

The Avalonian terrane around Saint John, New Brunswick and its relation to the evolution of the Appalachians

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The Saint John region exhibits basement of tonalitic gneiss (probably about 1700 Ma) veneered by a shelf-type metasedimentary sequence (marble-quartzite). These units are intruded and overlain by volcanic plutonic complexes of Late Precambrian age emplaced in three stages separated by significant deformation. The oldest stage (750–800 Ma) produced mafic to ultramafic plutons, accompanied by contemporaneous submarine slumps. The second stage produced major basalt-andesite-rhyolite units and cogenetic plutons, while the third (Eocambrian) stage produced bimodal rhyolite porphyry and basalt, with abundant volcanoclastic sediments. The latest Eocambrian stage passed with slight unconformity into Cambro-Ordovician sedimentation. Silurian rocks occur only as allochthonous slices, and Devonian rocks are absent. Abundant coarse clastics of Carboniferous and Triassic age accumulated in fault-bounded troughs.

Major structures, including folds overturned to the northwest and numerous transcurrent faults, appear to be

mainly of Carboniferous age, but the movement history of the faults probably dates to Precambrian time. Significant deformation of Taconic (Ordovician) or Acadian (Devonian) age has nowhere been demonstrated in this terrane. Despite local spectacular thrust allochthons, deformation resulted mainly from transcurrent fault motion on curved faults. Local kinematic indicators suggest diverse movement senses which explain the observed segmentation of the terrane.

Comparison of the Saint John terrane with other Avalonian terranes suggests that much of the Avalon tectonostratigraphic zone in Canada is floored by Precambrian basement of Grenville aspect. The western side of this zone was strongly affected by Late Ordovician–Early Silurian magmatism and deformation which reflects the amalgamation of this zone with more westerly zones. These observations suggest a relatively local, rather than exotic, origin for Avalon terranes, and a history involving repeated break-up and re-welding of a continental edge.