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Spatial Variation of Fluvial-Estuarine Style within The Sheet Sandstone of The Lower Castlegate Sandstone (Upper Cretaceous) in The Book Cliffs Area, Utah, USA

The Lower Castlegate Sandstone (Upper Cretaceous) in the Book Cliffs area, Utah, has been traditionally interpreted as a single lowstand braided-fluvial deposit within a regional third-order stratigraphic sequence. However, our detailed study, which adapts the architectural element analysis methodology, has revealed that it comprises at least four higher-frequency stratigraphic sequences separated by three angular sequence boundaries. Two of them, the Castlegate sequence boundary (CSB) and the lowest Se-go sequence boundary (LSSB), are regionally traceable between marine and non-marine facies belts and record regional, third-order tectonic events.

The facies architecture and fluvial-estuarine styles change rapidly across these sequence boundaries. In the Green River area, the CSB overlies large compound cross-beds filling a series of NW-SE trending, narrow and deep incised valleys cut into the underlying shallow marine Desert Member. These cross-beds are interpreted as side bars and/or mid-channel bars confined within the narrow, upper part of an estuary morphologically comparable to modern 'river-dominated' estuaries. The CSB here is overlain by braided-fluvial facies which grades upward to wave-dominated estuary deposits with increasing channel sinuosity, tidal indicators and mud/silt content. In the Little Park Wash area, some 15 miles up-dip, the LSSB truncates the braided fluvial facies below and is overlain by tidal sandbars correlatable down-dip to the tidal-estuarine Se-go Sandstone SE of the Green River area. This bar facies grades updip into tidally-influenced fluvial to estuarine point-bar deposits with high channel sinuosity. The amalgamation of these four high-frequency sequences into a single lithostratigraphic unit is attributed to the low regional subsidence rate.