

**Geochemical discrimination of provenance and tectonic setting of siliciclastic rocks
in the Antigonish Highlands**

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There has been increasing interest in the study of the relationship between geochemistry of clastic sediments and tectonic setting. Chemical composition of sediments may provide insight into the geology and tectonic setting of the provenance regions. The reliability of geochemical discriminants in sedimentary rocks can be tested in an area where the tectonic setting has been evaluated using penecontemporaneous volcanic rocks and sediments derived from the same source area are deposited in variable tectonic environments.

The Antigonish Highlands, Nova Scotia, is suitable for this analysis because Precambrian, Cambrian, Silurian, and Devonian-Carboniferous volcanic rocks are interlayered with clastic sedimentary rocks. Fine- to medium-grained rocks that are spatially associated with volcanic sequences were selected for geochemical analysis from Precambrian, Cambrian, Silurian, and Devonian-Carboniferous clastic sequences within the Antigonish Highlands. Geochemistry of the volcanic rocks indicates that the Precambrian turbidites were probably associated with an ensialic volcanic arc, whereas the lithologically similar Palaeozoic fluvial arkosic sequences were deposited in an intra-continental rift environment.

In some instances, standard discrimination plots for sedimentary rocks are consistent with provenance type and tectonic

setting determined from analysis of volcanic rocks. Other plots seem to indicate the discrimination diagrams cannot distinguish immature intra-continental sediments from volcanic arc turbidites.

In general, variation diagrams yield smooth trends showing progressive increases in SiO_2 , and decreases in Al_2O_3 , TiO_2 , $\text{MgO} + \text{Fe}_2\text{O}_3$, Rb, Ga, V, and Ni from older to younger sequences. These trends indicate a single provenance area for these sequences and increasing maturity of the younger sediments.

Rb-Sr isotopes show a limited range of $^{87}\text{Sr}/^{86}\text{Sr}$ initial ratios within each individual clastic succession, which lies within the ranges of initial ratios determined from the penecontemporaneous volcanic rocks. This indicates that the main source of sediment for each unit is the temporally related volcanic rocks. Calculated $^{87}\text{Sr}/^{86}\text{Sr}$ initial ratios for the Cambrian sedimentary rocks were extremely low (0.7007-0.7016), possibly due to post-diagenetic remobilization of Rb.

In this pilot study, geochemical analyses of the Devonian-Carboniferous rocks did not detect source contribution of the Meguma Group. However, it is conceivable that in some cases, abrupt changes in chemistry of sediments and/or characteristic $^{87}\text{Sr}/^{86}\text{Sr}$ initial ratios may help document terrane accretion.