

Shelf-Wide Tectonic And Eustatic Control On Sedimentation Of Mixed Carbonate-Clastic Sequence: Early Ordovician Theresa Formation Of Eastern Ontario, Canada

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ABSTRACT

The Early Ordovician (late Tremadoc-early Arenig) Theresa Formation is the lowest unit of the Beekmantown Group of the Ottawa Embayment. Its basin was a narrow (<200 km), elongate semi-closed seaway that opened eastward onto the epicontinental Laurentian platform. Deposition of the Theresa Formation occurred after an extensive regional exposure and development of shelf-wide exhumation of the Late Cambrian Potsdam Group sandstones. Extensive erosional boundary at the top of the Potsdam Group and Potsdam-derived grains with remnant quartz overgrowth cements within the Theresa Formation support this regional exhumation.

The Theresa Formation thickens (~15 to ~70 m) axially to the east. Three depositional units (A, B and C) comprise the formation and record a vertical peritidal-subtidal-peritidal depositional cycle. Unit A contains clastic-dominated sand shoal/flat facies and also is well represented in SW Quebec, beyond the eastern limits of the embayment. Unit B contains predominantly normal to marginal marine subtidal bioclastic dolostones that are restricted to the eastern and central parts of the embayment, as well as farther to the east in SW Quebec. Unit C contains marginal marine clastic and carbonate facies. The clastic content of Unit C decreases eastward (basinward) and intertidal to subtidal sandy to pure carbonates become predominant in the region south of Montreal. Thus, in the southeastern parts of SW Quebec, strata temporally correlative with units B and C are mapped as Ogdensburg Member of the Beauharnois Formation. The tripartite stratigraphy of the Theresa Formation recorded in the western part of the basin defines an asymmetric transgressive (longer)-regressive (shorter) cycle. Biostratigraphy shows that this cycle lies between mid-Tremadoc and early Arenig cycles (of interpreted 3rd-order eustatic origin) preserved 1500 km distant along the platform in western Newfoundland.

Post-Potsdam erosion fits an expected period of hinterland uplift during ongoing extension along the evolving Quebec re-entrant. The Theresa depositional cycle can be viewed entirely as a balance of thermal subsidence and sediment supply,

or subsidence and eustasy. A comparison with the Newfoundland record reveals, however, regional variation in sea level along the Laurentian platform that may identify differential interplay of subsidence and eustasy along continental re-entrants (Quebec Basin) versus promontories (western Newfoundland).