

Boninites and related tholeiites from the southernmost of West Mariana Arc: geochemical evidence for subduction initiation

*Ji Zhang^{1,2}, Guoliang Zhang¹

1. Institute of Oceanology, Chinese Academy of Sciences, 2. University of Chinese Academy of Sciences

Subduction initiation is one of the essential outstanding problems of plate tectonics. The first lavas to erupt during subduction initiation are fore-arc basalts (FABs) and Boninites. Appearance of boninites marks the turning point from mantle decompression melting to fluid-assisted mantle melting, and therefore boninites preserve key information on the slab-mantle interaction during subduction initiation. In this study, we analysed major element, trace element and Sr-Nd-Pb-Hf isotope data for samples collected from the diving sites on the southernmost of West Mariana Arc. These samples can be geochemically classified into Low-Si Boninites (LSB) and tholeiites. We interpret these tholeiites to be transitional compositions between FAB and boninites. These boninites are depleted in HFSE and enriched in LILE, indicating that the mantle source was metasomatized by subducted slab-derived components. High contents in LILE and Ba/Th and Th/Yb suggest the mantle wedge have been metasomated by slab-derived fluids. However, unlike the Izu-Bonin boninites with U-shaped REE pattern, depleted LREE signature of these boninites rule out the contribution of slab melts that might account for the relatively high LREE. We further propose that that the FAB-LSB-HSB rock sequence record the increased contribution of subducting slab during subduction initiation.

Keywords: Boninite, Subduction initiation, Slab-mantle interaction