Provenance of the Meguma Terrane, Nova Scotia[1]

C. E. White, J. W. F. Waldron, S. M. Barr, A. Simonetti and L. M. Heaman

The Meguma terrane of Nova Scotia is the most outboard of the peri-Gondwanan terranes in the Atlantic Canadian Appalachians. In some reconstructions Meguma remained attached to Gondwana throughout much of the Paleozoic, whereas others interpret the terrane as traveling with Avalonia during opening of the Rheic Ocean. Meguma terrane stratigraphy is dominated by thick (>10 km) turbidite successions of the Cambrian to Early Ordovician Meguma Supergroup (formerly Group), deposited in a submarine fan system comparable in size to modern large rifted-margin fans. Samples from the Meguma Supergroup were investigated using laser ablation detrital zircon U-Pb geochronology and Sm-Nd isotopic analysis. Sandstone samples from the stratigraphically lowest part of the succession are of probable Early Cambrian age, indicated by the presence of the trace fossil Oldhamia. These samples yield remarkably uniform populations of zircon grains with ages in a single broad cluster in the late Neoproterozoic and rare older Proterozoic grains. Positive epsilon-Nd values suggest derivation from juvenile late Proterozoic crust associated with Pan-African orogens. A Middle Cambrian sandstone, collected from a rare shelly fossil locality higher in the succession, yields a diverse population of zircon grains with peaks in the late Neoproterozoic (~600 Ma), and mid-Paleoproterozoic (~2 Ga) and has negative epsilon Nd, suggesting derivation from more distant sources in the Eburnian or Amazonian orogens. Rare late Mesoproterozoic (1.0-1.2 Ga) zircon indicate input from South America. Younger samples show consistently negative epsilon Nd, suggesting that the Meguma terrane continued to receive sediment from Gondwana until at least the Early Ordovician. The transition from relatively juvenile sources early in the history of the Meguma Supergroup, to much more broadly distributed, ancient sources higher in the stratigraphy, is consistent with deposition on an evolving rifted margin, in which subsiding rift flanks allowed progressively more distant sources to contribute sediment. Previously reported detrital zircon distributions in units unconformably overlying the Meguma Supergroup are consistent with recycling of sediment by erosion of the Meguma Supergroup and do not require external sources in either Avalonia or Gondwana.

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