AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

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Anatomy and Evolution of Deep-Water Channels: Case studies from Nigeria and the Gulf of Mexico

Four late Pleistocene deep-water channels observed in water depths > 2000 m are analyzed and contrasted using 3D seismic data. They range in width from <300 m up to 4 km and display a broad range of sinuosities. Three aspects of channel process morphology will be discussed: 1) *Erosion*. Each channel initially is broad (like a valley), associated with varying degrees of erosion at its base and frequently flanked by levee development. In general, steeper slopes engender greater incision, whereas less incision and more aggradation characterize channels on more gentle slopes. 2) *Channel Pattern*. Most channels meander to a greater or lesser degree. Several types of meander loop evolution are observed: gradational lateral meander migration representing a continuous shifts of channel location accompanied by aggradation; vertical aggradation with minimal lateral shift; and quantum jumps of channel meanders within the confines of the same meander channel belt. It is inferred that continuous shifts characterize systems where levee walls are high and flows are consistently confined and steady. Quantum shifts may also occur due to significant thalweg jumps within the confines of levees or due to jumps of the entire channel complex under conditions of catastrophic flow. Seismic reflection character of overbank deposits suggests that channels characterized by significant aggradation and minimal migration are associated with flows that are mud-rich. In contrast, channels characterized by meander loops that both swing and sweep down-system, as well as those that jump-migrate, are associated with flows that are relatively sand prone. 3) *Avulsion*. Channel avulsion, uncommon in the examples studied, may be sometimes associated with apparent sudden changes in flow discharge.