MITCHELL-TAPPING, HUGH J., Sun Exploration & Producing Co., Dallas, TX

Petrology and Depositional Environment of Sunniland Producing Fields of South Florida

Oil exploration began in Florida in 1901, but no oil was found until 1943. In November of that year, Humble Oil and Refining Co. made a discovery near Sunniland in southern Florida. This field and the producing zone were called Sunniland. No further discoveries were made in southern Florida until 1954 when the Forty-Mile field was discovered by Gulf Oil Co. Ten years later, in 1964, the Sunoco Felda field was discovered by Sun Oil Co., followed by West Sunoco Felda field in 1968. Since that time, nine new fields have been discovered all from the same formation although none are as large as the Sunoco fields.

The examination of numerous cores and thin sections of this formation, both from producing fields and wildcat wells, reveals a sequence of deposition in the Sunniland formation. It has been reported that tintinnids or calpionellids have been observed in the lower mud section, but investigation of many thin sections from this section revealed only ostracod particles. Above the mudstone, the section becomes increasingly plentiful in fragmented microbored rudist particles and forams such as *Orbitolina texana, Dictyoconus floridanus,* and *Coskinolina sunnilandensis.* Above this section the sequence is considered regressive and consists of pellets and forams with a few mollusk fragments. This section is interpreted as the basal unit of a grainstone bar shoal. The grainstone bar shoal is made up of reworked particles of oysters (*Texigryphea*), coated caprinid fragments, forams, and echinoid fragments. This unit was deposited initially as a tidal bar shoal and then exposed to subaerial leaching.

For some years, the rocks of the Sunniland formation have been considered reefal, but based on the results of this study, these rocks are interpreted to be a barrier tidal-shoal bar deposited well behind the main reef crest, which lies farther offshore at the edge of the Florida escarpment.

MOIOLA, R. J., and G. SHANMUGAM, Mobil Research and Development Corp., Dallas, TX

Submarine-Fan Sedimentation, Ouachita Mountains, Arkansas and Oklahoma

More than 10,000 m (32,808 ft) of interbedded sandstones and shales comprise the Upper Mississippian and Lower Pennsylvanian flysch succession (Stanley, Jackfork, Johns Valley, Atoka) in the Ouachita Mountains of Arkansas and Oklahoma. Deposited primarily by turbidity current and hemipelagic processes in bathyal and abyssal water depths, these strata formed major submarine-fan complexes that prograded in a westward direction along the axis of an elongate remnant ocean basin that was associated with the collision and suturing of the North American and African-South American plates.

A longitudinal fan system is visualized as the depositional framework for these strata, which were deposited in a setting analogous to the modern Bengal fan of the Indian Ocean. Facies analysis of the Jackfork formation indicates that inner fan deposits are present in the vicinity of Little Rock, Arkansas; middle fan channel and interchannel deposits occur at DeGray Dam and Friendship, Arkansas; and outer fan depositional-lobe deposits are present in southeastern Oklahoma.

Boulder-bearing units (olistostromes), many with exotic clasts, were shed laterally into the Ouachita basin. They occur throughout the flysch succession and in all fan environments (i.e., inner, middle, and outer). This relationship may serve as a useful criterion for recognizing analogous longitudinal fan systems in the rock record.

MOORE, CLYDE H., Louisiana State Univ., Baton Rouge, LA

Regional Patterns of Diagenesis, Porosity Evolution, and Hydrocarbon Production, Upper Smackover of Gulf Rim

