Deer Island-1993 to 1999

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Introduction

Deer Island, located in eastern Harrison County, Mississippi, is a privately held island and the closest of the Mississippi Islands to the mainland. It is a remnant Holocene beach ridge segment with a core of Gulfport sands (Otvos, 1985). The island has a stable history; unlike the islands located to its south, it is not dominated by migration. Of more concern is erosion, as there is no local (or updrift) source of sand to replenish what is lost during storm events. The southern shore of Deer Island is fronted by a large shallow sand sheet, which acts to buffer the island. This sand sheet is probably a result of island erosion through time and is underlain largely by Gulfport sands. The following data is being presented as an update on shoreline trends in the past 6 years, including the passage of Hurricane Georges.

Methods

Shoreline surveys of Deer Island have been preformed in 1993, 1997, and 1999. In each of these years the high tide shoreline was mapped using kinematic GPS techniques. The data have been post processed to yield accuracy's on the order of 1-2 meters. The high tide line has been chosen as a fairly repeatable datum (and also part of state held public land). Some error in interpreting the high-tide line exists, though effort has been taken to insure a level of consistency between mapping parties.

Analysis of morphology was preformed using 1:24000 false infrared air photos taken in 1992. The photos were aligned to the 1993 island outline in a Geographic Information System (GIS). Morphology was digitized from the aligned air-photo.

Localized erosion and accretion was computed using buffers on 1997 (5 meter) and 1993 (10 meter) shorelines. The buffer size was chosen to highlight areas of significant change within the confines of the survey accuracy. Any portions of the 1999 shoreline beyond the negative buffers were highlighted as erosion; portions beyond the positive buffers were highlighted as accretion.

Results

The shorelines (Figure 1) from 1993 to 1999 do not show any radical departures, which is consistent with a closed system. The island has lost about 10,000 square meters per year (1993-1,841,522; 1997-1,807,166; 1999-1,787,124), which equates to roughly a 0.5% change per year. The biggest changes occur on the western end and at the extreme eastern tip. The western end is a low spit that is breached easily, and quickly modified by the present weather trend. Through time the spit has migrated west and pinched together, indicating a small sediment budget. The small island to the west of Deer Island is, to a large degree, a result of dredging activity in the adjacent channel. The extreme eastern tip of Deer Island is subject to a dominant western longshore drift with no updrift source to feed it. It has eroded from 10 to 25 meters, depending on exact location, since 1993.

