

The genesis of the basalt-HMA association from Nagasaki in northwest Kyushu, southwest Japan

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In spite of their small volumes in modern earth magmatism, the genesis of high magnesium andesites in subduction zones has been attracted from earth scientists, since their genesis is considered to give us some insights into the growth mechanism of the continental crust. Based on results of high pressure experiments, hydrous components derived from the subducting slab, such as aqueous fluids and/or felsic melts, are considered to play significant roles in the genesis of HMA magmas in subduction zones (Tatsumi, 2006). Nevertheless, petrologic models emphasizing the role of slab-derived hydrous components have a critical weak point. HMAs are generally associated with basalts in each locality. The petrologic model for HMA magma therefore should also explain the genetic relationship between HMA magmas and basalt magmas. Results of high pressure melting experiments demonstrated that is a temperature difference more than 150 °C between HMA magmas and basalt magmas at an identical pressure under hydrous condition. This temperature difference is so large that flux melting models could not the genetic relationship between HMA magmas and associated basalt magmas in each locality (Shimoda et al., 1998). Our understanding of the genesis of HMA magmas is still incomplete.

According to results of high pressure melting experiments, HMA magmas could also be formed by partial melting of relatively anhydrous mantle at pressure lower than 0.6 GPa. Multi-stage partial melting of relatively anhydrous mantle could form HMA magmas at $P < 0.6$ GPa and basalt magmas at $P > 0.6$ GPa along a melting adiabat (Falloon et al., 1988). Multi-stage partial melting model could resolve the thermal problem concerning the genetic relationship between HMAs and associated basalts. In the context of multi-stage partial melting, geochemical features attributed to the subducting slab are explained with the involvement of accreted oceanic material at the base of the crust in the source mantle. It is therefore a critical issue for earth science which forms basalt-HMA associations in subduction zones, flux melting or multi-stage partial melting.

Basalt-HMA associations are distributed in northwest Kyushu, southwest Japan. Seismic observations indicate that the subducting slab does not extend there. The genesis of basalt-HMA associations in NW Kyushu gives us some insights into the debate concerning the HMA magma genesis. In this poster, I discuss the genesis of the basalt-HMA association from Nagasaki in NW Japan.