19.4 wt. % total salts for calcite-hosted inclusions and 20.0 wt. % for dolomite-hosted inclusions. Eutectic and intermediate melting data indicate that NaCl and $CaCl_2$ are the principal brine components. The significantly higher mean homogenization temperature for dolomite-hosted inclusions suggests that the dolomitizing fluids were warmer than the fluids from which calcite cement precipitated. Petrographic relationships shown dolomitization preceded calcite cementation. The presence of high-temperature, high-salinity fluids conflicts with previously proposed low-temperature, freshwater diagenetic conditions. The shallow (< 1,500 ft, 450 m) burial history of the Burlington sediments is incompatible with the generation of elevated temperature and salinity fluids intraformationally, and suggests a more deeply buried source, such as the Illinois basin. Cathodoluminescent cement stratigraphy and fluid temperatures indicate that the diagenetic history of the Burlington Limestone was complex, with several generations of hydrothermal brine migration into the porous Burlington carbonates along the northwestern edge of the basin. Two basinal brine expulsion models can account for the temperature variations seen during diagenesis, either an episodic, compaction-driven flow system or a gravity-driven ground-water flow system.

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Mechanical Compaction and Porosity Reduction of Miocene Sandstones, South Louisiana

Porosity reduction of 3 compositionally mature Miocene sandstones from Louisiana was determined petrographically. These sandstones were the S Sand at Weeks Island field, R_Z Sand at East Bayou Postillion field, and Planulina 6 Sand at Jeanerette field. The S Sand attained a maximum burial depth of 15,800 ft (4,800 m), the R_Z Sand 15,700 ft (4,800 m), and the Planulina 6 Sand 14,710 ft (4,485 m), all prior to structural uplift.

Porosity reduction caused by mechanical compaction ($\Delta\phi$) was determined by: $\Delta\phi = 40 - (C + \phi)$, where 40 is porosity prior to mechanical compaction, C is cement (petrographically determined), and ϕ is porosity (petrographically determined), all in volume percent. The term $(C + \phi)$ is the porosity remaining after reduction caused solely by mechanical compaction. The S Sand (with the greatest maximum burial depth) has an average $\Delta\phi$ of 11.5%, the R_Z Sand 16.0%, and the Planulina 6 Sand 17.5%. The difference in $\Delta\phi$ between these sandstones is due to differences in the depths at which calcite cementation began to hinder compaction.

By comparing the term $(C + \phi)$ of each sandstone to the porosity expected from the Atwater and Miller porosity reduction rate, it appears compaction-arresting cementation occurred at approximately 9,000 ft (2,750 m) in the S Sand, 12,500 ft (3,800 m) in the R_Z Sand, and 14,000 ft (4,270 m) in the Planulina 6 Sand. At greater depths, this calcite cement dissolved, resulting in secondary porosities up to 35 vol. %. Therefore, many deep hydrocarbon reservoirs may exist in the Gulf Coast with porosities greater than expected.

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Porosity Development and Dedolomitization in Bass Islands Dolomite of Kentucky

A 33-m (108-ft) core of the Upper Silurian Bass Islands formation from a well in Johnson County, Kentucky, consists mainly of finely crystalline dolomite and intraclastic dolomite. These rocks reflect low-energy, hypersaline coastal environments which bordered the Cincinnati arch. Environments included the supratidal mud flat (evaporite minerals and desiccation features), intertidal flat (algal stromatolites), tidal channels (intraclasts), and beach ridges (peloids and intraclasts). The original lime sediments are believed to have been totally dolomitized penecontemporaneously with deposition.

Several shows of natural gas were reported from the formation in this well. The entire "Corniferous" group, including the Bass Islands carbonates, was treated and had an initial production of 464 MCFGD. Porosity is generally poor throughout the formation, but it is as high as 9% in some zones. Porosity occurs as micropores (50μ) associated with dedolomitization, and mesopores (up to 5mm) interpreted to be solution-enlarged molds of carbonate grains and evaporite minerals, horizontal fractures along bedding planes, and incompletely filled vertical fractures.

