

Geochemistry of Early Paleozoic black shales in the northeastern Appalachians

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Samples of Late Cambrian to Early Ordovician black shale were collected in a transect extending across the Canadian Appalachians from the Humber Zone in Quebec, the Gander and Avalon zones in New Brunswick, to the Meguma Zone in Nova Scotia. The samples were analyzed for 40 elements including rare earths in order to test established plate tectonic models of the region. The chemical data provide information on provenance and depositional environments of sediments that are too fine-grained for more traditional mineralogical and sedimentological studies.

Generally high Al_2O_3 contents, high Al/Ti ratios and steep rare-earth-element (REE) distribution patterns are consistent with a continental margin depositional setting for shales from the Humber and Meguma zones on opposite sides of the Iapetus Ocean. Generally higher K_2O contents, lower

La/Th ratios and lower absolute REE abundances distinguish shale of the Humber Zone deposited on the Laurentian margin from that deposited in the Meguma Zone on the Gondwanan margin. High La/Th ratios indicate a similar Gondwanan source for shale from both the Meguma and Avalon zones. Shale from the Gander Zone contains less Al_2O_3 at increasing distances from its boundary with the Avalon Zone. Low Al/Ti and less fractionated REE distribution patterns suggest a greater component of volcanic detritus in shale of the Avalon and Gander zones. The presence of distinctive Balto-Scandian signatures (high U, V, and Mo) in shale of the Avalon and northwestern Gander zones are related to deposition in isolated peri-Gondwanan back-arc basins during a high stand of sea level.