

### Stratigraphy and Hydrocarbon Potential of Upper Jurassic Formations in Northeastern Gulf of Mexico Area

Upper Jurassic Norphlet, Smackover, and Haynesville deposition in Mississippi, Alabama, and Florida was controlled by the Mississippi Interior Salt Basin (MISB) and the Manila and Conecuh Embayments. Salt movement produced local variations in sediment distribution, and pre-Jurassic paleo-highs modified sedimentation. Norphlet lithofacies include eolian quartzose sandstone, alluvial-fluvial red-bed sandstone, alluvial conglomeratic sandstone, and bay black shale. The eolian lithofacies is best developed in the MISB area. The Conecuh Embayment and northern parts of the MISB and Manila Embayment are characterized by red-bed deposits, whereas the conglomerate lithofacies occurs in the updip parts of the study area. The shale lithofacies is present in the MISB and the Conecuh Embayment areas. In the tristate region, the Smackover Formation consists of a lower intertidal to subtidal, laminated mudstone lithofacies that overlies the Norphlet and an upper subtidal to intertidal lithofacies sequence dominated by grain-supported textures. The upper subtidal oolitic grainstone lithofacies is best developed in the MISB area. The Conecuh Embayment is characterized by subtidal peloidal packstone and intertidal laminated mudstone. Peritidal dolostone is the dominant lithology in the Manila Embayment area. The Buckner Anhydrite Member of the Haynesville Formation usually overlies the Smackover. This evaporite lithofacies is well developed in the southeastern part of the MISB, but thins eastward into the Conecuh Embayment. Upper Haynesville lithofacies change from alluvial-fluvial red bed dominated lithologies in the northern parts of the study area to supratidal-intertidal evaporite, limestone, and shale to the south. Over 100 oil and gas fields have been discovered in the tristate area with Smackover carbonate and Norphlet sandstone the primary reservoirs. Petroleum traps are combination traps involving favorable stratigraphy and salt features. Smackover algal mudstone is probably the source rock for the Jurassic oil.

MANNS, F. T., Univ. Toronto, Toronto, Ontario, Canada

### Use of Dolostone Rhythmite Stratigraphy to Interpret Origin of Cross-Cutting and Manto Breccias Hosting a Lead-Zinc Deposit at Robb Lake, Northeastern British Columbia

The Robb lake lead-zinc deposit occurs within a brecciated Silurian-Devonian dolostone succession of transgressive-progradational sabkha rhythmites. The rhythmites are characterized by light gray color, white sparry dolomite cemented bird's-eyes, dolomite pseudomorphs of gypsum, and zebroid textures, which are diagnostic evaporitic cementation structures. The rhythmites were identified by logging color and lithologic variations observed in diamond drill core. The light gray tops of rhythmites are attributed to penecontemporaneous oxidation during sabkha progradation; the darker gray bases of rhythmites are attributed to penecontemporaneous reduction during marine transgression. Recording the color variation encountered in drill cores, even of highly brecciated intervals, permits stratigraphic correlation based on key beds and rhythmites. Relative sag of groups of rhythmites from the brecciated areas demonstrates the origin of breccias by collapse. Correlation also suggests that manto-like breccias formed after gentle tilting of the host succession. Tilting probably resulted from differential consolidation of an underlying shale-carbonate facies front. The orientation of the manto-like breccias is interpreted to have been controlled by infiltration of migrating formational fluids along horizontal planes within the tilted evaporitic succession.

Well-defined rhythmites in the upper half of the succession average 2.8 m in thickness with a standard deviation of 1.8 m ( $N = 1,295$ ).

Poorly defined rhythmites in the highly brecciated lower half of the succession have an average thickness of 4.4 m with a standard deviation of 3.7 m ( $N = 791$ ) proving that even monotonously repetitive and brecciated strata can be differentiated by careful attention to thickness data.

MARION, DON, Calgary, Alberta, Canada

### Jurassic Subcrop and Its Effect on Sedimentation, West-Central Alberta

In eastern and central Alberta, topography on the Pre-Cretaceous surface reflects the presence of a northwest-trending drainage system which intermittently carved into older Paleozoic rocks from Late Mississippian until earliest Cretaceous time. Lower Cretaceous sedimentary rocks mapped across the area fill and cover the valley and ridge system. To the west, successively younger units subcrop at the Pre-Cretaceous surface. As a result, unconformity bounded Jurassic quartz sandstones are present beneath Cretaceous sandstones and, in the absence of paleontologic control (usual situation), can only be distinguished with difficulty. The tendency has been to include these sands in the Lower Cretaceous "Basal Quartz," masking the unconformity surface. Subsequent interpretation of Lower Cretaceous sedimentation patterns is seriously affected.

Mineralogically pure, fine-grained quartz sandstones of the Rock Creek Member (Middle Jurassic) in west-central Alberta are distinct from quartz sandstones of Early Cretaceous age, which have greater grain-size variation and significantly higher percentages of unweathered chert grains. The resulting Jurassic subcrop pattern reveals cuestas of resistant Rock Creek sandstone, similar to those composed of Mississippian carbonates farther east.

Erosional lows on the surface of the Rock Creek Member are commonly filled by estuarine and nearshore sediments of the Ellerslie Member, reflecting invasion of the Early Cretaceous sea into the area.

MARKERT, JOHN C., and ZUHAIR AL-SHAIEB, Oklahoma State Univ., Stillwater, OK

### Diagenesis and Evolution of Secondary Porosity, Minnelusa Formation, Powder River Basin, Wyoming

The upper member of the Minnelusa Formation in the Raven Creek and Reel oil fields of the Powder River basin consists of a sequence of interbedded sandstones, dolomites, and anhydrites of Early Permian age. This sequence represents depositional environments ranging from sabkha type to a coastal eolian dune complex. The sandstones of the Minnelusa Formation are predominantly moderate to well-sorted, fine to very fine-grained quartzarenites.

Silica overgrowth and anhydrite cement represent an early stage of diagenesis. Dissolution of anhydrite cement was the major process in the development of secondary porosity in the Minnelusa reservoir. Pore-filling dolomite and dolomite replacing anhydrite are late stage diagenetic products. The euhedral dolomite rhombs are ferroan in composition. Authigenic illite-smectite mixed-layered clays are formed contemporaneously with the diagenetic dolomite. Dissolution of anhydrites, formation of secondary porosity, and hydrocarbon accumulation may have occurred during Late Jurassic and terminated during Laramide orogeny.

An analysis of the subsurface formation waters from the Powder River basin was made using WATEQF computer programs. Results indicate that waters are supersaturated with respect to anhydrite and dolomite. The saturation indices of anhydrite and dolomite in the subsurface waters are plotted on maps. A