

NEARSHORE BAR MORPHOLOGY WITH RELATIONSHIP TO SHORELINE CHANGE ON A RENOURISHED BEACH: HARRISON COUNTY, MISSISSIPPI

Keil Schmid

Mississippi Office of Geology

PO Box 20307, Jackson MS 39289. Email: schmid@deq.state.ms.us

Voice: (601) 961-5651 Fax: (601) 961-5521

A long-term pattern of erosion, especially in specific discontinuous areas – ‘Hot Spots’ – along the wholly renourished beach in Harrison County, Mississippi, (Figure 1) prompts the need to periodically renourish the entire beach. These ‘Hot Spots’ along with varying patterns and magnitudes of shoreline change (retreat and advance) have been documented; however, a definitive set of conditions is still elusive. Variables such as shoreline orientation, culvert locations, and harbor structures have been studied and compared to shoreline change. These physical and man-made variables do have a high level of control on the shoreline’s behavior in some locations, but other areas of rapid shoreline change appear anomalous.



Figure 1. Location of study area in Mississippi, USA.

An interesting and dominant characteristic of mainland beaches in Mississippi is their broad, flat nearshore platforms, with depths typically less than five feet up to 500 meters (1600 ft) from shore. This platform is largely comprised of sand and is typified by a well developed bar morphology. While nearshore bar morphology on the Harrison County beach has been broadly studied in the past (Nummedal et al., 1980), it has not been compared to shoreline change patterns. This study focuses on the relationship between shoreline change and nearshore bar morphology.

Nearshore bar morphology in Harrison County has been categorized from aerial photographs from the 1970's to the middle 1990's using five genetic types. Bar types were expanded from a previous study of the area (Nummedal et al., 1980). Bar types range from simple shore-parallel bars to multiple bar interfaces. Bar morphology categories and change through time were classified along the shoreline at 50 m intervals. Shoreline change was computed by comparing surveyed (GPS) mean high water (MHW) positions from 1993 and 2000. The shoreline change data was then added to the same 50 m intervals used in mapping bar types.

Results from the western portion of the study area suggest that highly eroding areas are associated with a dominance of multiple sets of transverse bars (bars oriented at high angles to the shoreline) indicative of a bimodal longshore sediment transport regime (Figure 2). Areas that show little shoreline change and/or accretion tend to have multiple sets of low angle (shore-parallel) bars indicating low longshore transport (Figure 3). Structures, both large (harbors) and small (culverts) have localized effects on bar types, which are consistent with higher levels of shoreline change. The overall bar morphology patterns in Harrison County have remained nearly constant in the past twenty years, even with several renourishments taking place. This suggests that bar patterns are an inherent indicator of the dominant physical conditions and a powerful tool in understanding the sediment transport direction, and to some degree magnitude, at specific locations, e.g. 'Hot Spots', along the shoreline.

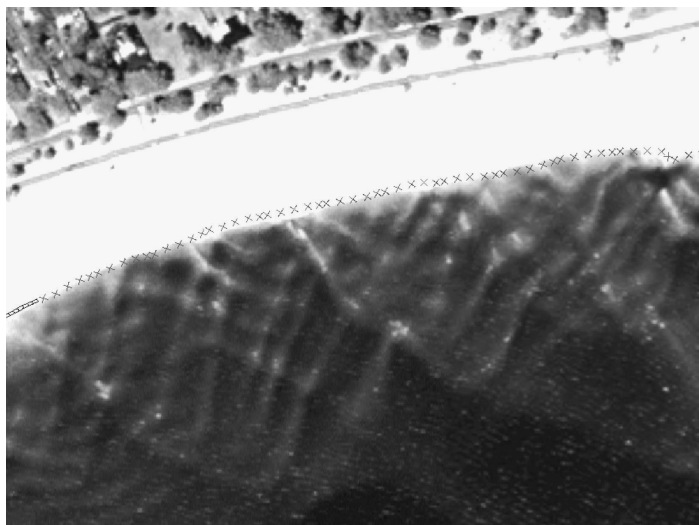


Figure 2. Bimodal (Interference Transverse) bars in Harrison County

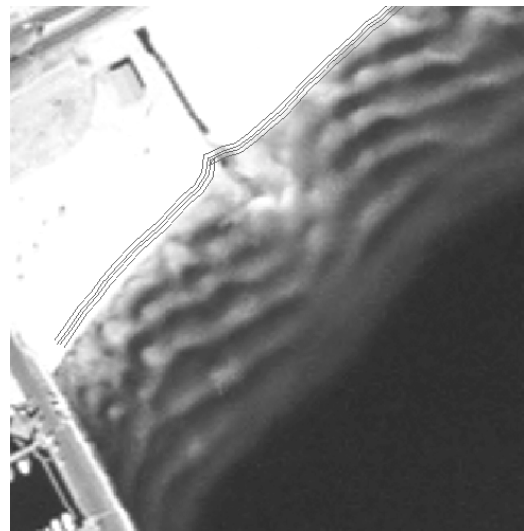


Figure 3. Multiple shore-parallel (Multiple Longshore) bars in Harrison County

Reference:

Nummedal, D., R. Manty, and S. Penland, 1980, Bar morphology along the Mississippi Sound Margin: Gulf Coast Association of Geological Societies, Transactions, v. 30, p. 465-466.