Geochemistry of MORB and OIB in the Yuejinshan Complex, NE China: Implications for petrogenesis and tectonic setting

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The Yuejinshan Complex, the remnants of the late Paleozoic western Paleo-Pacific Ocean, is located between the Jiamusi Massif and the Nadanhada Terrane in NE China. The complex consists of strongly deformed metaclastic rocks and metabasaltic lavas. The metabasalts can be divided into two broad rock groupings based on whole-rock geochemical indicators and Sr–Nd isotopic characteristics: (1) mid-ocean ridge basalt (MORB)-type tholeiites that range in composition from light rare earth element (LREE)-depleted varieties, showing high $\varepsilon_{Nd}(t)$ ratios (+10.2 to +10.5), to LREE enriched type tholeiites; and (2) ocean island basalt (OIB)-type alkaline lavas, characterized by high $\varepsilon_{Nd}(t)$ ratios (+6.20 to +8.61). Trace element and isotope systematics indicate that the tholeiitic basaltic rocks were derived from partial melting of a depleted MORB source in the spinel facies mantle, whereas the source of the E-MORB was a DMM source significantly enriched by OIB-type components. In contrast, the alkaline basalts were generated from an enriched OIB-type mantle source in the garnet facies and continued melting to spinel facies mantle depths. Therefore, the mafic volcanic rocks of the Yuejinshan Complex, located above the oceanic plate of the Paleo-Pacific Ocean, were most likely derived from chemically heterogeneous mantle sources during back-arc basin spreading and plume-related volcanism. The westwards subduction of the Paleo-Pacific Ocean lithosphere during the late Carboniferous to middle Permian resulted in the back-arc lavas, seamounts, and other oceanic fragments accreting onto the eastern Jiamusi Massif, forming the Yuejinshan Complex.