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Radiocarbon Dating of an Alpine Plant Leaf Found in Permafrost on the Daisetsu Mountains, Hokkaido, Japan

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The age of a small plant leaf frozen in ground ice at a depth of 8.3 meters in a borehole on the summit area of Mt. Goshiki in the Daisetsu Mountains, Hokkaido, Japan, was determined using radiocarbon dating. The calibrated age of the leaf (using OxCal v. 4.4.4) was 288±26 (40.0%) or 182±39 (48.2%) calendar years BP, placing it within the last Little Ice Age in Japan. This age indicates the last aggradation of mountain permafrost on the Daisetsu Mountains. The current summit area of the Daisetsu Mountains was formed approximately 5,000 years ago, and permafrost is sporadically distributed under the current mean annual air temperature of about -3℃. The leaf was found within ground ice that filled an oblique crack approximately 10 mm wide in the sample core. The dated leaf was identified as a member of the Ericaceae family, which is commonly found on the current ground surface around the sampled borehole.This finding suggests that the leaf infiltrated with liquid water down to 8.3 meters through a crack extending from the ground surface about 300 years ago. It also implies that the ground, consisting of volcanic ash and pumice, was dry and unsaturated by water or ice at the time the current ground ice in the summit area of Mt. Goshiki was formed. The permafrost must have thawed to at least 8.3 meters, likely due to volcanic activity related to the last eruption of Mt. Asahi, the highest peak of the Daisetsu Mountains, located about 5 km west of Mt. Goshiki.

Student Submission

No

Primary authors: IWAHANA, Go (International Arctic Research Center, University of Alaska Fairbanks); UCHIDA, Masao (NIES-TERRA AMS facility, National Institute for Environmental Studies)

Presenters: IWAHANA, Go (International Arctic Research Center, University of Alaska Fairbanks); UCHIDA, Masao (NIES-TERRA AMS facility, National Institute for Environmental Studies)

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