load casts interdigitating with the underlying muds to >30 cm. Below this, isolated sand pillows up to 10 cm in diameter extend into the matrix mud to >50 cm. Ratios of E-M I and II sand in the pillows were significantly different from the sand above. Trends in the E-M ratios in the surficial and load-cast sands and comparisons with other earlier studies suggest that dynamic emplacement of the shelf sand produced these structures. Owing to the size and isolation of the sand pillows in three dimensions, and lack of primary structures in the mud, a bioturbation origin was ruled out.

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Campanian–Lower Maestrichtian Paleobathymetric Models of Foraminiferal Assemblages in New Jersey and Delaware

Analysis of Campanian–Lower Maestrichtian benthic foraminiferal assemblages from outcrop and well samples in New Jersey and Delaware has led to recognition of five bathymetric biofacies. Each of the biofacies occurs in adjacent settings to one another in a profile downdip toward the Atlantic basin (paleoslope).

The *Gavelinella nelsoni–Gavelinella pinquis* biofacies occurs in nearshore sand lithofacies, deposited in depths of 30 to 50 m. The *Gandryina stephensoni–Nodosariid* biofacies occurs downdip from the above biofacies and indicates environments of deposition of approximately 60 to 80 m (midshelf). The *Praebulimina–Pseudouvigenina* biofacies which occurs adjacent to the *Gandryina stephensoni–Nodosariid* biofacies, suggests mid-outer shelf depths of approximately 100 to 150 m. The *Heterostomella americana–Gyroidinoides globosus* biofacies is characteristic of outer-shelf to slope deposition at approximately 200 to 300 m. The *Gavelinella ammonoides–Pullenia cretacea* biofacies occurs furthest downdip and suggests paleodepths of greater than 300 m in a slope environment.

These biofacies when plotted along a paleoslope profile enhance the accuracy of estimating paleobathymetry. When applied to studies of cycles of sea-level change the paleoslope profile provides constraints on the magnitude of rise and fall of sea level.

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Exploration Potential of Georges Bank

No abstract available.

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Exploration Results from Baltimore Canyon

No abstract available.

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Biostratigraphic Age Control for Paleo-Oceanographic Study of Atlantic Margin Miocene Diatomites from Planktonic Siliceous Microfossils

Miocene diatomaceous units are known from various outcrop and subsurface studies of the Atlantic continental margin. These are generally thought to reflect depositional environments dominated by nearshore processes. Many sections, however, contain microfossil assemblages with abundant pelagic forms, suggesting strong oceanic influence on the deposition of certain intervals.

Radiolarians and silicoflagellates are among pelagic microfossils valuable in providing biostratigraphic age information where calcareous forms are sparse. Lower and middle Miocene radiolarians (*Calocycletta costata* and *Dorcadospyris alata* zones) are present in the Calvert Formation (Maryland), whereas only lower Miocene (*C. costata* zone) forms occur in the Kirkwood Formation (New Jersey). Silicoflagellates from the *Corbisema triacantha* zone occur in both sections.

This biostratigraphic information is useful in analyzing the marine influence on the Atlantic margin in terms of Miocene paleo-oceanography. The diatomaceous interval falls within the major Miocene high stand of sea level on the Vail et al curve. Furthermore, the third-order cycles proposed on this sea-level curve appear to be consistent with the depositional history of the Calvert Formation. The earlier termination of diatomaceous sedimentation in the Kirkwood is possibly due to local detrital influx.

The effect of enhanced circulation in the northwestern Atlantic following closure of eastern Tethys at Arabia and western Tethys at Gibraltar, in the early and middle Miocene, is possibly reflected in the deposition of the diatomaceous units as well.

PERLOW, MICHAEL P. E., JR., Michael Perlow Jr. & Associates, Easton, PA, JULIUS A. KOCZAN and CONSTANTINE I. TSENTAS, Dames & Moore, Cranford, NJ, et al

Pre-Lease Geohazard Evaluation of Mid-Atlantic Slump Features, Sale 49 Area

A detailed review and analysis of published and unpublished geologic, geophysical, and geotechnical data, including regional bottom and subbottom conditions was conducted prior to Lease Sale 49 to evaluate potential geohazards within the 109 blocks located within the lease sale area. A preliminary slope-stability analysis was developed considering gravity, storm wave, and earthquake loading to aid in determining the stability of soils near exploratory well sites. Guidelines for estimating slope stability in areas of potential sea-floor instability were developed for those blocks in which areas have been, and may still be, subject to mass sediment movement. Also, recommendations have been provided for supplemental geotechnical studies intended to satisfy U.S. Geological Survey (USGS) regulatory stipulations which require a lessee to demonstrate that mass movement of sediment is unlikely, or that exploratory operations can be safely designed to protect the environment if mass movement should occur.

A detailed summary of potential geohazards (slope instability, slump deposits, gas-charged sediments), for the 49 lease blocks in the USGS Stipulation Categories 2, 3, and 4 has been prepared, with a series of interpretive maps detailing the generalized sea-floor slope, potential geohazards, subsurface reflectors, and buried slump masses. A generalized stratigraphic soils model for the shelf-slope break area was developed and summarized together with key engineering properties of Holocene, Pleistocene, Pliocene, and Miocene strata.

