related to the adjacent prodelta slope.

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Well Log Analysis Concepts in Clastic and Argillaceous Sediments, United States Gulf Coast

Reliable estimates of amount, type, and distribution of clay minerals encountered in Gulf Coast sands improve log-derived determination of reservoir properties, such as porosity, hydrocarbon saturation, and permeability.

Log-derived determination of clay properties also provide information for geologic and formation evaluation studies, including detailed stratigraphic correlations, clay diagenesis, source rock potential, cation exchange capacity, overpressure detection and evaluation, and commercial hydrocarbon distribution in overpressure regimes.

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Diagenesis of Middle Miocene Sands in Geopressure Zone of Lirette Field, Terrebonne Parish, Louisiana

A study of temperature, pressure, and salinity distribution in the Lirette field reveals important information concerning the effects of the hydrodynamic regime on sandstone diagenesis. Mineralogic examination of associated shales also aids in the understanding of diagenesis in these sands.

The Lirette field is a large domal structure related to deep-seated salt, approximately 20,000 ft (6,096 m), bounded to the north and south by major growth faults. Isothermal surfaces in the Lirette field closely follow the structure. Isotherms commonly drop in downthrown fault blocks. Along fault leakage zones, temperatures increase. Pressure distribution in the Lirette field is primarily related to structure, and the presence of a sufficient shale to sand ratio. Formation water salinities are lower (<50,000 ppm) for wells that have been "flushed" by geopressured waters.

The well-documented decrease of smectite in mixed-layer illite-smectite is present in Lirette shales. A more detailed analysis indicates that some montmorillonite may be converted to beidellite before it is converted to illite.

Sandstone diagenesis in the Lirette field is complex and there are significant lateral and vertical variations. The relative sequence of diagenetic events in Lirette sands is as follows: (1) spherulitic calcite cement, probably formed at or near the sediment-water interface; (2) authigenic chlorite rims and platelets, which help to preserve primary porosity; (3) quartz and feldspar overgrowths, uncommon; (4) ferroan calcite cement, due to localized flushing of sandstones by waters released from clay diagenesis; and (6) authigenic kaolinite cement, which reduces porosity along fluid escape routes.

Extensive carbonate cement and orthomatrix are the primary contributors to decreased porosity. Late stage kaolinite cement in flushed zones also reduces porosity, but to a lesser extent.

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Clay Minerals as Indicators for Depositional Environment in South Halletsville Field, Lavaca County, Texas

The South Halletsville field, Lavaca County, Texas, has gas and condensate production from lower Wilcox sandstones and shales which have been interpreted as either channel turbidite deposits in outer-shelf to slope locations or deltaic and strand-plain sands and muds. Twenty-four core samples from the General Crude Oil Co. 1 A. G. Henkes Gas Unit were analyzed by X-ray diffraction methods to determine whether a semiquantitative estimate of clay mineral content would aid in determining the depositional environment. Discrete illite and chlorite are of particular interest because the presence of these minerals is interpreted as being due to original deposition.

Three shale samples, from 10,194 to 10,206 ft (3,107 to 3,111 m) and 11 sandstone samples, 10,180 to 10,194 ft (3,103 to 3,107 m) were selected from one core section. This sequence of samples is particularly important because it contains a shale and the overlying sandstone. In addition, a deeper sandstone was sampled in the interval of 11,032 to 11,072 ft (3,363 to 3,375 m).

If a turbidity-type event had occurred, the weight percent of non-diagenetic clays should (1) decrease significantly as the boundary is crossed between the shale and the overlying sandstone, and (2) gradually increase in progressively shallower samples within the sandstones. However, the weight percent for chlorite does not vary significantly regardless of a change in lithology, shale to sandstone, or a change in depth. The illite content gradually decreases with shallower depths in both core intervals. This sequence is more compatible with a transgressive deltaic environment.

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Exploration Ramifications of Subsurface Fluid Migrations in Lake Borgne–Valentine Area of Southeastern Louisiana

An area in southeastern Louisiana is studied to determine possible areas of subsurface fluid migrations. The lithology and structural geology are determined so as to identify potential pathways of these migrations. The bore-hole readings are also used to determine the patterns of temperature, pressure, and salinity parameters. Where vertical subsurface fluids have migrated, the fluids at shallow depth have temperature and salinity characteristics of fluids at greater depth, i.e., anomalously high temperatures and low salinities. In addition, the mass movement of the water from depth (out of the abnormally pressured zone) reduces the pressure and lowers the top of this zone.

Areas which indicate migrations are economically important because the migrating waters are theoretically capable of carrying hydrocarbons. Traps in the vicinity of these migrations are of special interest to the hydrocarbon explorationist. Anomalously high temperatures and low salinities are also of interest to the geothermal explorationist.

