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High Resolution, 3-D Seismic Interpretation of a Late Pleistocene Mississippi Fan Channel, Northern Deep Gulf of Mexico

Mississippi Fan channel # 10 (ca. 0.7-0.6 Ma) is located in the western Atwater Valley protraction area. A detailed interpretation of a 3-D seismic data cube (9.0 km by 18.6 km) was done to evaluate the updip evolution of the channel-fill and associated sediments. The thick nature of the sequence (800 m) and extreme amounts of lateral migration of the channel fill (10 km) made the sequence ideal for studying depositional processes in detail.

Three main architectural elements are present: channel-fill, levees, and slides. Channel-fill sediments are characterized by high amplitude, sub-parallel reflections, commonly one to three reflections in occurrence. Eleven discrete positions of the channel-fill could be traced through the data set. Levees are characterized by lower amplitudes, with parallel to subparallel reflections that form an external wedge shape near the flanks of the channel and that taper away from the channel. There are several erosional surfaces and subfacies (isolated high amplitude events, slides, reflection free, extremely deformed zones) within the levee-overbank that reflect the complex sedimentary processes within the levee. Slides are characterized by a variety of seismic facies and are distributed in many positions throughout the sequence. Externally they are rotated, faulted, folded, and thrust sediments. Three types of slides are present: slides derived from levees into channels, slides within the levees away from the channels, and slides that deform portions of the entire levee and channel. The complex juxtaposition and evolution of facies have important implications for reservoir modeling and development of submarine fan channels.