CONTINENTAL RISE OFF EAST COAST OF NORTH AMERICA: DEEP STRUCTURE

Gravity and magnetic measurements together with continuous seismic profiling have provided new information about the structure beneath the sediments of the continental shelf, slope, and rise off the east coast of North America. Free-air and simple Bouguer gravity anomaly charts were prepared for this region from data obtained on three cruises of the *R/V Chain* in 1968 and published submarine pendulum observations by Vening Meinesz and Worzel. The zero free-air gravity anomaly contour parallels the strike of the continental slope and is located over water depths ranging from 1,000 to 3,000 m. A continuous band of positive free-air anomaly values occurs over the landward side of the continental shelf. The maximum measured anomaly ranges from about +10 to +85 mgal along the band, and maxima occur near Cape Hatteras, off southern New Jersey, near 66° W long., and near 60° W long. Structure-model studies suggest that the positive anomaly band is caused mainly by a basement ridge beneath the edge of the continental shelf. The same structure models also suggest that the continental shelf and rise are largely in isostatic equilibrium, and that only crustal segments near the continental slope with widths of about 40–50 km are not in equilibrium.

Magnetic measurements made on various cruises of WHOI ships show that the continental rise and slope have a smooth magnetic anomaly field about 400 km wide. The anomaly amplitudes here are generally less than 200 γ except above isolated seamounts. West of this low-amplitude region, a belt of strong positive anomalies trends along the slope. East of the smooth anomaly region, an abrupt transition takes place to high-amplitude anomalies, commonly greater than 500 γ. Tentative correlation of these anomaly peaks suggests that the anomaly trend north of the New England seamount chain is toward the east and, south of the chain, toward the south-southwest. Model studies suggest that the top of the magnetic material that produces the anomalies observed across the abyssal plains could be the rough opaque seismic reflector beneath this area. Magnetic susceptibility contrasts within the basement material, rather than topographic effects, are required if the basement produces the observed anomalies. Sea-floor-spreading-type models were constructed using simple two-dimensional blocks of alternately positive and negative magnetized material and a spreading rate of 1 cm/yr. The region of low-amplitude anomalies is inferred to have a uniform negative magnetic polarity and to have formed during the Kiaman Magnetic Interval: a 50-million year period during late Paleozoic time when the geomagnetic field polarity was reversed. It is suggested that the belt of strong magnetic anomalies beneath the slope, but west of the low-amplitude anomalies, was formed during Early Permian time prior to the Kiaman Magnetic Interval.

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POSTMORTEM HISTORY OF A PERMIAN PELECYPOD ASSEMBLAGE FROM WYOMING

The full understanding of fossils must include consideration of their burial (taphonomy) and subsequent alteration (diagenesis). Analysis of time and mode of burial enhances interpretation of depositional environments. Furthermore, insight into diagenetic changes in fossiliferous rocks may be acquired from studies of physical changes in fossils. Yet these important aspects of the history of fossils commonly are neglected in both paleontologic and petrologic studies.

Field and laboratory studies of "silicified" Permian bivalves in Wyoming have provided a complex case history of one fossil assemblage. These surficial and shallow-burrowing pelecypods commonly are broken and randomly scattered through about 6 in. of calcarenite. Circumstantial evidence suggests that the bottom disturbance was caused by rooting predatory fish. Subsequently, valves were dissolved selectively from hardening sediment not far below the sea bottom.

Induration of sediment and removal of buried shells apparently took place during an interruption in sedimentation. At that time burrowers penetrated the bottom and introduced younger quartz sand and fine shell debris into the substrate and into some of the shallowest molds of valves. The infilling produced detrital casts. Unfilled molds then were lined with precipitated fine-grained quartz, chalcedonic laminae, and euhedral quartz crystals, as in geodes. Such "silicified" fossils are essentially silica casts rather than the result of replacement in the usual sense.

Finally, the fossiliferous stratum was buried under a new increment of pebbly, calcareous quartz sand similar to that of the detrital casts below the now-obscure stratigraphic discontinuity.

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GEOLOGY OF PART OF OUTER CONTINENTAL SHELF OFF OREGON

Since 1960 the outer continental shelf off Oregon has been actively explored by petroleum companies. Initial surveys between Cape Blanco and the Columbia River established the presence of a thick Tertiary rock sequence within a framework of several composite offshore basins. Gravimeter and magnetometer results indicate the existence of more than 20,000 ft of relatively homogeneous section in Tertiary depositional centers beneath the shelf. A decrease in the amount of interbedded volcanic rock offshore has encouraged exploration of the offshore Tertiary basins.

Detailed exploratory programs, including conventional seismic, sparker, and gas-exploder surveys, reveal numerous well-defined structural trends and many large-size anomalies. Shallow core drilling and ocean-bottom sampling established a composite thickness of more than 8,000 ft of late Miocene, Pliocene, and Pleistocene deposits which are not present in the adjacent coastal area. Diagnostic foraminiferal assemblages have been found in much of the Tertiary column. Absence of overburden on submarine banks off the central and southern parts of the coast makes it possible to map the formations exposed on the ocean floor. The oldest rocks penetrated on the shelf are believed to be of middle Eocene age. Several important unconformities are recognized in the offshore stratigraphic column.

In October 1964 the Federal government offered 1,090,000 acres off Oregon and Washington for competitive oil and gas lease. The total bonus received from this sale was $35.6 million, of which $27.8 million was for leases off Oregon.

To date, eight exploratory wells have been drilled totaling 71,149 ft of hole; however, no commercial production has been reported. Many large structures re-