Recognition of Bounding Surfaces: An Example from the Lower Cretaceous, Upper Mannville Group (Sparky, Waseca, and McLaren Formations), West-Central Saskatchewan

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Abstract

The Lower Cretaceous Upper Mannville Group (Sparky, Waseca, and McLaren formations) of the Lloydminster area of west-central Saskatchewan comprises an interval up to 60 m thick, consisting of weakly consolidated sandstones, shales, heterolithic bedsets, and minor coals, which were deposited in shallow-marine to coastal plain/delta plain environments. Despite the abundance of core and well logs and its importance as a heavy oil producing area, a sequence stratigraphic framework for these Upper Mannville units has not been constructed. The majority of previous interpretations have relied largely on lithofacies analysis and well-logs characteristics. The deposits, however, exhibit marked vertical and spatial variability owing to several autogenic and allogenic processes, which has led to a complex stratigraphic architecture. The integration of ichnological data with physical sedimentological data leads to a better understanding of the depositional framework and can be used to discriminate the different coastal margin subenvironments. The data can also be employed effectively to aid in the recognition of subtle changes in base level, changes in the degree of marine influence, identification of various discontinuities, and to assist in their genetic interpretations. Stratigraphic surfaces associated with base-level rise include marine flooding surfaces (MFS), transgressive surfaces of erosion (TSE), maximum flooding surfaces (MxFS), and flooding surfaces (FS). Surfaces related to base-level fall correspond to both subaerial unconformity (SU) and regressive surface of marine erosion (RSME). In some locations, surfaces associated with base level rise are amalgamated with surfaces generated by relative base level fall (FS/SU). Each surface type possesses discernible sedimentologic and ichnologic characteristics.