contained in the marls associated with the Tuscahoma Sand of the Wilcox Group in southwest Alabama, most of the formation can be assigned to the two late Paleocene planktonic foraminiferal zones recognized worldwide. The occurrence of *Planorotalites pseudomenardii* (Bolli) in the unnamed lower marls places these beds in the *Planorotalites pseudomenardii* Range Zone. The Greggs Landing and Bells Landing Marl Members contain a diverse assemblage of planktonic foraminifers including, *Morozovella velascoensis* (Cushman), *Morozovella acuta* (Toulmin), and *Morozovella aequa* (Cushman & Renz). The presence of *M. velascoensis* and *M. acuta* and the absence of *P. pseudomenardii* put these marls in the latest Paleocene *Morozovella velascoensis* Interval Zone. The occurrence of *Morozovella subbotina* (Morozova) and *Pseudohastigerina wilcoxensis* (Cushman & Ponton) in the Bashi Marl Member of the Hatchetigbee Formation place this marl in the earliest Eocene *Morozovella subbotina* Interval Zone. Based on planktonic vertical distribution in southwest Alabama, the Paleocene-Eocene boundary occurs above the top of the Bells Landing Marl Member of the Tuscahoma Sand and probably near the base of the Bashi Marl Member of the Hatchetigbee Formation.

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Kurten Field—Discovered by Stratigraphic Prospecting

The Woodbine Kurten field trap is a stratigraphic sand lens surrounded by shale. This field is a significant discovery in Brazos, Grimes, and Madison Counties, Texas. Structure plays only a minor role in oil entrapment. The sand was deposited in a structural and topographic low demonstrated by comparing maximum pay sand thickness with a computer trend surface residual thick derived from Austin to Buda isopach map.

Sand migration southward down the East Texas trough was deflected westward by the Angelina-Caldwell flexure and caught in a sag at the Kurten field locality. The higher Madisonville nose to the northeast has essentially no sand at the crest. Structural elevation at Madisonville and on the Angelina flexure only serves to limit sand deposition.

Many porosity pod-type fields may result by looking for sags near a sand-shale regional boundary.

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Chemical and Isotopic Evidence of Origins of Natural Gases in Offshore Gulf of Mexico

The chemical and isotopic composition of natural gases from 55 fields in the offshore Gulf of Mexico province has been analyzed. The gases display a trend of more positive $\delta^{13}C_1$ values (-70 to -35 per mil) with increasing depth and age of producing reservoir. The mechanisms responsible for this fractionation are biogenic enrichment of $^{12}C_1$, thermal cracking, and mixing. Separate trends are present in Texas and Louisiana which suggest a higher geothermal gradient or different type of organic matter in offshore Texas. There is considerable scatter along the general trend because gases generated from deeper, thermally mature source rocks have commonly migrated to shallower immature reservoirs.

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Mineralogy, Diagenesis, and Porosity in Vicksburg Sandstones, McAllen Ranch Field, Hidalgo County, Texas

Average porosity from porosimeter analyses of Vicksburg sandstone core plugs from McAllen Ranch gas field is approximately 15%, but average porosity from point counts is only 6.5% due to exclusion of microporosity. Average permeability is less than 1.5 md. These low porosities and permeabilities are due to extensive diagenetic modification of a chemically unstable sand.

The Vicksburg Formation in Hidalgo County was deposited in a deltaic environment. Most of the reservoir sandstones are submature fine-grained lithic arkoses and feldspathic volarenites containing less than 30% quartz. Primary porosity was most commonly occluded by precipitation of authigenic minerals, predominantly calcite cement. The onset of extensive calcite precipitation occurred at relatively shallow burial depth, approximately 3,000 ft (915 m), in the Hidalgo County area. Carbonate cements are abundant in most samples to depths of more than 13,600 ft (4,145 m). Most porosity present is secondary porosity which formed by dissolution of cements and grains.

Diagenetic modification is much greater in Vicksburg sandstones of Hidalgo County than in other Tertiary sandstones of the Texas Gulf Coast. This is due to the chemically unstable mineral assemblage and the high thermal gradient in this area.

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Paleoenvironmental Analysis of Joachim Dolomite (Middle Ordovician), North Arkansas

The Joachim Dolomite (Middle Ordovician) crops out in an east-west trending belt across north-central Arkansas. This formation is the oldest of four members composing the post-St. Peter Ordovician carbonate sequence, which was deposited during an overall marine transgression. These units prograded in response to progressively deeper epeiric conditions caused by a relative rise in sea level near the low-relief, positive Ozark Dome.

The Joachim Dolomite ranges in thickness from 1 to 25 m and contains four units in a shoaling-upward sequence: subtidal basal sheet unit, subtidal bank unit, sublittoral sheet unit, and intertidal-supratidal veneer unit. These units represent an offlapping sequence of subtidal to intertidal to supratidal environmental zones. Marine sedimentation caused carbonate banks to shoal and prograde seaward, producing a local marine regression. Algal mat communities promoted carbonate bank progradation by forming a cohesive mat that stabilized substrates and resisted wave scour. These algal mats created cryptalgal fabrics, cryptalgal columnar structures and stratigraphic sequences analogous to those