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Late Cretaceous–Tertiary Marine Cycles and Paleo-Environments in Gulf of Guinea, Eastern Equatorial Atlantic Margin

Late Cretaceous to Tertiary subsidence and global eustasy are recorded in the sedimentary basins along the Gulf of Guinea in the eastern Equatorial Atlantic margin. The major marine transgressions occurred in the middle to late Albian, late Cenomanian to early Turonian, late Turonian to early Santonian, late Campanian to Maestrichtian, middle to late Paleocene, middle to late Eocene, late Oligocene, and early to middle Miocene. Foraminiferal and ostracod ages from the Benue Trough, the Niger Delta, and the Dahomey Embayment in Nigeria and Benin Republic allow a time framework whereby comparisons of the timing of marine events and faunal developments can be made across the Atlantic Ocean. Although the eastern margin of South America has been the traditional area in which similarities are sought with West Africa, comparisons with the eastern margin of North America are becoming feasible as more information accumulates from the latter region.

Foraminiferal paleo-ecologic data from the Nigerian basins allow the recognition of intervals of paleo-anoxicity, and the delineation of trends of ancient submarine canyons.

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Effect of Large-Scale Shifts of Gulf Stream on Miocene Sedimentation Patterns of Southeastern U.S. Continental Margin

A broad scour band bordered by zones of nondeposition is present today beneath the high-velocity core of the Gulf Stream; deposition takes place on either side of the scour band where bottom currents are weaker. Because the Gulf Stream serves as a barrier to the seaward dispersal of river-derived detritus, deposits are compositionally zoned; clastic sediment blankets the Florida-Hatteras shelf and slope and carbonate oozes, the Blake Plateau. Similar bands of erosion and nondeposition are observed in buried Cenozoic deposits across the Blake Plateau and under the shelf. The character and areal distribution of these bands suggest earlier Gulf Stream tracks. The vertical and horizontal distribution of these unconformities and their timing coincident with high and low stands of sea level as mapped by Vail suggest that they result from a dynamic response of the Gulf Stream to global sea-level oscillations and that the Gulf Stream axis shifts landward against the Florida-Hatteras slope during high stands of sea level and seaward across the central Blake Plateau during low stands of sea level. As a consequence, a complex sedimentary record is produced in which the scour band and sedimentary facies shift landward with deepening water and seaward with shoaling water.

This hypothesis was tested with a sedimentation model based on Vail's sea-level curve for the Miocene. The model successfully predicts the distribution of sedimentary facies, location of depocenters, and disposition of major unconformities within the Miocene section of the region as defined by seismic reflection profiles and drill-hole data from nine well sites. These results suggest that large-scale shifts in the position of the Gulf Stream have exerted the primary control on sedimentation patterns along this sector of the continental margin.

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Relation of Miocene Phosphorite Sedimentation to Structure in Atlantic Continental Margin, Southeastern United States

Regional sedimentologic and stratigraphic studies of Miocene phosphorites on the continental margin of the southeastern United States demonstrate a strong structural control over the formation and deposition of major concentrations of phosphorite in the Hawthorn and Pungo River Formations. The first-order structures controlled the regional limits of the phosphogenic system and provided the necessary depositional environments. Major phosphate sedimentation was concentrated along the nose and flanks of the Ocala arch and Carolina platform and decreased to a minimum into the intervening Southeast Georgia and Hatteras Embayments. Recent discoveries of Miocene phosphorite on the North Carolina continental shelf, in combination with the extensive lag deposits of phosphate on the Blake Plateau, represent a major phosphogenic system which occupies a position relative to the Carolina platform that is analogous to that of the major central and south Florida phosphogenic province relative to the Ocala arch.

Superimposed upon the regional structural framework is a series of second- and third-order structural highs and adjacent basins. Each structural high producing a platform or shoaling environment with the necessary associated accumulation basins, may contain one or more phosphate deposits. The specific location, size, and geometry of the resulting deposit is dictated by the folding or faulting, subaerial or submarine erosion, primary depositional processes, groundwater solution and collapse, etc. The location of the second- and third-order structures and the first-order structural highs dictates the subsequent depositional-erosional history. The latter determines the ultimate preservation and degree of secondary alteration of each phosphate deposit.

RIGGS, STANLEY R., DON W. LEWIS, East Carolina Univ., Greenville, NC; ALBERT C. HINE, Univ. of South Florida, St. Petersburg, FL, et al

Depositional Patterns of Neogene Sediments Around Carolina Platform on Mid-Atlantic Continental Shelf

An extensive network of high-resolution uniboom subbottom seismic profiles in combination with 9-m vibracores was obtained across the North Carolina continental shelf in Onslow Bay. Resulting data delineate an extremely complex depositional pattern of the Neogene sediments around the east and southeast flank of the Carolina platform. This major broad platform structure trends southeast across the Mid-Atlantic shelf and consists of Paleogene and Cretaceous sediments. The Neogene section, dominated by the Miocene Pungo River Formation, forms a complex clinoform sediment package which dips and thickens eastward and southeastward from the platform margin. This sediment package consists of numerous depositional sequences which are abruptly truncated by erosional surfaces and associated channels. Each channeling system was subsequently filled during the following depositional regime. The depositional sequences, which may reflect third- and fourth-order cyclical events, are characterized by interbedded lithologies consisting of phosphorite sands, phosphatic foraminiferal muds, dolosilts, and calcareous quartz sands. Deposition of the Pungo River Formation reflects deposition on a major second-order transgressive cycle. Thus, the upper part was deposited over the edge of the Carolina platform filling numerous erosional channels in the underlying sedimentary units. Postdepositional folding followed by subsequent erosional cycles severely truncated the sediments again. This resulted in a series of flexure basins and channels, filled with Pungo River sediments, lying on top of the Carolina platform as isolated outliers. The complex depositional erosional patterns of the Pungo River sediments reflect several orders of complex cyclical sedimentation taking place on the continental shelf during the Miocene.