Mesozoic sediments are a mixture of clastics and carbonates. Cenozoic sediments are predominantly limestones, dolomites, and anhydrites with some sandstones and shales. Environments of deposition range from continental to deep marine.

The Cyrenaican area has not been heavily explored and, until recently, no commercial hydrocarbons were found. Drilling on surface structures of some of the first wells in Libya resulted in one Devonian gas well. A reported 5,600 BOPD Cretaceous discovery offshore Benghazi in mid-1984 demonstrates that hydrocarbon potential exists where thick sediments have been preserved.

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Shoreline, Grain-Size, and Total-Carbon Distribution Changes Before and After Hurricane Alicia, Galveston Island, Texas, 1983

Shoreline, grain-size, and sediment total-carbon changes were monitored, on a monthly basis, on three Galveston Island beaches, from January through December 1983. The study area included: (1) East Beach, obstructed by groins and a seawall; (2) Galveston Island State Park, obstructed by fences artificially stabilizing the dunes; and (3) West Beach, an unobstructed beach.

Beach profiles revealed the effects of beach obstruction, such as erosion and undercutting at East Beach, and truncation of the dunes at Galveston Island State Park. Approximately 20 m of expansional cutback occurred on the beaches after Hurricane Alicia hit on August 18, 1983.

Contour maps of grain-size and total-carbon distributions reflect the movement of beach sand by either onshore-offshore transport during low-energy periods, or longshore, edge-wave transport during high-energy periods.

Statistical analyses revealed a small variation in grain size throughout the year. There were well-defined times of either no correlation or strong correlation between total carbon vs. mean grain size, skewness vs. mean grain size, kurtosis vs. mean grain size, total carbon vs. percent sand, total carbon vs. skewness, and skewness vs. kurtosis. Strong correlation was found in response to high-energy events, whereas no correlation was found in response to low-energy events.

Galveston Island is undergoing net erosion and appears to be in a metastable state, still capable of responding to oceanographic conditions. The economic effects of Hurricane Alicia include considerable loss of the shoreline and destruction of property. Beach nourishment appears to be the only economically feasible solution to counteract the extensive erosion.

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North America–Greenland–Eurasian Relative Motions: Implications for Circum-Arctic Tectonic Reconstructions

The Mesozoic-Cenozoic tectonic evolution of the Circum-Arctic region is based on constraints imposed by (1) relative motion histories of the three major plates (North America, Greenland, and Eurasia) and a number of smaller pieces; and (2) distribution and age of sutures, accretionary prisms, volcanic arcs, fold-thrust belts, stretched continental crust, strike-slip faults, and ocean floor. We conclude that: (1) North America and Eurasia remained relatively fixed to each other until the latest Cretaceous-Paleocene opening of the Labrador Sea–Baffin Bay and Greenland-Norwegian and Eurasian basins (earlier convergence between North America and Eurasia in the Bering Sea region shown on many reconstructions are artifacts of incorrect plate reconstructions); (2) the North Slope–Seward-Chukotka block has constituted an isthmus connection between North America and northeast Asia since at least the middle Paleozoic and did not rotate away from the Canadian Arctic; (3) the Canada basin opened behind a clockwise-rotating Alpha Cordillera–Mendeleyev ridge arc during the Early to middle Cretaceous and consumed older, Paleozoic(?) Makarov basin ocean floor (the Chukchi cap is a detached continental fragment derived from the Beaufort Sea; the North Slope Arctic margin is a left-lateral transform fault associated with the opening of the Canada basin); and (4) the Nares Strait fault has a net relative displacement of approximately 25 km, but actual motion between Greenland and northern Ellesmere was about 250 km of strongly transpressive motion that resulted in the Eurekan and Svalbardian orogenies.

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South China Sea Tectonic Evolution and Hydrocarbon Potential: New Geological and Geophysical Constraints

The South China Sea has yet to receive a DSDP investigation; consequently, numerous untested models have been proposed for its post-Cretaceous evolution. From a compilation of regional oceanographic heat-flow measurements with offshore and onshore bore-hole temperatures, we thermally model and constrain possible interpretations of its tectonic evolutionary path. The heat-flow data, together with magnetic profiles, depth to basement determinations, and regional sediment isopachs, characterize two principal subbasin extensional elements—one trending east-west (northern area between Hainan and Luzon) and the other trending northeast-southwest (central area between Palawan and Vietnam). The thermal models of simple lithosphere cooling suggest the central area began spreading 55-58 m.y.B.P. and the northern region 34-35 m.y.B.P. These dates of incipient extension correspond to two principal unconformities in Paleocene and Oligocene strata of both offshore China and Palawan, and together they indicate regional uplift of the South China Sea owing to thermal expansion prior to the spreading events. The thermal models also suggest that in the northern region, spreading ceased approximately 19 m.y.B.P., which compares favorably with published magnetic estimates of 17.7 m.y.B.P. A late Cenozoic heating event is evidenced by a thermal anomaly in the southern portion of the central region (southern Vietnam margin) that may be related to incipient spreading along a zone of crustal weakness inherited from the Jurassic-Cretaceous Sunda-Tethys suture. Overall, these data tend to support the hypothesis of spreading occurring first in the central region and then in the northern region.

From the geophysical data and observations of Cretaceous ophiolites cropping out to the south in Sabah and Brunei, we kinematically border our model to the south and propose the Palawan Ulugan fault to be a right-lateral suture between continental and intermediate crust. Structurally, within limits of the data presently available, our model further predicts the southern China shelf to have experienced two principal episodes of extension with a net result of younger (<34 m.y.B.P.) east-west trending graben normal faults superimposed upon older (<55 m.y.B.P.) northeast-striking pregraben normal faults. In terms of thermal maturity, geochemical kinetic modeling of Late Cretaceous source rocks suggests depths to the oil ceiling to range from 1.3 to 1.8 km in the northern region and from 0.98 to 1.6 km in the central region. Similarly, depths to the oil floor are estimated to range from 2.4 to 3.4 km and from 1.8 to 3.2 km in the two respective regions.

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Facies and Geochemical Characterization of Mississippian Rocks in Palo Duro and Hardeman Basins, Texas

Mississippian rocks in the southern Texas Panhandle constitute a complex sequence of carbonate deposits formed in a platform-to-basin setting. Following relatively rapid transgression and inundation of the area from the north and east, the Hardeman basin area was characterized by outer platform conditions in which isolated carbonate buildups developed surrounded by relatively deep water. The Palo Duro basin to the west was the site of shallow-water, inner platform deposition. In intermediate areas, limestone turbidites, perhaps derived from carbonate buildups to the east, accumulated in quiet water. After this initial transgression, an upward-shallowing trend resulted in the formation of ooid to skeletal shoals throughout the area

Although current production in the area is coincident with the distribution of organic-rich Upper Mississippian shales in the eastern part of the Hardeman basin, TOC studies indicate that potential carbonate source rocks are present in the western Hardeman and eastern Palo Duro basins. Mississippian rocks in the Palo Duro basin proper have little source rock potential. Vitrinite reflectance studies indicate that Hardeman basin rocks are well within the oil window. However, correlative deposits at