

ERUPTIVE HISTORY AND STRUCTURE OF YOTEI VOLCANO, SOUTHWESTERN HOKKAIDO, JAPAN

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Yotei Volcano is an active large stratovolcano located at Kril and NE Japan arc-arc junction. Although there are few pioneering geological and petrological studies of this volcano (e.g. Katsui, 1956; Kashiwabara et al., 1976), eruptive history and structure of this volcano are not revealed sufficiently. Generally, it is difficult to understand whole structure of stratovolcanoes with only geological study because of its few field occurrences. In order to reveal eruptive history and structure of Yotei Volcano, geological and petrological investigations were carried out on the Yotei Volcano and its surround area, and volcanic edifices were correlated with tephtras using petrological method.

Around the foot of Yotei Volcano, 43 tephtra units from Yotei Volcano interbedded in soil layers are identified (Y1 - Y43 in descending order), and four widespread tephtras were also recognized. In addition, Kimobetsu pyroclastic flow deposits distributed in eastern area of Yotei Volcano and Shiribetsu-dake debris avalanche deposit distributed in southern foot of Yotei volcano underlie Yotei tephtras. Based on the thick volcanic ash soil layer indicating long dormancy among the tephtra groups, Yotei tephtras are distinguished into three groups: Yotei tephtra group I, Yotei tephtra group II and Yotei tephtra group III. In particular, petrological characteristics of Yotei tephtra group I is different from other groups. Yotei tephtra group I is characterized in comprising porphyritic (phenocryst content = 47.2-5.8 wt. %) pumice containing hornblende and quartz whereas others are in comprising aphyric (phenocryst content = 14.5-0.3 wt. %) pumice and scoria with absence of hornblende and quartz. Additionally, Yotei tephtra group II is distinct from Yotei tephtra group III in whole-rock composition. Kimobetsu pyroclastic flow deposits comprise porphyritic pumice containing hornblende and quartz and are distinct from Yotei tephtras in Whole-rock composition. Moreover, nine ¹⁴C ages are obtained from soils beneath Yotei tephtra units (ca. 43 ka - 17.7 ka) and Fission-Track ages of pumices from Kimobetsu pyroclastic flow deposits are also obtained (ca. 50 ka) in this study. Thus, we can do chronology of Yotei and Kimobetsu pyroclastic flow deposits. On the other hand, Yotei volcanic edifice can be distinguished into three groups: Yotei volcanic edifice I to III in ascending order on the basis of stratigraphic relations, degrees of preserved land forms and petrological characteristics. Additionally, Shiribetsu-dake volcanic edifices (including debris avalanche deposit) distributed in western area of Kimobetsu pyroclastic flow deposits are distinct from Yotei volcanic edifice in petrological characteristics (Fig. 1).

Based on the characteristics of whole-rock compositions, these Yotei volcanic edifice groups are conformed to Yotei tephtra group I, Yotei tephtra group II and Yotei tephtra group III in ascending order, respectively. In addition, Kimobetsu pyroclastic flow deposits are conformed to Shiribetsu-dake volcanic edifices in whole-rock composition. As a result, Yotei Volcano can be divided into two volcanoes: Pre-Yotei Volcano and Yotei Volcano by long dormancy (>7,000). Moreover, Yotei Volcano consists of two stages separated by dormancy (~3,500) namely Early Yotei Volcano and Late Yotei Volcano. Based on the chronology of Yotei Volcano, Pre-Yotei Volcano started its activity at least from approximately 50 ka until ca. 40 ka, and Yotei volcano has been active from ca. 33 ka to present astride dormancy from ca. 17.5 ka to ca. 14 ka. Shiribetsu-dake also had been active around the same time as Pre-Yotei volcano or older period. Then, we can recognize that the activity of Yotei volcano has changed coupling with eruption rates, eruptive styles, and magma types, and that eruption rate of Early Yotei Volcano (1.5 km³/ky) is anomaly value. These relationships indicate that magma systems beneath the volcano affect to growth process and eruptive stages of this volcano.

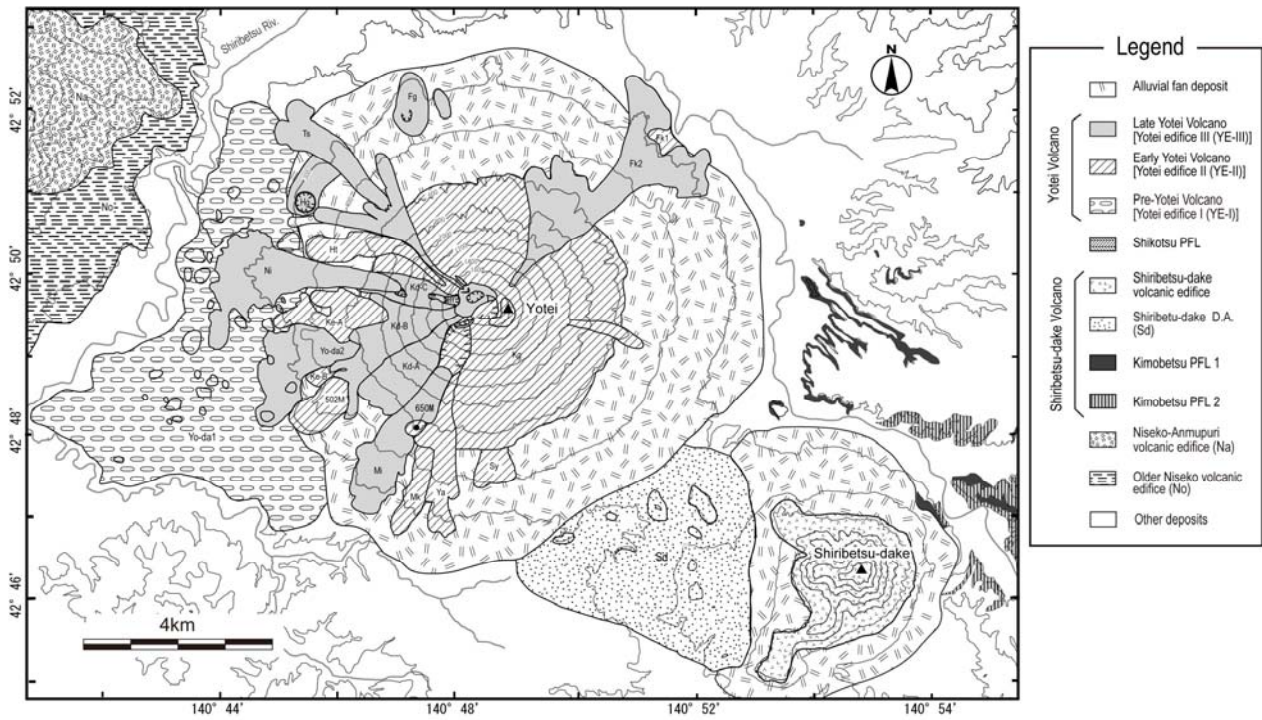


Fig. 1 Geological map of Yotei Volcano, Shiribetsu-dake Volcano and related pyroclastic flow deposits.