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Formation of Deep Incisions into Tidal Deltas of the Segó Sandstone, Book Cliffs, Utah, USA

Standard sequence stratigraphic models show a single valley cut during each episode of sea level fall. In the Segó Sandstone 10-20m thick sandstone layers (interpreted to be deposits of individual prograding tide-dominated river deltas) are cut by multiple deep incisions spaced only a few km apart along strike. Erosion surfaces bounding these incisions and abrupt vertical facies changes marking the base of tidal sandstone layers have been related to high-frequency changes in sea level or tectonic movement of the basin floor, which caused valleys to be cut and filled. Formation of multiple deep incisions into individual deltas by (1) down cutting of multiple distributaries during relative sea level fall, (2) switching of delta-front incised valleys above a knickpoint, (3) tidal enlargement of abandoned distributaries during delta progradation and flooding are discussed. These hypotheses lead to different predictions for relationships between depths of delta front erosion, landward extent of erosion surfaces, the variable character of different incised fills, and the volume of sediment bypassed to more basinward areas. Different explanations for these erosion surfaces has led to contrasting interpretations of large-scale depositional patterns within this foreland basin; with the Segó Sandstone assumed to be deposited either during initial transgression of a major sequence boundary or during initial stages of regression following maximum basin flooding. Resolving this controversy depends critically on differentiating erosion surfaces and abrupt facies transitions that reflect regional relative sea level changes from those formed by more local changes in depositional processes within the basin.