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Robert W. Scott[1] (1) Precision Stratigraphy Associates, Cleveland, OK

Controls on Lower Cretaceous Sequences, Texas Gulf Coast and Arabian Gulf

Cretaceous carbonate platform systems host major hydrocarbon reservoirs and source rocks in the North American Gulf of Mexico and the Arabian Gulf. Reservoirs occur in highstand facies beneath disconformable sequence boundaries with and without karstification, as well as in transgressive facies above sequence boundaries. Some slope deposits also form significant reservoirs. Lower Cretaceous sections in Texas consist of six major depositional-seismic sequences separated by regionally extensive bounding exposure and/or drowning unconformities. These sequences correlate with sequences in the Arabian Gulf by means of biostratigraphic and geochemical criteria and may be the product of eustasy.

Numerous factors interacted to control the development of Lower Cretaceous carbonate platforms. Antecedent structures and the resulting topography defined the location of the shelf break and the subsequent thicknesses. Syndepositional tectonics and salt movement influenced the position of down-to-the-basin faults and thicknesses. The alternation of siliciclastic and carbonate input was partly controlled by climate and sea level. The various biotic assemblages were a function of the paleocommunities and paleobathymetries. The Comanchean and Arabian platforms developed mainly over continental crust so that subsidence rate was relatively constant. Successive platforms began as simple ramps that built up into shelves by carbonate aggradation and progradation.

Clues to the controls of carbonate platform sequences are in the architecture of stratal surfaces, such as regional erosional or drowning surfaces, transgressive surfaces, maximum flooding intervals, and stratal surfaces internal to sequences. On the platform transgressive and highstand systems tracts are well developed; lowstand deposits are on the slope. Sediment accumulation rates at prograding shelf margins generally were faster than in forereef basins or on platforms, where hiatuses between shoaling-up marl-limestone cycles were frequent.