

A revised geological interpretation of the Chéticamp area, western Cape Breton Island, Nova Scotia, Canada

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Geological mapping, U-Pb (zircon) dating, and petrographic, geochemical, and structural studies in the Chéticamp area have resulted in a revised geological interpretation of this part of the Ganderian Aspy terrane. Detrital zircon analyses and cross-cutting relations suggest that the age of metamorphic rocks of the Jumping Brook Metamorphic Suite (JBMS) is <530 Ma and >485 Ma. This suite includes a lower N-MORB-affinity mafic metavolcanic unit (Faribault Brook formation), overlain by turbiditic metasedimentary and metatuffaceous rocks (Barren Brook and Dauphinee Brook formations) and related(?) metaconglomerate (Rocky Brook formation). To the northeast, higher metamorphic grade but likely equivalent units are included in the Corney Brook and Fishing Cove River formations. A large area of amphibolite (George Brook amphibolite) is associated with the higher grade rocks. The lower metamorphic grade rocks in JBMS have a shallow foliation (S_1) subparallel to bedding (S_0). This foliation is parallel to the axial surfaces of rare isoclinal folds in shear zones. Fold axes (F_1), crenulation fold axes (F_2), and S_0/S_1 intersection lineations are subparallel and plunge gently to the north.

New U-Pb (zircon) dating has shown that plutonic units of five different ages occur in the area: (1) ca. 567 Ma (Pembroke Lake monzogranite, Farm Brook and Rigwash Brook granodiorite); (2) ca. 485–480 Ma (Chéticamp River tonalite and Upper Fisset Brook quartz diorite); (3) ca. 440 Ma (MacLean Brook granodiorite and Lavis Brook quartz diorite); (4) ca. 429 Ma (Grand Falaise syenogranite), and (5) ca. 370 Ma (French Mountain syenogranite and the previously dated Salmon Pool granite). The Neoproterozoic, Cambrian, and Silurian-Devonian plutons have petrographic and chemical characteristics consistent with calc-alkaline affinity and emplacement in a volcanic-arc tectonic setting, indicating a long history of subduction-related magmatism in the area.

The ca. 567 Ma plutonic units are chemically similar to ca. 575–550 Ma Andean-type plutons that are characteristic of the Bras d'Or terrane. The associated metasedimentary rocks of the newly named Stewart Brook formation are lithologically similar to parts of the George River metamorphic suite, supporting the interpretation that rocks in this area may be a fragment of the Bras d'Or terrane. The ca. 440 Ma Lavis Brook and MacLean Brook plutons show similarity to igneous units of similar age elsewhere in the Aspy terrane, and may be further evidence of a Silurian-Devonian arc and back-arc system. How and when these units became juxtaposed in their present configuration remains uncertain.