ly festooned and planar-cross-bedded tidal-channel sandstone and festooned, burrowed washover sandstone. The beach-bar sandstones are very fine to medium grained, quartz rich (54%), and commonly burrowed by *Ophiomorpha.*

Differentiation of Pictured Cliffs Sandstone depositional environments led to recognition of deltaic and back-barrier coal deposits of the overlying Fruitland Formation.

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Ancestral Delta Lobe of Santee River Near Charleston, South Carolina

The Santee River of North Carolina and South Carolina emptied into the sea 75 km west of its modern mouth when the shoreline was 15 to 21 m above present sea level in early Pleistocene time. For a short time, the river deposited a fluviomarine delta lobe (volume 5 cu km) that covered 400 sq km near Summerville, South Carolina, 35 km northwest of Charleston. The Summerville lobe was abandoned before the late Pleistocene, and the sea has not covered the area since then. The original wave-constructed ridge-and-swale topography is still visible; drill holes have revealed the subsurface lithofacies relationships. In the modern Santee delta and the chenier plain of Louisiana, similar topography and patterns of lithofacies reflect alternating dominance of flood-plain deposition and shoreface redistribution.

Paleontology, paleomagnetic stratigraphy, and sediment mineralogy contribute to the age determination of the Summerville lobe. On the basis of fossil pollen and invertebrates identified by U.S. Geological Survey paleontologists, the Summerville lobe deposits are tentatively believed to be equivalent in age to the Waccamaw Formation (late Pliocene and early Pleistocene) of northern South Carolina. Surficial heavy- and light-mineral suites are more mature, and thus older, than paleontologically dated late Pleistocene shoreline deposits nearby. Less weathered mineral suites below the water table in the Summerville lobe reflect the Piedmont (Santee River) source of the sediment. Preliminary paleomagnetic data are compatible with this age determination.

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Oceanic Crust

The model presented is based on the interpretation of marine geophysical data, studies of dredged rocks, theoretical modeling, geologic investigations of ophiolite complexes on the continents, and results of deep-sea crustal drilling by JOIDES/IPOD.

Along the axis of the midoceanic ridge system a zone of upwelling asthenosphere extends from the base of the lithosphere at 50 to 70 km to the base of the oceanic crust. Within this prism, which narrows upward, adiabatic decompression of asthenospheric material results in partial melting, forming basaltic melt. The basaltic liquid coalesces into pockets of magma at shallow depths, forming magma chambers typically located a few kilometers beneath seafloor and centered beneath the axis of the ridge crest. Crystal fractionation takes place within these chambers, but generally never evolves too far because of the periodic addition of fresh magma from below and loss of magma to the seafloor. Profound complications exist, however, because several primitive magma types have been clearly defined which cannot be related to each other by crystal fractionation in shallow, crustal magma chambers, but must reflect different mantle compositions and/or melting processes. Either several zones of melting and magma ascent in the asthenosphere or a compositionally heterogeneous mantle is implied. Furthermore, drilling results demonstrate that distinct magma types occur in units of variable thickness (50 to 200 m), implying generation and fractionation of distinct batches of magma. This suggests that magma generation and emplacement is an episodic rather than a steady-state process, and argues for the coexistence of several magma chambers of restricted size, rather than a single, large, continuous magma chamber. In time, cooling of the magma chamber leads to a lower oceanic crust composed of gabbroic rocks and cumulates. The plutonic foundation of the oceanic crust is overlain by an assemblage of sheeted dikes which are capped by a chaotic extrusive carapace of pillow basalts, massive and thin flows, sills, and intercalated sediments. Seawater percolates down through the brittle carapace of the oceanic crust along permeable pathways, reacts with the hot rock at depth, and leads to metamorphism of the lower crust. Furthermore, the high thermal gradients at the ridge crest lead to the development of convective circulation of seawater through the shallow intrusive and extrusive lid of the crust, causing widespread low-temperature alteration. The water is heated and leaches material from the rocks; these dissolved constituents are either deposited along voids within the crust or are deposited on the seafloor as metallic sulfides, manganese and iron oxides, or metal-enriched sediments.

This model is still a working hypothesis, and much of it is based on circumstantial evidence. The model will change as a function of the evolving, accreting-plate-margin mosaic.

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Geology of Southeast Georgia Embayment

Computer-generated lithology-porosity calculations based on corrected sonic, density neutron, and gamma-ray logs can aid greatly in interpreting the rock record. Percentage shale calculations averaged over uniform intervals show one-to-one correlation with environmental interpretations derived from micropaleontologic data for Upper Cretaceous rocks in the COST GE-1 well. For the marine section percentage quartz parallels percent shale and both follow the general trend of transgressions and regressions suggested by P. Vail et al.

The transgressive pulses at the GE-1 site are quite similar to those at the B-2 site. The depositional sequence is similar at the two sites, with both containing Upper Cretaceous shelf carbonates, Lower Cretaceous nonmarine clastics, and a decreasing rate of deposition with time.

Lower Cretaceous Albian anhydrite present at GE-1 is absent at B-2. Conversely Lower Cretaceous coal,