

Petrological groups of Nekodake volcanic rocks and origin of their compositional variations

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Volcanic activities prior to caldera-forming eruptions give important constraints on the magma supply system leading to catastrophic eruptions. Nekodake volcano, located in the eastern end of Aso Caldera, Central Kyushu, SW Japan, was considered to have been active during the post-caldera period. However, the stratigraphic relations and radiometric ages suggest that the Nekodake volcano was active during the caldera forming periods. This study elaborated the magma genesis of the Nekodake volcano from those geological, petrographic, mineralogical and geochemical features.

We classified the Nekodake volcanic products into six groups from phenocryst assemblage, rock type and chemical composition. We also found a correlation between petrographic groups, compositional groups and stratigraphy. For instance, incompatible elements are mainly abundant in olivine group (olivine + 2 pyroxene + plagioclase), and the volcanic ejecta of these groups are predominantly located in lower eastern part of Nekodake. Petrographical and petrological disequilibrium features, such as co-existence of olivine and hornblende, dusty plagioclase, An-rich (An72 - An92) and An-poor (An48 - An58) plagioclase, were observed in lower part and some upper part of Nekodake volcano. In contrast to them, some ejecta shows clear plagioclase and mono-modal distribution of An contents of plagioclase (An58 - An72). Moreover, we found many crustal materials in these upper parts of volcanic ejecta.

These observations indicate that several types of magma chambers are developed during volcanic activities of Nekodake, and that compositional diversity of the magmas can be explained by magma mixing among the end-member magmas in addition to fractional crystallization and crustal assimilation.

Keywords: Aso, Nekodake volcano, Whole rock chemical compositions, Mineral compositions, Magma mixing, Assimilation