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Deltaic systems: perspectives on facies models and sequence stratigraphy

Deltas were among the first depositional systems built into widely utilized facies models. Elegant process-response classifications of Holocene examples as river, wave, or tide-dominated provided the building blocks for actualistic models. The advent of sequence stratigraphy has changed this simple view of deltas.

Deposition and preservation of reservoir, source, and seal facies is better viewed in the context of continual deltaic evolution, reflecting both autocyclic and allocyclic forcing factors. During falling base level, delta switching is minimal and shelf-phase deltas prograde rapidly. These deposits typically lack well-developed transgressive phases and may become progressively wave-dominated during the overall fall, as decreasing shelf-width lessens frictional attenuation of wave energy. Fluvial systems erode into and cannibalize the deltas, creating incised valleys.

At eustatic low stand, deltaic systems are fixed at the heads of the valleys, at or near the shelf margin. These shelf-margin deltas can reach significantly greater thicknesses, are greatly modified by mass movement processes, and deliver sediment to deeper water. Rising base level forces deltaic systems to retrograde, producing estuaries and backstepping shelf-phase deltas. Embayments created by transgression can enhance tidal effects, yielding tide-dominated deltas. In more fluvially dominated systems, delta switching becomes more important. Delta complexes, unique in space but not necessarily in time, may develop simultaneously in different areas of the delta plain. Transgressive deposits make up a significant portion of the stratigraphy. Understanding these phases of deltaic evolution has produced better tools for more accurately interpreting the ancient record.

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Biographical Sketch

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