The part of southeastern Louisiana studied has twelve areas of possible subsurface fluid migrations and

includes eight hydrocarbon fields, a geothermal prospect, and two viable prospects. The areas of migration are most likely to occur at areas of structural expansion, i.e., at grabens, crests of diapirs, or at the intersections of faults. The latter appears to be especially important as eight of the twelve areas of migrations are near fault intersections.

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Effects of Hurricane Frederic on Morphology of Dauphin Island, Alabama

Hurricane Frederic made landfall at Dauphin Island, Alabama, on September 12, 1979. With property damage estimates as high as $2 billion, Frederic represents the costliest natural disaster in United States history.

Most of the destruction caused by Frederic was due to winds up to 65 m/s (126 knots), storm-surge (3.1 m above mean sea-level) flooding, beach erosion, and overwash. The latter of these three factors was the most significant in terms of property damage.

Photographic overflights, ground surveys, and inspection of structures after the hurricane all led to the conclusion that damage was controlled by the following features: (1) nearshore bathymetry, (2) relative elevation of different parts of the island, (3) location and orientation of pre-storm canals and driveways, and (4) placement of house-support pilings.

The ebb-tidal delta of Mobile Pass dominates the nearshore bathymetry of eastern Dauphin Island. Extending several kilometers offshore, this delta platform produced shoaling and breaking of storm waves offshore, and thus spared the eastern part of the island from more intense wave attack. However, immediately west of the delta, wave refraction and focusing produced the highest beach retreat (40 m) of any place on the island.

Dauphin Island exhibits two distinct physiographic divisions. The eastern fifth of the island is composed of a Pleistocene core topped by high dunes, with elevations over 10 m. This area escaped much of the destruction of the storm, receiving only relatively minor wind damage. The western four-fifths of Dauphin Island consists of a low-lying Holocene spit, which was completely inundated by the passage of Frederic. The overwash of this part of the island resulted in damage to virtually every building and complete destruction of many.

Streets and canals which ran perpendicular to the beach on the Holocene spit served as initial passageways for storm-driven water. These areas developed into the major overwash channels and were responsible for the most intense property damage.

Numerous small overwash channels were found to have developed in the lee of house-support pilings. Presumably scour was enhanced by the turbulence of water flowing around such pilings. In areas of high building concentration, this effect was most pronounced and caused significant damage.

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Biostratigraphic Significance of Fossil Molluscan Larvae

Most marine mollusks have some form of pelagic larval stage which produces a distinctive protoconch. Scanning electron microscope studies reveal that larval shells are routinely preserved in sediments as old as the Upper Cretaceous, and that protoconchs are characteristic enough to identify to species on the basis of the unmetamorphosed larval shell. This has paleoecologic and biostratigraphic potential in cores where only a few identifiable adult mollusks are normally found. In addition, larval shells are carried by water currents to areas not inhabited by the adults, extending the species geographic range and partly eliminating facies dependence. Fossil mulluscan larvae are, therefore, a potentially valuable new micropaleontologic group.

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Louisiana Tuscaloosa Versus Southeast Texas Woodbine

The deep Tuscaloosa play extending across south-central Louisiana has resulted in the recent discovery of large gas reserves. This same downdip lower Upper Cretaceous interval, known as the Woodbine in southeast Texas, extends into Texas across Newton, Jasper, Polk, and Tyler Counties. Although well control is sparse through this interval in southeast Texas, available data suggest a different depositional and structural setting for the lower Upper Cretaceous interval. No thick units of sands are within the interval, and most of the production has been found in stratigraphic traps exhibiting thin sands, as in the Seven Oaks field.

Subsurface studies of the lower Upper Cretaceous interval across south-central Louisiana and into southeast Texas indicate it is unlikely the Louisiana Tuscaloosa play will extend into the southeast Texas area. However, there is sparse downdip control in Texas south of the Lower Cretaceous shelf edge and it is, therefore, possible that some sands have been deposited subparallel to the shelf. The best area to explore for this possibility would be south of the 1,000-ft Tuscaloosa or Woodbine isopachous contour which extends across southeast Texas.

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Pressure, Temperature, Salinity, Lithology, and Structure in Hydrocarbon Accumulation in Constance Bayou, Deep Lake, and Southeast Little Pecan Lake Fields, Cameron Parish, Louisiana

Pressure, temperature, salinity, lithology, and structural studies indicate that hydrocarbons in Deep Lake, Constance Bayou, and Little Pecan Lake fields were generated in the shale beds of the hard geopressured zone and migrated upward along major growth faults. The hydrocarbons were originally dissolved in hot fresh pore water and came out of solution in the overlying low temperature and pressure zones, accumulating in the sand beds of the first structural traps encountered. By examining regional cross sections and anomaly maps, fluid escape routes taken by the hot pore water containing dissolved hydrocarbons can be identified. Areas below which a vertical flush of hot fresh pore