

## Eruption history of the Shirane Pyroclastic Cone Group (SPCG), Kusatsu-Shirane volcano, from trench survey and $^{14}\text{C}$ dating: eruption ages of a crater chain and the Yumi-ike maar on the southern foot of the SPCG

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The Holocene eruption history of Mount Kusatsu-Shirane, one of the most active volcanoes in Japan, was examined based on two trenching surveys and  $^{14}\text{C}$  dating. The summit of the volcano consists of three young pyroclastic cones (the Motoshirane Pyroclastic Cone Group, Ainomine Pyroclastic Cone, and Shirane Pyroclastic Cone Group), several small craters and crater chains, and the Yumi-ike maar. Two 3 m-deep trenches were dug on the southern and eastern foot of the Shirane Pyroclastic Cone Group. The RH trench, located ca. 600 m south of the Yugama crater of the Shirane Pyroclastic Cone Group and ca. 200 m northeast of the Yumi-ike maar, contains seven eruption products, namely RH1–7 in descending stratigraphic order overlaying the basal debris flow deposit (RH8). The SJ trench, located ca. 800 m southeast of the Yugama crater, contains four eruption products, namely SJ1–4 in descending order overlaying the basal debris flow deposit (SJ5). Component and petrologic analyses showed that (1) RH7 and SJ4, (2) RH6-3 and SJ3-2, and (3) RH1 and SJ1 were respectively co-deposited during a single eruption episode. The white clayey RH7 (SJ4) layer comprises deposits of the largest phreatic eruption in the past few thousand years. Based on the thickness of the deposits, it is plausible that the RH7(SJ4)-forming eruption occurred at the Shirane Pyroclastic Cone Group. The RH6-3 layers are deposits of a single phreatomagmatic/magmatic eruption episode that occurred during 568–641 AD according to the  $^{14}\text{C}$  age of charred wood fragments. The RH6-3 layers contain deposits of a pyroclastic surge and volcanic bombs with cooling joints. Chemical compositions of juvenile volcanic bombs in the RH6, SJ3, and SJ2 are similar to those sampled at Yumi-ike maar. Consequently, it is plausible that the RH6-3(SJ3-2) is a deposit of the volcanic eruption that formed Yumi-ike maar. The RH2 layer is a deposit of phreatic explosions that occurred during 970–1022 AD based on the  $^{14}\text{C}$  age of the buried soil. The RH2 layer overlies the top of the funnel-shaped vent that was exposed during the trench survey. The extension of the vent wall meets the nearby northeast–southwest-trending crater chain, suggesting that the vent was a source of the RH2 deposit and played an important role in forming the crater chain. The uppermost RH1 layer comprises deposits derived from phreatic explosions that occurred around Yugama crater in 1882 AD.