These blanket sandstones thin progressively updip and eventually pinch out into the time-equivalent Hico Shale.

The sandstones can be divided into two groups based on thickness and extent. Sandstones of group I are generally less than 70 ft (21 m) thick and extend across most of northern Louisiana. In group II, sandstones are rarely greater than 30 ft (9 m) thick and are far less extensive, commonly occurring in isolated pods. Sandstones of both types are stacked vertically and are distributed across northern Louisiana in an elongate, arcuate belt.

The Terryville sediments were delivered to a slowly subsiding shelf by two major marine-dominated delta systems. Marine processes spread the sediments across the shelf, forming massive sandstones. The blanket sandstones were produced when minor marine transgressions—resulting from eustatic sea level rise, deltaic subsidence, or both—caused the transportation of sediments northward from the area of massive sand accumulation. Local topographic relief on the shelf apparently had little effect on the distribution of the blanket sandstones, although overall deposition of the Cotton Valley Group was influenced by several local structures.

Cross sections and isopach maps produced in this study define precisely the distribution of the blanket sandstones and demonstrate the repetitive nature of the Cotton Valley sandstones.

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Geomorphology and Morphologic Development of Ebb-Dominated Tidal Inlet on Microtidal, Wave-Dominated Texas Coast

Few geologic studies have been made of tidal inlets on the Texas coast, and the total picture of inlet dynamics in that region remains poorly understood. Generalizations of inlet geomorphology characterize Texas inlets as wave-dominated with large, well-developed, flood-tidal deltas and small, poorly developed, ebb-tidal deltas. However, in this study, that geomorphology appears not to be the case.

The geomorphology of Bolivar Roads Inlet, located between Galveston Island and Bolivar Peninsula on the Texas coast, was studied through the examination and comparison of aerial photographs, historic maps and charts, and written accounts of historic changes, as well as the analysis of hydraulic, bathymetric, and meteorological data compiled by various sources. Depositional environments and process-morphologic response relationships were determined and compared to models presented for East Coast and Gulf Coast tidal inlets. In addition, examination of the historical development of the inlet between 1721 and 1876 determined long-term changes and trends in tidal inlet hydrodynamics and morphology.

In its natural state (pre-1890), Bolivar Roads Inlet was geometrically stable and behaved like present-day mesotidal, mixed-energy (tide-dominated) tidal inlets, even though it was (and is) in a microtidal, wave-dominated environment. An atypical, large, well-developed ebb-tidal delta was maintained by (a) wind tides and ebb flow enhancement associated with "northers," (b) a large sediment supply, and (c) an ebb dominance and time-velocity asymmetry of tidal currents resulting from a diurnal inequality of the tides and tidal phase lags in Galveston Bay.

Historical documentation of the inlet indicates that the asymmetric flood-tidal delta migrated in a southerly direction, apparently because of norther-generated wave and tidal current action. Major changes in the ebb-tidal delta were associated with repetitive cycles of "channel abandonment bypassing" similar to that documented on the South Carolina coast. The present-day morphology of Bolivar Roads Inlet is the result of a complex interaction between tidal currents, wind waves, and longshore currents, all of which have been disrupted as a result of extensive modification of the inlet.

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Alluvial Architecture of Channel Belt Margins of Mississippi River, False River Region, Louisiana

The term "alluvial architecture" refers to the spatial arrangement and stratigraphic relationships between fixed channel belts (shoestring sands) and finer grained intervening flood-basin deposits. Overbank subenvironments associated with an active channel belt of the Mississippi River, including the levee, crevasses, and splay deposits, the upper point bar, and the abandoned channels, were cored using a standard vibracorer and Giddings Rig Soil probe. This study proposes that two end-member types of transition zones exist between channel belts and flood basins at an instant in time for a simple, sine-wave-shaped stream meandering in a fixed channel belt: (1) a levee to backswamp transition zone (type A), and (2) an upper point bar to backswamp transition zone (type B). Type A transition zones, which consist of interstratified crevasse channel-fills, crevasse splay sheet sands, and fine-grained material of the natural levee, have greater potential for preservation than do type B transitions because crevasse splay deposits may extend for kilometers out into flood basins (type A) whereas preexisting point-bar deposits are destroyed during channel migration within the channel belt (type B). In type B transition zones, a sharp, erosional contact between the backswamp and upper point-bar subenvironments exists because of lateral migration of the point bar through preexisting facies within the fixed channel belt.

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Improving Interpretation of SAR Imagery for Hydrocarbon Exploration and Development in Gulf Coast by Modifying Data Acquisition Conditions: Three Case Histories

A comparison of synthetic aperture radar (SAR) parameters that are characteristic of airborne and orbital systems (e.g., SEASAT and SIR-A) indicates that the major advantage of airborne SAR is its inherent flexibility in matching image acquisition flight paths and altitudes to enhance the geologic "grain" of the terrain and the prevalent relief. The latter factor is particularly significant in low-relief areas, such as the Texas Gulf Coast. There, extensive SAR image coverage was acquired by flying the airborne system at a relatively low altitude, with the radar antenna tilted at a shallow angle. The combination of low altitude and antenna positioning provided a grazing illumination that highlighted, by shadowing, the otherwise subtle relief features in the resulting imagery. A comparison of the SAR with Landsat imagery in a key area demonstrates how "featureless" the terrain appears when illuminated with an energy source in a higher position.