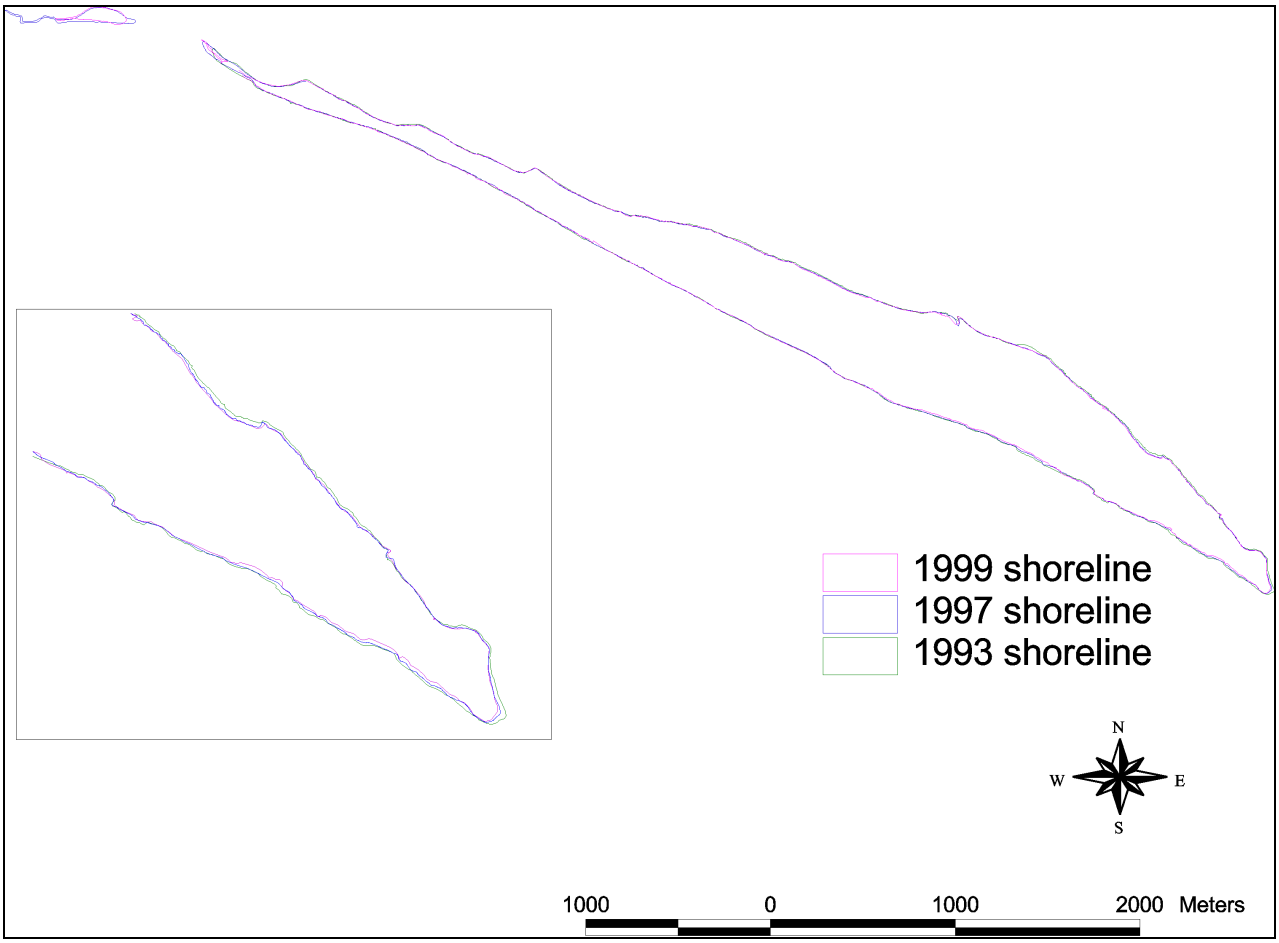

Figure 1. GPS shorelines

Erosion and accretion trends (Figure 2) from 1997 to 1999 indicate that a significant portion of the southeast section of the shoreline has experienced more than 5 meters of erosion in the past two years (>2.5 meters/year). Five meters was chosen to represent some degree of change while accounting for the inaccuracies of the technique. As mentioned the most western portion of the island has also eroded more than 5 meters over the period, though this is probably an ephemeral change. Accretion of more than 5 meters between 1997 and 1999 is less evident; however, the northwestern portion does show an accretionary trend. Accretion and erosion data suggest that the western section of the southern shoreline (Mississippi Sound side) and the northern shoreline (Biloxi Bay side) as a whole are nearly balanced in terms of erosion and accretion.

