

Local Paleotopographic Controls on Intertidal-Supratidal Depositional Systems in the Mississippian Midale Beds of Southeastern Saskatchewan

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ABSTRACT

Local paleotopography was an important control on the availability of accommodation space and the distribution of intertidal-supratidal facies in the Mississippian Midale Beds of southeastern Saskatchewan. Two important paleotopographic controls were 1) northeast-southwest trending paleotopographic ridges and 2) the distribution of earlier deposited shoals in the underlying Frobisher Beds.

Linear paleotopographic ridges are probably related to reactivation along basement faults, because they are observed as repetitive features on structure maps of various Mississippian strata. Barrier-beach deposits in the lower Midale are often coincident with linear ridges (e.g., western margins of the Benson and Steelman fields) indicating control during Midale times. Abrupt facies changes are associated with the ridges, suggesting local changes in depositional dip and available accommodation space.

Lower Midale barrier-beach complexes are largely confined to the seaward flanks of underlying Frobisher shoals. The barrier-beach depositional system could not develop further landward due to a lack of accommodation space in areas overlying the crests of Frobisher shoals.

The distribution of the barrier-beach facies is important for several reasons. Firstly, the barriers controlled the distribution of landward depositional systems (e.g., back-barrier, lagoon, and supratidal). Secondly, barrier growth occurred aggradationally, and landward, muddier lagoonal sediments underwent higher rates of compaction. As a result, accommodation space was gradually created on the landward side of the barriers and affected the distribution and thickness of later subtidal facies of the upper Midale. Lastly, diagenetic processes such as dolomitization and anhydrite plugging were facies selective and therefore petrophysical properties and reservoir heterogeneities are closely related to the distribution of the barrier-beach systems.