AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

William A. Tedesco[1], R. P. Major[1] (1) The University of Mississippi, University, MS

Stratigraphic and Diagenetic Controls on Production from Smackover Formation Reservoirs, Womack Hill Field, Eastern Gulf Coastal Plain

The Upper Jurassic Smackover Formation is a major hydrocarbon-producing unit across the Eastern Gulf Coastal Plain. Smackover reservoirs in this region commonly produce from dolomitized oolitic to oncoidal shoal grainstones and packstones. An understanding of depositional and diagenetic processes that formed these rocks is necessary for effective reservoir management.

Deposition of Upper Smackover Formation carbonate sediments at Womack Hill field occurred as a series of three upward-shoaling cycles. Each cycle consists of a peloidal micrite or wackestone basal unit overlain by pelletal to oolitic wackestone and packstone. Oolitic and oncolitic grainstone caps each cycle. Within each cycle there are upward trends of more complete dolomitization and increasing porosity and permeability.

Smackover diagenesis began with early marine cementation of grains by fibrous aragonite. Partially preserved tangential fabrics in ooids suggest that these grains were originally aragonite. These unstable sediments were highly altered in the meteoric diagenetic realm creating large amounts of moldic porosity. Isopachous rim and blocky calcite cements precipitated in intergranular and moldic pores and were followed by three phases of dolomitization. The first event was a fabric selective dolomitization, most complete at cycle caps, likely caused by penecontemporaneous, downward-moving, evaporitically-concentrated marine brine. This was followed by fabric-destructive dolomitization, creating large amounts of intercrystalline porosity. The final phase occurred in the deep burial environment as precipitation of large saddle dolomite rhombs in fractures. Burial effects include both physical and chemical compaction leading to major reductions of porosity and permeability in sediments not already dolomitized or altered to stable calcite.