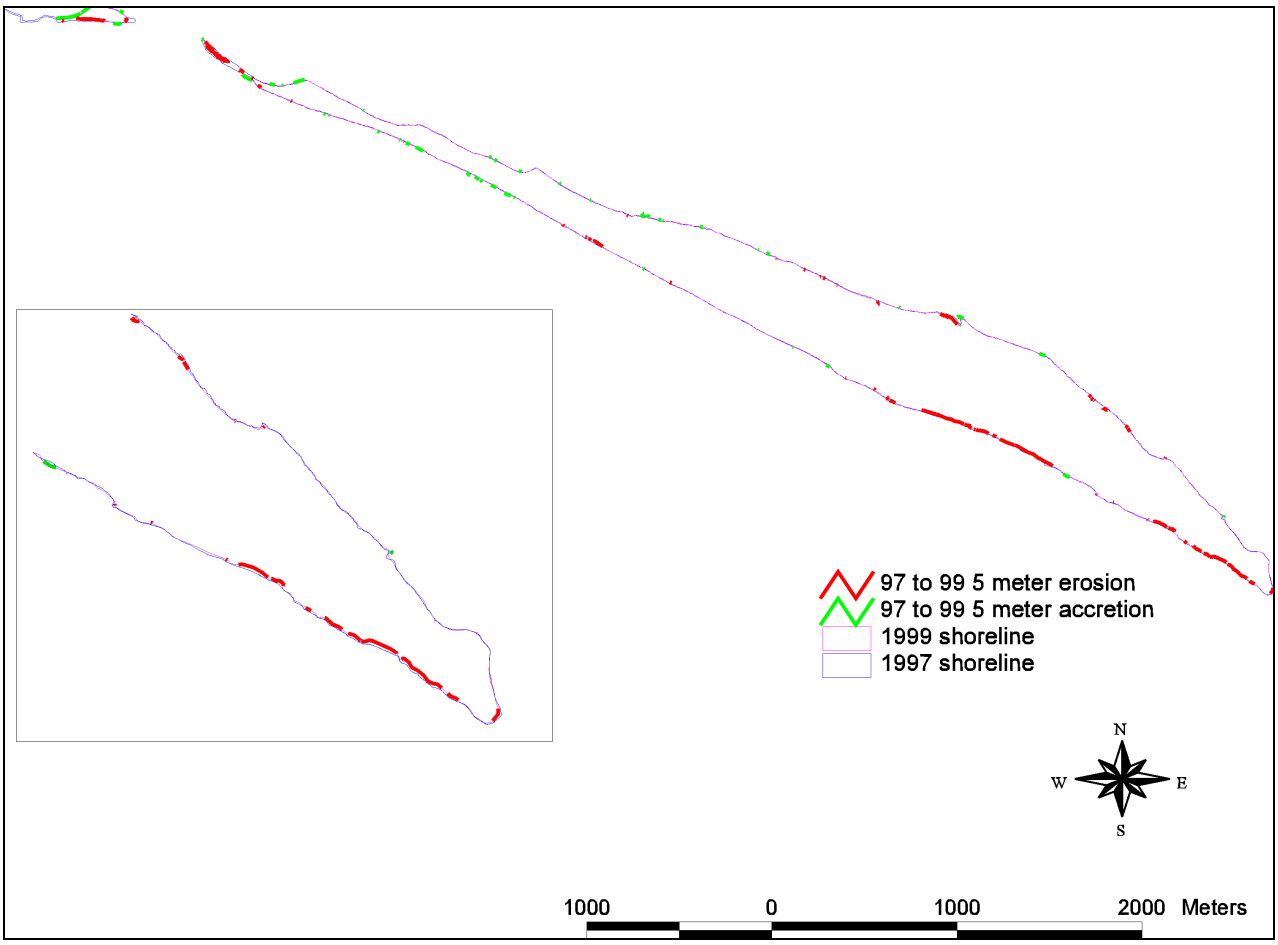

Figure 2. 1997 to 1999 shoreline change

In the longer term, 1993 to 1999, the same trends are evident (Figure 3). In this case a 10 meter interval was chosen to highlight areas with more severe erosion (>1.67 m/yr.). Once again the southeastern section of the island is typified by erosion. Accretion is almost nonexistent on Deer Island over the period; the small dredge spoil island has been modified since 1993 and is not considered. Accretion coupled with adjacent erosion on the extreme western end of Deer Island is a function of the rapid fluctuation of the terminal spit.

