

Understanding the nature of the lower arc crust: The Calaton Hill complex vis-a-vis the Ichinomegata crustal xenoliths

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Most studies of erupted volcanic products in island arcs suggest the existence of complementary plutonic sequences and cumulates at depths corresponding to the lower arc crust. The solidifying unextruded arc magmas in the lower arc crust are often subjected to upper amphibolite to granulite facies metamorphism as a consequence of multiple magma generation accompanied by large amounts of magmatic underplating. To better understand the nature of the lower arc crust, we present petrographic and geochemical data on the Calaton Hill and metamorphic/plutonic complex vis-a-vis the Ichinomegata crustal xenoliths. Located in the Tablas Island (Romblon Island Group, Central Philippines), the Calaton Hill is composed of amphibolites, metagabbros, hornblende pyroxenites and hornblendites which are believed to be representative of the lower arc crust of the Philippine archipelago. Previous works on the Ichinomegata crustal xenoliths from the NE Honshu arc have established that the lower arc crust of the NE Honshu arc consist of amphibolites, hornblende gabbros and most likely granulites. Petrographic analysis of the metagabbros, hornblende pyroxenites and hornblendites from Calaton Hill reveal striking resemblances to the Ichinomegata gabbroic xenoliths. These include the presence of well-preserved coronas composed of orthopyroxenes, amphiboles and green spinels around olivines in the metagabbros, the formation of abundant amphiboles at the expense of the pyroxenes and the identical appearance of the hornblendites. In terms of geochemistry, major oxide contents of the orthopyroxenes in the Calaton Hill rocks fall within the range of orthopyroxenes in the Ichinomegata pyroxene-hornblende gabbros. Chondrite-normalized REE patterns of clinopyroxenes in the Calaton Hill rocks are similar to the concave downward patterns of the clinopyroxenes in the Ichinomegata gabbroic samples. Depletion in Nb, Zr and Ti are also evident in the extended trace element diagrams of the clinopyroxenes from both localities. The similarities in the petrographic and geochemical characteristics observed in the Calaton Hill and the Ichinomegata samples may help provide clues in deciphering and understanding magmatic and metamorphic processes in the lower arc crust.

Keywords: Lower crust, Calaton Hill, Ichinomegata, Arc magma