Identification of an event deposit in the Miyazaki Plain based on chemical composition of volcaninc glass

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The Kikai-Akahoya (K-Ah) volcanic ash from the 7.3 ka Kikai caldera eruption is one of the representative tephra of the Quaternary. The K-Ah tephra is overlying the Koya pyroclastic flow (K-Ky) and used as a key age marker of the Quaternary in Japan. Several tsunamis related to the K-Ah eruption have been suggested (e.g., Nanayama, 2018; Kobayashi, 2022). The sediments originating from these tsunamis have been reported in Kyusyu Island, Shikoku Island, Kinki area and so on (e.g., Nanayama et al., 2021). We newly found the event deposit associated with the tsunami of the K-Ah eruption in the core (MMS1) from the Miyazaki Plain. Here, we present the results of tephra analysis and ^{14}C dating of samples in the MMS1 core.

We collected the MMS1 core in the uppermost part of the Holocene terraces (Shimotajima I terrace; Nagaoka et al., 1991). ^{14}C dating was conducted for 17 samples by an accelerator mass spectrometry (JAEA-AMS-TONO-5MV, NEC 15SDH-2). The refractive index of volcanic glass was analyzed for 4 samples using a refractometer by thermal immersion method in Kyoto Fission-Track Co., Ltd. and chemical composition of volcanic glass was analyzed for 7 samples by an electron probe micro analyzer and a laser ablation-inductively coupled plasma mass spectrometry in Tono Geoscience Center, Japan Atomic Energy Agency.

The sediments between 10.4 m and 12.0 m in depth contained volcanic glasses and pumices that developed planar lamination with sand, indicating that tephra was deposited secondarily as submerged sediments. Nanayama et al. (2019) founded the similar sediments in a river near the boring site and interpreted to be deposit of tsunami during the 7.3 ka Kikai caldera eruption. Radiocarbon ages were obtained from one sample at 13.0 m depth (7570–7430 cal BP) and three samples at depths of 12.0–11.0 m (7580–7280 cal BP, 7680–7430 cal BP, 7420–6940 cal BP). A Sample in the deeper than 13.0 m contained slightly volcanic glass and 90% of volcanic glass in the sample identified Aira-Tn (AT) tephra based on chemical composition. The fractions of volcanic glass at depths of 12.3 m and 11.8–10.2 m increased and 25% and 70–80% of volcanic glass in the samples, respectively, which were identified as the K-Ah tephra based on chemical composition. Based on refractive index, almost volcanic glass at 12.6 m depth was identified as the AT tephra, while the samples at depths of 12.0–11.0 m were identified as the K-Ah tephra. The results of ^{14}C ages and identification by chemical composition and refractive index of volcanic glass are consistent with the assumption that the sediments between 10.4 m and 12.0 m in depth were tsunami sediments related to the K-Ah eruption.

Chemical composition of volcanic glass in the K-Ah tephra is bimodal: ca. 65wt.% (Type L) and ca. 75wt.% (Type H) of SiO_2 concentration. Type H erupted in the early K-Ky eruption, and then the magma mixed with Type L erupted in the late K-Ky eruption (Fujiwara and Suzuki, 2013; Nakaoka et al., 2022). The samples contained the K-Ah volcanic ash in this study consist of mainly Type H and slightly Type L, which is consistent to the results of samples at the Sukumo Bay area (the SKM core) in Shikoku Island and the MIK1 core in the Miyazaki Plain (Nanayama et al., 2021). In the MMS1 core, Type H from 11.8–10.2 m depth was subdivided into two clusters on the Harker diagram for K_2O and that from 12.3 m depth contained only one cluster of higher SiO_2 concentration. The feature of the volcanic glasses may indicate the change in magma composition during the eruption.

Keywords: K-Ah, Kikai caldera eruption, Miyazaki Plain, tsunami deposit, chemical composition of glass

