Rapid Morphologic Changes to a Transgressive Tidal Inlet due to the Active 2005 Hurricane Season, Little Pass Timbalier, Louisiana

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ABSTRACT

The 2005 season of Gulf of Mexico hurricanes resulted in drastic changes to the transgressive barrier systems of the Mississippi River delta plain. The majority of shoreline changes along the barrier coast occurred at tidal inlets. Pre- and post-hurricane season, high-resolution bathymetric surveys of Little Pass Timbalier Inlet were conducted in June 2005 and November 2005, respectively. During the period between surveys three major tropical cyclones, Hurricanes Cindy, Katrina, and Rita, made landfall near the study area. Digital elevation models (DEMs) were constructed for each bathymetric dataset. A comparison of the two DEMs show that the inlet widened from 5 to 6 mi, and the main ebb channel accreted on its eastern flank and eroded on its western flank. The entire axis of the main ebb channel shoaled except for a small region just landward of the inlet throat that eroded. The greatest shoaling (5 ft) occurred in the seaward most portion of the ebb channel. This pattern of landward scour and seaward shoaling results in migration of the inlet throat in a northeasterly direction. Shoaling was also extensive across the proximal ebb-tidal delta and landward of Timbalier Shoal and the main ebb channel. In the vicinity of eastern Timbalier Island two recent sand borrow pits shoaled completely during the storms.

It is proposed that the post storm shoaling is the result of dispersal of sediment previously comprising swash bars, ephemeral intra-inlet islands, and recurved spit sediment from the adjacent barrier shoreline. These morphological features were partly to completely destroyed by hurricane processes. As a result, the dispersal of the sand previously stored in bars and shoals was made available for sediment bypassing, temporarily increasing downdrift longshore sediment transport volumes. Documentation of this pattern of inlet channel migration in a regime of rising sea level and shoreline recession is important in recognizing tidal inlet fill deposits in transgressive shoreface sequences. Understanding rapid, event-driven sediment transport processes is essential for identification of viable sand resources for barrier reconstruction and effective shoreline management.