Stratigraphic Evolution of Upper Jurassic Strata, Northeastern Deepwater Gulf of Mexico: Preliminary Results

Travis Payeur[1], Paul Weimer[1], William Gutterman[1], Eric Zimmermann[2], and Steve Cumella[3]

[1]Energy and Minerals Applied Research Center, Department of Geological Sciences, University of Colorado, UCB 399, Boulder, Colorado 80309

[2]LLOG Exploration, 1001 Ochsner Blvd., Ste. 200, Covington, Louisiana 70433

[3]Consulting Geologist, Evergreen, Colorado

GCAGS Explore & Discover Article #00205*
http://www.gcags.org/exploreanddiscover/2017/00205_payeur_et_al.pdf
Posted October 30, 2017.

*Article based on a full paper published in the *GCAGS Transactions* (see footnote reference below), which is available as part of the entire 2017 *GCAGS Transactions* volume via the GCAGS Bookstore at the Bureau of Economic Geology (www.beg.utexas.edu) or as an individual document via AAPG Datapages, Inc. (www.datapages.com), and delivered as an oral presentation at the 67th Annual GCAGS Convention and 64th Annual GCSSEPM Meeting in San Antonio, Texas, November 1–3, 2017.

ABSTRACT

The geologic evolution of the Upper Jurassic strata of the northern deepwater Gulf of Mexico was analyzed using the logs from 25 wells, mud logs, and biostratigraphic data, and 500 km of 2D seismic data. These strata record the initial transgression in the Gulf of Mexico after final continental breakup and early ocean spreading. After deposition of the Louann salt (Callovian), the Norphlet eolian system (early Oxfordian) was deposited on the salt (thickness ranges from 300–1200 feet). These strata were then transgressed by the Smackover Formation, a shallow marine limestone comprising five distinct lithofacies (thickness ranges in feet): Red Shale (0–34), Pyritic-Dolomite (55–225), Basal Carbonate (95–275), Middle Marl (95–495), and Upper Carbonate (55–165).

The Haynesville Formation (Kimmeridgian–early Tithonian) overlies the Smackover, and consists of shallow marine marls and limestones (thickness ranges from 135 to 2550 feet). With continued water deepening, the Cotton Valley Formation was deposited, primarily as a shallow-marine shale unit but with occasional storm and thin progradational deposits (thickness ranges from 220 to 2075 feet).

Deposition of these Upper Jurassic strata was strongly affected by active salt tectonism. The Middle Ground Arch, a northeast–trending basement high, segmented the Norphlet into an eolian facies to the north, and a mixed eolian-fluvial-overbank setting to the south. During the Kimmeridgian, salt rafts developed and began to translate basinward (southwest) creating differential accommodation for the Haynesville and Cotton Valley strata, as recorded by the widely varying thickness in the wells. As a result, expulsion rollovers developed, creating basinward thickening wedges that terminate onto the decollement within the fault gaps of the rafts. Today, a series of isolated rafts area present; the traps for all four discoveries developed associated with the formation of the rafts.

Originally published as: Payeur, T., P. Weimer, W. Gutterman, E. Zimmermann, and S. Cumella, 2017, Stratigraphic evolution of Upper Jurassic strata, northeastern deepwater Gulf of Mexico: Preliminary results: Gulf Coast Association of Geological Societies Transactions, v. 67, p. 235–257.