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Paleozoic-Triassic Plume-Derived Magmas in the Canadian Cordillera Play a Key Role in Continent Growth

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Two major Paleozoic-Triassic oceanic sutures in the North America Cordillera extend from Alaska to Northern California. The western one (Cache Creek Terrane) consists of tectonic slices of Upper Triassic mafic magmatic rocks, mid-Permian oceanic-island tholeiites, undated foliated ultramafic rocks and Triassic blue schists. The eastern boundary of this Terrane is marked by the Pinchi Fault which contains slices of Paleozoic platform carbonates and undated cumulate gabbros intruded by dolerites. Slide Mountain, the eastern suture, is made up of dolerites, pillow basalts associated with gabbros and serpentinites ranging in age from Carboniferous to Permian. In both sutures basalts and dolerites are stratigraphically associated with greywackes and cherts. From major- and trace-element compositions and Sr, Nd, Pb isotopes, three types of rocks have been distinguished in both terranes. Isotope ratios were calculated at 260 Ma (Slide Mountain) and 210 Ma (Cache Creek). Type one, which consists of aphyric or intersertal basalts and dolerite dykes, is depleted, relative to primitive mantle, in LREE [$0.65 < (La/Yb)N < 0.97$] and Zr, Hf, and Th. Negative Nb-Ta anomalies are absent. These features suggest N-MORB affinity, in good agreement with the $(^{87}Sr/^{86}Sr)_i$, ε_{Nd} and Pb/Pb isotope ratios. Unlike the basalts and dolerites of the N-MORB group, the gabbro has lower trace-element abundances and significant negative Nb-Ta anomalies. Type 2 is mainly composed of pillow basalts and hawaiites that are mildly to highly enriched in LREE [(La/Yb)N = 2-10] and in Ti, Zr, Hf, Nb, Ta and Th. These lavas exhibit typical alkalic characteristics and fall in the OIB field in standard isotope diagrams. Type 3, which is made up primarily of basalts, has flat REE patterns [(La/Yb)N = 1.1-1.4] and moderate Nb and Ta enrichments, and isotope compositions between those of the two other types. The Cache Creek Terrane is distinguished from Slide Mountain by the presence of basalts and icelandites with convex REE patterns [(La/Sm)N = 0.6] and higher TiO_2 and Ni abundances. These basalts have similar isotope compositions to Type 3 basalts. ε_{Nd} values of all magma types from Slide Mountain are systematically higher than those from Cache Creek. Foliated ultramafic rocks from Cache Creek (pyroxenites and peridotites) have very low trace-element contents (less than 0.1 primitive mantle abundances), fractionated REE [(La/Yb)N = 0.18-1.22], positive Ba, Pb, U and HREE anomalies, and negative Nb-Ta and Zr anomalies. Permian tholeiites from Cache Creek have high ε_{Nd} (+9.6 to 7.8) and low $^{206}Pb/^{204}Pb$ (18.15) and $^{207}Pb/^{204}Pb$ (15.49). The association of N-MORB-like basalts with OIB-like tholeiitic and alkali lavas in the Slide Mountain and Cache Creek terranes suggests that both terranes represent fragments of complex oceanic crust - either normal crust surmounted by oceanic islands, or a near-ridge oceanic plateau. The chemical compositions of Cache Creek lavas suggest a more complex development than Slide Mountain. The flat REE patterns and moderate isotope compositions of the Cache Creek samples suggest derivation from an oceanic plateau; the dominance of N-MORB patterns at Slide Mountain and high ε_{Nd} are more consistent with normal ocean crust. Mafic-ultramafic rocks comprise ~70% the two terranes, and these terranes make up a significant portion of these part of the North American Cordillera. The accretion to the North American craton of these large volumes of oceanic rock constituted a major contribution to continental crust growth. After processing in the orogenic zone, these originally oceanic terranes may be converted into normal granitoid crust.