infilled by matrix-supported gravel overlain by mass-flow deposits of planar-interstratified sand and mud. Channel infills are overlain by stratified matrix-supported gravels and sands and structureless clast-supported gravels deposited by debris flows which deformed underlying sands. Inasmuch as submarine outwash-fan sequences characteristically contain matrix-supported gravels, planar-interstratified sand and mud infill of channels and lack large-scale trough cross-bedding, they can be distinguished from deltaic sequences.

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Relationships Among Carbon Dioxide, Pore-Fluid Chemistry, and Secondary Porosity, Texas Gulf Coast

Sequences of diagenetic minerals associated with secondary porosity show striking similarities. The formation of quartz overgrowths on detrital quartz grains is followed generally by carbonate cementation. The dissolution of this carbonate is the main secondary porosity-forming event, which commonly precedes kaolinite precipitation and iron-rich carbonate cementation. In the Texas Gulf Coast, oxygen isotopic analyses provide temperature estimates of authigenic phases that predate and postdate secondary porosity development: quartz, ≥ 80°C (176°F); kaolinite, ≥ 70°C (158°F); albite, 100°-150°C (212°-302°F); late carbonate, > 100°C (212°F). These data suggest that secondary porosity in the Tertiary Gulf Coast forms at temperatures of about 100° ± 25°C (212° ± 45°F).

Correlations among calcite saturation indices in pore fluids, abnormally high permeabilities, and mole % CO_2 in natural gases of the Eocene Wilcox Group imply a strong interrelationship between CO_2 and secondary porosity development in clastic reservoirs. The CO_2 content of gases varies systematically with both the reservoir age and temperature, which suggests a kinetic control on generation. The amount of CO_2 in natural gases increases rapidly at approximately 100°C (212°F); this coincides with a rapid increase in the ratio of secondary to primary porosity in associated sandstones. Stable isotopic analyses of carbonate cements indicate a strong component of organically derived carbon and therefore cycling of carbon between inorganic and organic systems. The type, amount and distribution of organic matter, and early carbonate in both shales and sandstones control the quantity of CO_2 available for generating secondary porosity.

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Complete Dehydration of Illite/Smectite in Gulf Coast Overpressured Shales

Twelve samples of Frio and Vicksburg (Tertiary) overpressured shales from Brazoria and Hidalgo Counties, Texas, were examined by both x-ray and transmission electron microscopy (TEM) techniques. TEM lattice fringes from shallower samples show mixed-phase illite/smectite (I/S) layers in random orientations relative to each other. Electron diffraction patterns of these shallower I/S layers show very diffuse basal reflections together with very pronounced turbostratic structure and streaking along z*. Electron diffraction patterns of I/S layers from intermediate depths still show z* streaking and turbostratic structure, but the basal reflections are more distinct. TEM lattice fringe images of intermediate depth samples show I/S layers arranged in a subparallel orientation. Electron diffraction patterns of I/S layers from deeper samples generally show well-defined basal reflections, and both turbostratic structure and z* streaking are less pronounced. An electron diffraction pattern of I/S layers from one deep sample (12,490 ft, 3,800 m, calculated equilibrium temperature of 168°C, 334°F, and pore-pressure gradient > 0.7 psi/ft, 15.8 kPa/m) shows an illite $2M_1$ pattern, indicating complete dehydration of original I/S layers. The presence of pronounced z* streaking is thought to be due to disordered stacking of layers, which in turn is caused by diagenesis of original mixed-phase I/S layers. TEM lattice fringe images for this sample show parallel illite layers with basal spacing of approximately 20 A.

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U. S. Geological Survey Oil and Gas Atlas of the United States

The U. S. Geological Survey is compiling a series of oil and gas maps that the Survey will publish as an oil and gas atlas of the United States. The maps in the series will synthesize information both on the national scale and for individual basins, and will include geologic, geochemical, geophysical, and exploratory data.

The maps displayed are the preliminary publications (open-file reports) of this new series. The national-scale maps for the conterminous United States show (1) location and names of basins, (2) total thickness of sedimentary rocks, (3) location of oil and gas wells drilled deeper than 15,000 ft (4,500 m), and (4) location of oil and gas wells drilled deeper than 20,000 ft (6,000 m). Basin maps of the north slope of Alaska show (1) well locations, (2) isopachs, and (3) structure contours.

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Reservoir Facies Architecture in a Micro-Tidal Barrier System, Frio Formation, Texas Gulf Coast

Barrier-bar sand bodies are a complex mosaic of barrier-core, shoreface, inlet-fill, tidal-delta, and back-barrier facies. In addition, sandbody stratigraphy and internal depositional architecture are determined by the progradational, aggradational, or transgressive origin of the barrier complex.

The Frio barrier/strandplain system of the middle Texas Gulf Coast has produced more than 3 billion bbl of oil. Examination of the Greta, Glasscock, and 41-A sands in West Ranch field illustrates the variability of barrier reservoirs. Each reservoir is a mosaic of variably interconnected compartments having sheet, tab, pod, or channel geometries. Conventional facies analysis (isolith and log-pattern mapping and limited core examination) combined with semiquantitative delineation of hydrocarbon-saturation distribution using resistivity logs defined the facies components of each reservoir. The 41-A sand consists of juxtaposed progradational barrier-core, inlet-fill, and flood tidal-delta units. The Glasscock sand is largely a transgressive barrier-flat and washover-fan deposit. The Greta sand is a complex of aggradational barrier-core and inlet-fill facies.

Productive attributes of each reservoir are influenced by its facies architecture and attendant relative permeabilities. Natural water drive is ineffective in the volumetrically restricted transgressive Glasscock reservoir. Permeability distribution in the 41-A reservoir is facies defined. Erratic injection response, irregular oil-water contact advance, and variable water/oil ratios observed during the productive history of individual reservoirs document localized facies effects on fluid flow. Spatial variation of the gas/oil ratio may also reflect facies distribution.

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Potassium-40/Argon-40 Age Determinations on Low-Potassium Glauconites Near Missing Cretaceous-Tertiary Transition at Littig Pit, Travis County, Texas

Potassium-40/Argon-40 dating on glauconites from Littig Pit, Travis Co., Texas, indicates that 4 to 6 Ma of lowermost Tertiary section are missing. The glauconite-containing samples were examined biostratigraphically. At least 1 calcareous nannofossil zone and at least 2 planktonic foraminiferal zones missing from the lowermost Tertiary limit the missing section to 2.5 to 5 Ma. These paleontologic data are fully consistent with the radiometric dates obtained on low potassium glauconites and refute the view of Odin that all low potassium glauconites are suspect. A missing nannofossil zone in the uppermost Cretaceous represents an undetermined amount of time.

A strong probability exists that the Midway Group at Littig Pit and elsewhere was deposited rapidly during one of the earliest Paleocene transgressions described by Vail and others, and our data support the conclusion of Berggren and Aubert that the Midway fauna are correlatable worldwide. The iridium layer of Alvarez and others is missing at the Littig