Petrological study of the products from Zenikamezawa volcano, east off the coast of Hakodate, Southwest Hokkaido

Chise Hashimoto[1]; Mitsuhiro Yoshimoto[2]; Mitsuhiro Nakagawa[3]

[1] Science, Hokkaido Univ.; [2] Sci., Hokkaido Univ.; [3] Earth & Planetary Sci., Hokkaido Univ.

Zenikamezawa volcano is located off the eastern coast of Hakodate, 2.5km from shoreline. The age of its eruption is estimated from 42000 to 45000 years B.P. The eruption occurred on land. After eruption, it sank below the sea level. It generated 19km^3 of fall deposit and 9km^3 of pyroclastic flow deposit (Yamagata et al., 1989). The petrogical characteristic of the product changed remarkably in the middle of eruption. Yamagata et al. (1989) indicated the existence of multiple magma cambers or a layered magma chamber, but detailed study has not been done. We reinvestigate the petrological features of Zenikamezawa volcano ejecta to reveal the magma system beneath Zenikamezawa volcano.

According to Yamagata et al. (1989), there is pyroclastic flow deposit near the vent. Pumice fall deposit sometimes lies under it. In the area about 20 km east-northeast away from the volcano, only fall deposit is recognized. This fall deposit is divided into Lower-part and Upper-part. Lower-part corresponds to the fall deposit near the vent and Upper-part corresponds to the pyroclastic flow deposit, respectively.

We collected the samples from the fall deposit, located about 20 km away from the vent. We divided this deposit into 4 units. Unit1 is volcanic ash containing biotite. Unit2 is mainly composed of orange pumice. Unit3 and unit4 are mainly composed of white pumice. Compared with division by Yamagata et al., Unit2 may correspond to Lower-part. Unit3 and Unit4 may correspond to Upper-part. Pumices are divided into 5-type based on colors and mineral assemblage. Orange pumice is main component of Unit2. It contains orthopyroxene (opx), hornblende (hb), cummingtonite (cum), plagioclase (pl) and magnetite (mt). White pumice is main component of Unit3 and Unit4. It contains hb, cum, pl, quartz (qz), mt and ilmenite (il). Other three types are recognized in Unit3 and Unit4. Grey-cpx pumice contains clinopyroxene (cpx), opx, hb, pl and mt. Grey-qz pumice contains hb, cum, pl, qz, mt and il. Fine-grained pumice, whose phenocrysts are very fine, contains hb, pl, mt and il.

Focused on mineral composition, hornblende is divided into 4 types by relationship between Mg# (Mg/ (Mg+Fe)) and Ti (cation O=23). Type-1 is Mg#60˜65 and Ti 0.15˜0.20. Type-2 is Mg#63˜70, Ti 0.06˜0.12. Type-3 is Mg#65˜70, Ti 0.17˜0.23. Type-4 is Mg#53˜56, Ti 0.11˜0.14. Cummingtonite is divided into two types, Mg#53˜56 and Mg#64˜68. Orthopyroxene also has two types, Mg#52˜64 and Mg#65˜76. Clinopyroxene is only one type, Mg#73˜78. Plagioclase is divided into two types, high-Or (K/ (Ca+Na+K)) and low-Or. Magnetite and ilmenite are also divided into different types.

Phenocrysts can be divided into four groups based on the co-existence in each sample. We assume that each group is derived from distincted magma. These magmas are grouped two types on the basis of mineral assemblage. Px-type is characterized by existence of pyroxene. Px-1 containes hb (type-1), opx, pl, and mt. Px-2 containes hb (type-3), cpx, opx, pl and mt. The amount of Px-2 is much smaller. Cum-type is characterized by existence of cummingtonite. Cum-1 containes hb (type-2), cum, pl, il and mt. Cum-2 containes hb (type-4), cum, pl, il and mt. The amount of Cum-2 is much smaller. Cum-type has relatively lower temperature and existed in shallower level than Px-type. Orange pumice is main component of Unit2 of fall deposits. Phenocrysts in it are mainly from Px-1. There are small amount of phenocrysts from other magmas, too. White pumice, main component of Unit3and Unit4, contains phenocrysts from only Cum-1.

Therefore, Px-1 erupted first when Zenikamezawa volcano eruption started. Px-1 mixed with other magmas. Pumice fall was ejected then. Secondly, Cum-1 was active. Then pyroclastic flow and pumice fall were occurred.