Sheet-Like Fluvial Architecture on Regional Scales from the Cretaceous Western Interior Seaway of North America: The Case for Allogenic Control

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Extant sequence stratigraphic models for lowland/coastal plain fluvial successions emphasize vertical changes in stratal stacking patterns through a cycle of relative sea-level change. A common element to most models is a basal sequence boundary that has significant erosional relief and incised valleys. Not all lowland fluvial successions conform to this pattern, however, with many showing sequence boundaries of more planar cross-sectional geometry (ie., lacking significant valleys). Here, we draw attention to this under-appreciated stacking pattern by documenting the stratal architecture of three Upper Cretaceous formations, broadly of coastal plain origin, from the Henry Mountains of south-central Utah, USA. The upper part of the Ferron Sandstone comprises a series of distributary channel sandstones and coastal floodbasin deposits. The channel bodies appear to be amalgamated laterally to form single- to locally multi-storey channel complexes of 10's of km extent in a depositional strike orientation. Lateral extent of these composite bodies is at least an order of magnitude greater than the channel belt width predicted from paleohydraulic calculations or channel form dimensions. Accordingly, the stack of sheet-like channel complexes, separated by equally laterally extensive floodbasin intervals, may be interpreted as a series of sequences, forced by relative sea-level fluctuation. The overlying Muley Canyon Sandstone contains two intervals of tidally-influenced fluvial deposits enclosed by shoreface sandstones. Again, these intervals are of regional extent (>20 km) and sheet-like, with modest erosional relief (<10 m) on basal sequence boundaries. The most spectacular example of the sheet-like fluvial stacking pattern occurs in the overlying Masuk Formation, where several cycles of fluvial channel bodies and intervening coastal floodplain facies can be traced over >10 km as continuous sheets, again strongly suggesting an external forcing control on their cross-sectional geometry. The common factors among these three formations are the prevalence of a sheet-like architecture to fluvial units, and their enclosing stratal intervals, the condensed and incomplete nature of sequences, and the lack of significant incisional relief at the base of sequences. These patterns suggest that fluvial channel complexes apparently lacking incised valley fills may in some cases nonetheless be records of external forcing and may be of great lateral extent.