Sediment Dispersal Across Late Cretaceous Shelf, Western Interior Seaway, Northern Utah and Colorado, USA

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Two large (200-300 km), near-continuous outcrop transects and extensive well-log data (c. 2800 wells) allow quantitative analysis of sediment dispersal and associated high-resolution (c. 0.1-0.5 Ma) stratigraphic architecture across a large area (c. 60,000 km^2) of the latest-Santonian-to-middle-Campanian coastal plain, shoreline and offshore shelf environments along the western margin of the Western Interior Seaway in northeastern Utah and northwestern Colorado, USA.

In the lower part of the studied interval, sediment was dispersed via wave-dominated deltaic systems with a “compound clinoform” geomorphology in which an inner, wave-dominated shoreface clinofom was separated by a muddy subaqueous topset from an outer clinofom containing sand-poor, gravity-flow deposits. These strata are characterised by relatively steep, net-regressive shoreline trajectories (>0.1°) with concave-landward geometries, narrow nearshore belts of storm-reworked sandstones (2-22 km), wide offshore mudstone belts (>250 km), and relatively high sediment accumulation rates (c. 0.27 mm/yr).

The middle and upper parts of the studied interval also contain wave-dominated shorefaces, but coeval offshore mudstones enclose abundant “isolated” tide-influenced sandstones that were transported sub-parallel to the regional paleoshoreline by basinal hydrodynamic (tidal?) circulation. These strata are characterised by relatively shallow, net-regressive shoreline trajectories (<0.1°) with straight to concave-seaward geometries, wide nearshore belts of storm-reworked sandstones (19-70 km), offshore mudstone belts of variable width (130 to >190 km), and relatively low sediment accumulation rates (c. ≤0.11 mm/yr).

The change in shelfal sediment dispersal and stratigraphic architecture, from (1) “compound clinoform” deltas characterised by across-shelf sediment transport to (2) wave-dominated shorelines with “isolated” tide-influenced sandbodies characterised by along-shelf sediment transport, is interpreted to reflect increased interaction with the hydrodynamic regime in the seaway as successive shelfal depositional systems advanced out of a sheltered embayment (“Utah Bight”). This advance was driven by decreasing tectonic subsidence rate, which also suppressed autogenic controls on stratigraphic architecture.