

Sequence Stratigraphy of the Smackover Formation in Northern Louisiana

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ABSTRACT

Electric logs, conventional cores, 2D and 3D seismic reflection data reveal three sequences in the Smackover Formation in northern Louisiana and adjacent areas. In ascending order these are the Smackover “C”, “B”, and “A” sequences. Characteristics of these sequences were controlled by relative sea-level change, climate, and the nature of the carbonate factory—namely the rate of inorganic carbonate production. The lowstand systems tract (LST) portion of the “C” sequence has not been recognized, but it could possibly be the Norphlet Formation. The Smackover portion of the “C” sequence was initiated by a rapid sea-level rise resulting in a very sharp lithologic contact between the Norphlet and Smackover formations. The “C” sequence lacks a distinct transgressive systems tract (TST) component, and consists primarily of beach-to-basin prograding highstand systems tract (HST) deposition on a ramp. The “C” sequence deposition was terminated by a type-1 sequence boundary characterized by caliche

and silcrete. A shelf morphology with a distinct shelf margin had developed by the end of the “C” sequence upon which the “B” sequence was deposited.

The “B” sequence consists of a LST that is composed of basinal terrigenous sediment gravity flow deposits. A rapid sea-level rise flooded the shelf area, but again no clear TST deposition occurred. The “B” sequence is composed primarily of HST shoal complexes that prograded over the shelf. A type-1 sequence boundary ended “B” sequence deposition.

The “A” sequence consists of an LST that is also composed of basinal terrigenous sediment gravity flow deposits in the basin. The “A” sequence consists of progradational shoals formed slightly basinward of the “B” sequence shelf margin. The “A” sequence sedimentation was terminated by a type-1 or type-2 sequence boundary.

The Buckner Formation is not time-equivalent to any of Smackover sequences. It is a younger unit and was deposited in a broad restricted lagoon during a sea-level rise after the Smackover deposition had ended.

