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Continental shelf landscapes of the southeastern United States since the last interglacial

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ABSTRACT

The wide, sediment-starved continental shelf and modern coastal areas of the southeastern United States retain well-preserved but scattered remnants of a submerged paleolandscape. This paper presents a conceptual model of stratigraphic deposition and landscape formation since the last interglacial on the continental shelf of South Carolina, with portions of North Carolina, Georgia, and Florida (USA). Data for this study include multibeam bathymetry surveys, sidescan sonar mosaics, high-resolution subbottom profiles, and ground-truth surveys from −250 m to the modern tidewater region.

Four bathymetric zones are recognized with eleven landforms and landform indicators. The described zones range in depths from the modern shoreline, across the shelf, and over the shelf edge to −250 m MSL. Relative sea level curves are presented for the area and discussed in conjunction with cultural and climatic events.

The potential for preservation of Paleoamerican sites is high at the shelf edge between −130 m and −45 m, with Archaic and later occupations likely in depths of less than −25 m. Prominent vantage points for Paleoamericans (>11 kya) would have existed at the shelf edge, and tidewater resources would have been available nearby for a period of almost 6 ka. Rapid transgression rates (>60 km/ka) after the sea level rose over the shelf edge make preservation of tidewater sites less likely on the outer and middle shelf. Searches for the earliest Paleoamericans should focus on promontories at the edge of the shelf and along future discoveries of paleoincisions on the shelf. Mapping and delineating this paleolandscape and associated unconsolidated sedimentary deposits interspersed with rocky plains and ledges will continue to be a priority to marine archeologists, coastal managers, fishery scientists, and marine spatial planners over the next several decades.

1. Introduction

Geomorphic mapping of submerged continental margins is critical to understanding the development and evolutionary history of ancient landscapes and for discovering potentially significant archeological sites. Placing mapped landforms into a broader conceptual model of margin evolution provides an understanding of paleolandscape formation and the role of those landscapes in shaping human settlement patterns. As the management, exploitation, preservation, and protection of our submerged physical, biological, and cultural resources are increasing in importance, we further use and occupy these paleolandscapes with the potential to degrade cultural resources. Combined with critical reasoning, these rich seafloor datasets that describe submerged landscapes can be used to better predict important cultural sites offshore.

This paper focuses on developing a conceptual model for paleolandscape history and evolution on the southeastern U.S. (SEUS) continental margin (Fig. 1) in the region of the South Atlantic Bight (SAB), with specific emphasis on the geological and cultural histories of this region. In order to cover the entire range of the existing paleolandscape related to human habitation in the SAB, the model of shelf evolution that is developed explains geologic conditions from the last high-stand of sea level (MIS 5a), through the last major regression into the Last Glacial Maximum (LGM; MIS 2), then follows the postglacial transgression to the modern coastline. Examples of various landforms and associated landscapes that are visible or implied from shelf features are presented individually and then placed into an overall model of shelf development and human habitation.

Submerged continental margins record the paleolandscapes and paleolandscape remnants that have been modified by the interactions of

