Nearshore Processes and Sediment Dynamics Generated by Frontal Passage: West Ship Island, Mississippi

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Low wave energy and a mixture of sandy and muddy bottoms characterize the Northern Gulf of Mexico. The low energy environment enhances the effect of transient signals like meteorological fronts on the dynamics of wind-wave generation and sediment transport processes relative to other forcing. The site of particular interest to this study is West Ship Island, which is located 12 miles offshore of Gulfport, Mississippi. In an investigation of erosion processes around historic Fort Massachusetts, located on the sound side of West Ship Island, a monitoring program was established. Beach and nearshore surveys were completed in June, October, and December of 1996, and in February, March, April, and June of 1997. Hydrodynamic measurements were made at Fort Massachusetts between 17 February and 8 March, and between 13 March and 1 April 1997.

We are performing a modeling investigation on the sound side of Ship Island near Fort Massachusetts to examine the effects of frontal passage on nearshore dynamics and sedimentation and beach profiles. A prior study (Kaihatu et al., 2003) determined that the coupled wave-hydrodynamic system simulated the observed flow patterns well, with general westward flow at Fort Massachusetts present during the front. A preliminary sedimentation study (Keen et al., 2003) suggests that sediment was transported by this westward flow, with erosion focused near Fort Massachusetts. We are extending these studies by incorporating the wave forcing into a mixed mud-sand model (HydroQual Contaminant Model, HQCM) and examining profile changes due to both oscillatory and mean flow from waves. Comparisons to measured bathymetric profiles will be performed to determine the contribution of wave-induced sedimentation on beach profiles.

References:

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