Deepwater Sedimentation from Hyperpycnal Flows of Shelf-Margin Deltas in an Active Tectonic Setting: Upper Cretaceous Prairie Canyon Member (Mancos B) of Mancos Shale, Eastern Utah and Western Colorado

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ABSTRACT:

The Cretaceous (Campanian) Prairie Canyon Member (PCM) of the Mancos Shale is interpreted as deepwater hyperpycnites derived from shelf-margin deltas during thrusting events in the foreland basin. Deepwater channel, overbank and lobe sedimentary bodies form basinward-thickening, sand-poor lowstand wedges located downdip of sand-rich, storm-dominated deltas of the Blackhawk Formation in eastern Utah and western Colorado. Sediment transport through a distributary network of submarine scours and channels, which decrease in size but increase in number basinward, generated fan-shaped sediment thicks. Though this deposit type occurs throughout the Western Interior Cretaceous Seaway, its sedimentology and stratigraphy is poorly understood; in the case of the PCM, it has been variously interpreted as forced regressive shoreface, shelf, or turbidite deposits.

Evidence for PCM deposits recording deposition from hyperpycnal flows includes: (1) waxing-waning succession of unidirectional current-generated sedimentary structures dominated by thin-bedded ripples; (2) down-profile bed thickening and changes in the proportion of waxing-waning parts and erosional surfaces within event beds; (3) four different hyperpycnites demonstrate a repetitive process explained by variable magnitude floods; (4) low diversity, ichnofacies assemblages dominated by sandstone bed-top traces; (5) basinward thickening and fan shaped sedimentation patterns; and, (6) suppressed longitudinal flow transformation reflecting the longer duration and accelerative nature of flood-stage flows, which sustains the supply of sediment to a distal gravity flow, normally depleted of sediment during transport. Hyperpycnal flow durations mimic fluvial flood events. It is well known that floods generate the most terrestrial channel migration, which may explain the high sinuosity and bar translation observed in these sinuous submarine channels.

Conspicuous thickness variations across the Salt Valley Anticline suggest flood-generated, hyperpycnal flow deposition was influenced by salt movement in the northern Paradox Basin. This study also sheds insight into delta-derived gravity flow processes, the sedimentology of hyperpycnal flows, the

architecture of sinuous submarine channels, the role of subtle salt movement and partial ponding of deepwater strata, and sediment gravity flow systems in foreland basins.