

# **Paleosols in the Mississippian of Western Canada: Morphology, Genesis and Reservoir Implications**

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Although paleosols in Mississippian carbonate sequences in western Canada have been mentioned by various workers, in general they are poorly documented and their stratigraphic and reservoir implications overlooked. Recognition of diagnostic paleosol fabrics is difficult and may require detailed core examination and petrography. Calcrete crusts, glaebules, circumgranular cracks, alveolar septal fabric, rhizcretions, meniscus micrite cements, microbial micritic crusts, pisoids, and gravitational cements are typical fabrics found within Mississippian paleosols. They suggest an arid climate.

Paleosols are associated with reservoir sequences in the Mississippian Mount Head and Shunda Formations and have significant implications for stratigraphy, diagenesis and porosity development. Paleosols are unequivocal indicators of subaerial exposure and indicate lowstand conditions. They may be associated with a contemporaneous low stand wedge of reservoir-quality sediments in distal settings dominated by basinal non-reservoir sequences.

In this arid setting, early diagenetic fabrics are characterised by extensive laminar caliche crusts and only minor early cementation. Primary intergranular porosity dominates and reservoirs may be horizontally compartmentalized. Caves, sinkholes and fissures are rare and vuggy, channel and cavernous porosity is absent. Reflux dolomitization may occur if there are associated hypersaline brines. Secondary intercrystalline porosity may develop in the dolomite. Additionally, during lowstand conditions, mixing water dolomitization may occur.

Paleosols and related subaerial features represent definitive stratigraphic horizons that can be used to constrain and refine stratigraphic correlations, leading to a better definition of exploration play trends. Paleosols and associated reservoirs are characterised by distinctive diagenetic fabrics and a predictable porosity system, that may be enhanced by early dolomitization.