with minor mica and feldspar. Heavy-mineral analysis indicates high ZTR and SSK ratios.

Stratigraphic and sedimentologic interpretation suggests deposition as channel fill and overbank deposits by meandering streams in a subaerial environment. Sediment source area was probably the crystalline highlands on the northwest.

COSTAIN, JOHN K., and LYNN GLOVER, III, Virginia Polytechnic Inst. and State Univ., Blacksburg, VA

Moderate-Temperature Geothermal Resources Beneath Atlantic Coastal Plain

The most promising geothermal resource in the eastern United States is warm water stored in the permeable sediments of Cretaceous and younger age beneath the Atlantic Coastal Plain. Optimum sites for high gradients are locations where the heat flow is high and sediment thermal conductivity is low. Low conductivity is characteristic of most of the Coastal Plain sediments.

Heat flow in the eastern United States varies from about 33 mW/m^2 to 100 mW/m^2. All variations in heat flow in the eastern United States are caused either by differences in the concentrations of the heat-producing isotopes of uranium, thorium, and potassium in crystalline rocks, or by differences in thickness of heat-producing crystalline rocks. The highest concentrations of heat-producing elements, and the highest heat flows, are in the relatively young (ca. 300 m.y.) unmetamorphosed granite stocks and batholiths. Similar granites also are present in the southeast in the basement beneath the Coastal Plain. Thus, optimum sites for the development of moderate-temperature geothermal resources beneath the Coastal Plain require a knowledge of the (1) distribution and thickness of heat-producing granites in the basement, (2) thermal conductivity and thickness of sediments above basement, and (3) nature and extent of aquifers in the sediments above basement.

A site for the first deep geothermal test on the Atlantic Coastal Plain was chosen at Crisfield, Maryland. A temperature of 57°C was found at a depth of 1.26 km. Economic analyses at this site and elsewhere by the Applied Physics Laboratory of Johns Hopkins University, aquifer pump tests, and numerical modeling of the thermal lifetime of a reservoir suggest that geothermal energy may be an important resource at some locations on the Atlantic Coastal Plain.

DEMAREST, JAMES M., Exxon Production Research Co., Houston, TX, and ROBERT B. BIGGS, Univ. Delaware, Newark, DE

Unconformities and Depositional Sequences During Transgression and Regression of Continental Shelf

Major transgressions and regressions are recognized on the basis of vertical sedimentary sequence between major unconformities in the stratigraphic record. The more laterally continuous an unconformity is, the more time significance it is interpreted to have. Studies of transgressions and regressions during the Holocene and Pleistocene provide new insights into the character of unconformities and the interpretation of depositional sequences. In addition, these studies indicate that extensive regressive deposits do not develop during falling sea level.

During transgressions, the base of the transgressive depositional sequence is marked by a subaerially eroded unconformity at the top of the pretransgression deposits. The deposits just above the basal surface are usually back-barrier lagoon or estuarine sediments. Three types of basal contacts can develop depending upon the material directly overlying the unconformity: fringing marsh, distal lagoon, or lagoonal beach sediment. The processes which develop these lithosomes also serve to make the contact lithologically indistinct. In fact, with lagoonal beach and distal lagoon the contact can become gradational owing to erosion and bioturbation, respectively. Considerable topographic relief is present on this surface, whereas paleosoil is rarely preserved. The most lithologically distinct contact developed during the transgression is the ravinement surface caused by shoreface retreat. This contact is also the most laterally continuous and has the least topographic relief; it is underlain by back-barrier lagoonal deposits and overlain by nearshore marine deposits.

During many transgressions and regressions, such as have occurred in the Quaternary, the sequence of back-barrier lagoon, truncated by the ravinement surface and overlain by nearshore marine deposits may be repeated several times in one vertical section. When the ravinement surface is mistaken for a major unconformity and the commonly obscured contact at the base of the lagoonal lithosome is taken as a gradational facies change, the vertical sequence is interpreted as prograding (regressive) shoreline deposits with nearshore marine overlain by lagoon. Each such sequence is interpreted to be separated by a transgressive surface. When the ravinement surface and the basal contact are recognized as such, the section is interpreted as a set of transgressive sequences with lagoon truncated by the ravinement surface, overlain by transgressive nearshore marine deposits.

DILLON, WILLIAM P., U.S. Geol. Survey, Woods Hole, MA

Geologic History of U.S. Eastern Continental Margin South of Cape Hatteras

The continental margin off the southeastern United States contains two major basins, the Blake Plateau Basin off Florida and Georgia and the Carolina Trough off South and North Carolina. The Blake Plateau is a large, equidimensional basin that probably is underlain by relatively thick rift-stage crust. It probably was filled dominantly by shallow-water carbonate platform deposits. Reef and carbonate-bank buildups occurred near its seaward edge and the platform deposits interfingered with continental facies deposits near its landward edge. Reef building was interrupted in Barremian time and ended after an Albian-Aptian pulse. Subsequently, deposition did not keep pace with subsidence, and a deep-water plateau was formed. Onset of Gulf Stream flow across the inner Blake Plateau during the Paleocene prevented seaward progradation of the continental shelf across the plateau, and major deep-water erosion removed the old continental slope, creating a steep cliff, the Blake Escarpment. The Carolina Trough is a long, narrow basin underlain by a narrow zone of rift-stage crust, much thinner than that beneath the Blake Plateau basin. This thin crust, presumably the result of major stretching of continental crust in the rift stage of ocean opening, floated deep isostatically and formed a salt-depositing basin early in continental-margin history. Later sediment loading caused the salt to flow into a series of slope diapirs, and withdrawal of the salt resulted in major subsidence of the block of sediment overlying the trough; movement occurred along growth faults.

DAVIES, THOMAS A., and WILLIAM W. HAY, Joint Oceanographic Institutions, Inc., Washington, D.C.

Ocean Margin Drilling Program

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.

DOMERACKI, DANIEL D., ERICH R. GUNDLACH, and LARRY C. THEBEAU, Research Planning Institute, Inc., Columbia, SC

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.

DOMERACKI, DANIEL D., LARRY C. THEBEAU, and GEOFFREY I. SCOTT, Research Planning Institute, Inc., Columbia, SC

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.

EPSTEIN, SAMUEL A., Cities Service Co., Houston, TX, and GERALD M. FRIEDMAN, Rensselaer Polytechnic Inst., Troy, NY

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.

FOLEY, FRANCIS D., and VERNON J. HENRY, Univ. Georgia, Savannah, GA

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