distribution and speciation by affecting paleogeography, climate, and deposition. Intercontinental links were broadened during regressions. Transgressions had moderating effects on climate, produced by lessening continentality. A middle Paleocene major regression probably marked the withdrawal of the North American interior seaway, and its absence was linked to Paleocene-Eocene transition climatic warming and drying. Shifts in sea level shifted loci of deposition, affecting rates of animal burial and diagenesis.

Sea level effects on shape and disjunction of ranges on the Gulf Coast were of particular importance because southern sources were likely for the wave of new forms, many representing the first appearance of modern mammal orders, which marks the Paleocene-Eocene transition in northern sites. Gulf Coast regressions exposed a broad continental shelf producing terrestrial conditions analogous to those of the broad, stable epicontinental seas produced by major transgressions. An embayment in Texas at the location of the Cretaceous interior seaway could have functioned to produce eastern and western Gulf Coast terrestrial provinces as the Mississippi embayment did in the Pleistocene. Transgressions reduced the area of lowlands, constricted ranges, and promoted speciation by isolating demes in highlands. Regressions could also promote speciation, by lowering water tables, increasing the extent of savannas, and thus fragmenting the habitats of forest dwellers. The effects of sea level changes are important in the burst of mammalian speciation that characterizes the early Tertiary, just as they are in marine evolution.

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Late Tertiary and Quaternary Depositional Systems in Subsurface of Central Texas Coastal Plain

Late Miocene, Pliocene, and Pleistocene deposits in the subsurface of the central Texas coastal plain were subdivided into six operational units equivalent to the surface-defined Fleming, Goliad, Willis, Lissie, and Beaumont Formations. These sedimentary units constitute the last major depositional episodes in the northwestern Gulf Coast basin. Late Miocene deposition is represented by transgressive shelf and shallow-marine shales overlain by progradational clastics of the upper part of the lower Fleming, upper Fleming, and lower Goliad–Willis units. A minor Pliocene transgressive event is represented by downdip, marine embayment facies of the upper Goliad–Willis unit. Finally, Pleistocene highstand fluviodeltaic progradation (Lissie and Beaumont units) terminated pre-Holocene sedimentation.

Interpretation of sediment distribution, established by constructing a series of net and percentage sand-maps for each unit, permits delineation of the following main depositional systems: fluvial braided-meander belt and flood basin; fluviodeltaic; lagoon; large marine embayments; small bayhead deltas; thick wave-dominated deltas; strand plain; and thick stacked coastal barriers. Western fluviodeltaic systems were consistently less active than the eastern ones, which deposited greater volumes of sand.

Inherited, subtle structural influence of the deeper seated San Marcos arch had some effect on sediment distribution and paleogradients. Shallow extensions of the deeper Vicksburg, Frio, and Miocene fault systems display respectively decreasing (from 400 ft or 122 m) displacements in the section studied. Faults clearly were a central factor in the distribution of fluvial, deltaic, and strike-oriented coastal sands.

Most sands in the updip parts of the operational units contain fresh water, whereas those of downdip areas contain predominantly brackish to saline waters. The area with greatest reservoir potential for fresh water includes Victoria, Jackson, Wharton, and Colorado Counties. Possible use of sealed, thick coastal sands in the lower Fleming unit for the disposal of industrial and municipal liquid-waste is recommended.

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Characteristics of Diapirs on Outer Continental Shelf-Upper Continental Slope Boundary, Northwest Gulf of Mexico

An 18,000 km^2 segment of the shelf-slope boundary off southwest Louisiana was studied using high resolution seismic profiles. Mapping of the distribution of diapirs, faults, synclinal and anticlinal axes, and the configuration of the subseafloor surface of diapiric material revealed significant patterns.

On the outer continental shelf, diapirs are characteristically either buried or exposed and severely eroded. Erosional surfaces on upper-slope diapirs can be used to estimate subsidence rates. The complex bathymetric contours on the upper slope are the result of diapiric activity and show characteristic fault patterns and relations to pierced sediments that can be attributed to gravity-induced movement of salt downslope triggered by the weight of overlying sediment prisms. Salt is present at shallow depths on the upper slope and is usually capped by a sheath of seismically chaotic, fine-grained sediments. Diapirism and the loading of sediments in depositional basins are interdependent processes actively reshaping the shelf-slope boundary through marginal accretion.

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Evolution and Morphology of Sedimentary Environments, Atchafalaya Delta, Louisiana

Progradation of Atchafalaya Delta, one of the most dynamic geologic events of the century, has produced a sizable new sand body on the Louisiana coast. Evolution of depositional environments in Atchafalaya Bay has been determined from analysis of sediment cores and bathymetric surveys. Use of X-ray radiography has made possible recognition of a number of subenvironments within major environments. Atchafalaya Delta exhibits all of the sedimentary environments recorded in earlier Mississippi delta lobes. However, excellent stratigraphic control and current knowledge of the processes of deposition in Atchafalaya Bay make it possible to link process-response better in this than in other Mississippi subdeltas. In contrast to the modern Mississippi subdelta, the Atchafalaya should prograde more rapidly, form thinner sand bodies, and eventually cover a wide area, much like the Lafourche, St. Bernard, and Teche delta lobes.

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Atchafalaya Mud Stream and Recent Mud Flat Progradation: Louisiana Chenier Plain

The Chenier plain coast of southwestern Louisiana has been recognized as the downdrift recipient of fine-grained sediment derived from the Atchafalaya River, to the east. Carried as suspended sediment in the Atchafalaya "mud stream," silts and clays are now accumulating as nearshore deposits of gel-like fluid mud along what has historically been one of the most

rapidly retreating shorelines in the United States. The major effect of this sediment is to attenuate incoming wave energy, thus providing conditions favorable for further sedimentation. The initiation of a new cycle of sediment input will provide us with our first opportunity to study the processes that have led to development of the Louisiana chenier plain over the past 5,000 years.

