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# Dolomitization of Ordovician epeiric carbonate rocks, northern Williston Basin, Southeastern Saskatchewan, Canada

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The Red River carbonate rocks in the northern Williston Basin of southeastern Saskatchewan were deposited in an abroad epeiric sea during Late Ordovician time. Three types of dolomite were identified in these rocks: (1) dolomitized burrow mottling which is distinctive and widespread in the entire formation; (2) dolomitized host matrix that occurs preferentially in the upper 50 m of the formation; and (3) minor saddle dolomite cement in vugs and fractures. The Red River forms important hydrocarbon reservoirs and production is primarily from dolostone, indicating that dolomitization has played a major role in forming reservoir quality porosity.

The preferential dolomitization of burrow mottling and its widespread occurrence suggest that burrow mottling was likely dolomitized contemporaneously in a normal-marine environment by seawater. The dolomitization could be related to the activities of the burrowing organisms, which created a better permeability in the burrowing network. This would have facilitated fluid flow in the burrow networks and responsible for the preferential dolomitization of burrow mottling. The dolomite in the host matrix is interpreted to have occurred during very shallow burial (ten's of meters) by evaporitic seawater during precipitation of Lake Alma anhydrite because the vertical and lateral distribution of matrix dolomite is closely related to the Lake Alma anhydrite. The trace amount of saddle dolomite cement is probably related to cannibalization of earlier replacement dolomite through chemical compaction during the deep burial, as indicated by their low oxygen isotopic values and high homogenization temperatures of fluid inclusions. This sequence of diagenetic processes was probably common in shallow epeiric sea successions.