

New Correlation from SW Colorado Outcrop to Eastern Paradox Basin Based on Outcrop Gamma Ray and Conodont Biostratigraphy*

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Abstract

Outcrop gamma ray, combined with biostratigraphic control from conodonts and fusulinids, enable the first (moderately) well constrained correlation from the Hermosa Cliffs, on the active SE margin, into the subsurface of the Paradox Basin.

The Hermosa Cliffs, north of Durango, Colorado, expose a 15 km-long, dip-oblique section of the Pennsylvanian (Desmoinesian) Hermosa Group that was subdivided into nineteen unconformity-bounded sequences (Gianniny and Miskell-Gerhardt, 2007). This framework has been extended another 7 km south after re-measuring the classic Hermosa Mountain section and compiling outcrop gamma ray data. The southern area exposes upper paleo-slope deposits, illuminating the bedding relationship between more basinally restricted sediments from sea-level lowstands, and shelf sediments deposited during transgressions to highstands.

Within this succession, the boundary between shelf and basin evolves from a shelf- break margin to a ramp margin over time as progradational sequence sets progressively fill in accommodation space. Relative sea level dropped below the shelf edge during sequences 11, 13, and 15 forming onlapping wedges in the study area. These tongues are interpreted to correlate, respectively, to the uppermost, widespread tongue of Akah Evaporite (Hite cycle 6), the entire Desert Creek (Hite cycles 5 & 4) and the base of the Hovenweep Shale (Hite cycle 2).

In sequences 10-12, transgressive to highstand fluvio-deltaics and carbonate biostromes on the shelf are interpreted to represent facies-change basinward to thin, distal marine shales in the upper Akah and Chimney Rock Shale. Strongly progradational sequence sets 13 and 14

fill in most of the accommodation space on the shelf, and push deltaic sedimentation much closer to the basin. Calcareous, pro-deltaic shales at Hermosa Mountain are interpreted to correlate to the subsurface Gothic Shale. The carbonate biostrome capping this sequence extends beyond the former shelf-slope boundary, becoming the widespread Lower Ismay limestone. The following marine lowstand of sequence 15, onlapping shallow-marine clastics, transitions basinward to marine parasequences in logs. This interval is overlain by late transgressive to highstand calcareous, marine shales. This entire package is interpreted to be the Hovenweep Shale. The sequence 15 highstand carbonate biostrome is again very widespread and is interpreted as the Upper Ismay Limestone.

Younger deposition on the shelf is dominated updip by paleosols and fluvial deposits transitioning downdip to shallow tidal flats, tidal deltas, and silty lagoonal carbonates. These facies correlate in part to the shaly breaks and mixed lithologies of the subsurface interval from the top of the Upper Ismay into the Honaker Trail.

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