

Abstract

Ice caps melting and thermal expansion of ocean waters during the Holocene lead to a sea level rise. This rise is however not globally uniform due to the Earth's irregular surface (Clark et al., 1978). More specifically, local environmental controls such as palaeotopography, palaeoclimate, isostasy contribute to the complexity in interpreting sea level variations.

The geological record of glacioeustatic variations during the Cenozoic in The Bahamas has been widely studied. Relative sea level changes have been inferred from stratigraphic and petrographic studies of outcrops yet have rarely been interpreted from pond sedimentary records.

Eleuthera is an elongated island situated in the northwest of the Bahamian archipelago on the Atlantic margin of the Great Bahama bank. Some ponds have been characterized including detailed studies dealing with different aspects such as microbial activity but their relationship to sea level rise was not investigated.

This study focuses on the later stages of the Holocene transgression in Eleuthera. It aims on determining sedimentological changes related to sea level fluctuations. Calcimetry, loss on ignition and micropalaeontological data among other analyses were used to characterize the sediments. This multi proxy approach was applied to the sedimentary record of seven ponds and these results were related to eustasy. Field observations, and existing geographic information systems data (Shuttle Radar Topography Mission) provided additional useful information. These data suggest that the relative sea level curve specific to Eleuthera, differs from the calculated and well-known curves from Boardman (1989) and Kindler (1992) which apply to The Bahamas archipelago. The Eleutheran relative sea level rise went beyond present sea level by approximately 2 metres as indicated by inundated areas in the centre of the island. This conclusion is mainly based on the observation of specific foraminifera such as *Peneroplis* spp. and *Archaias* spp. that belong exclusively to the marine realm (Boltovskoy and Ramil 1976).

Additionally, this study shortly addresses the geomorphological evolution of coastal environments and their signature in the sedimentary record using two particular cores. The same routine analyses techniques as previously mentioned were used in order to observe those changes in the sedimentary record. Field observations and aerial views provided the supplementary information to understand the recorded variations. Although geomorphological changes are tightly related to sea level variations, the understanding of the former, from the sedimentological record is more complex. In general, abrupt changes in sedimentation were often paired with major events, such as coastal ridge breakage or steady yet rapid water body isolation.

The last focus of this study was on humidity variations on Eleuthera. Three sediment records were suitable for that purpose but only one concentrated the attention of this study because the pond from which it retrieved was relatively isolated from the ocean. The study focused on the micropalaeontological and organic carbon content records in order to interpret the different changes. Values as high as 60% of organic carbon were associated to humid conditions enabling vegetation to thrive. The presence of bivalves and gastropods has been associated with lower humidity conditions. Dry conditions were associated to fossil barren units with a characteristic red colour typical of Bahamian *terra rossa* paleosols.

Keywords

Bahamas, Eleuthera, Holocene transgression, pond sedimentary records, carbonate stratigraphy