

Holocene eruption history of the Motoshirane Pyroclastic Cone Group, Kusatsu-Shirane Volcano

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The Kusatsu-Shirane Volcano, one of the most active volcanoes in Japan, is situated near the boundary of the Gunma and Nagano Prefectures. The summit of the volcano consists of three young pyroclastic cones, i.e., the Motoshirane Pyroclastic Cone Group (MPCG), the Ainomine Pyroclastic Cone, and the Shirane Pyroclastic Cone Group (SPCG). All historical (phreatic) eruptions occurred in the summit area of the SPCG. In contrast, the eruptive history of the MPCG has not yet been studied in detail. In order to decipher the eruption history of the MPCG, correlations between eruptives constituting the pyroclastic cone edifices and dispersed tephra are investigated. Petrological affinities, such as whole rock major-element chemistry and mineral assemblages, are utilized to identify eruptives contemporaneous with various modes of emplacement. The MPCG consists of a group of overlapping pyroclastic cones, including Kagamiike-kita, Kagamiike, Younger Motoshirane, and Older Motoshirane, which are arranged from north to south. The summit of each cone is cut by overlapping craters. In addition, three lava flows, i.e., the Isidu, Sessho, and Furikozawa lavas, poured out from the bases of the Younger Motoshirane, Kagamiike, and Kagamiike-kita cones, respectively. Stratigraphic relations suggest that each cone consists of three eruption stages; the initial lava-flowing stage, the subsequent cone-forming stage (accompanied by dome extrusion), and the final crater-enlarging explosion stage. The surface of the Older Motoshirane cone is covered by a bomb layer, which formed during the crater-enlarging stage of the adjacent Younger Motoshirane cone. In turn, the surface of the Younger Motoshirane cone is covered by the bomb layer that formed during the crater-enlarging stage of the adjacent Kagamiike cone. The proximal eruption products of the Kagamiike cone can be correlated with the 12L Volcanic Sand (4.9 cal ka BP; Yoshimoto et al., 2013) on the eastern foot based on geochemical affinities. We identified six new phreatic tephra layers sandwiched by soil layers on the southern flank of the Kagamiike cone. Here, the volcanic bombs from the Kagamiike-kita cone (probably formed during the crater-enlarging stage of the Kagamiike-kita cone) rest on the brown soil of ca. 1.5 cal ka BP. In summary, the volcanic activity of the MPCG sifted from south (Older Motoshirane cone) to north (Kagamiike-kita cone), lasting until ca. 1,500 yr. BP. This study was supported by a grand-in-aid for young scientists from PaleoLabo Co. Ltd.

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