

Contrasting isotopic signatures as constraints for the paleogeographic reconstruction of the Avalon Composite Terrane

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The importance of the Avalonian tectonostratigraphic belt in understanding ancient orogenic processes was emphasized by Hank Williams in 1964. Controversies concerning the Late Proterozoic and Early Paleozoic position of the belt and the timing and nature of its accretion to Laurentia still remain. Available Nd and U/Pb (detrital zircon) isotopic data from Avalonian rocks in Nova Scotia support available paleomagnetic and biostratigraphic data that the Avalon Composite Terrane developed at the periphery of a Neoproterozoic supercontinent adjacent to the Amazonian craton. Generally positive ϵ_{Nd} values (0 to +6) of Late Proterozoic to Early Silurian volcanic and sedimentary rocks reflect derivation

from moderately depleted sources. The recurrence of T_{DM} model ages between 0.95 Ga and 1.0 Ga is remarkable. In contrast, the ϵ_{Nd} signature of the Early Silurian sedimentary rocks in the Beechill Cove Formation are strongly negative (-4.77 to -6.08) with T_{DM} model ages of ranging from 1.4 Ga to 2.7 Ga. This signature cannot be attributed to the erosion of Avalonian basement or coeval volcanic rocks. Paleogeographic reconstructions for Avalonia in the Early Silurian, although controversial in detail, suggest proximity to Laurentia, and the isotopic signatures are consistent with a Laurentian derivation thereby providing constraints on time of accretion of the Avalon Composite Terrane.