instability occurred during the Mississippian, Pennsylvanian, and Wolfcampian with concurrent uplift of the producing structures and subsidence of the intervening grabens. The period of instability is coincident with the period of maximum activity along the Ouachita subduction zone.

Thermal and isostatic activity related to the subduction zone may have caused the differential vertical uplift and subsidence. The stress system appears to be caused by fluid movements in the crust or subcrust. As lighter material was subduced to mantle depths there was some partial melting and diapiric rise of these lighter materials. The complete process is not fully understood.

Rigid basement blocks were tilted and uplifted along basement faults. The overlying sediments behaved plastically, and basement faults die out abruptly upward in the section. Faulting is rarely found in the borehole, but steep to overturned beds are common. Minor faulting in the producing fields appears to have served as a conduit for rising hydrothermal fluids which cause some secondary cementation and loss of porosity and permeability. This has caused some structurally well-located wells to be dry or noncommercial.

The tectonic style of the Val Verde-Delaware basin is similar to that of many foreland basins throughout the world.

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FORMATION EVALUATION WITH LOGS IN DEEP ANADARKO BASIN

The complex lithology, and the nature of the "measurement environment," make the "deep Anadarko basin" one of the more difficult log-evaluation problems facing the industry anywhere today. Methods for solving this problem are adapted to various conditions of hole size, temperature, pressure, salinity, and gasified mud, as well as to the particular case of salt-saturated drilling fluid, high temperatures, and deep invasion. Log-evaluation methods include Quick-Look interpretation techniques employing the Dual Laterolog and/or the Compensated Neutron/Formation Density (Compensated) as well as the advanced computation system, CORIBAND. Evaluation systems available are capable of a highly consistent and reliable evaluation of this complex reservoir.

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DEPOSITIONAL ANTICLINES OF DEEP ENVIRONMENTS—PAST SUCCESS AND FUTURE EXPLORATION

As the energy quest probes deeper into the oceanic environment, enormous depositional anticlines formed by deep current action are being documented, and certain of these with favorable rock properties beckon the explorationist.

Wind-driven surface currents such as the Gulf Stream can shape these anticlines at the outer edges of detrital sedimentation, where high-velocity currents sweep the bases of continental slopes. Similarly, the "bottom" currents, which are moving at slower velocities deeper on the continental rises, will form varied anticlinal profiles characteristic of particular bottom conditions. Redistributed terrigenous materials, which in great part compose these anticlines, are carried into both current systems by spasmodic gravity sliding and turbidity currents.

A striking example of wind-driven current deposition is present in the Florida Strait where calcareous sands from the Florida reef area are swept by the Gulf Stream along a trough, thence onto a broad anticlinal rise. Examples typifying "bottom" current anticlines are numerous in the North Atlantic, and deep-water coring programs have partly documented their sediments.

A wind-driven current origin can explain plausibly the Poza Rica trend in Mexico. As the Golden Lane Reef contributed its Tamabra talus downslope into swift currents of the Chicontepec foredeep, anticlines were shaped at the base of the slope. Similar origins are suggested for other examples in the geologic record.

Significant reserves in anticlines formed by forceful currents will be found beyond the reefs and laterally away from the deltas in the deep environment where the subtle character of these features must come to be recognized. Reservoirs such as Poza Rica attest to the excellent structural and reservoir qualities which can be realized in an inspired search for such targets.

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REGIONAL DEPOSITIONAL MODEL FOR EARLY PENNSYLVANIAN OF CENTRAL TEXAS

No abstract available.

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PETROLEUM GENERATION IN GULF COAST TERTIARY SEDIMENTS

Organic detritus in sediments is composed principally of carbon, hydrogen, oxygen, and nitrogen. At the time of deposition, only small amounts of hydrocarbons are present. However, this organic matter has the potential to generate hydrocarbons in quantities that depend largely on its hydrogen content.

Organic matter disseminated in sediments, when heated, undergoes carbonization by mechanisms very similar to the thermochemical processes responsible for coalification. Carbonization is a thermal process marked by the generation of volatiles relatively rich in oxygen and hydrogen, and the formation of a kerogen residue increasingly enriched in carbon. The most significant oxygen-rich volatile is carbon dioxide, and the most significant hydrogen-rich volatiles are hydrocarbons.

Measurement of changes in the elemental composition of the organic matter as a function of depth can determine the principal volatile products of the carbonization reactions. Data from the Gulf Coast Tertiary indicate that carbon dioxide is the principal volatile product of early carbonization, and that hydrocarbons are not significant products until the later stages. Amounts of hydrocarbons generated during carbonization are vast compared to those from any other natural source or process.

The data indicate that the rate of carbonization or, more specifically, hydrocarbon generation is a chemical process which follows the general rules of chemical kinetics. As sediment age decreases, the temperature required to reach the level of carbonization associated with hydrocarbon generation increases. For example, significant hydrocarbon generation occurs in the Oligocene at a log temperature of 170°F and above; for lower Miocene log temperature is 186°F; and for upper Miocene log temperature is 205°F. Appreciably higher temperatures are required for significant hydrocarbon generation in post-Miocene sediment.

Kerogen with relatively low hydrogen levels (*e.g.*, similar to levels found in coals) probably would generate gas rather than oil. Thus, the relatively low hydrogen level in organic matter from these wells suggests that the sections penetrated would be better sources for gas than oil.

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SILURIAN-DEVONIAN OF WEST TEXAS AND SOUTHEASTERN NEW MEXICO

During the early Paleozoic, a shallow depositional basin called the Tobosa basin developed in western Texas and southeastern New Mexico. The basin was bounded on the north and east by low-lying land masses and probably opened to the south into the subsiding Ouachita-Marathon geosyncline. Throughout Silurian and Early and Middle Devonian times the