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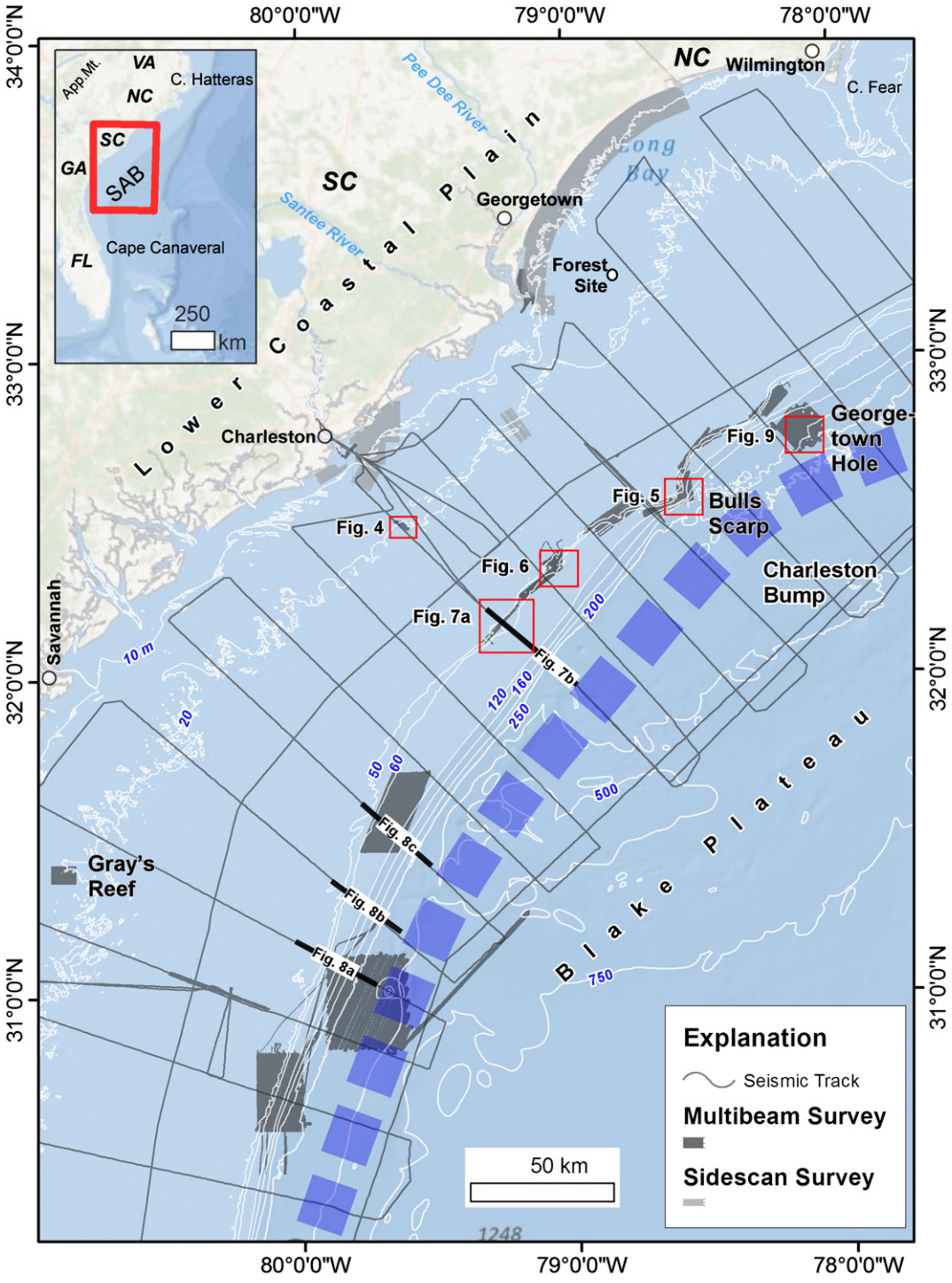

Fig. 1. The South Atlantic Bight (SAB) and dataset locations used for the study are depicted. Other figures locations are noted. Dark shaded areas are multibeam bathymetric surveys, light shaded areas are sidescan sonar surveys, and thin tracklines are 1976 R/V *Fay* trackline data. The Gulf Stream is represented by the large-dashed line. Depths are in meters below mean sea level. FL = Florida; GA = Georgia; NC = North Carolina; SC = South Carolina; App Mt = Appalachian Mountains.
Data are from the U.S. Geological Survey, NOAA/NOS, NGDC, and U.S. Army Corps of Engineers. Base map is from ESRI, Inc.

climate, sediment supply, waves, tides, biota, and relative sea levels across a dynamic and commonly complex stratigraphic framework and uneven surface. At the climax of the last interglacial (MIS 5), most continental shelves and seaward parts of coastal plains were submerged above their current level (Rabineau et al., 2006). Following MIS 5, sea levels fell, dropping below the edge of the continental shelves during the LGM. As a result, formerly marine environments were exposed to a wide-range of climatological, ecological, and geological conditions very different from those of today (Watts, 1980; Leigh, 2008; LaMoreaux et al., 2009). In the context of this simple conceptual model, Paleoamericans utilized the available physical and biological materials available to them in many different environments and climates, and may have taken advantage of localized food-source refugia adjacent to marine systems (Hetherington et al., 2008). Since the end of the LGM, sea-level rise forced the landward migration of the shoreline and coastal environments, drowning the previously exposed landscape.

The South Atlantic Bight (SAB) along the southeastern US continental shelf is not unique in its setting. Mid-latitude continental shelves off