Miocene and reflects a combinatyion of dextral strike-slip motion and oblique convergence. The proposed tectonic model suggests that most of the eastern Gulf of Alaska is underlain by early Tertiarty and older oceanic crust and that large-scale lateral displacement of the Yakutat block may not be necessary.

Late Tertiary convergence in the central Gulf of Alaska, or Yakataga district, has controlled the structural evolution of a complexly deformed, fold-thrust belt consisting of numerous subparallel folds and north-dipping thrust faults. Moving from north to south, deformation in this belt becomes progressively younger and less intense; most of the structures in the offshore part of the Yakataga district are late Pliocene to Pleistocene in age. Industry leased a number of these relatively young structures in April 1976, and subsequently drilled ten dry holes. The drilling results suggest that geopressures, resulting in part from tectonic stresses, low geothermal gradients, and poor sand development appear to be characteristic of these structures and contributed to the lack of success.

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Field Appraisal with 3-D Seismic Surveys, Offshore Trinidad

The Southeast Coast Consortium block offshore eastern Trinidad contains four structures in each of which hydrocarbons have been discovered. Field appraisal to date had included two 3-D seismic surveys: the Pelican structure was surveyed in 1977 and, following its success, the Ibis 3-D survey was conducted in 1978.

The 3-D migrated data over both the Pelican and Ibis structures exhibit significant enhancement in the deeper part of the section and also improved fault resolution relative to previous 2-D control. On the north flank of the Pelican structure, primary dips have been recognized for the first time. As a consequence, estimated reserves have been increased by approximately 20%, thus substantially affecting development economics. Furthermore, the interpreted position of reserves in the minor reservoir sand has shifted from one fault block to another as a result of the revised fault interpretation. The acoustic nature of the stratigraphic boundary which may delimit this reservoir has been clearly demonstrated using seismic logs. Also the extent of this boundary has been manned from Seiscrop™ sections. The major change resulting from interpretation of the 3-D data at Ibis has been the definition of a much more complex fault pattern affecting all the reservoirs. This will have a significant impact on future field development plans. The 3-D seismic surveys are a useful tool for prospect evaluation in this area offshore Trinidad and should be considered prior to commitment to expensive offshore development programs.

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Lithofacies and Depositional Environments of Monterey Shale, California

The Miocene Monterey Formation records the deep basinal phase of a major late Tertiary cycle of basin formation and filling associated with wrench fault tectonism. Over much of coastal California, Neogene facies show a progression from Oligocene nonmarine and neritic rocks to Miocene basinal shales and siliceous rocks and then to upper Miocene to Pliocene turbiditic and neritic clastic rocks. In many places the Monterey consists of a basal calcareous facies, a middle transitional phosphatic facies, and an upper thick siliceous facies composed of diatomaceous rocks and their diagnetic equivalents (cherts, porcelanites, etc). Hydrocarbon-producing turbidite sandstones occur in these basinal rocks in the southern San Joaquin Valley and in redeposited pelletal phosphorites in the central Coast Ranges.

By analogy with modern environments of phosphate formation off South America and Africa, Monterey phosphatic shales probably represent phosphatization of shelf-slope-basin muds near the boundaries of the oxygen minimum zone. Nodular and pelletal phosphorites may also have formed near the boundaries of the oxygen minimum zone, but on sediment-starved bank tops and shelves. The widespread siliceous facies represents rapidly deposited diatom ooze that records high plankton productivity spawned by late Miocene climatic deterioration and intensified upwelling. Abundant organic matter, ecologic inferences from faunal data, and sedimentary structures such as alternations of massive and laminated cycles indicate that these siliceous rocks also formed as basin, slope, and shelf deposits within or near the fluctuating boundaries of a well-developed oxygen minimum zone—a depositional environment similar to the present Gulf of California and western margin of South America.

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Diagenesis and Methane Generation in Upper Cretaceous Gammon Shale, Northern Great Plains, United States

In the northern Great Plains, isotopically light methane is entrapped at shallow depths in marine rocks of Late Cretaceous age. Products of early diagenetic decomposition of organic matter in the Gammon Shale support the view that the gas is biogenic and formed at shallow depths early in the burial history of the sediments. This interpretation implies widespread gas occurrence and is consistent with a larger gas resource figure than alternative interpretations suggest.

The Gammon Shale was deposited offshore during a major regression of the Late Cretaceous epeiric sea. The sediment-water interface was oxygenated, and soft-bodied organisms burrowed the silt-clay sediment. Organic matter was sufficiently abundant for oxygen depletion at shallow depths. Bacterial sulfate reduction occurred quickly and resulted in the formation of framboids and octahedra of pyrite. Abundant concretions and discrete crystals of siderite began forming within tens of meters of the sediment surface. Interstitial waters became saturated with methane, and a free gas phase, held in siltstone layers by capillary forces, inhibited silicate diagenesis. Methane generation probably continued to burial depths of hundreds of meters. At the maximum burial depth (1,200 to 1,500 m), interstitial waters contained their maximum dissolved methane, and silt layers still contained free gas. Cenozoic uplift and erosion permitted gas exsolution. Exsolved gas combined with free methane already in the reservoirs to form the gas being currently explored and extracted.

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Plate Tectonic Evolution of Southern South America–Scotia Sea–Antarctica Area

Jurassic, Cretaceous, and Tertiary stratigraphy is analyzed