

Eruptive history of Asahidake Volcano, central Hokkaido: New study of the stratigraphy and eruption ages of the products.

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Taisetsu volcano group is part of Quaternary volcanoes in the central part of Hokkaido, Japan. Asahidake is part of Taisetsu volcano group formed after the caldera forming eruption of Ohachidaira-caldera at 34 ka (Katsui *et al.*, 1979) and is considered as an active volcano with continues fumarolic activity. The activity and disaster response of Asahidake need to be evaluated through scientific research and observation because of many climbers and tourists visit the proximal area of Asahidake. The eruption history of Asahidake comprised of two eruptive stages of early and late stage (Ishige and Nakagawa, 2017). The early stage (until ca. 5 ka) is characterized by repeated magmatic eruptions formed a stratovolcano, while the late stage (since 2–3 ka) is characterized by phreatic eruptions. Eruptive history of the late stage activities was provided by Katsui *et al.* (1979) and Wada *et al.* (2001) and additional two radiometric ages by Okuno (2003). In addition, Holocene activities have been compiled in “The Active Volcano Summary” (ed. Meteorological Agency, 2013), but the supporting data has not been released. To clarify the Holocene eruption history and style of the late stage of Asahidake activity, we conducted volcanic geological survey. In addition, we reported new ¹⁴C dating of 4 samples to generate a more accurate cumulative volume step-diagram for eruptive magmas of Asahidake and clarified the characteristics of the history of phreatic eruptions activity over the past 5,000 years. Here, we also reported our evaluation to the long-term eruption history of Asahidake volcano.

New ¹⁴C dating data revealed that the magmatic eruption ages of Asahidake west lower lavas (WL) and Asahidake Summit pyroclastic rock (SU) are cal yBP 15367-15064 and 4871–4821, respectively. The eruption rate was changed from >0.2 km³ DRE/ky before 15 ka, to 1.0 km³ DRE/ky, during 15 ka to 9 ka, and 0.03 km³ DRE/ky since 9 ka to 5 ka. After 4,800 years ago, the eruption rate is considered 0 as the main eruption style became phreatic eruptions. Through detailed geological survey, we have identified two phreatic fallout deposits above SU on the proximal area. The two fallout deposits are named as Jigokudani volcanoclastic rock 1 and 2 (JD-1 and 2), in ascending order, with eruption ages are cal yBP 2845-2751 and 728-672, respectively. Eruption sequences of JD-1 were initiated by collapsed edifice producing debris avalanche which is followed by phreatic explosion. These activities formed the Jigokudani horseshoe-shaped crater. After that, lahar was effused from many small craters and fissures located in the vicinity of the opening part of the Jigokudani crater. The eruptive activity started to decrease. JD-2 eruption remarked the latest small scale phreatic eruption at North-West craters. Eruptive activity has not been frequent after the JD-1 eruption despite of the remarkable fumarolic activities. Considering the temporal change of eruptive activity, it might reasonable to infer that the activity of the Asahidake volcano has gradually decreased. However, to mitigate volcanic hazards, it should be noted that small scale of phreatic explosion and/or effusion of lahar, similar to that of JD-2 eruption, might occur near the tourism infrastructures.

Keywords: Asahidake, phreatic eruption, eruption style, eruption rate, radiocarbon dating