Recognizing Condensed Sections and Their Significance in the Development of Reservoir-Scale Microbial Reefs in Upper Jurassic Carbonate Sequences

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Outcrop and subsurface examinations of Upper Jurassic microbialite from North America and Western Europe suggest that the formation of condensed sections during the Late Jurassic was critical to the development of reservoir-scale microbial reefs. Outcrop studies include Kimmeridgian sections in the Lusitanian and Algarve Basins in central and southern Portugal, and Oxfordian strata of the eastern Paris Basin in France. Subsurface studies focus on the Oxfordian Smackover Formation in the eastern Gulf Coast, U.S.A. Condensed sections are recognized by a number of criteria including stratigraphic geometries, iron staining, fossil-rich and glauconite-rich horizons, black to gray coloration, and pervasive cementation. These condensed sections are associated with low pelagic sedimentation rates, increased marine restriction, and elevated anoxia associated with rapid sea level rise and shutdown of the carbonate factory.

Geologic and computer modeling suggests that three local physical factors were responsible for the development of microbial reefs. These include a stable substrate, low background (pelagic) sedimentation rates, and low water energy. These factors would have been prevalent during deposition of the condensed section. Earlier examinations of Jurassic microbial buildups in North America and Western Europe have focused on local-scale controls on reef development. This research advances these earlier studies by placing the microbial reefs within a sequence stratigraphic framework, thereby integrating regional and global controls with local-scale factors.