Constrasting MORB-Boninite Reaction Trends in IBM forearc mantle

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Petrographic and geochemical analysis of spinel from 35 lower crustal dunites, peridotites, troctolites and gabbros recovered from the inner trench slope of the Bonin Ridge (BR) reveals 2 groups of samples which reacted with distinct melt compositions. Group A consists of peridotites (cpx-harzburgite), troctolites, and gabbroic rocks with medium Cr# (100 x Cr / Cr + Al) spinels ranging from 45 to 60 and high TiO2 and Al2O3 spanning ~0.1-2.25 and ~12-30 wt. % respectively. Group B consists of only dunites and cpx-free peridotites with high Cr# spinels ranging from 65 to 94 and low TiO2 and Al2O3 spanning ~0-0.12 and ~3-21 wt. % respectively. The group A and group B samples are the result of melt-rock reaction with a mid-ocean ridge basalt (MORB)-like melt and a more depleted boninitic melt respectively. MORB-like forearc basalts (~50-52 Ma) and boninites (~44-48 Ma) recovered from the BR have been interpreted to represent a change from decompression melting at subduction initiation to flux melting and boninitic volcanism. The group A and group B samples are a lower crustal record of the change from MORB-like melts created by decompression melting at or soon after subduction initiation to arc-type flux melting and boninite volcanism. Further, the presence of melt-hybridized peridotites and gabbroic rocks with spinels belonging to group A and not group B suggests that the lower crust of the BR may be dominated by gabbroic rocks and material related to the FABs. This would imply that a large portion of the lower crust in the fore-arc was formed during or shortly after subduction initiation and is similar in composition to MOR lower crust.