

Wave-to-Tide Process Change in a Campanian Shoreline Complex, Chimney Rock Tongue, Wyoming/Utah

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The Campanian Chimney Rock tongue is exposed on a 20 km long, dip-direction oriented steep mountainside on the Wyoming/Utah border in Minnies Gap area. The Chimney Rock has three distinct stratigraphic intervals: (1) steep prograding clinorms of a wave-dominated delta, (2) fluvial to wave-dominated estuarine incised valley fill, and (3) a tide-dominated backstepping succession. The highstand to falling-stage deltaic clinofolds show overall wave-domination, although distributary channels cut into the tops of the individual clinofolds expose significant tidal influence. The distinction between the highstand and falling-stage clinofolds is seen by the flattening of the shoreline trajectory.

The tops of the youngest deltaic clinofolds are severely eroded. This erosion surface is in many places marked by ubiquitous roots (locally calcite filled), calcite concretions, limonite precipitation, and mottling, and is covered by fluvial deposits. The fluvial deposits are overlain by a landward-stepping wave-dominated estuarine succession, up to 38 m thick, that consists of fluvial and tide-influenced fluvial channels in the landwards end, bayhead deltas, central basin mudstones, flood tidal deltas, and estuary-mouth barriers, in the seawards end. This lowstand to transgressive incised-valley fill is succeeded by a landward-stepping, up to 45 m thick succession of estuarine tide-dominated channels and bars, interbedded by occasional river-derived sandstones. The transgressive tidal succession is overlain by marine shales.

Interestingly, the wave-to-tide process change occurs during the transgression, rather than at the regressive-transgressive turnaround. Increased tectonic confinement, depth of the valley incision (85 instead of 38 m), or increased tidal range in the Cretaceous Seaway are possible causes of the process change.