

The Nordegg Member Exposed

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Although fine-grained sediments constitute the majority of the Western Canada Sedimentary Basin rock column, details of their sedimentology, internal stratigraphy and depositional environments are poorly known. One reason for their neglect is the misconception that shale packages are generally uniform, deep-water sediments with few sedimentary structures, and hence little useful information can be gained from their study. However, the fine-grained Lower Jurassic Nordegg Member contains significant facies variations and provides valuable information pertaining to basin paleogeography and tectonic setting.

Subsurface Nordegg Member cores contain a variety of sedimentary features such as normally graded beds, phosphatic peloid sandstones, conglomerates, polygonal shrinkage cracks, ripple and bi-directional ripple cross-stratification, wavy, parallel, flaser and lenticular bedding and minor trace fossils.

The most unexpected elements observed within “deep-water” Nordegg Member drill-core are paleosols. These are interpreted on the basis of pedogenic features such as drab colours, branching roots, root fill, degraded cutans of translocated clays as well as irregular calcite crystals with abundant inclusions.

The presence of Nordegg exposure surfaces challenges current interpretations of Lower Jurassic stratigraphy, paleogeography and tectonism of the Western Canadian Sedimentary Basin. Water depths must have been shallow enough for exposure to result from minor and/or short-term relative sea-level fluctuations. Some of the observed paleosols occur in Lower Toarcian strata. The Early Toarcian was generally a time of global transgression. Thus, exposure of Toarcian Nordegg strata was probably due to local tectonic processes. One likely process is forebulge migration associated with Cordilleran tectonics and the docking of allochthonous terranes.