GEOCHEMICAL CHARACTERISTICS OF YOTEI VOLCANO AND SHIRIBETSU VOLCANO, SOUTHWESTERN HOKKAIDO, JAPAN

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Yotei Volcano locates at the arc-arc junction of Kuril and Northeast Japan arcs (Fig. 1) and shows local anomaly in regional spatial compositional variations of volcanic rocks from Hokkaido and NE Japan volcanoes (Nakagawa, 1992). However, there has existed no systematic petrological geochemical study of the volcano. Recently, the structure of Yotei Volcano has been revealed (Uesawa et al., in prep.). Based on the stratigraphic relations, we carry out petrological and geochemical study of Yotai and adjacent volcanoes, Shiribetsu (Sh) and Kimobetsu pfl (K-pfl) (Fig. 1). The activity of Yotei volcano can be divided into two major stages, Old (Y-1) and Young Yotei (Y-2). The latter stage can also be divided into two sub-stages, early (Y-2-1) and late (Y-2-2). In this study, we show analytical data of major and trace elements, REE, and Sr-Nd isotopes to reveal the temporal and spatial change of magma and the plumbing systems beneath the volcanic field.

The rocks of Yotei and Shiribetsu volcanoes are andesite and dacite and their whole-rock SiO_2 contents are 55 - 70 wt% in Y-1, 55 - 68 in Y-2-1, 55 - 65 in Y-2-2, 59 – 66 in Sh, and 65 – 69 in K-pfl, respectively. These are classified as medium-K series on the K_2O-SiO_2 diagram. Phenocryst contents and assemblages of these rocks from Sh, K-pfl and Y-1 are similar and are distinct from those of Y-2-1 and Y-2-2. The rocks of Y-2-1 and Y-2-2 are nearly aphyric (<15 vol.%) and contain plagioclase, orthopyroxene,clinopyroxene and Fe-Ti oxides phenocryst often associated with olivine. On the other hand, the rocks of Y-1, Sh and K-pfl are porphyritic (6 – 47 %) and are characterized by the presence of hornblende and quartz phenocrysts, in addition to plagioclase, pyroxenes and Fe-Ti oxides phenocrysts. Olivine phenocrysts are often recognized in some rocks of Y-1. On the basis of the FeO/MgO-SiO_2 diagram, the rocks of Y-2-1 and Y-2-2 are classified into tholeiitic series, whereas those of Y-1, Sh and K-pfl show variations of calk-alkaline series.

Whole-rock chemistry of the rocks from two adjacent volcanoes, Yotei (Y-1 and Y-2) and Shiribetsu (Sh and K-pfl), are distinct on many SiO_2 variation diagrams (Fig. 3). On the SiO_2 –Rb, Ba, Nb, Pb, Zr and Y diagrams, although mafic rocks of the both volcanoes have similar contents, the silicic rocks are distinct on these diagrams. In contrast, although MgO contents of the silicic rocks of both volcanoes are similar, those of the mafic rocks are largely different. P_2O_5 contents of the rocks of Sh and K-pfl decrease simply with increasing of SiO_2 content, whereas the rocks of Yotei volcano have maximum P_2O_5 contents in silicic andesite (SiO_2~62 %). Comparing with the rocks of each stage of Yotei volcano, it seems that systematic, temporal changes of whole-rock chemistry are recognized. Rb, Ba, Nb, Zr, Y and Na_2O contents of the rocks increase from Y-1 to Y-2-1. The rocks of Yotei volcano show systematic, temporal increase of contents of incompatible elements, such as Zr and Ba, from Y-1 to Y-2-1 (Fig. 3). These chemical differences among geological stage suggest that magma generation and/or magma

differentiation processes have changed temporally in the volcanic field. Now, we are analyzing REE and Sr-Nd isotopes of the representative rocks from the volcanoes to discuss temporal and spatial evolution of magma source region and structures of magma plumbing systems.

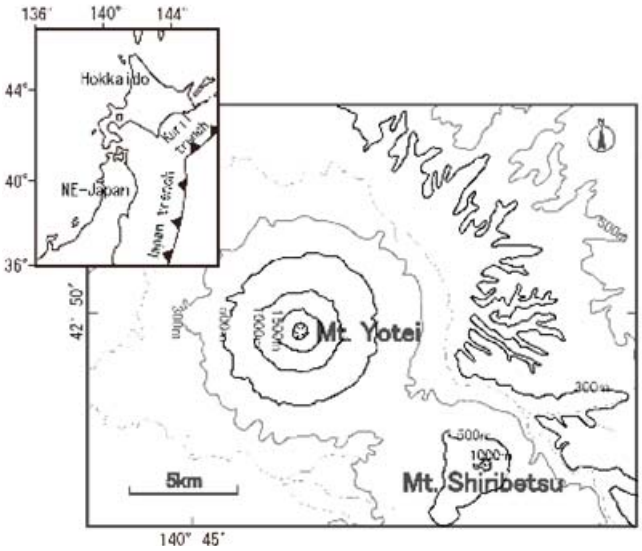

Fig. 1 Locality of Mt. Yotei volcano and Shiribetsu volcano.