Dedolomitization probably occurred with the development of an Early Devonian paraconformity, when the Bass Islands was buried to a depth less than 40 m (130 ft). Evaporitic sulfate minerals were attacked by anaerobic bacteria and replaced by silica in this near-surface diagenetic setting. Both reactions released calcium to the pore water. As the calcium/magnesium ratio increased, calcite began to replace dolomite. The dedolomitized calcite generally has a poikilotopic texture but also has a porphyrotopic texture. At some later time, outside pore water entering through fractures in the carbonate formation partially leached some of the dedolomitized calcite, thus creating most of the porosity preserved in the Bass Islands.

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Validity of Spontaneous-Potential Curve Shape for Interpretation of Sandstone Depositional Environments

Many explorationists employ the spontaneous-potential (SP) curve shape as an aid in interpretation of sandstone depositional environments and prediction of subsurface sand-body occurrence. The bell, cylinder, and funnel-shaped SP profiles are among the most widely used. The basic assumption of users of these curve shapes is that decreasing deflection of the SP curve from the baseline is due to decreasing quartz grain size and/or increasing clay content in a reservoir sandstone. However, theoretical, experimental, and actual field data indicate that quartz grain size bears no relation to the amount of SP deflection. Clay content does show a relation, but is often overshadowed by a number of variables which affect SP.

Hydrocarbons can also influence SP, often yielding a false bell profile. In addition, borehole or formation-pressure differentials, variations in mud-filtrate resistivity, and regional differences in formation-water salinity can greatly alter the SP curve shape. Bed thickness, especially when less than 3 ft (1 m), also exerts some control over the SP response.

Field examples in which these factors influence SP in Gulf Coast sandstones demonstrate that the SP curve shape is often misleading. Paleoenvironmental reconstructions and predictions of subsurface sand-body occurrence based on such shapes would therefore be in error.

Curve shapes derived from the micro-resistivity tool (expanded dipmeter curve) are suggested as alternatives to SP curve shapes. Unlike the SP, the micro-resistivity tool is immune to the effects of hydrocarbons, variations in mud-filtrate resistivity and formation-water salinity, pressure differentials, and bed thickness.

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Relationship of Benthic Foraminiferal Biofacies to Lithofacies in Phosphatic Miocene Sediments, Mid-Atlantic Continental Shelf

Changes in benthic foraminiferal assemblages accompany changes in total sediment texture and mineralogy (primarily percent phosphatic grains) throughout the Pungo River Formation in Onslow Bay, North Carolina. Only Burdigalian (late-early Miocene) deposits have been cored in southern Onslow Bay. Basal phosphorite sands (30% phosphate) are overlain by phosphatic (8%) muds and slightly phosphatic (4%) quartz sands. Elongate buliminaceans (*Bolivina, Bulimina, Buliminella, Uvigerina*) comprise over 50% of the benthic assemblage in phosphorites. They also predominate (43%) in phosphatic muds where *Siphogenerina* and *Florilus* become conspicuous faunal elements. Diverse trochospirally coiled forms (mainly *Hanzawaia*, also *Valvulineria* and *Cibicides*) become predominant in quartz sands; buliminaceans decline to 30% of the fauna. Pungo River deposits in northern Onslow Bay are Burdigalian, Langhian (early-middle Miocene), and Serravallian (middle Miocene) in age. Burdigalian deposits are nonphosphatic, muddy quartz sands in which *Hanzawaia* predominates and buliminaceans comprise only 22% of the fauna; *Florilus* accounts for 5%. *Hanzawaia* remains the dominant genus in the slightly phosphatic (4%) quartz sands of the Langhian and the phosphatic (10%) sands of the Serravallian; buliminaceans increase to 29% of the fauna, but *Florilus* nearly disappears. Both vertically and laterally through the Miocene of Onslow Bay, nutrient-loving buliminaceans thrive where phosphate content increases. *Florilus* and *Siphogenerina* are associated with the influx of fine-grained terrigenous sediments. The *Hanzawaia*-dominated assemblage thrives in clean,