

New U-Pb zircon ages from the Caledonia Highlands, southern New Brunswick, Canada: solving some problems and creating new ones

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Volcanic and sedimentary rocks of the Caledonia Highlands in southern New Brunswick have been divided into two groups: Broad River and Coldbrook. The ca. 630–615 Ma Broad River Group and related Andean-type dioritic to granitic plutons occur mainly in the eastern highlands and in small faulted slivers along the Bay of Fundy coast. The ca. 560–550 Ma Coldbrook Group and associated gabbroic/dioritic and granitic plutons form most of the northern and western highlands, extending into the city of Saint John. However, the number of dated rocks is small compared to the size and geological complexity of the highlands, and ages reported from apparently younger volcanic rocks of the Ordovician Grassy Lake Formation and Devonian Fairfield Formation are poorly constrained.

Six new U-Pb ages in part corroborate previous ages but also indicate more complexity than previously known. The Fairfield Formation, previously assigned a maximum Devonian age has yielded a Neoproterozoic age of 621.5 ± 5 Ma, showing that it is part of the Broad River Group. A porphyry body in mafic rocks along the new Fundy Parkway yielded an unexpectedly old age of 695 ± 5 Ma, indicating the presence of volcanic rocks significantly older than the Broad River Group in at least that part of the highlands.

Two samples of rhyolitic welded tuff from widely separated areas in the Ben Lomond and Silver Hills formations in the Coldbrook Group yielded identical ages of 556 ± 2 Ma. The dated Ben Lomond tuff lies at the base of a section >1.5 km thick of felsic, intermediate, and mafic volcanic rocks from which a previously dated rhyolite tuff at the top of the sequence yielded an age of 559 ± 5 Ma, indicating voluminous pyroclastic volcanism at ca. 555 Ma in the Coldbrook Group.

The poorly constrained Ordovician age reported previously from the Grassy Lake Formation was supported during the present study, with data indicating it could be as young as ca. 443 Ma. Two new samples from widely separated areas in the highlands have yielded additional Paleozoic ages. A ca. 443 Ma maximum age was obtained from rhyolite in the Bloomsbury Mountain Formation, which yielded sparse and mainly inherited zircon grains with ages of ca. 580–560 Ma, but one concordant grain at ca. 443 Ma. A sample of dacite from Mount Theobald near Grassy Lake contains a different assemblage of inherited zircon ages (ca. 1484, 684, 548 Ma) and a single concordant Early Ordovician age of ca. 488 Ma.