Channelized and Lobate Seafloor Analogs from Offshore Western Nigeria: Facies Architecture, Temporal Deposition Patterns, and Application to Turbidite Reservoirs

Zane Jobe[1]

[1]Shell

Abstract

The study of the modern seafloor and shallow subsurface has long been a key source of high-fidelity information about morphology, architecture, and evolution of deep-water depositional systems. A dataset from the western Niger Delta slope allows for the detailed characterization of both channelized and lobate depositional systems, which are excellent scale and lithologic analogs for producing reservoirs. The dataset consists of industry-grade and high-resolution 3D seismic reflection data, ultra high-resolution 2D sub-bottom profiles, high-resolution multibeam bathymetry, backscatter, and sidescan sonar, and piston cores with radiocarbon ages and grain size analyses. In addition, the bathymetry was used as an input for the 3D numerical simulation of turbidity currents. Three submarine channels traverse the study area: the entrenched Y channel is fed by two tributaries, the X and Y' channels. The X channel feeds a perched apron on the slope before discharging into the Y channel. In contrast with models of downstream and lateral fining/thinning, piston cores reveal that there is no significant lateral or downslope change in sand content or quality. This sand-rich apron is similar in facies and scale to many producing fields in the Gulf of Mexico. The Y' channel is weakly confined and displays significant overbank sand deposition before discharging into the Y channel. Recent (50ka – 20ka) development of inner levee deposits in the Y channel is likely caused by changes in sediment supply related to tributary activity. The well-imaged, sampled, and dated deposits of the Y channel are analogous to many fields producing from channelized turbidites. The study of these inner levee deposits allows for the quantification of the potential upside of these out-of-channel deposits, which are often ignored with current development strategies.