shallow-bank environments.

Evidence of recurring scour by current erosion is found in the Florida Straits. Erosional events apparently occurred in middle Cenomanian, middle Paleocene, early-middle Eocene, and middle Oligocene, which are times of lower eustatic sea level. This evidence of Florida current scour indicates that the current was present as far back as the Cenomanian.

A carbonate bank margin and reef complex has been present along the Bahama Escarpment since Middle Jurassic. Apparently these organic buildups seeded on structural relief on oceanic basement created during the spreading-center jump along the Blake Spur anomaly. The bank margin apparently has retreated at least 15 km below the A^u unconformity.

Active faulting at least through the Late Cretaceous and perhaps into the Tertiary, occurred along the Great Abaco fracture zone. These relatively young tectonic events, along with the post-Albian faults in Providence Channel, indicate interactions between the Atlantic and Caribbean plates and extensions of faulting far to the northeast of Cuba and the greater Antilles.

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Importance of Regional and Local Structure to Devonian Shale Gas Production from Appalachian Basin

Over 1 Tcf of high-quality natural gas has been produced from Devonian shales during the past 100 years. The shale is its own source, seal, and reservoir; natural features within the shale form the reservoir. Organic shale is the prime requisite for production, but productivity relates to the presence of open fractures so that one can presume that abnormally productive trends correspond to open fracture zones. This presumption is supported by the direct association of linear zones of high production with linear basement structure detailed in three fields studied. The blanketlike nature of the lower production ubiquitous in southern West Virginia and eastern Kentucky probably relates to a fracture facies developed within the shale and controlled by shale lithology and Appalachian tectonics.

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Depositional Environment of Albian Sandstone, Baltimore Canyon Trough, Mid-Atlantic OCS

The Albian sandstone, found throughout the Baltimore Canyon Trough, was studied using data from well logs, cores, and cuttings from COST and exploration wells from common-depth-point seismic lines. The sandstone is 300 m at the thickest point and covers at least 10,000 sq km; its top is at depths of 1,600 m to 2,900 m. Although the sandstone is mostly Albian in age, in some wells its top is about middle Cenomanian and in others the sandstone is partly in the Aptian. The sandstone overlies a shale and grades upward from silt to a medium to coarse sandstone with interbedded shales. At the top of the Albian sandstone is a well-sorted coarse- to medium-grained sandstone averaging 24 m thick that can be correlated in all the wells studied. Grain-size analyses of the uppermost sand were done on the cuttings using an automated rapid sediment analyzer; results indicate deposition in an environment intermediate between beach and fluvial environments. The top of the Albian sandstone is marked by an unconformity with overlying marine shales. During a time of global sea-level rise, sediments continued to accumulate near the shelf edge creating the thick sand sequence in the center of the Baltimore Canyon Trough. A major sea-level drop, and subsequent rise, during the Cenomanian coincided with the end of sand deposition.

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Geochemical Framework and Source-Rock Evaluation of Mid-Atlantic OCS

Geochemical analysis of exploration and deep stratigraphic test wells has provided new information on organic richness, thermal history, and type of source material in much of the Baltimore Canyon Trough. The total organic carbon content and concentrations of light-gas through high-molecular-weight hydrocarbons in Jurassic, Cretaceous, and Tertiary samples define zones of marginal to excellent richness. Levels of thermal maturation, primarily determined by thermal alteration index and vitrinite reflectance data, indicate that burial below 3,500 m is generally required for petroleum generation. Microscopic analysis of kerogen also delimits oil-prone and gas-prone organic facies.

Measured parameters when mapped by a computer contouring program show geochemical trends in strata of different ages. In addition, some geochemical zones of exploratory interest that were originally observed in the COST wells can be extended to oil company wells. Cretaceous and Cenozoic rocks have little petroleum potential in this area because of their thermal immaturity. However, organic-rich units in Jurassic strata may have generated significant quantities of natural gas or oil in some parts of the basin.

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Thermal and Mechanical Evolution of U.S. Atlantic Continental Margin

The postrifting tectonic subsidence of the U.S. Atlantic continental margin appears to be due to thermal contraction following continental breakup. This subsidence is greatly increased by the effect of sediment loading. Models for the response of the lithosphere to loads show that the rigidity of the lithosphere is a strong function of temperature. Hence the flexural rigidity at the U.S. margin should vary in both space and time. The thermal structure and subsidence of the margin has been modelled using a two-dimensional extension model where the amount of extension has been allowed to vary across the margin and lateral conduction of heat has been included. The equivalent elastic thickness of the lithosphere has been approximated as the depth to an isotherm. Thermoelastic effects of the cooling lithosphere, as well as the flexural loading of the sediments, have been included. The lateral flow of heat and flexure have contrasting effects. The lateral heat flow tends to cause uplift of the coastal plain region landward of the hinge zone and to increase the subsidence rate in the regions of the transitional crust. In addition, the effects of lateral heat flow modify the thermal history of the sediments and heat flow. Flexure, on the other hand, causes subsidence of the coastal plain and decreases the sediment accumulation beneath the transition zone. The stratigraphy of the U.S. margin is seen to be the result of the complex interaction of these effects as their contributions vary through the history of the margin.

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