

# Snapshots of Late Pleistocene Climatic and Ecologic Variability: A Multiproxy Assessment of Northern Gulf of Mexico Sediment Cores

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## Abstract

Terrestrial environments, such as bald cypress swamps, were established on the exposed continental shelf during the last ice age when sea level was lower. However, such environments are rarely preserved due to the erosive nature of the subsequent marine transgression. Here, we investigate two sites in the northern Gulf of Mexico (nGOM) with well-preserved terrestrial deposits to better understand ice age coastal environments. The first site, known as the Alabama Underwater Forest, is located ~13 km south of Gulf Shores, AL, at ~15 m water depth, and formed around the Wisconsin glaciation (dated to  $72-56 \pm 8$  ( $2\sigma$ ) ka via optically stimulated luminescence). The second site is ~22 km south of Horn Island, MS, at ~25 m water depth, and the deposits date to the Early Holocene (14C dated to 10,228–11,175 cal yr BP,  $2\sigma$ ). We analyzed the terrestrial sections of three sediment cores for palynomorphs and stable isotopes ( $\delta^{13}\text{C}$  (bulk organic) for C3 vs C4 vegetation,  $\delta^{15}\text{N}$  for nutrient cycling,  $\delta^{34}\text{S}$  for freshwater vs saltwater) to determine the type of environments that existed during these time intervals. We developed a model using linear discriminant analyses of  $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ , and  $\delta^{34}\text{S}$  to determine a likely depositional environment. Our multiproxy, model-based approach suggests that despite differences in climate and sea level during glacial and deglacial intervals, nGOM coastal environments have kept similar ecologic compositions that migrate with shifting coastlines due to changing sea level. Additionally, our findings identify euxinic conditions, thus explaining, in part, why organic deposits this area have remained well-preserved.