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High Resolution Sequence Stratigraphy and Organic Geochemistry Study of the Raven Ridge Lacustrine Eocene Series (Uinta Basin, Colorado, USA) : Implications on Organic Matter Accumulation

The Uinta basin is an asymmetric Laramide structural and sedimentary basin in eastern Utah and northwestern Colorado. We extensively studied the Raven Ridge area near Rangely (Co), where a series of Green River (Eocene) cuestas crop out on the northeast edge of the basin. The Raven Ridge (19 miles extension), exhibits rapid proximal to distal facies change from North to South. Isolated fluvial channels and braidplain sand sheets feed fan deltas and high-gradient, storm-dominated lacustrine shorefaces. The siliclastic shorefaces interfinger with offshore carbonate shoals and open lacustrine mudstones and carbonated oil shales. We focus here our attention to the vertical and lateral transitions from fine grain shaly organic matter bearing facies to the coarser higher energy proximal facies.

At Raven Ridge, field observations and laboratory studies indicate an initial stage of terrigenous organic matter inputs with recurrent sub-metric cycles indicating shallow water marshy conditions. Preservation of the organic matter is obviously in balance partly with the rate of dilution by terrestrial mineral particles, but more evidently by predation from contemporaneous gastropods and pelecypods. Basinward, only geochemical techniques (Rock Eval screening at very least) are able to pinpoint such facies change. Moving landward, few inch thick stromatolitic concretions are found at the transition. The episodic stromatolitic bodies become more continuous and grade to carbonate .

Higher in the Raven Ridge series, the depositional environment turns more chemically driven. The obvious broadening and deepening of the lake at Raven Ridge make a more profitable balance for intense primary production and subsequent preservation. Predation from lake bottom animals seems minimal. Dilution by minerals is also negligible. The huge amount of accumulated organic matter suggests also a water dissolved nutrient rich system (enriched by evaporation, or by other processes?).

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