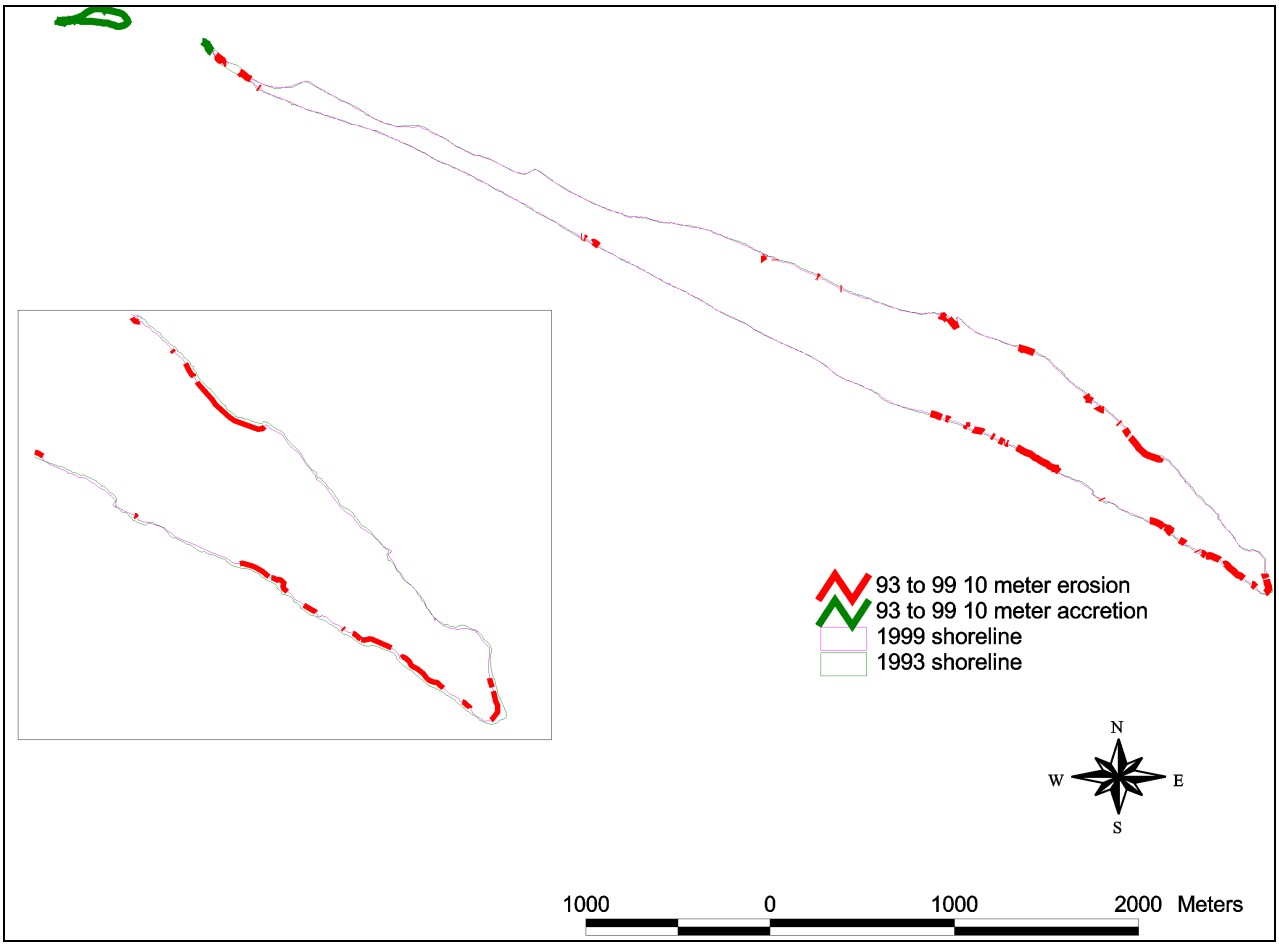

Figure 3. 1993 to 1999 shoreline change

Discussion

The results suggest that Deer Island is fairly stable, with about 0.5% of the island lost each year. The southeastern section of the island has the highest erosion. In this region there is a slight change in the shoreline orientation (A to B in Figure 4), which is accompanied by a change in morphology. The morphology adjacent to the beach from A to B (Figure 4) is typified by marsh whereas most of the remaining shoreline is backed by higher relief sand ridge. A short segment at C (Figure 4) between A and B has a lower erosion rate and appears to have a slightly different morphology, possibly a small segment of a beach ridge. Thus, it appears that the island's erosion patterns on the southern shore (Mississippi Sound side) are a function of the changing morphology. Erosion on the northern shore (Biloxi Bay side) is less localized, but occurs on the eastern portion, which is slightly more exposed to a north wind.

