Mainland Marsh Shoreline Response to Barrier Island Transgressive Submergence: Preliminary Results from Chandeleur Sound, Louisiana, USA

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The Mississippi River delta plain (MRDP) is currently undergoing the highest rates of shoreline erosion (> 15 m/yr) in North America as wetlands are converted to open water in a regime of subsidence-driven rapid relative sea-level (RSL) rise (~1 cm/yr). The development and evolution of barrier islands from former deltaic headlands within the MRDP requires high rates of RSL rise and attendant wetland erosion for mainland detachment to occur. The first stage of deltaic barrier evolution is initiated with an upstream avulsion and deltaic headland fluvial abandonment. As a consequence, reworking of the erosional headland by marine processes and longshore sand transport to the headland flanks generates laterally accreting terminal spits and flanking barrier islands. Continued erosion of interior wetlands and expansion of bay area results in mainland detachment, leading to the formation of a barrier island arc separated from the mainland by a partially restricted lagoon. Ultimately, continued RSL rise and a net loss of sand from the barrier system forces transgressive submergence converting barrier islands to subaeqeous sand shoals. On the basis of existing conceptual models for shoreline systems of the MRDP, the disappearance of barrier islands could lead to the formation of a new sandy barrier shoreline along the seaward periphery of mainland marshes. This study focuses on the fate of Biloxi marsh as the Chandeleur Islands are progressively converted to subaeqeous sand shoals. As open Gulf processes become an increasingly more dominant driving force along this shoreline, the availability of subsurface sand for liberation during shoreface retreat will determine the character of the new coastal system. Hence, shoreline development along this region will be strongly influenced by: 1) shallow stratigraphy underlying the modern marsh surface, 2) marsh response to RSL rise and increased wave energy, and 3) character and rate of increasing marine-influence. Preliminary results suggest that much of the shallow subsurface is comprised of clay-rich marsh and interdistributary bay deposits; both of which are sand deficient resulting in the development of shell-lag islands and shelly shorelines. As barrier shorelines become increasingly less effective at protecting interior wetlands from open water wave attack and regulating estuarine processes, knowledge of the mode and rate of marsh response is critical for successful management and planning efforts.