Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SVC062-P08 Room: Convention Hall Time: May 23 17:15-18:45

Geology and petrology of Takakura volcanic chain, Iwate Prefecture, and its bearing on change of magma plumbing system

Sakiko Nakaya[1*], Akihiko Fujinawa[2]

[1]Ibaraki Univ., [2]Ibaraki Univ.

We tried to figure out the magma plumning system that caused the compositional diversity of the tholeiitic magma series at the Takakura volcano, northeast Japan arc. Takakura volcanic chain is located at the southern end of the Sengan geothermal area extending near the volcanic front of the northeast Japan around 40N. This volcanic chain consists of Kotakakura, Takakura, and Marumori volcanoes sitting in a row from NE to SW. A compositional diversity of tholeiitic series of the Takakura volcano was first pointed out by Terui(2002MS), but plausible magma plumbing model that properly explain the compositional diversity had not proposed successfully.

Firstly, we revised the geologic map of this volcanic chain,mainly on the basis of topographic features, lithofacies and petrolocical and petrochemical characteristics. We divided this chain into 4 lava groups. Every lava group comprises a set of lava flows, which have common eruption center to form distinct volcanic cone. Each of the Kotakakura and Marumori volcanoes consists of a a single lava group, KT and MM. On the other hand, the Takakura volcano is composed of two volcanic cones. We call the older and newer cones as Takinosawa (TS) and Takakura(TK) lava groups, respectively. The TK members invariably overly their relevant TS members along the boundary surface at the Yunosawa valley.

All the rock samples of the KT,TS, and TK belong to the pegeonitic rock series of Kuno, tholeiitic series of Miyashiro(1974), and are mostly plotted in the low-K area of Gill(1981). Both the low-K tholeiitic and medium-K calc-alkaline series co-occur in the Marumori volcano. The KT samples show distinct trend displaying higher Al2O3 and lower CaO, relative to the TS and TK samples in the silica variation diagrams. The TS and TK samples seem to be indistinguishable chemically. Rather, the TS and TK samples are chemically dividable into two groups, high-Nb,Zr and low-Nb, Zr groups, respectively. The former consists of TS3, 6, 8, 9, and TK1, 4, 9, 10, 15, 16, whereas the latter comprised TS1, 2, 4, 5, 7, 10, and TK2, 3, 5. Each of the two chemically distinctive groups is further divided into two subgroups in terms of the pattern of the spidergram. In the high -Nb,Zr group, earier eruptions(TS3,6,8,9,TK4) generally display gentle slope toward less mobile element with a peak at Ce, whereas, later ones(TK9,10,15,16) less evolved characteristics with common peak at P. As for the low-Nb,Zr group, dominant subgroup consisting of TS1,2,5,7 and TK2,5 consistantly shows a peak at Ce, whereas miner subgroup composed of TS4,10 and TK3 displays a peak at P.

Evolutionary process for the coexisted high-Nb,Zr and low-Nb,Zr magma plumbing system can be explained as follows. In the high-Nb,Zr system, a crystallization differentiation process with minor injection of cognate mafic magma had been dominant during the first half, whereas injection of non-cognate mafic magma became evident at the second half of the evolution history. This view is supported by a mass balance least square calculation. Another mass balance calculation for the low-Nb,Zr system implies that members of dominant subgroup chamber were likely related through crystal fractionation process in the chamber, but intermittent injections of non-cognate

basaltic magmas to the chamber might induce eruptions of TS4,10, and TK.

Keywords: crystallization differentiation, tholeiite, magma plumbing system