The illumination geometry-enhanced SAR imagery has been used to evaluate three areas in the Gulf coastal plain of Texas. These are, from east to west, an area of salt domes near Houston, an area of strong fractural control near Matagorda, and an area of serpentine plugs near Luling-Austin.

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Depositional Environments of Sunniland Formation and Diagenetic Characteristics of Productive Facies, Lehigh Park Field, Florida

The Sunniland formation in the subsurface of Lehigh Park field, south Florida, consists of 11 carbonate facies deposited during a transgressive and regressive cycle in five major depositional systems: shallow-water shelf, shoal-water carbonate complex, restricted and open lagoon, tidal flat, and sabkha.

The shallow-water shelf facies consists of northwest-southeast-trending caprinid-chondrodontid patch reefs that overlie chondrodontid mounds. Caprinid-chondrodontid rudstones, grainstones, and packstones form a talus debris apron surrounding the patch reefs with abundant carbonate mud in more protected areas. Mollusk, gastropod, peloidal packstones and/or grainstones flank the shallow areas adjacent to the patch reefs. Sea grass probably grew in a mud-rich, protected, back-reef lagoon. In protected shallow-water areas between and behind the patch reefs, chondrodontid and requieniid wackestones and mudstones were deposited. *Orbitolina*(?) sp. and *Coskinolina sunnilandensis* are found in the higher energy shallow-water shelf deposits with miliolids prevalent in the more protected areas. The productive shoal-water complex overlies the shallow-water shelf facies and consists of porous mollusk, echinoid, intraclast, orbitolinid packstones, and grainstones.

Impermeable lagoonal deposits of low-energy, burrowed, miliolid mudstone or wackestone and nodular anhydrite in dolomitic mud provided the trap rock for the productive shoal-water sequence. Requieniid, miliolid wackestones accumulated in the shallow-water protected lagoon on the lee side of the shoals. Broad colonies of chrondrodontids inhabited the transitional lagoon-tidal flat areas. Oolitic-coated grainstones composed of miliolids, gastropods, and dasyclads occur in tidal channels, banks, and bars.

The lagoonal facies are overlain by tidal-flat deposits composed of an algally laminated, miliolid, pycnodont, gastropod, intraclastal, dolomitic mudstone and wackestone. Sabkha deposits of nodular or nodular-mosaic anhydrite overlie and are interbedded with the tidal-flat sediments.

The time of lower Sunniland deposition was characterized by a gradual transgression over the underlying Punta Gorda anhydrite resulting in an open, shallow-water shelf environment in which the patch reefs formed. Progradation of the open-marine and landward facies during a rapid eustatic fall in sea level probably resulted in this evolution of facies and eventually led to the anhydrites of the overlying Lake Trafford Formation ("upper massive anhydrite").

Subaerial exposure and freshwater phreatic diagenesis preserved high, primary interparticle porosity and resulted in good secondary moldic porosity in the grainstones and packstones of the shoal-water complex and shallow-water shelf sediments. Diagenetic similarities exist with four other producing facies identified from Sunniland fields. Other high-energy facies deposited and subaerially exposed during Sunniland deposition may also provide attractive exploration targets.

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Depositional Influences in Sandstone Diagenesis of Lower Cretaceous Hosston Formation, Marion and Walthall Counties, Mississippi

Poor reservoir quality is a significant impediment to exploration success in the deep Hosston gas-condensate trend of south-central Mississippi. Regionally, depositional lithology of the Hosston exerts significant influence on cementation and porosity reduction. The primary variables are depositional carbonate content, quartz sand-grain size, and the presence of matrix clay. Feldspar content is a variable of lesser significance.

In Hosston fluvial and deltaic facies, carbonate content is low and coarser sediments are present in channel sandstones. These coarser sandstones preserve commercial porosities, whereas finer grained, shaly sandstones offer marginal porosities. Quartz overgrowths, pressure solution, and authigenic kaolinite are responsible for most diagenetic porosity reduction in this facies.

In Hosston marine prodeltaic sandstones, depositional carbonate is more common. Carbonate cements, dominantly ankerite and dolomite, are recrystallized from shell fragments and carbonate grains to occlude porosity. Quartz overgrowths, pressure solution, and stylolitization are also common in these finer sandstones. In distal marine shelf sandstones, depositional carbonate is abundant and quartz sand is very fine grained. Porosities are low in these lithofacies because of pervasive early carbonate cementation and later quartz overgrowths in intervals not cemented by carbonate.

