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A Late Cretaceous Calcarenite Beach Complex Associated with Submarine Volcanism, Wilson County, Texas

A Late Cretaceous, submarine, igneous extrusion and an associated biocalcarenite beach facies occur in the subsurface of the North Poth area, Wilson County, Texas. The volcano and reworked volcanic material built a framework upon which a well-formed carbonate beach developed in the Austin Formation.

The volcanic material was extruded on the shallow sea floor. Prevailing wave energy from the northeast reworked the volcanic materials that were deposited as a fringing platform off the flanks of the extrusion. West of the volcano and stratigraphically above the reworked volcanics is a 35-ft (11 m) bioclastic calcarenite. It was deposited as a barchanoid-shaped beach which lapped on the accumulated reworked volcanics.

The maximum thickness of the Austin Formation in the vicinity of the North Poth volcano is 300 ft (92 m). The Austin Formation thins rapidly toward the volcano; there it is less than 20-ft (6 m) thick near the crest. A considerable amount of draping around the volcano is indicated by the structure of the Austin Formation. Much of the draping is due to differential compaction.

The North Poth, Northwest Poth, East Poth, and the Helen K. Fields appear to be related to this igneous extrusion. Oil has been produced from the Buda and Austin Formations and from the biocalcarenite facies of the Austin Formation. Occurrence of oil appears to be related to porosity in the reworked volcanics and beach complex and to fractures in the Austin Formation. The fractures probably are associated with differential compaction of sediments over the volcano.

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Gulf Coast Stratigraphic Traps in Lower Cretaceous Carbonates

Prolific oil and gas production is being obtained from carbonate patch-reef reservoirs within Lower Cretaceous formations along the Gulf Coast from Florida to Mexico. Many of these reservoirs are trapped stratigraphically where facies changes within a formation or patch-reef unit establish an updip permeability barrier. Examples of such traps from the literature illustrate oil and gas fields in Florida, Mississippi, Louisiana, and east Texas. A geologic model provides the explorationist with an actual drilling target suitable to a multiple-well exploratory program.

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Geothermal Conditions and Their Implications for Basement Tectonics in Gulf Coast Margin

Tectonic interpretations of new heat flow data from Louisiana, Mississippi, Alabama, and panhandle Florida, and radiometric dates for subsurface igneous rocks from Mississippi suggest a complex basement configuration of both continental and oceanic crust for the Gulf Coast region. Original (early Paleozoic) North American continental terrain, characterized by average heat flow ($\sim$1.0 heat flow units), is postulated to extend no further south than a northwest-trending boundary linking the truncation of the southern Appalachian Mountains with the Ouachita Mountains. A northwest-trending zone of thinned continental basement and thick sedimentary deposits with anomalously low heat flow and Mesozoic volcanic rocks exists in southern Alabama and pinches out in northern Mississippi (Black Warrior basin and central Mississippi deformed belt). South of that belt, a zone of high heat flow (1.5 to 2.1 hfu), subsurface Mesozoic basalts, and feldspathoidal rocks characterizes northern Louisiana and west-central Mississippi. This zone is distinguished by mobilized, thermally conductive salt diapirs and alkalic igneous rocks. The Wiggins uplift with Paleozoic granitic rocks in southernmost Mississippi and its westerly continuation in southern Louisiana yield average heat flow values and are interpreted to represent residual fragments of a South American continental mass that was convergent in the late Paleozoic Era and divergent during the early to middle Mesozoic Era.

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Stratigraphy and Structure of Rosita Gas Fields, Duval County, Texas

Deep Wilcox sandstones in the Rosita field produce large quantities of gas from highly faulted reservoirs at depths of 9,500 to 15,300 ft (2,895 to 4,660 m). The producing sandstones were deposited downdip from a large, active growth-fault system. Six full-diameter cores and 25 electric logs were used to interpret structure and environment of deposition.

Structural movement along listric normal faults resulted in structural closures and stratigraphic thickening. These faults and rollover structures form hydrocarbon traps. Thick sequences of sandstones and shales show a basal shear zone, overlain by a folded and contorted zone, and finally, a normal bioturbated section. The sequence ranges from 10 to 50 ft (3 to 15 m) in thickness and may indicate soft-sediment deformation by slip along nearly horizontal glide planes. The extensive deformation suggests that the entire Wilcox section moved intermittently shortly after deposition under the force of gravity. Numerous deformed slides are present within major fault blocks. High pore pressure probably facilitated movement of these slide blocks.

The depositional environment of Wilcox sandstones in the Rosita field was probably outer neritic to upper bathyal. This interpretation is supported by regional stratigraphic location and trace fossil morphology. The style of deformation is also compatible with an outer-shelf or upper-slope morphology. The producing sandstones are classified as lithic and feldspathic graywackes. Variation of texture and composition is small. Low permeabilities of 0.001 to 2 md can be attributed to high authigenic-clay content.

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Detailed Evaluation of Two Texas Lignite Deposits of Deltaic and Fluvial Origins

The Wilcox and Jackson Groups are the most important lignite-bearing geologic units in Texas. Depositional systems interpreted for these units in east Texas are fluvial and deltaic, respectively. Assessment of the geologic characteristics of a lignite deposit in both the Jackson and the Wilcox Groups indicates positive correlations with the regional depositional models. Regional evaluations of the Jackson Group associate high-sand areas with lignite occurrence. In the Wilcox Group, lignites are associated with low-sand areas.

A Jackson Group deposit in east Texas reflects two distinct