Holocene Evolution of Apalachicola Bay, Florida

Research Summary

A program of geophysical mapping and vibracoring was conducted in 2007 to better understand the geologic evolution of Apalachicola Bay (fig. 1) and its response to sea-level rise. A detailed geologic history could help better understand how this bay may respond to both short-term (for example, storm surge) and long-term sea-level rise. The results of this study were published (Osterman and others, 2009) as part of a special issue of Geo-Marine Letters that documents early results from the Northern Gulf of Mexico (NGOM) Ecosystem Change and Hazard Susceptibility Project.

Analyses of the geophysical data and sediment cores along with age control provided by 34 Accelerator Mass Spectroscopy (AMS) ^{14}C dates on marine shells and wood reveal the following history (see figs. 2 and 3). As sea level rose in the early Holocene, fluvial deposits filled the Apalachicola River paleochannel, which extended southward under the central part of the bay seaward across the continental shelf. Sediments on either side of the paleochannel contain abundant wood fragments, with dates documenting that those areas were forested at 8,000 ^{14}C years before present (B.P.) (fig. 2A-B). As sea level continued to rise, spits formed from headland prodelta deposits. Between 6,400 and 2,500 ^{14}C years B.P. (fig. 3), deltas associated with the Apalachicola River prograded and receded several times across the inner shelf that underlies the western part of the bay (fig. 2C-G), depositing fine-grained material. An eastern deltaic lobe was active for a shorter time, between 5,800 and 5,100 ^{14}C years B.P. (fig. 2E). Estuarine benthic foraminiferal assemblages occurred in the western bay as early as 6,400 ^{14}C years B.P. and indicate that there was some physical barrier to open-ocean circulation. It is considered that shoals formed in the region of the present barrier islands as the rising sea flooded an interstream divide. These shoals later emerged to form the modern barrier-island system, constraining the sound and forming the estuarine conditions established very early in the post-glacial flooding of the bay (fig. 2D-H).

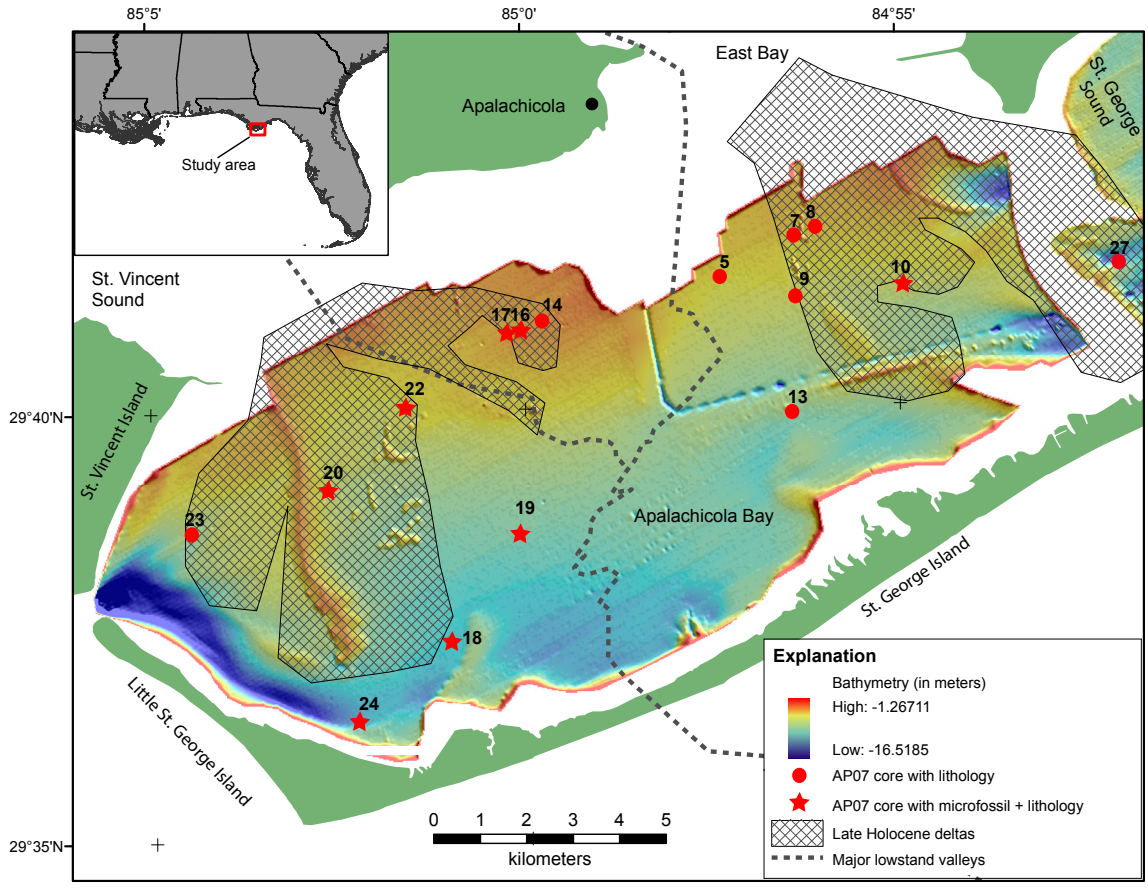

Figure 1. Map showing the location of the study area (inset map) along the northern Gulf of Mexico coast, and the locations of vibracores in Apalachicola Bay, FL, used for this study (Osterman and others, 2009).

