

Variability of Thin Grainstone Units in the Trenton and Black River (Ordovician) of the Michigan Basin and the Significance to High Resolution Cycle Stratigraphy and Reservoir Characterization

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Thin packstone to grainstone beds, intercalated with open shelf deposits, have been identified in the Trenton and Black River Groups of Michigan and Indiana. The origin of these centimeter to decimeter thick grainy beds has been previously described by most workers as either being storm deposits (tempestites), with normal marine skeletal debris shed from shallower water, or representing localized shoal deposits. Since the majority of both Trenton and Black River facies consist of deeper subtidal, bioturbated wackestones and packstones deposited on an open shelf or ramp, an interpretation of these grainy units as shallow marine shoal deposits would have significant value in the development of a high resolution cycle stratigraphic framework for these units.

The packstone and grainstones occur in thin beds, ranging from a few to several centimeters in thickness. Compositionally these beds contain a normal marine fauna consisting primarily of trilobites, brachiopods, and crinoids. These skeletal beds are intercalated with muddier deposits within the Trenton Black River which have previously been interpreted as open marine, deeper shelf or ramp. Initial evaluation indicates that there is a distinct textural variation within the skeletal beds ranging from pure skeletal grainstones to mud-rich packstones, with at least some of the grainstones exhibiting evidence of flooding surfaces or transgressive lags along the upper boundaries. Our preliminary hypothesis is that these grainstones represent shoal deposition while the muddier packstones were likely deposited as storm deposits. As such, the grainstones would provide good cycle cap markers for cyclostratigraphic correlation while developing a reservoir model. These thin beds are readily identifiable on image logs, and could provide a means for cycle stratigraphy within the Trenton and Black River Groups without relying on core data.