

Depositional Systems, Lithofacies, and Lithofacies Stacking Patterns of the Jurassic Smackover Formation (Oxfordian) and Buckner Anhydrite (Kimmeridgian) in Van Zandt County, Texas: A Type-Cored Section from Northeastern Texas

Peter Schemper¹, Robert G. Loucks², and Qilong Fu²

¹ExxonMobil, ExxonMobil Houston Campus, 22777 Springwoods Village Pkwy., Spring, Texas 77389

²Bureau of Economic Geology, Jackson School of Geosciences, University of Texas at Austin, Box X, University Station, Austin, Texas 78713–8924

Abstract

The Jurassic Smackover Formation and Buckner Anhydrite compose a widespread petroleum system along the onshore northern Gulf of Mexico. This system comprises a thick sequence of carbonate and evaporite strata deposited on a gently sloping ramp in a semi-enclosed basin between North and South America. The general climate was arid, which is reflected in the lithofacies deposited. The Smackover section is generally divided into three intervals that reflect inner, middle, and outer ramps. The lower Smackover section was deposited in a deeper water (below storm-wave base) outer-ramp setting. Sedimentation was dominated by low-energy, dysoxic to anoxic mud-dominated lithofacies punctuated by gravity-flow deposits. The outer ramp is the major source rock for the Smackover reservoirs, and much of the organic matter is associated with anoxically deposited microbial mats. Middle Smackover sediments on the middle ramp were deposited under oxic conditions varying from below- to above-storm-wave base. Living conditions of biota improved relative to the outer-ramp setting, as evidenced by extensive bioturbation. Upper Smackover sedimentation in the inner ramp produced a mosaic of lithofacies deposition under oxic, low- to high-energy conditions. The Buckner Anhydrite is separated from the Smackover Formation by an unconformity and is dominated by evaporite deposition in various settings ranging from salina to sabkha, with influences from eolian and wadi depositional processes. The investigated core, Sun No.1 Travis Gas Unit in Van Zandt County, is proposed as the type-cored section of the Smackover Formation–Buckner Anhydrite in northeastern Texas. The range in lithofacies in the core covers the spectrum of types seen in the Smackover Formation–Buckner Anhydrite trend along the onshore northern rim of the Gulf of Mexico.

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