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Depositional Systems of Lower Tuscaloosa Formation (Cretaceous), North-Central Gulf Coast Basin

The lower Tuscaloosa Formation in east-central Louisiana and southwestern Mississippi consists of a southward-thickening wedge of coarse to fine-grained sandstones and shales. The Lower Cretaceous carbonate-shelf margin is a natural boundary separating the updip fluvial depositional system from the downdip deltaic depositional system. The lower Tuscaloosa Formation thickens from a minimum thickness of 120 ft (37 m) updip to a penetrated thickness of 2,800 ft (850 m) downdip. The tectonic setting is one of regional uplift to the north, local uplifts within the alluvial valley, and growth faulting south of the Lower Cretaceous shelf margin.

Based on analyses of core, lithologic logs, and a series of sandstone isolith maps constructed from electric logs, the lower Tuscaloosa is interpreted to have been deposited in 3 major depositional systems: (1) a fluvial system, (2) a deltaic system, and (3) a barrier-island system. Seven subenvironments of these depositional systems include: (1) fluvial channels, (2) floodplains, (3) deltaic distributary channels, (4) distributary natural levees, (5) crevasse splays, (6) shallow-marine bays, and (7) accretion ridges.

The deltaic depositional system is composed of several fluvial-dominated, wave-influenced deltas. The distribution of deltaic depositional subenvironments was influenced by the tectonics of the basin and by the near-shore wave energy. This type of delta persisted throughout most of the lower Tuscaloosa deposition.

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Exploration Potential and Variations in Shelf Plume Sandstones, Navarro Group (Maestrichtian), East-Central Texas

Fine-grained marine sandstones within the Kemp Clay of the Navarro Group (Maestrichtian) of east-central Texas were deposited on a muddy, shallow shelf by migrating sandbars. These sands were transported in traction from deltaic headlands by seaward-deflected coastal/shelf currents. The sand formed thin (3-20 ft; 1-6 m) arcuate belts (shelf sand plumes) which were 17-20 mi (27-32 km) wide and extended 27-30 mi (43-48 km) downdrift and 21-40 mi (34-64 km) onto the shelf. Orientation of the long axes of ridges, formed by the stacking of individual bars within the shelf sand plume, changes (from dip to strike-oriented downdrift) corresponding to the flow directions of the shelf currents.

Southwestward, fair-weather reworking of these delta-supplied sands by shelf currents resulted in the down-current stratigraphic climbing of the migrating shelf-bar complexes. Onshore stratigraphic climbing in the landward parts of the plume complexes was related to storm activity. Current patterns and the resulting distribution of sand were influenced by the configuration of the shelf and the topographic relief inherited from previously deposited deltaic/shelf depositional platforms.

Three variations of the basic shelf sandstone-plume model were recognized in the study area: (1) a rapidly deposited, immature plume, (2) an abandoned, current-reworked plume, and (3) a storm-modified, onshore-reworked plume. Each of these variants displays unique characteristics which influence their potential as hydrocarbon reservoirs.

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Sand Shoal Development on Muddy Mississippi River Delta Shelf

Trinity and Ship Shoals are transgressive sand bodies on the Louisiana inner continental shelf, and they represent the reworked sands of the abandoned Holocene Teche and Maringouin deltas. The development of these shoals is initiated by an episode of delta abandonment followed by subsidence-enhanced sea level rise. Through the process of shoreface retreat, the abandoned delta lobe evolves from an erosional headland with flanking barrier islands to a barrier-island arc and finally into a submerged inner-shelf shoal system. Trinity and Ship Shoals represent the final stage in the Mississippi River delta barrier shoreline cycle and provide a possible modern analogue for some Cretaceous shelf sandstones of the Western Interior. More than 1,000 km (620 mi) of high-resolution seismic profiles correlated with cores provide the data base for interpretation of the depositional history of sand-body development on the muddy Louisiana shelf.

Ship Shoal is the oldest inner-shelf shoal associated with the abandonment and subsequent reworking of the Maringouin delta 6,150 y.B.P. Located 25 km (16 mi) south of the Isles Dernieres, the Ship Shoal transgressive sands lie disconformably over the Maringouin deltaic muds. The Ship Shoal sand body is shore parallel, 32 km (20 mi) long and 2-4 km (1-2 mi) wide. The inner-shelf relief ranges (east to west) from 2-6 m (7-20 ft) with a corresponding decrease (east to west) in the water depth over the shoal crest from -6 to -3 m (-20 to -10 ft). The shoal profile is asymmetric landward. The Ship Shoal sand body is composed of an upward-coarsening sequence of well-sorted fine-grained sand with a median size of 125μ.

Trinity Shoal is associated with the Teche delta, abandoned 3,500 y.B.P., and it is located 20 km (12 mi) south of Marsh Island. The base of Trinity shoal lies unconformably over the Teche deltaic sediments. Trinity shoal is a shore-parallel lunate sand body, 36 km (22 mi) long and 5-10 km (3-6 mi) wide. The inner-shelf relief ranges (east to west) 2-3 m (7-10 ft), with a corresponding decrease (east to west) in the water depth over the shoal crest 5-2 m (16-7 ft). The Trinity Shoal sand body is 5-7 m (16-23 ft) thick.

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Cross Structures and Cover Response in Gulf of Suez Tilt Blocks

Two studies along the west bank of the Gulf of Suez show that: (1) complex cross structures control the subcrop pattern and synorogenic facies; (2) brittle faulting in the preorogenic rocks gives way to more plastic behavior in overlying units; and (3) secondary normal faults sole within the cover but reflect underlying fault patterns.

Gebel Zeit is the eroded crest of a major horst block, exposing Precambrian through Recent rocks. Internal structures include gulf-parallel faults, normal cross faults, and complex keystone grabens. Internal faulting, in conjunction with erosion, controls the reservoir subcrop pattern and synorogenic facies, including location of porous reefs.

The Ras Issaran horst system exposes Miocene to Recent deformed sediments. Continuing movements on cross faults control synorogenic clastic facies and reef locations. Reversal of movement direction on cross faults is common. Even through thick cover, the internal breakup of the horst is discernable.

The role of secondary cover faulting has been neglected in the Gulf of Suez. At Gebel Zeit, brittle faulting in the rigid preorogenic rocks dampens out as less pronounced faulting and folding in the plastic Miocene cover. At Ras Issaran, faults in the brittle Plio-Pleistocene clastics apparently sole in underlying evaporites. While these faults are decoupled from the underlying primary structures, they mimic the concealed fault pattern and provide clues to later movements of these faults. More detailed investigation of the internal breakup of horsts and the role of secondary faulting in the Gulf is needed.

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Presentation of New Tectonic Map (and Accompanying Sections) of Trinidad and Tobago

The Geologic Map of Trinidad, compiled by H. G. Kugler and published in 1961, is currently out of print. While it is the most widely available geologic map, it is confined to onshore Trinidad. This map remains an important reference source, but there have been significant increases in our knowledge of Trinidad and Tobago geology since its publication. In particular, there has been: (1) considerable geophysical work, on land and offshore, including 20,000 km (12,400 mi) of seismic lines; (2) approximately 1,000 exploration and development wells drilled, including wells in the previously unexplored north and east coasts of Trinidad; and (3) significant advances in our understanding of the tectonic evolution of the area, which has resulted largely from the development of the plate tectonic theory.

The following items, which take into account many of these new data