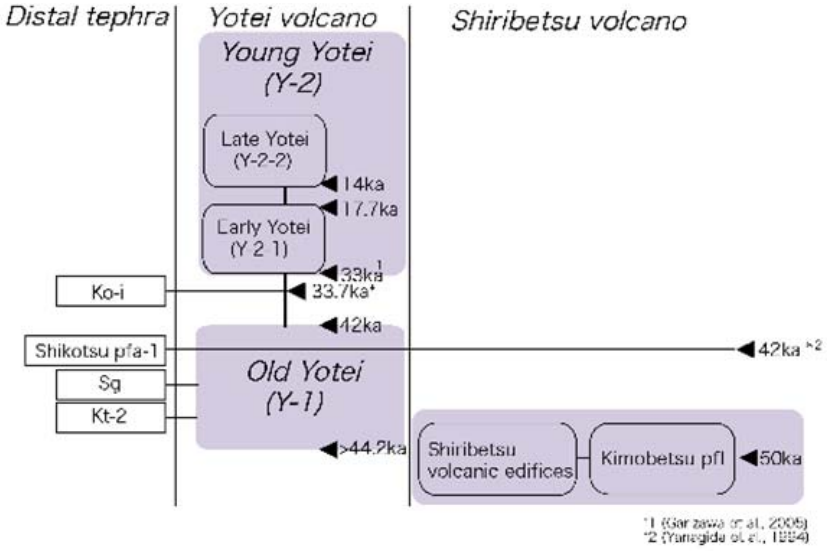

Fig. 2 Block diagram showing the relationships between Yotei and Shiribetsu volcano and four distal tephras.

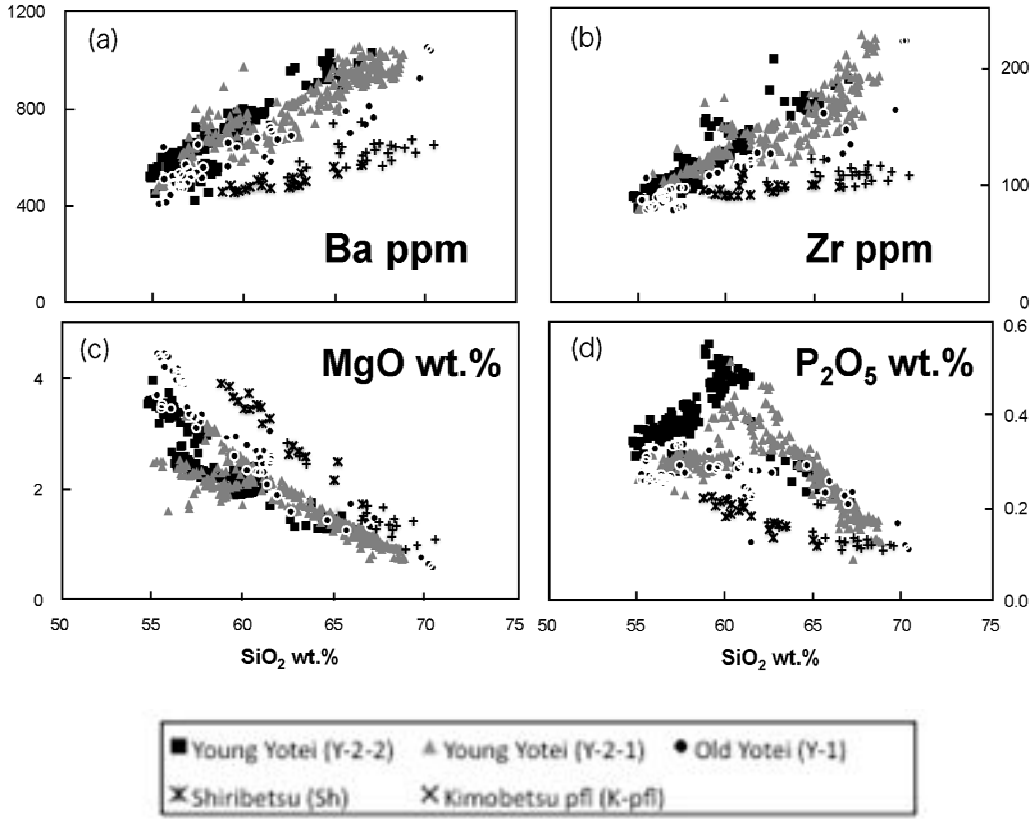

Fig. 3 (a, b, d) incompatible elements and (c) major of whole rock chemistry, respectively.