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Seismic Stratigraphy of Barrier-Island Arc Retreat Paths in Mississippi River Delta

The stratigraphic record preserved in the retreat path of Mississippi delta barrier-island arcs is controlled by erosional shoreface retreat processes, relative sea level rise, and sediment supply. Marine reworking combined with subsidence of the abandoned delta generate a characteristic sequence of facies from flanking barrier islands, barrier-island arcs to inner-shelf shoals depending on age. The preservation of any part of these sequences is a function of the rate of relative sea level rise and the depth at which individual barrier environments accumulate below the base of the advancing shoreface. More than 500 km (300 mi) of high resolution shallow seismic profiles correlated with vibracores from retreat paths fronting the Isles Dernieres and Chandeleur barrier-island arcs, show contrasting stratigraphic sequences preserved on the inner continental shelf (Mississippi delta).

The Isles Dernieres barrier-island arc developed as a consequence of the Caillou Headland abandonment in the early Lafourche delta approximately 800 years B.P. The base of the advancing shoreface lies 3 to 4 m (10 to 13 ft) below sea level and truncates the entire Isles Dernieres barrier-lagoonal sequence and the upper part of the Caillou delta plain. On the lower shoreface, channels can be seen projecting seaward under the central part of the island arc; associated with it is a beach-ridge plain extending eastward. On the inner shelf, a sand sheet up to 60 cm (2 ft) thick marks the retreat path of the Isles Dernieres.

The Chandeleur barrier-island arc was generated by abandonment of the St. Bernard delta complex 1,500 years ago. The base of shoreface erosion lies 6 to 8 m (20 to 26 ft) below sea level, and truncates the entire barrier-lagoonal sequence in the central part of the system. On the downdrift flanks only the upper portion of tidal inlet and recurved spit complexes are truncated. Scattered outcrops of shell reefs and lagoonal deposits occur on the lower shoreface. Beyond the shoreface, a 1 to 5 m (3 to 16 ft) thick sand sheet, with gently seaward dipping interval reflectors, caps tidal inlet scars up to 10 m (33 ft) thick, as well as the basal portions of migrating barrier-island sequences associated with earlier shoreline positions.

Differences seen in the two stratigraphic sequences are a function of distributary size and depositional history of each barrier-island arc. The Isles Dernieres developed from a series of small sand-deficient distributaries in the Lafourche delta complex, whereas the Chandeleur Islands developed from large sand-rich distributaries of the St. Bernard delta complex.

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Miocene Production in Southwest Alabama

The first commercial Miocene production in Alabama was discovered in early 1979 by Amoco Production Co.. The 2 Roy Amos 32-12 was completed through 13 3/8 in. casing at 1,664 ft (507 m) flowing 950 MCFGD on a 20/64-in. choke with 380 lb FTP. Since then 10 additional Miocene fields have been discovered from two different Miocene sands, the Amos and the Meyer. Completed well costs are approximately \$150,000. Flow rates are usually in excess of 1 MCFGD. Porosities range from 25 to 38%. Permeabilities range from a few millidarcys to > 2,500 md. Average reserves are in excess of 1 bcf/well. The depositional environment is postulated to be a flood-plain point-bar system. Shale compaction forms most of the structural relief. After perforating, the wells are gravel packed using 40/60 sand. Most wells exhibit natural flow rates in excess of 1 MCFGD (28,000 m³/day). The primary method of exploration is through stratigraphic interpretation of seismic. The productive gas sands appear on seismic data as an amplitude anomaly or "bright spot."

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Statistical Determination of Mean Strike and Dip: Example from Basal Tuscaloosa, Eastern Alabama

An unconformity may be a very complicated surface. A few strike and dip measurements are not adequate to define such a surface, and simple

solution of the three-point problem commonly does not improve the definition. However, the use of trend surface analysis permits (a) determination of the "best fit" plane which represents the strike and dip for the region studied; and (b) evaluation of local departures from that plane, in terms of paleotopography.

This procedure has been demonstrated in a study of the basal contact of the Tuscaloosa Group with an underlying variably weathered "gneiss" complex, which was sampled at 17 localities in Macon and Tallapoosa Counties (Notasulga Quadrangle), Alabama. At each locality the elevation and nature of the basal Tuscaloosa contact was recorded along with lithologic observations. A trend surface analysis was used to generate a first order regression plane. This plane represents mean strike and dip of the unconformity; it strikes N81°W and dips 0.61°SW. This result is highly significant ($F_{2,14} = 190.5$; $N = 17$) and accounts for 96% of the variance in elevation ($R^2 = 0.965$).

First order residuals plotted against map location reveal little regional trend. However, mapping of basal Tuscaloosa grain-size data onto the residuals reveals a preponderance of coarse material at localities with negative residuals. This indicates the expected preferences for coarse (gravel) deposition in paleotopographic "lows." Mapping the weathered state of the underlying gneiss onto the residuals reveals no pattern, suggesting that much of the alteration of this unit postdated the unconformity. These results, although on a simple data set, illustrate the utility of the technique to stratigraphic problems involving mean strike and dip.

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Metallic Sulfide Deposits in Gulf Coast Salt Dome Cap Rocks

Sixty-five core tests at Hockley salt dome, Harris County, Texas, indicate an annular zone of iron, zinc, lead, and silver sulfides around the perimeter of the cap rock in cumulative concentrations from trace amounts to over 50% total sulfides. Barite has been identified in concentrations exceeding 60%. The textures within and the geometry of the mineralized zone suggest rapid precipitation in a highly reducing, tectonically active environment.

Petrographic, isotopic, trace element, hydrocarbon, and biological information supports origin of the deposit through a complex evolutionary system involving halokinesis; cap rock development and diagenesis; and the generation, migration, and accumulation of hydrocarbons and associated brines. Existing information indicates that at least 13 other Gulf Coast salt domes host metallic sulfide deposits containing zinc and/or lead as a result of similar processes.

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Characteristics of a Deep-Sea Channel on Middle Mississippi Fan as Revealed by a High-Resolution Survey

A high-resolution, deep-tow side-scan sonar and subbottom profiler survey has been completed across a section of the middle Mississippi fan in water depths of 2,470 to 2,600 m (8,100 to 8,500 ft). A traverse across the fan-axis channel revealed a variety of sediment types: a buried acoustically opaque unit, an extensive mantle of stratified, conformable sediments, and two channel infills. Sea-floor morphology displayed ridge systems, both marginal to the channel and elsewhere on the fan surface, and various channel bed forms, including mottling and ripple systems. Rills and bed truncations are indicative of erosion on the fan surface.

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Depositional Sequences in Pensacola Clay of Southwest Alabama and Their Significance in Petroleum Exploration

In southwest Alabama, the subsurface Pensacola Clay of Miocene age overlies Tampa Stage sediments of early Miocene and is overlain by Miocene coarse clastics. The Pensacola Clay consists of greenish-gray to light olive-gray, slightly calcareous, glauconitic, micaceous, fossiliferous, silty to sandy clay containing beds and lenses of sand, some of which produce