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How accurately do offlap-break elevations of shelf-phase deltas record past sea-level elevations? Clues from the morphology of the Mississippi River deltas

On the basis of a worldwide average of shelf-edge elevations, Shepard (1973) proposed a lowstand elevation of -130 meters. For this estimate to be meaningful, the modern shelf edge must be the intact lowstand coastal-plain strata. In addition, the elevation of the coastal plain should not have been significantly affected by transgressive/highstand erosion (i.e., ravinement), or subsidence (i.e., compaction, loading, etc). On a worldwide basis, the degree to which these criteria hold has not been demonstrated. The morphology of post-lowstand Mississippi River deltas provides an interesting opportunity to evaluate the relationships between shelf-phase deltaic geomorphology and sea-level elevation. Our preliminary geomorphic analysis of the modern (Balize) Mississippi River delta shows that the offlap-break features are ~10 meters below sea level and are roughly 2 to 10 kilometers basinward of the coast line. The older St. Bernard lobe (lobe 9 from Frazier, 1967) has an offlap break elevation at ~16 meters below today's sea level. Despite being abandoned only 1800 years ago (i.e., when eustatic levels were similar to today), the greater than expected depth of the offlap break suggests either appreciable ravinement and/or subsidence occurred after shelf-phase deltas are abandoned.