The first stage of Hosston sandstone diagenesis was early calcite or quartz cementation. Calcite was later replaced by ankerite or dolomite. Deeper burial initiated plagioclase feldspar dissolution and the development of pore-filling kaolinite. Hydrocarbons subsequently accumulated in structural and stratigraphic closures and retarded further diagenetic porosity reduction in these sandstones. Deeper burial caused thermal degradation of oil reservoirs to dry gas and pyrobitumen. Minor galena, sphalerite, pyrite, and barite are present in open tensional fractures, associated with stylolites, and as intergranular cements. These sulfides and sulfates were probably precipitated from metalliferous brines common in the Hosston.

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Depositional Framework of Early Miocene (Fleming) Episode, Northwest Gulf Coast Basin

The Fleming Group and its basinward equivalents constitute deposits of a major Cenozoic depositional episode of the northern Gulf Coast basin. The facies complex is bounded by the *Amphistegina* B shale and below by the Anahuac shale. Initially, lower Miocene (Oakville) progradation built across the broad, submerged shelf platform constructed during the earlier Frio depositional episode. At the Frio paleocontinental margin, the rate of outbuilding slowed as large-scale growth faulting created a narrow lower Miocene expansion zone. The later part of the episode was characterized by a stable to retreating shoreline and consequent aggradational to retrogradational deposition (Lagarto formation).

The lower Miocene depositional framework includes, in south Texas, the Santa Cruz fluvial system and the North Padre delta system. The bed-load fluvial complex fed a wave-dominated delta, constructing a broadly convex deltaic headland across the foundered Frio Norias delta system. Extensive wave reworking and longshore transport of sand and mud nourished a broad barrier/lagoon and strand-plain complex that extended along the central and much of the northeastern Texas coast. This well-known Matagorda barrier/strand-plain system was bounded updip by a coastal plain traversed by numerous small intrabasinal streams. Near the present Sabine River, westernmost deposits of a continental-scale, mixed-load fluvial and equivalent delta system extend beneath the Texas coastal plain and shelf from the Miocene depocenter in Louisiana. Here, the initial phase of early Miocene progradation was also complicated by the incision and filling of numerous submarine gorges.

Lower Miocene reservoirs have produced nearly 4 billion bbl of oil-equivalent hydrocarbons from nine identified plays in the Texas coastal plain and shelf. The most prolific play, the salt domes of the Houston embayment, accounts for most of the oil and more than two-thirds of the total production from the sequence. Four offshore plays offer the greatest discovery potential for substantial new reserves, primarily gas. To date, however, the yield per volume of reservoir sandstone for Miocene plays remains low, relative to more prolific units such as the Frio Formation.

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Submarine Canyon System in Frio Formation of South Texas

Regional lithofacies mapping in south Texas and stratigraphic relationships, which are best documented in the Edinburg fault block, suggest the presence of a nested series of submarine canyons cutting the southern flank of the Frio (Oligocene) Norias delta system. Canyon fill consists of thick sequences of mudstone, locally containing interbedded siltstone and sandstone, that abruptly replace the normal section of deltaic coastal-barrier and delta-flank barrier-bar sandstones and prodelta or shelf mudstones. Individual canyon fills are several miles wide and as much as 2,000 ft (600 m) thick, making them comparable in scale to the late Quaternary Mississippi canyon. Canyon excavation and filling appear to have been recurrent processes during deposition of the lower and middle Frio depositional complex of south Texas; however, the best documented canyon fills predate cutting and infill of the Hackberry canyon complex of east Texas and Louisiana. The Edinburg canyon system, like its counterparts in the Cenozoic deposits of the Gulf Coast and Niger delta, occupies a paleogeographic setting at the flank of a major deltaic depocenter. This and similar canyon complexes offer deep exploration targets that have commonly been only sparsely tested and may be largely unrecognized.

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Cretaceous-Tertiary Boundary in East-Central Texas

The Cretaceous-Tertiary boundary is exposed in a series of outcrops near and along the Brazos River near Eloise in Falls County. At the best known exposure, 400 m downstream from the Texas Highway 413 bridge over the Brazos River, the precise location of the boundary, based on a detailed study of nannofossils, is in a mudstone interval approximately 15 cm above a 50-cm thick prominent sandstone-mudstone-siltstone complex that has been used traditionally to designate the boundary. The complex consists of a basal friable sand lying on a scoured surface, a hard rippled calcareous sandstone, a thin soft mudstone, and a prominent hard chalk or siltstone. This same complex is exposed about 1 mi (1.6 km) downstream at the mouth of a gully, where the thickness and the character of the members of the complex are similar. Toward the head of the same gully, the sandstone complex is again exposed, but there, the rippled sandstone member is substantially thicker and more massive, although the other members of the complex retain their thickness and character. A short lateral distance downstream from the mouth of the gully, the sandstone complex becomes increasingly clayey and disappears quickly. The entire complex has been interpreted variously as a storm deposit or shelf