of heterogeneity.

The shallow marine reservoir types covered in the sensitivity analysis spans the continuum from linear wave-dominated to elongate river dominated deltas.

The following types of sedimentological heterogeneity are considered most critical for flow in shallow marine reservoirs. 1) Coastline morphology as a function of wave and river influence (linear – lobate –finger). 2) Direction of coast progradation (with respect to water drive direction). 3) Aggradation angles (within parasequences and parasequence sets). 4) Degree of flooding surface cementation. 5) Clinoform spacing and frequency. 6) Barrier continuity along clinoforms.

Sedimentological variability within the project is represented in a 3 x 3 matrix with horizontal and vertical heterogeneity on the x and y axes respectively. Increasing horizontal heterogeneity is produced by modelling more fluvial influence on the shoreline with increasing shoreline curvature and increasing clinoform frequency. Higher aggradation angles also increase the horizontal heterogeneity. Increasing degrees of vertical heterogeneity has been modelled by increasing the cementation along flooding surfaces, introducing more clinoforms and decreasing the aggradation angles.

An extensive literature study has been carried out to establish ranges in values for the various input parameters, and the resultant models represent a realistic spectrum of heterogeneous shallow marine reservoirs.