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An Embryonic Major Delta Lobe: A New Generation of Delta Studies in the Atchafalaya-Wax Lake Delta System

Delta studies in the Holocene Mississippi delta system have progressively focused more on the Atchafalaya-Wax Lake deltas since the 1970s when the deltas emerged as subaerial features after the abnormally high flood of 1973 (peak discharge of about 20 x 10^3 m^3 s^{-1}). Water and sediment from the Atchafalaya River have two outlets into Atchafalaya Bay, the natural Lower Atchafalaya River Outlet and the man-made Wax Lake Outlet which was dredged from Grand Lake—Six-Mile Lake to the bay in 1941. Since the Wax Lake Outlet took only about 30% of the Atchafalaya discharge in 1973, most initial subaerial of the delta growth occurred opposite the Lower Atchafalaya River Outlet. Numerous distributary channels and associated sand-rich bars characterized this early delta development with major proximal channels eroding through the deltaic sediments into old bay-bottom deposits. Average annual discharge between 1981-2000 has been calculated at 6,523 m^3 s^{-1} and average sediment discharge down the Atchafalaya is approximately 75,200 x 10^3 t y^{-1}. Even though the Atchafalaya River captures nearly 60% of the Mississippi's suspended load, CSI Studies show that the Atchafalaya and Wax Lake deltas are sand-rich (nearly 70% sand). Wave action, water level setup and setdown, and abrupt wind shifts associated with winter cold front passages resuspend fine-grained bay sediments and transport them to the adjacent continental shelf. It has been estimated that the average cold front exports ~ 400,000 metric tons of sediment from the bay. Numerous studies by CSI researchers have shown that much of this sediment is advected to the west where it is deposited along the eastern chenier plain creating mud flats at the coast and low-angle progradational clinoforms on the inner shelf. The deltas currently fill most of Atchafalaya Bay and soon will prograde onto the continental shelf signaling the final chapter of this evolution from lake deltas (Atchafalaya Basin) to bayhead deltas (Atchafalaya Bay) to a shelf delta on the inner continental shelf. At the point of becoming a shelf delta, a new major delta lobe in the Mississippi River delta system will be developing.