

Extrabasinal Tectonic and Paleo-Wind Control on Variations of Regional-Scale Carbonate Stacking Patterns in the Middle-Upper Devonian Beaverhill Lake Group in South-Central Alberta

Jack Wendte*

Geological Survey of Canada, Calgary, AB
jwendte@NRCan.gc.ca

and

Tom Uyeno

Geological Survey of Canada, Calgary, AB, Canada

Summary

Beaverhill Lake strata of late Givetian to early Frasnian age in the subsurface of south-central Alberta consist of basinal shales or limestones and shelfal carbonates, up to 240 meters thick, that were deposited in the Central Alberta Basin and on banks and isolated reefs on both sides of the basin. These strata consist of 14 Devonian third-order T-R cycles.

The interaction of base-level changes, extrabasinal tectonism and depositional controls resulted in different stacking patterns on carbonate banks. Banks on the east side of the Central Alberta Basin vary in stacking pattern, from backstepping to forestepping, and have a dominant, progradational style of growth. The areally widespread progradation of these banks was controlled by the delivery of argillaceous sediment, sourced from distant orogenic belts to the northeast, and transported in a southwesterly direction into the basin by marine currents that flowed parallel to the paleosoutheasterly trade wind belt. This argillaceous sediment sufficiently infilled portions of the east side of the basin to allow for extensive westerly, leeside bank progradation during intervals of base-level fall or slow base-level rise.

Banks on the west side of the Central Alberta Basin were far removed from the entry of clay-rich sediment. Lacking appreciable argillaceous infill in adjacent portions of the basin, these banks prograded basinward only by building out over their own bank-derived sediment. This severely limited the extent of bank progradation. As a consequence, banks on the west side of the basin display an overall retreating to backstepping style of growth.

Isolated reef growth occurred at different times on the east and west sides of the Central Alberta Basin, reflecting the difference in the prior evolution of carbonate banks.