Mudstone Facies of the Channel-Dominated Coastal Plain to Estuarine Transition in the Campanian Dinosaur Park Formation, Alberta, Canada

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Abstract

Mudstone facies of the Dinosaur Park Formation were characterized and distinguished in the field and laboratory to help determine their significance as they relate to the flooding events of the last major transgression of the Western Interior Seaway at ~75 million years ago. The Campanian Dinosaur Park Formation (76-75 Ma) is well exposed in Dinosaur Provincial Park in southern Alberta, and represents a transition from coastal plain to estuarine (Dinosaur Park Formation) to marine environments (Bearpaw Formation). The mudstones were categorized according to their visual characteristics (colour, type and orientation of organics present, size of organics, percentage of organics, and any structures present), and measured total organic content (T.O.C.). Six distinct facies are represented, and are interpreted as: (1) lacustrine or estuarine bays; (2) mud-filled incised channels or abandoned channels; (3) swamps; (4) overbank paleosols; (5) point bars; (6) and marine muds. Bentonite is also common throughout the Dinosaur Park Formation. The geometry of these mudstone facies and their lateral and vertical relationships will be determined in the field to improve interpretations of the depositional environments represented, as well as the stratigraphic significance of the different facies.

Mudstones interpreted as lacustrine and estuarine bay deposits are dominantly organic-rich, darker in colour, are laminated, and preserve transported organics. Those from mud-filled incised channels comprise fine-grained silt and clays, have transported organics as well as in situ roots, and are characterized by their conchoidal fractures. Mud-filled incised channels have incised lower contacts, and lenticular geometry in the field. Swamp deposits consist of coaly muds, with abundant organics and no distinguishable roots. Paleosols, developed on overbank deposits, are massive and blocky with in situ roots. Point bar deposits are heterolithic, alternating between muds and very fine-grained sandstones with roots and small plant fragments on bedding planes. The marine muds are dark grey in color, with no preserved roots.

These analyses will help to determine if the Dinosaur Park Formation represents a freshwater coastal plain throughout the succession, or if there are also estuarine deposits distributed throughout the formation that can be mapped as flooding surfaces. If recognized, these surfaces can then be used for the stratigraphic prediction of overlying amalgamated channel sandstones that contain resources (gas) in the subsurface. Future research will be focused on mapping these mudstones facies in the field.

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