

Second-Order Accommodation Cycles and Points of “Stratigraphic Turnaround”: Implications for Carbonate Buildup Reservoirs in Mesozoic Carbonate Systems of the East Texas Salt Basin and South Texas

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Abstract

The Middle Jurassic-Lower Cretaceous stratigraphy of the onshore region of the Gulf of Mexico in Texas consists of five major second-order (approx. 15 myr duration) supersequences, defined as large regionally-correlative, retrogradational-aggradational/progradational accommodation packages. Each exhibits systematic vertical/lateral stacking patterns of subordinate third-order sequences (1-3 myr. duration) and component lateral/vertical facies and systems tracts. The 5 supersequences are: Supersequence 1 (SS1)—Upper Bathonian to Lower Kimmeridgian (158.5–144 mya), SS 2—Lower Kimmeridgian to Berriasian (144–128.5 mya), SS3—Upper Valanginian to Lower Aptian (128.5–112 mya), SS 4—Lower Aptian to Upper Albian (112–98 mya), SS 5—Upper Albian to Santonian (98–84 mya).

An analysis of Gulf of Mexico (GOM) regional Mesozoic sequence stratigraphy and paleogeography has direct application to enhancing our understanding of carbonate reservoirs within the Upper Jurassic stratigraphy of the East Texas Salt Basin (ETSB). In this system, carbonate buildup reservoir facies (pinnacle reefs, grain-support shoals, and biostromal banks) form as the terminal phase of carbonate deposition on top of regionally backstepped ramps (Upper Jurassic) and low-relief rimmed shelves (Lower Cretaceous), within the transgressive systems tract (TST) of a second-order supersequence. Near the top of the TST the retrogradational carbonates are draped in regionally widespread marine shale facies (interval of second-order maximum flooding) which provide both source and seal. The top of the CVL/Haynesville carbonate is a diachronous surface characterized by appreciable depositional topography, overlapped by marine shales along a well-documented submarine condensed section. Little evidence exists for a significant relative sea-level drop at this surface in either system. The reservoir-bearing second-order TST's are separated from second-order progradational highstand systems tract carbonates by GOM-wide second-order supersequence boundaries which mark points of accommodation minima.