

Petrologic Study of the Stage IV Eruptives of Myoko Volcano

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Myoko Volcano (2445 m a.s.l.), a near-conical composite stratovolcano with a summit horseshoe-shaped depression ~1.5 km wide, is located at the western Niigata Prefecture. To date, the eruptive history and characteristics of this volcano have well studied. The volcanic activity started at 0.3 Ma and is divided into four eruption stages on the basis of K-Ar and ¹⁴C ages (Hayatsu, 2008; hereafter H08). In order to decipher the magmatic evolution of the composite volcano, petrographic features and whole-rock compositions of the Stage IV eruptives are investigated.

The stage IV, the youngest stage of Myoko Volcano, consists of three sub-stages, i.e., pre-collapse (43 ka-), collapse (21 ka-6 ka), and post-collapse stages (6 ka-present) (stage names are modified from those in H08). The volcanic activity during the pre-collapse sub-stage formed the dacitic to andesitic Shibutamigawa Pyroclastic Flow Deposit (SPFD; 55.2-62.9 wt.% SiO₂; 42190 ±380 yr BP) and the directly overlying, basaltic Nishikawadani Scoria Flow Deposit (NSFD; 50.5-52.8 wt.% SiO₂). (¹⁴C age is from 08). The SPFD shows a hydrous phenocryst assemblage (Pl + Amp + Opx + Cpx ± Ol ±Opq) whereas the NSFD shows an anhydrous phenocryst assemblage (Pl ±Opx + Cpx + Ol ±Opq). The volcanic activity during the central cone stage formed two andesitic to dacitic pyroclastic flow deposits, i.e., the Akakura Pyroclastic Flow Deposit (APFD; 5510 ±70 yr. BP, 60.3-64.4 wt.% SiO₂) and the Ohtagirigawa Pyroclastic Flow Deposit (OPFD; 4060 ±60 yr. BP, 56.9-64.1 wt.% SiO₂) (¹⁴C ages are from H08). The APFD and OPFD show hydrous phenocryst assemblage (Pl + Amp + Opx ±Cpx ±Ol ±Qtz ±Opq) and contain quenched mafic enclaves (55.2-57.1 wt.% SiO₂; phenocryst assemblage Pl ±Amp + Opx + Cpx ±Ol ±Opq). Eruptives of pre- and post-collapse sub-stages show distinct linear mixing trends on many Harker diagrams. Although major and trace elements are broadly similar in all dacites erupted between pre- and post-collapse stages, there are slight differences in K₂O contents. In addition, the mafic magmas erupted between pre- and post-collapse stages are differ in TiO₂, Al₂O₃, K₂O, P₂O₅, V, and Sr contents. These petrological features indicate that the eruptions of the pre- and post-collapse sub-stages were fed by different and transitory silicic magma chambers, repeatedly recharged by mafic magmas of diverse compositions.

Keywords: Myoko Volcano, magma mixing, magma system