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Age, Depositional Environment, and Organic Metamorphism of Woodbine (Cretaceous) of Polk County, Texas

Cores and cuttings from six wells in Polk County, Texas, were studied to determine the age, depositional environment, and organic maturation history of the Woodbine hydrocarbon producing interval and superjacent Rapides Shale.

Palynologic analysis of the Woodbine core samples indicates a late Albian to earliest Cenomanian age for the section. Palynomorphs recovered from the Rapides Shale samples indicate a much younger age than the Woodbine with the unconformity representing possibly as much as a full stage.

The depositional environment of the Woodbine section is interpreted from palynologic, sedimentary structure, petrographic, and seismic data to have been on a prodelta continental shelf seaward to a topographic break in the shelf formed by an earlier (Early Cretaceous) carbonate buildup.

Organic maturation studies of the Woodbine samples indicate vitrinite reflectance (R_O) values ranging from 1.1 to 1.4 with thermal alteration index (TAI) values of 2.3 to 3.2. The organic matter distribution consists of abundant vitrinite and inertinite with mixed matter assemblages less common. Two samples are from intervals that have produced hydrocarbons. These samples had R_O values ranging from 1.1 to 1.2 with mixed matter organic distributions. Theoretical studies indicate that such samples should be the source of wet gas. Wet gas is precisely what these sample intervals have produced.

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Preliminary Petroleum Source-Rock Assessment of Pre-Punta Gorda Rocks (Lowermost Cretaceous-Jurassic?) in South Florida

Reconnaissance geochemical analyses—total organic carbon (TOC) and Rock-Eval pyrolysis—were conducted on drill cuttings of pre-Punta Gorda rocks in seven widely scattered boreholes in south Florida to assess the petroleum source-rock potential. The rocks judged to have the best source-rock characteristics, by virtue of their relatively high TOC contents (0.4 to 3.2 wt. %) and relatively high pyrolytic hydrocarbon yields (0.4 to 16 mg/g rock), occur chiefly in the upper half of the Pumpkin Bay carbonates (upper Coahuilan) and to a lesser extent in the Alva, the topmost unit of the overlying Lehigh Acres carbonates (Trinity 'F' of Exxon). Geographically, the richest of these rocks are located in the vicinity of the Lehigh Park field and in the lower part of the Florida Keys.

The rocks in the lower part of the Pumpkin Bay and in the underlying Bone Island (lower Coahuilan) and Wood River sequences (Jurassic?) have low TOC contents ($< 0.3\%$) and low pyrolytic hydrocarbon yields (< 0.3 mg/g rock). These data suggest that the potential for oil is poor for rocks below the middle Pumpkin Bay. Potential for natural gas, however, cannot be ruled out even though the levels of organic matter seem insufficient. Gas shows have been reported in at least one well at 15,700 ft (4,785 m) in the Phillips-Mobil 1-C Seminole; hence, the pre-Punta Gorda rocks of south Florida may have some potential for gas, depending on factors such as porosity, permeability, and the distribution of traps.

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Opening of Tectonic Evolution of Northern Gulf Coast

Several lines of evidence suggest that the Gulf of Mexico opened synchronously and in the same northwest-southeast direction as the central North Atlantic, from about 180 to 130 Ma. The Atlantic and Gulf spreading centers were linked by left-lateral transform faults across the Florida-Bahamas platform. To the west, spreading was accommodated by left-lateral transform faults (megashears) across Mexico.

The basin and uplift structure of the northern Gulf Coast can be interpreted in terms of northwest-southeast rifting before the Gulf and Atlantic opening began. Alternatively, early rifting could have been a result of north-south motion between North America and Africa-South America. The latter inference is suggested by correlations between pre-Mesozoic Florida and Africa basement terranes as well as the crustal fabric of the northern Gulf Coast.

Basin formation in the northern Gulf Coast probably involved shallow, closely spaced graben-horst formation combined with larger scale ductile thinning of the lower crust during rifting. Following the end of rifting the sedimentary record indicates that the basin subsided in an exponential manner, as would be predicted from thermal models of sedimentary basin formation.

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Some Microfossils of Tamaulipas Limestone (Lower Cretaceous) in Santa Rosa Canyon, Sierra de Santa Rosa, Nuevo Leon, Mexico

About 2,000 m of Upper Jurassic (Tithonian) to Upper Cretaceous (Maestrichtian) rocks are exposed in Santa Rosa Canyon. The Tamaulipas is composed of resistant, light-gray to black, thin to thick-bedded, well-indurated lime mudstones about 800 m thick.

A medial unit (64 m) of black, laminated, thin-bedded lime wackestones allows division of the succession into three parts which appear to be homotaxial with the lower Tamaulipas, the La Pena, and the upper Tamaulipas.

Microfossils are rare to sparse in the lowest unit but are abundant in the medial unit and common in the upper unit. Extreme induration has prevented disaggregation and recovery of individual specimens; consequently this study is limited to thin sections of the rock. The general aspect of the fauna is pelagic and is dominated by radiolarians and foraminifers, although colomiellids, nannoconids, calcispheres, and pelagic pelecypods(?) are abundant at some levels in the upper unit.

Identifiable and chronostratigraphically useful taxa include *Colomiella mexicana* Bonet, *C. recta* Bonet, *Favusella washitensis* (Carsey), *Globigerinelloides algerianus* Cushman and Ten Dam, *G. barri* (Bolli, Loeblich, and Tappan), *G. ferreolensis* (Moullade), *Planomalina cheniouriensis* (Sigal), *Microcalamoides diversus* (form B) Bonet, *M. diversus* (form C) Bonet, *Nannoconus steinmanni* Kamptner, and *N. wassalli* Bronnimann.

The distribution of these taxa indicates that virtually all of the lower unit of the Tamaulipas is Hauterivian and Barremian. The middle unit (= La Pena?) is Aptian, and the upper unit is lower Albian. Some of the earliest Albian may be missing.

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Effects of Sea Level Changes on Distribution and Evolution of Early Tertiary Mammals

Sea level changes in the early Tertiary affected mammalian