

## **Evolution of magma plumbing system of the Iwate Volcano, Northeast Japan, constrained by chronological relationship of the bulk chemical and isotopic composition**

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Iwate Volcano is one of the active volcanoes in the NE Japan Arc Quaternary volcanic front. The volcanic activity started about 300 ka, however, most active only since the last 120 ka. Topographically, the volcano is divided into two bodies: Higashi-Iwate (HI) forming a stratocone and Nishi-Iwate (NI) having a 2.5 by 1.5 km caldera. Eruption activities of the Iwate Volcano are divided into 4 stages for NI and 3 stages for HI. The chronological relationship of these stages is interfingered. Eruptive rocks of Iwate volcano are composed mainly of low-K tholeiitic basalt to andesite. Calc-alkaline andesite to dacite are rare component.

Low-K tholeiite from the two volcanic bodies (NI and HI) are interpreted to be derived from different sources and/or different magma chambers based on the major and trace element compositions. In the case of NI, interaction of primitive magma with heterogeneous crustal assimilant (assimilation and fractional crystallization: AFC) in crustal magma chambers would explain the chemical and Sr-Nd-O isotopic compositions. Whereas, chemical variations of the HI volcanic rocks are controlled mainly by fractional crystallization (FC).

AFC process gradually progressed in the NI magma chamber, and the injection of the newly arrived primitive magma renewed the chamber. Drastic change of chemical and isotopic compositions are observed before and after the caldera forming stage. The fact that the most geochemically enriched volcanic rocks erupted only before the caldera forming, while the volcanics produced after the depression were isotopically depleted. We suggest the caldera formation may relate to activities of shallower crustal magma chamber where crustal material may be more enriched than those deeper, formed after the collapse.

Bulk chemical compositions of HI eruptive rocks show two chemical trends; High-Si and Low-Si type. High-Si type shows significantly increase in SiO<sub>2</sub> (51 to 55) with the increase in FeO/MgO ratios (1 to 2). SiO<sub>2</sub> contents of the Low-Si range between 51 and 53. Comparison of the bulk chemical trend between the two chemical types and MELTS (Ghiorso and Sack, 1995) model variation trend suggest that the High-Si type is formed at lower pressures (ca. 0.5-1 kb) than the Low-Si type (ca. 3-7 kb). The temporal chemical variation of the Low-Si type rocks shows MgO decrease with eruptive sequence. This compositional cycle lasted about 3-4 thousand years. Whereas the High-Si type volcanics occurred in the later stages of the composition cycle. We proposed that the magma plumbing system in the HI main magma chamber was stored at 3-7kb condition and FC process controlled the change of eruptive products. The injection of more primitive magma into main magma chamber renewed the chemical cycle of HI volcanics. In contrast, the High-Si magma was operated by FC process in shallow magma pocket where magma being stored at lower pressures (0.5-1 kb).