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# Subduction zone magmatism in the Ryohaku mountains

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Volcanoes of Northeast Japan are located from 100km to 180km above the Wadati-Benioff zone (WBZ). On the other hand, the Ryohaku mountains in Central Japan are located 300km above the WBZ of the subducting Pacific plate. This anomalous feature is attributed to the thermal influence caused by Philippine sea plate on the dehydration process of subducting Pacific plate(e.g.,Iwamori,2000). However, there is no models for magma generation in mantle wedge is presented, to discuss the chemical composition of the volcanic rocks in arcs. Here a numerical model of magma generation in mantle wedge is presented, to discuss the chemical compositions of the arc magmas quantitatively.

In general, volcanic rocks in subduction zones have a common trend that alkali metal elements, LILE(Rb,Ba), and HFSE(Nb,Zr,Ti) increase from volcanic front to back-arc side. Variations of primary magmas in Central Japan (Yatsugatake-Ryohaku mountains) is determined and compared with those of Northeast Japan. The concentration of elements in each primary magma are estimated based on Takahashi(1986), which is then used to discuss the trace element variations in the primary magmas on he reciprocal plot (Sakuyama and Nesbitt,1986). These results show that the difference in composition of primary magma from the front to back-arc side of Central Japan (Yatsugatake-Ryohaku mountains) is smaller than those of Northeast Japan. Those reciprocal points are also plotted on a straight line, except Sc, indicating that degree of melting increase toword the trench from the back-arc side. However, the spidergram shows a different trace element pattern between the Ryohaku mountains and Northeast Japan. The Nb and Pb concentrations in the Ryohaku mountains do not show a clear trend toward the back-arc side from the volcanic front as in Northeast Japan. Therefore, it is difficult to explain the difference between Northeast Japan and the Ryohaku mountains only by a difference in degree of melting. One of the possible mechanisms to explain the difference, the chromatographic effect in the mantle wedge, is discussed below.

McKenzie(1984) and Navon and Stolper(1987) demonstrated the importance of the chromatographic effects for the percolating melts in the mantle. Kelemen et al.(1990) argued that the HFSE depletion characterizing arc magmas can be produced in ascending liquids by interaction (chromatographic effect) between depleted mantle perdotite and the melt.Stern et al.(1991) adopted Navon and Stolper(1987) model to boninite at the mariana arc. Stern et al. suggest that a slab-derived fluid moves through mantle column, and then produces melts at shallow level. Only the fluid and alkali melts in boninites may be slab derived. Sr,Nd, and Pb (and other non-alkali metal LILE) come from mantle wedge during infiltrative ascent.

These models have several problems: 1) there is no constraint on the location of melting 2) mantle convection appropriate for subduction zones was not taken into account 3) distribution coefficients of the elements between solid, fluid and melt have been poorly constrained. Considering these points, a model for melt flow in the convecting mantle wedge with chromatographic effect is constructed based on Iwamori(1998;2000) model for the points 1) ,2) and utilizes recent high pressure experimental results for 3).