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The Relationship between Sequence Stratigraphy, Depositional Systems, Salt Tectonics, and Compressional Folding in the Central US Gulf of Mexico

It is commonly accepted, but rarely demonstrated, that there should be a relationship between eustacy, the position of maximum sediment load on the slope, and phases of salt movement and gravity tectonics. This relationship is illustrated in offshore Louisiana, where seismic and well data define the structure and stratigraphy in the continental slope. Regional mapping allows us to break the stratigraphy down into its components, from the megasequence to the 5th order sequences.

The most important control is exerted by 2nd and 3rd order sequences, which occur on a million-year timeframe; salt movement and folding are too slow to be influenced by 4th-5th order cycles.

Dramatic shifts of depositional systems occur during 2nd order highstands: the center of mass of the depositional system shifts updip to the shelf/upper slope, the lower slope is abandoned, and the whole system may shift laterally by avulsion. During these highstands, structure growth outpaces sedimentation in the ultra deep water, creating significant bathymetric relief. Salt canopies have time to initiate and spread. Lateral shifting of the updip depocenter can cause a radical change in the downdip structural style.

In the succeeding 2nd order lowstand, deposition is once more focused on the lower slope. Topography developed during the highstand strongly influences lowstand sediment pathways. The influence of topography diminishes as sediment supply once more outpaces structure growth.