

Tectonic history of the Popelogan arc – Tetagouche-Exploits back-arc system in New Brunswick and adjacent Maine

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Detailed geological studies combined with radiometric age dating indicate that the Lower to Middle Ordovician volcanic rocks of central New Brunswick can be divided into at least 8 separate tectonic blocks and slivers; each block and

sliver has its own unique Arenig–Caradoc volcanic stratigraphy and tectonic history. Nonetheless, all of the blocks and slivers are tectonically related and represent widely separated ensialic to ensimatic portions of the west-facing

Popelogan arc/Tetagouche – Exploits back-arc basin system which were structurally juxtaposed during Ashgill–Ludlow back-arc basin closure.

The Lower to Middle Arenig (479–473 Ma) arc volcanic and plutonic rocks of the Meductic block in the southern Miramichi Highlands of New Brunswick and adjacent Maine represent the vestiges of the remnant Popelogan arc, that was built on the Gondwanan Gander margin (e.g., Woodstock, Miramichi, and Cookson groups). The remnant arc formed as a result of intra-arc rifting and opening of the Tetagouche – Exploits back-arc basin, which was induced by trench-ward (west) migration of the Popelogan arc. The Popelogan arc was extensional throughout its life span and vestiges of its youngest phases are preserved in the upper Arenig–lower Caradoc Balmoral Group in northern New Brunswick and Winterville Formation in northern Maine.

The other 6 blocks and slivers recognized in central and northern New Brunswick have a limited regional extent and may not continue into Maine, although related blocks that formed part of the Tetagouche – Exploits back-arc basin have been preserved there (e.g., Weeksboro-Lunksoos and Ripogenus Dam). An important new finding is that the rifting of the Popelogan arc was diachronous along its length with the start of intra-arc rifting given by the first appearance of rift-related basalts in each block. The oldest preserved phase of intra-arc rifting took place in the middle to late Arenig (~474 Ma) whereas the youngest known phase took place in the lower Llanvirn (~465 Ma) Sheephouse block. Analogies with modern arc/back-arc systems such as Japan suggest that rifting started in arc segments characterized by a marked oblique convergence vector.