The exploration fairway of the Upper Jurassic Smackover, from the Rio Grande to Florida Panhandle, consists of a rather simple carbonate-ramp depositional system characterized by thick, widespread blanket ooid sands. The ooid sand belt gives way landward to quartzose clastics and, locally, shales and evaporites. This high-energy ooid sand belt changes into dark, fine-grained limestones and shales in a short distance seaward. Early salt movement, buried basement structures, and growth faulting locally affected facies patterns within the upper Smackover. Salt anticlines, which were active during Smackover deposition and led to localization of favorable facies, are particularly important along the east Texas and south Arkansas parts of the trend. Buried basement structures, as well as salt structures, controlled detailed sedimentation patterns in the Alabama-Florida parts of the trend, whereas growth faults controlled sedimentation along a narrow belt straddling the Arkansas-Louisiana border. Initial porosities and permeabilities were generally quite high across the entire Smackover fairway prior to burial. Presently observed porosity-permeability trends were generally controlled by postdepositional processes including compaction, dissolution, cementation, and dolomitization. Regional differences in burial history across the Gulf rim, related in part to proximity to the isolated interior salt basins (Mississippi, North Louisiana, and East Texas salt basins), has resulted in striking differences in reservoir characteristics across the trend, reflecting significant regional differences in pathways of porosity evolution.

East Texas is a province dominated by dolomitized reservoirs, with production controlled by proximity to major fault trends, such as the Mexia-Talco, or to well-defined salt anticlines. Reservoir quality is tied inextricably to dolomitization. Dolomitization occurred early, associated with a regional fresh meteoric water system, hence reservoir characteristics were generally established prior to significant burial. Fracturing is a general feature of east Texas sequences, and there is evidence that fractures have acted as conduits for hydrocarbon migration. East Texas Jurassic rocks contain mainly gas. Oil migration occurred relatively early in the burial history of the sequence. Late burial diagenetic events in east Texas seem to have had little influence over ultimate porosity evolution.

Because of the depths involved, the south Texas Jurassic has not been explored to any extent and no production has been established. Recent work indicates a strong similarity to east Texas in terms of porosity evolution and general diagenetic framework, but with significant late subsurface secondary porosity development.

South Arkansas, Louisiana, and Mississippi stand out in stark contrast to the Texas parts of the trend. Reservoirs are generally limestones, with porosity either early fresh meteoric, secondary moldic, or preserved primary. The early meteoric moldic porosity occurs in a predictable trend across the updip portion of the fairway. Reservoirs with preserved primary porosity occur in a band seaward of the secondary trend, and show no evidence of freshwater influence or of early diagenetic processes other than minor marine cements. Porosity preservation in this zone was a function of grain type (ooids vs. pellets) and original sediment texture, and hence was ultimately controlled by depositional processes. In the primary porosity zone, production is, in almost all places, associated with salt-related structures, whereas in the early secondary zone, updip permeability barriers (diagenetic and stratigraphic?) as well as salt-related structures are important. Late diagenetic events that were associated with the migration of basinal derived fluids across the shelf during moderate burial, include cementation, dedolomitization, and calcite dissolution. All reservoirs in this part of the trend show ample evidence of significant porosity enhancement during this late solution phase. The limestone trend of Arkansas, Louisiana, and Mississippi is primarily an oil province with hydrocarbon migration that took place much later than migration on the west in Texas.

In Alabama and Florida, the trend is also toward dolomite reservoirs. Most dolomite, and hence porosity and permeability, formed early in association with meteoric water processes. Most large reservoirs, such as Jay, are associated with salt anticlines, with minor production from updip basement structures. This part of the trend produces mixed gas and oil. Hydrocarbon migration into reservoirs seems to have been a relatively late event.

The Jurassic upper Smackover of the Gulf rim is a simple sedimentologic system that has had a complex and variable burial history along the trend, which is distinctly reflected in major regional differences in diagenetic history, reservoir-porosity type, trap characteristics, and hydrocarbon-migration timing.

NILSSON, HAROLD D., Louisiana Tech Univ., Ruston, LA

Deep-Basin Lignite in Northwest Louisiana

Analysis of more than 2,000 electric logs has identified at least 63 sites in northwest Louisiana that have potential deep-basin (300-2,500 ft or 91-762 m) lignite deposits thicker than 5 ft (1.52 m). Locations are principally