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Pre-Drill Depositional Facies Characterization of Sinuous Submarine Channels, Deepwater West Africa

Channel deposition characterizes vast areas of the West African paleoslope. Large-scale channel-levee systems of the upper extensional slope grade into laterally accreting channel systems at the compressional toe-of-slope where elongate, shelf margin parallel bathymetric lows reduce the slope gradient.

This project focused on analysis of complex reservoir geometries inherent to sinuous channel systems based on amplitude extractions from 3D seismic data. Paleogeographic reconstructions delineated five depositional facies: accretionary channel fill, sand-rich channel fill, heterolithic channel fill, levee/overbank, and splay. The accretionary channel fill consists of arcuate high-amplitude units along the inside channel loops reflecting lateral migration of inclined sand beds, separated by shale drapes. Sand-rich channel fills are linear and sinuous high amplitude facies that result from bank collapse and subsequent backfilling of the channel form. Levees on the outside loop are deposited from spill-over of turbidity currents, yet the innermost part of the levees is continuously eroded during channel migration. Splay deposits accumulate on the flanks of locally breached levees. The abandonment channel form is preserved as linear low amplitude events, reflecting their heterolithic to mud-rich fill.

Lateral accretion appears to be the dominant mode of deposition in these sinuous channel systems. Their intricate geometries suggest that long lasting hyperpycnal flows from flood stage rivers were the primary mode of sediment delivery to the area. Most of the sand appears to have been deposited within the sinuous channel systems, resulting in relatively small depositional lobes. Results of this work provided the context for subsequent reservoir modeling.