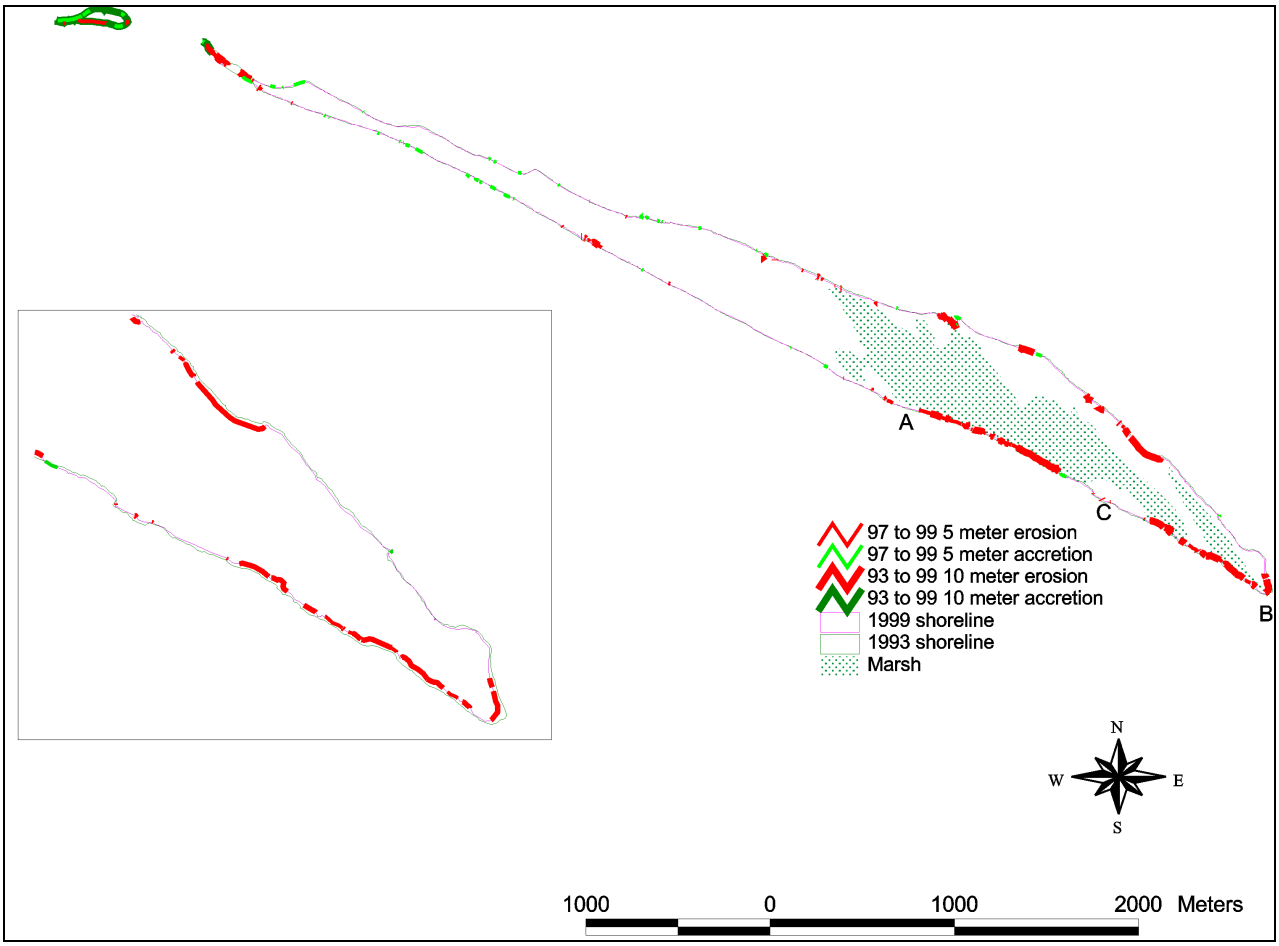

Figure 4. Shoreline change analysis

References

Otvos, E, G., 1985, Coastal Evolution: Louisiana to Northwest Florida; American Association of Petroleum Geologists Annual Meeting, New Orleans, Field Trip, March 27-29, 91 pages.