The overlying dark shales are early-middle Callovian, which revises upward with 10 to 20 m.y., the age of the Blake Spur and M-28 anomalies, and the time of early spreading of the central North Atlantic. Widespread Callovian transgression may be an expression of rapid, early spreading.

The new bio- and magneto-stratigraphic data are being integrated with local zonal schemes for Atlantic basins to provide an improved Jurassic time scale of events.

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Cretaceous-Jurassic Dinoflagellate Stratigraphy in Blake-Bahama Basin

A stratigraphically conformable dinoflagellate zonation ranging in age from Vraconian Albian to earliest Oxfordian-middle Callovian is distributed through 875 m of section recovered at Deep Sea Drilling Project Site 534A. The Cretaceous interval is the most fossiliferous studied to date in the paleobathymetrically deep western North Atlantic, and correlates well with five other sites. The Cretaceous-Jurassic boundary, considered to be conformable, is in nannofossil ooze just below the first red intercalated layers but above the major lithology of the Jurassic Cat Gap Formation. Jurassic assemblages are not as well preserved, but provide stratigraphically useful species.

Blackish sediment is present intermittently throughout the investigated section at Site 534A; its origin is considered to be related to sedimentation rates.

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Bottom Morphology and Shallow Subbottom Sedimentary Structures on U.S. Continental Shelf Between Cape Hatteras, North Carolina, and Jacksonville, Florida

During the period July 1978 to 1980, a survey of the U.S. South Atlantic shelf was made to determine the occurrence and distribution of biologically productive bottom areas and bottom and shallow subbottom geologic features of potential hazard to petroleum exploration and production. Methods of data acquisition included the use of high-resolution seismic systems, sidescan sonar, towed television, and minisub.

Shelf sediments are largely composed of 2 to 5 m of Quaternary sands and silty clays with mixtures of shell that were deposited in fluvial, paralic, and shallow-marine environments. Greater sediment thicknesses (up to 40 m) are present in buried river channels, tidal inlets, and cut-and-fill structures associated with meandering tidal streams.

Surficial sediments exhibit a wide range of bed-form type and maturity. Ripples of less than 0.5 m wavelength and megaripples of 0.5 to 1 m wavelength are common across the shelf. Crest orientation is generally north-south. Algal growth along the crests of many of the smaller bed forms as well as abundant bioturbation and tracks indicate bottom stability except during storms. Sand waves up to 100 m long are common, particularly within the 25-m isobath and are present in discrete fields 3 km or more wide with north-south crest orientation. They are less common, less sharply defined offshore and usually underlie smaller bed forms of different orientation. These features may have resulted from infrequent major storms and, because of rising sea level, may now be below the effect of most storm-generated waves. Although the mobility of these large bed forms is inferred by the presence of buried reefs within some of the sand bodies, the time and rate of movement are unknown. Many areas of the shelf exhibit irregular, low-relief bed forms that appear to be in advance stages of deterioration from intense bioturbation.

Several distinct, acoustcally hard reflectors present in the shallow subbottom over much of the shelf represent indurated strata which on outcrop provide substrate for the development of reef and hardground communities. These temperate bioherms are primarily populated by sponges and octocorals and, on the basis of topographic expression, are classified as low-relief hardgrounds (> 0.5 m), moderate-relief reefs (up to 2 m), and high-relief reefs (up to 15 m). Low-relief hardgrounds are the most widely distributed of the three types but are the least productive in terms of biomass. Moderate- and high-relief reefs occur most commonly off North and South Carolina and along most of the shelf break. Substrate ranges from Pleistocene to Miocene in age and locally contains significant percentages of phosphate grains. The total area of shelf occupied by reefs and hardgrounds is estimated to be less than 10%. Outcrop patterns reflect both local bottom processes and regional structural framework.

In the middle to outer shelf off the Georgia coast, a relatively narrow zone of large channels and numerous cut-and-fill structures occur in Quaternary deposits just landward of a shallow buried Miocene high. These features are very similar to sedimentary structures associated with present-day barrier islands, tidal inlets, and estuaries and strongly suggest a sea-level stillstand near the end of the last Pleistocene regression or early in the present transgression.

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Methane from Coal Beds: Unconventional Energy Source in Warrior Basin

One of the largest potential gas resources of the Atlantic Coast margin may lie in coal beds and adjacent strata of the Warrior basin in Alabama and Mississippi. The resource assessment phase of the Department of Energy's Methane Recovery from Coalbeds Project (DOW/MRCP) conservatively estimates gas content of Warrior basin coals to be 10 Tcf.

The Warrior basin is a triangular area in northern Mississippi and Alabama containing extensive gaseous bituminous coal reserves. The major coal seams, in the upper Pottsville Formation, formed as clastic material filled in the channel-lake-swamp environments of a Late Pennsylvanian upper delta plain. Of the seven major coal groups in the upper Pottsville, the Mary Lee Group and Black Creek Group have been identified as likely candidates to be coal-bed gas reservoirs. Direct measurement of coal core samples indicates that gas content ranges from 2 cc/g (64 cu ft/ton) from 700 ft (213 m) of overburden to 18 cc/g (576 cu ft/ton) at a depth of 2,000 ft (610 m).

Coal operators in the basin are keenly interested in developing coal bed methane both to increase safety of underground mines through degasification in advance of mining and as a marketable product to be pipelined or used on site. After 2 years of operation, the U.S. Steel mines near Oak Grove, Alabama, have produced 750 MMcf of gas from a 17-well field, with an average gas flow per well of 70,000 cf/day. The Jim Walters Resource Co. has an in-mine system which collects the gas for local use. One horizontal well produced 40 MMcf of methane over its lifetime of 10 months. These and other examples support the conclusion that the Warrior basin contains an economically recoverable resource for meeting local and national energy needs.