

Estuaries and Incised Valleys

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Estuaries are complex depositional environments that are characterized by the following key features. Firstly, they owe their origin to fluvial processes that form a valley. Secondly, estuaries are the direct result of sea level rise, depositing estuarine sediments during the transgression and subsequent highstand. Thirdly, an important point that distinguishes estuaries is the presence of both marine and fluvial sediment sources. Fourth, as defined geologically, estuaries contain a unique combination of facies controlled by wave, tide and river processes, and can be best classified with a ternary plot of these three factors. Both wave and tide dominated estuaries accumulate sedimentary facies in a tripartite zonation resulting from the down-valley variation in river and marine processes. Wave dominated systems appear to be more common in the ancient record, but tidal features are widespread and an important estuary recognition criterion. Estuaries are particularly important in low accommodation basins such as the WCSB where they are preferentially preserved. In these settings, the initial valley locations are often controlled by underlying structure and paleotopography. Hence the resulting estuary fills may be compound, reoccupying the valley over multiple cycles. Advances in understanding estuaries and incised valleys over the past decade have emphasized the initial development of comprehensive facies models for these settings (such models were not available in the 1980's). Other advances focused on the relationship of estuaries to sequence stratigraphic concepts, the establishment of key recognition criteria such as tidal facies and estuarine ichnology, and the detailed and complex 3-D nature of the estuarine valley fill.