

The Middle Paleozoic in northern New Brunswick, Canada: stratigraphy, deformation, and the Salinic and Acadian orogenic cycles

Reginald A. Wilson¹, Cees R. van Staal², Sandra L. Kamo³, and Dawn A. Kellett⁴

1. *New Brunswick Geological Surveys Branch, P.O. Box 50, Bathurst, New Brunswick E2A 3Z1, Canada*

[<reg.wilson@gnb.ca>](mailto:reg.wilson@gnb.ca)

2. *Department of Earth and Environmental Sciences, University of Waterloo, 200 University Ave. West, Waterloo, Ontario N2L 3G1, Canada*

3. *Jack Satterly Geochronology Laboratory, University of Toronto, Toronto, Ontario M5S 3B1, Canada*

4. *Geological Survey of Canada (Atlantic), Natural Resources Canada, P.O. Box 1006, Dartmouth, Nova Scotia B2Y 4A2, Canada*

Deposition of Upper Ordovician to Lower Devonian rocks of the Matapedia successor basin coincided with polyphase deformation of mainly Middle Ordovician volcanic and sedimentary rocks of the Tetagouche backarc basin, which were amalgamated into the Brunswick subduction complex. Successor basin sedimentation and volcanism, and deformation in the subduction complex, each span the Salinic and Acadian orogenic cycles, and postdate Late Ordovician collision of the Popelogan arc and composite Laurentia, marking the end of the Taconic cycle. ⁴⁰Ar/³⁹Ar dating of white mica in S₁ and S₂ cleavage domains establishes the timeframe for underplating of the various crustal blocks that were sequentially incorporated into the subduction complex (D₁), as well as the D₂ event recording the closure of the Tetagouche backarc basin and collision of the Gander passive margin with composite Laurentia ca. 430 Ma. The progressive D₁ deformation generally has only subtle effects on the successor basin sequence, but includes an early Llandovery unconformity that may coincide with ca. 442 Ma underplating of the California Lake block in the subduction complex. In contrast, D₂ deformation in the subduction complex is correlated with a basin-wide mid-Silurian unconformity and local northwest-trending folds lacking axial planar cleavage in the Matapedia cover rocks. Breakoff of the subducted Tetagouche backarc slab ca. 425 Ma resulted in rapid uplift of the Salinic orogen (Brunswick subduction complex) and subsequent gravitational collapse recorded by latest Silurian-earliest Devonian (D₃) vertical shortening. In the successor basin, slab breakoff led to within-plate volcanism beginning ca. 422 Ma; furthermore, local ENE- to ESE-trending folds in Late Silurian rocks suggest a correlation with D₃ in the subduction complex. Precise ID TIMS dating of Silurian-Devonian volcanic rocks demonstrates that within-plate volcanism occurred in two episodes separated by an earliest Devonian disconformity: the first (422–419 Ma) is associated exclusively with slab breakoff, but the second (417–407 Ma) shows the influence of a northwest-propagating Acadian “flat slab” following ca. 422 Ma closure of the Acadian seaway and Avalonia-Laurentia collision. The 419–417 Ma disconformity is coeval with a regressive event represented mainly by deposition of shallow-water red beds. This regression was succeeded by deposition of voluminous Lochkovian turbidites; this regressive-transgressive sequence is interpreted to record a propagating Acadian forebulge and foredeep, immediately preceding northwest migration of the Acadian deformation front, which

traversed the successor basin between ca. 415– 395 Ma. Complex late Silurian-early Devonian relationships indicate rapid transition involving temporal (but not spatial) overlap of the Salinic and Acadian cycles.