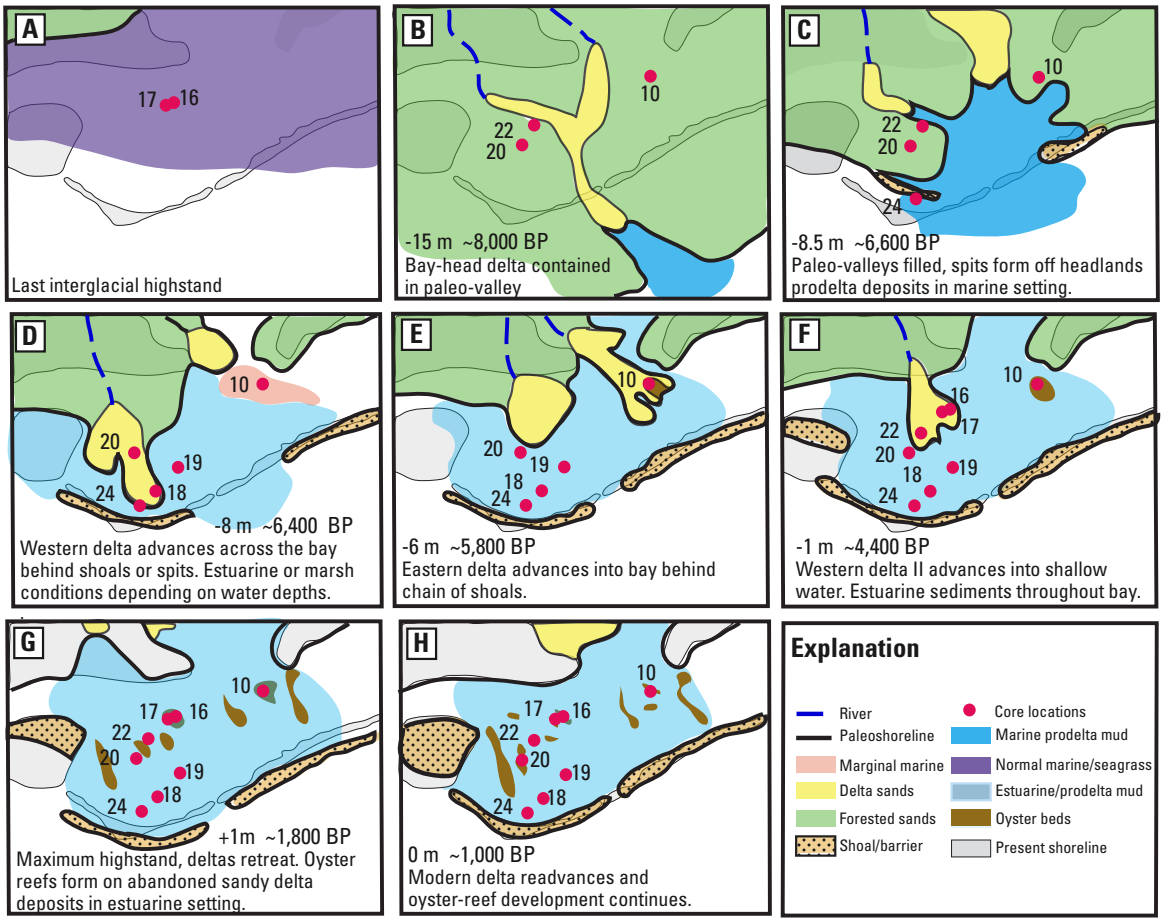

Figure 2. History of the Apalachicola Bay based on the results of this study focusing on the eight cores used for microfossil analysis (Osterman and others, 2009). B.P. is years before present.

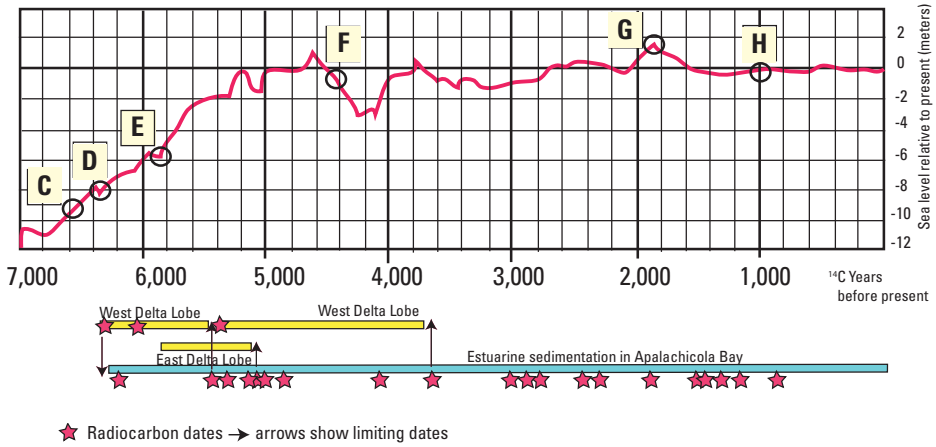

Figure 3. Gulf of Mexico sea-level curve from Balsillie and Donoghue (2004). Boxes labeled C-H correspond to the parts in figure 2. Episodes of possible delta formation (yellow bars) based on radiocarbon dates (red stars) in the cores are shown at the bottom. Estuarine sedimentation is shown with a blue bar. Maximum and minimum dates for the events are shown with associated arrows. All ages are uncalibrated.

References Cited

Balsillie, J.H., and Donoghue, J.F., 2004, High resolution sea-level history for the Gulf of Mexico since the last glacial maximum: Florida Geological Survey Report of Investigations, no. 103, 65 p.

Osterman, L.E., Twichell, D.C., and Poore, R.Z., 2009, Holocene evolution of Apalachicola Bay, Florida: Geo-Marine Letters, v. 29, no. 6, p. 395-404.

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