Plate tectonics provides a valuable descriptive framework for understanding the evolution of the earth over the past 200 m.y. However, many important questions remain unanswered as to processes occurring at plate boundaries, the evolution of the ocean environment, and the relation between continental and oceanic crust. The Ocean Margin Drilling Program (OMDP) represents a cooperative effort by industry, academic, and government scientists to investigate these topics.

The scientific objectives of OMDP may be conveniently grouped under the headings of passive and active ocean margins, ocean crust, and ocean paleoenvironment. They will be addressed by a comprehensive program involving regional marine geologic and geophysical studies, drilling and coring, and subsequent downhole experiments. The program will place particular emphasis on the ocean margins. As the basis for future planning, several regions have been selected to form a model drilling program. This model program will be refined as the program evolves.

Although OMDP is a basic research effort, it will begin to build the geologic framework against which to assess the resource potential of the region beyond the continental shelves.

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Coastal Planning for Offshore Petroleum Development

The increased likelihood of an oil spill near exploration sites and tanker lanes along the Atlantic Coast requires detailed oil spill contingency plans to lessen the adverse effects of spilled oil. To this end, a system called the Environmental Sensitivity Index has been developed which delineates spill-sensitive shoreline environments, wildlife resources, and socioeconomic features. Coastal environments are ranked on a scale of 1 to 10 on the basis of information from previous spill studies; least sensitive environments are designated as 1 and the most sensitive as 10. Oil-sensitive biologic resource information, presented with color-coded markers, shows the distribution of major, legally protected or oil-sensitive wildlife such as marine bird rookeries, anadromous fish spawning sites, marine turtle nesting beaches, and intertidal shellfish beds. Unlike the identification of coastal environments which are determined almost entirely by field observations, most wildlife resources information is taken from the literature. Sources for biologic information are published and unpublished literature, communications with state and local wildlife investigators, and federal documents such as the U.S. Fish and Wildlife Ecological Inventory. Socioeconomic information concerns coastal facilities that would be affected by a spill—public beaches, parks, recreational areas, marinas, etc. Once these spill-sensitive areas are known, the appropriate response activity (primarily boom and skimmer deployment) is added.

Although this system has been applied to most of Alaska, Puget Sound, southern California, Texas, south Florida, South Carolina, and Massachusetts, only two states (with Virginia in progress) have been mapped along the entire Atlantic Coast—not a very good record in light of the expected offshore petroleum potential in the area.

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Effects of Oyster Beds on Back-Barrier Geomorphology—a Three-Dimensional Model

Studies along the South Atlantic coastline show that the geomorphology of tidal flats and salt marshes is commonly altered or controlled by the development of *Crassostrea virginica* oyster mounds. Two major mechanisms for geomorphic control have been recognized. (1) The oyster mound is a long sinuous bar encompassing large parts of the tidal-flat fringe. This bar acts as a barrier, slowing and in some areas completely impeding drainage of the flat during the receding tide. The impoundment of sediment-laden water increases the rate of deposition over the flat, eventually raising the surface topography and accelerating the progradation of the fringing salt marsh. (2) An oyster mound grows perpendicular across a small tidal channel, effectively damming the channel, causing increased rates of sedimentation. Sometimes the tidal prism of the channel has been sufficiently altered so that an initiation of lateral tidal-creek migration occurs. Migration rates up to 1 m/year have been measured. In other cases, the channel fills with a fine-grained plug.

Coring of two marsh systems in South Carolina shows that oyster mounds can play an important role in the depositional history of the marsh. In areas where lateral tidal creek migration occurs, much of the stratigraphic record is dominated by channel-fill point-bar sequences. Combining modern process data with subsurface cross sections derived from over 20 cores, a three-dimensional model showing the effects of oyster mounds on the back barrier environment has been developed.

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Gulf of Elat (Aqaba): Modern Analog to Mesozoic U.S. East Coast Shelf and Slope

The tectonic setting and depositional environments in the Gulf of Elat (Aqaba) may be similar to those along the ancient margin of the U.S. East Coast. The Gulf of Elat is the northern continuation of the Red Sea rift zone, where carbonates are accumulating contemporaneously with clastics under arid conditions. The clastics are primarily deposited in submarine alluvial-fan complexes—wadis which impinge upon the shelf. Carbonate deposits and reef complexes sit along the shelf break. Calcium carbonate cementation has significantly reduced the porosity and permeability (θ 28%, k, 0.01 md) of both clastic and carbonate deposits. However, Pleistocene carbonates on uplifted blocks in the adjacent onshore have undergone dissolution due to the meteoric leaching. They contain high secondary porosity and permeability (θ 60%, k, 10,000 md).

The U.S. eastern continental margin initially rifted during the Triassic. Jurassic-Cretaceous sediments reflect early stages of rifting. Offshore east coast sediments are comprised of continental clastics, which are believed to grade progressively into carbonates to the east (approaching the shelf break). To date, only the clastic facies have been extensively drilled.

We have seen that reservoir quality in carbonates of the Gulf of Elat can be significantly enhanced by subaerial exposure. Thus, exploration for good carbonate reservoirs should be focused on unconformity surfaces, where subaerial exposure may have created or enhanced secondary porosity and permeability. Such unconformities cutting the carbonate buildup have been identified, and suggest good potential reservoirs under the U.S. East Coast shelf break and slope.

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Neogene Seismic Stratigraphy and Depositional History of Lower Georgia Coast and Continental Shelf