

Tectonic Controls On Cenomanian And Turonian Deltaic Successions In The Western Cordilleran Foreland Basin Of Wyoming And Utah, USA

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ABSTRACT

The geometry, orientation, and spatial distribution of coastal to shallow marine sandstone bodies in the Cenomanian/Turonian succession of Utah and Wyoming has proved difficult to rationalize, with numerous plausible explanations proposed. This paper integrates results from recent studies of several such stratigraphic units, notably the Frontier Formation of the northern Bighorn Basin, the Frontier Formation of the Uinta Mountains region, and the Ferron Sandstone of the Henry Mountains. These successions preserve diverse evidence for tectonic controls on sediment dispersal and stratal stacking patterns. All examined delta complexes show fluvially-dominated to fluvially- and wave-influenced characteristics, in contrast with the more wave-dominated deltas of the later, Santonian to Campanian succession (e.g., Emery Sandstone, Blackhawk Formation). Most show evidence of planform asymmetry, driven by southward deflection of delta lobes and to a lesser extent by southward longshore drift currents. All show evidence of diversion around subsurface growth structures, particularly but not exclusively related to the growth and migration of the forebulge. The locations of Frontier deltas in the Vernal area of northern Utah were also influenced by early growth of the east-west-trending Uinta Mountains. Elsewhere, clear stratigraphic evidence is preserved of early growth on other "Laramide" structures such as the Sheep Mountain Anticline in the Bighorn Basin and the Moxa Arch in the Green River Basin. All of the documented successions show preferential preservation of falling stage and lowstand sandstone bodies, some of which were further modified during transgressions to form enigmatic, isolated sandstone bodies. Offlapping and downlapping stratal stacking patterns, together with descending regressive shoreline trajectories, demonstrate the importance of falling stage deposits in units such as the Ferron Sandstone of the Henry Mountains. The growth of anticlines, particularly those related to forebulge dynamics, created topographic barriers to sediment dispersal. This is invoked as a major control on the process balance in Cenomanian/Turonian deltas (fluvial dominance due to limited wave fetch), delta planform, and delta lobe deflection. Differential structural growth, moreover, led to situations wherein accommodation varied both temporally and spatially, leading to complex sediment distribution patterns.