Detrital Nd isotopes as an indicator of hinterland tectonics, Jurassic-Cretaceous, Scotian Basin

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The study of detrital minerals provides good evidence for specific sediment sources and thus transport routes. However, it is difficult to estimate the volumetric proportions of sediment from different sources using mineralogical data, because many source rocks lack abundant diagnostic minerals. We have attempted to use bulk Sm-Nd isotopic determinations to make semiquantitative estimates of the role of different source terranes in provenance studies.

A GIS geological map of Atlantic Canada was assembled from individual provincial maps. Rock units were characterised by proportions of different lithologies. Epsilon Nd data from the literature were assembled and the average ε_{Nd} of each rock unit was estimated. In this manner, the ε_{Nd} isotopic composition of detrital sediment from any designated source area could be calculated. Four principal sources to the Scotian Basin are expected from mineralogical studies: the outboard Meguma terrane (present-day epsilon Nd -11 to -14), more inboard Appalachian terranes with more juvenile igneous rock sources (present-day epsilon Nd -6 to -10), the Grenville Province of southern Labrador (present-day epsilon Nd -12 to -16 for juvenile rocks, average -20 including reworked basement), and Mesozoic volcanic rocks (present-day epsilon Nd +3 to -1).

Ninety-two samples from different parts of the Scotian Basin and at different stratigraphic levels were analysed for Nd isotopic composition. In general, adjacent shale and sandstone show similar Sm-Nd isotopic composition and show no evidence of systematic aliasing by REE-rich heavy minerals. Relative proportions of supply from the various sources are partly constrained by mineralogical studies and can be further quantified from Sm-Nd isotopic studies. Volcanic input was most important in the Tithonian, Barremian, and basal Albian. Supply from Labrador was most important in the Albian. No difference in source area was detected from the Barremian Upper Missisauga Member to the Aptian Naskapi Member, despite their quite different depositional environments.

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