Subduction initiation deduced from peridotites of the Izu-Bonin-Mariana forearc and ophiolites: Implicatins for Arc MOHO diversity

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Compared with comprehensive studies on arc-related volcanic rocks [1], there have been still few studies of the lower crust/mantle evolution related to igneous activity in the earliest stages of subduction initiation. We examine peridotites recovered from an exhumed crust/mantle section exposed along the landward slopes of the northern Izu-Bonin Trench [2] and peridotite bodies from the so-called "suprasubduction ophiolite" such as, the Mirdita ophioite, Albania [3]. The Cr# (=Cr/(Cr+Al) atomic ratio) of spinel in the IBM and ophiolites coupled with chemical compositions of silicate inclusions within spinel, two distinctive melts are in equilibrium with these dunites: a boninitic melt for the high-Cr# dunite (> 0.7) and a mid- oceanic ridge basalt (MORB)–like melt for the medium-Cr# dunite (< 0.65). In the case of the Eastern Mirdita ophiolite, cpx porphyroclast-bearing harzburgite (Cpx-harzburgite) occurs structurally in the lower parts of the peridotite massifs, whereas harzburgite and dunite are more abundant towards the upper parts. The Cpx-harzburgite is formed as the residue of less-flux partial melting that is similar to those in abyssal peridotites from MOR systems. On the other hand, harzburgite is produced as a result of enhanced partial melting of depleted peridotites triggered by infiltration of hydrous LREE-enriched fluids/melts. The wide range of variation in dunites from the IBM forearc and the uppermost section of ophiolites probably reflects changing melt compositions from MORB-like melts to boninitic melts in the forearc setting due to an increase of slab-derived hydrous fluids/melts during subduction initiation. This scenario is consistent with the temporal and spatial variation of volcanic rocks in the Izu-Bonin-Mariana arc [1]. Ultramafic rocks above the mantle section of ophiolites, such as ultramafic-mafic layered sequence and late ultramafic intrusions in gabbros can be also explained by crystallization from hydrous MORB-type and boninitic compositions. Observations from ophiolites indicate that arc magmatisms during subduction initiation modify the pre-existing MOHO significantly.

[1] Reagan *et al*. (2010) *G-cubed* **11**, doi:10.1029/2009GC002871. [2] Morishita *et al*. (2011) *Geology* **39**, 411-414. [3] Morishita et al., (2011) *Lithos* **124**, 215-226.