Computations based on current and sediment concentration measurements reveal that the volume of sediment carried west from the Atchafalaya River is on the order of 50×10^6 m^3/year, a value that represents nearly one-half of the sediment that leaves Atchafalaya Bay. Process-oriented field studies initiated in 1980, together with satellite imagery, color infrared photography, and aerial overflights since 1974, indicate that mud-flat sedimentation is increasing to the west. A reversal of the overall pattern of coastal retreat now characteristic of the chenier plain is expected when Atchafalaya Bay becomes sediment filled, thus allowing an even greater volume of sediments to enter the dynamic shelf region seaward of the bay.

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Depositional Environments and Regional Stratigraphy of Jurassic Norphlet Formation in South Alabama

In the western Gulf coastal plain area the Norphlet Formation is typically characterized by nonmarine and red bed lithofacies. In south Alabama, the Norphlet consists of an updip conglomerate, a basal shale, red beds overlying the shale, and an upper quartzose sandstone, the Denkman Member. The Norphlet unconformably overlies either salt, anhydrite, red beds, or Paleozoic rocks. The Smackover Formation overlies the Norphlet with a sharp contact over most of south Alabama, except in parts of Mobile County where the contact is gradational.

The conglomeratic lithofacies is discontinuous in areal extent, and is present in cores from Escambia, Monroe, and Wilcox Counties. It consists of red and gray sandstone, conglomerate, and conglomeratic sandstone. The shale lithofacies also appears to be discontinuous in areal extent, and is present in cores from Escambia County. It consists of mostly black shale, with some brown and red shale. The red bed lithofacies was penetrated in wells in Escambia and Clarke Counties. It consists of red, brown, and gray, very fine to coarse-grained sublitharenite and subarkose, with an average composition of 64% quartz, 13% feldspar, 8% rock fragments, and 10% matrix. It is characterized by low-angle planar cross-beds and discontinuous laminae, along with interbedded silt and coarse sand. The quartzose lithofacies (or Denkman Member) is present in cores from Mobile, Baldwin, Escambia, Clarke, Choctaw, and Washington Counties. It attains a thickness of from 400 to over 700 ft (122 to over 213 m) in parts of Choctaw, Washington, and Mobile Counties, and thins to the northeast and east (Clarke, Monroe, Conecuh, and Escambia Counties) where Norphlet red beds and conglomerates predominate. The quartzose lithofacies consists of gray and brown, very fine to medium-grained subarkose with an average composition of 76% quartz, 12% feldspar, 3% rock fragments, and 2% matrix. It is characterized mainly by low to high-angle planar cross-beds, and also contains slump structures, wavy discontinuous laminae, and massive intervals.

Norphlet deposition in south Alabama occurred in an arid climate. The lower shale probably was deposited in lagoons or mud flats left from a retreating hypersaline sea which had deposited the Louann salt. Accompanying the retreat of this sea were climatic and/or tectonic changes which resulted in clastics being shed from exposed paleo-highs. Initial clastic deposition occurred in alluvial-braided stream environments which are represented by sediments of the conglomeratic and red bed lithofacies. These sediments were reworked into downdip areas and deposited in desert dune and inter-dune environments. A transgression near the end of Norphlet time resulted in reworking of underlying sediments and deposition in intertidal environments. These deposits may be partial landward equivalents of seaward Smackover carbonates. Dune, interdune, and intertidal environments are represented by the quartzose lithofacies or Denkman Member. Basement paleohighs not only were a source of sediments but also controlled Norphlet deposition in that the formation thins or is absent over them.

The Norphlet Formation is an important reservoir in south Alabama. Stratigraphic relations indicate that lower Smackover Formation carbonate mudstone provide the petroleum source rocks. Reservoirs are facies selective, occurring mainly in Norphlet intertidal, eolian, and braided-stream deposits. Traps are due to a combination of favorable stratigraphic, structural, and diagenetic development.

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Seismic Stratigraphy and Depositional History of Holocene Sediments on the Central Texas Gulf Coast

Application of seismic stratigraphic analysis to high-resolution sparker profiles from Corpus Christi Bay, on the central Texas Gulf Coast, allows the development of a three-dimensional model of Holocene sedimentation in the study area. To establish a time-stratigraphic framework for the seismic sequence, a regional basal unconformity was picked as the lower sequence boundary and the sediment/water interface was defined as the uppermost boundary.

The seismic sequence is subdivided into discrete seismic facies based on reflector configuration, geometry, and bounding relations. Facies delineation allows the development of a model seismic facies tract composed of a lowermost complex/chaotic-fill facies, bounded by the subjacent regional unconformity, grading upward into an onlap fill facies, which then grades into an overlying parallel/subparallel/divergent facies.

Based on lithologic and textural data from borehole logs, a correlative sedimentary facies tract is found to consist of a fluvial/channel-fill facies, unconformably overlying a subjacent erosional surface and grading upward into a deltaic facies, which then grades into the uppermost bay-estuarine facies.

Chronostratigraphically, the lower, bounding unconformity is correlative with the last Pleistocene (late Wisconsin) lowstand of sea level. At approximately 10,000 years B.P., rising sea level associated with the Holocene transgression began to flood the erosional valleys, causing a gradual flux from fluvial to deltaic deposition. With continued sea level rise, the deltaic environment shifted landward (moving up the drowned valley) and bay-estuarine conditions began to dominate as sea level approached stillstand, about 4,500 years B.P. Aggradational bay fill has been the dominant mode of sedimentation since that time.

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Fluid-Inclusion Temperature Study of Paleozoic Carbonates, Llano Uplift, Texas