

Phreatic eruption history at the latest stage (since ca. 3ka) of Hakone Volcano

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The increase of fumarolic and geothermal activities has been observed frequently in the Owakudani fumarolic zone at the foot of Kanmurigatake, the latest lava dome (ca.3ka) of Hakone volcano. This study has been focusing on clarifying history of the phreatic eruption after the Kanmurigatake event in order to understand the hazard of the eruption of Hakone volcano before the 2015 eruption. We discovered eruption deposits (Owakudani tephra group (Hk-Ow tephra): Hk-Ow1 to Ow5) and studied the eruption mechanism based on those component material, through investigating their ages, distributions, and deposition facies (Kobayashi et al., 2006).

Currently, we are conducting research to extract and describe the vent-like terrain that were traces of past eruptions in detail using the Red Relief Image Map (RRIM: Chiba et al., 2007) acquired from airborne high-precision LIDER DEM. As a result, it was found that there are several clear fissure vents in the NW-SE direction on the central cones around Kamiyama and Owakudani (Fig. 1). In particular, it was found that the vent terrains are concentrated near the ridge extending northeast from the summit of Kamiyama (B and C in Fig. 1). Furthermore, it was found that there is a fissure vent about 500m long on the north side from dense area of vent terrain, and this fissure vent crosses the prefectural road connecting the foot from Owakudani Park (A in Fig. 1). In the geological survey, we correlated eruption events based on the stratigraphy and ¹⁴C age, and considered the source vents based on the distribution of each eruption deposits (Fig. 2).

As a result, it is considered that most of the fissure vents around Kamiyama and Owakudani were related to the Kamiyama sector collapse, the Kanmurigatake event or earlier Kamiyama eruption. On the other hand, the fissure vents of Hk-Ow tephra are located only in the NW-SE region centering on the headwall of the Owakudani from the NE ridge of Kamiyama. These fissure vents are in good agreement with the location and direction of the hydrothermal intrusion at the 2015 eruption (Doke et al., 2018), so the 2015 eruption should be interpreted as reactivation of the hydrothermal crack that caused the Hk-Ow tephra

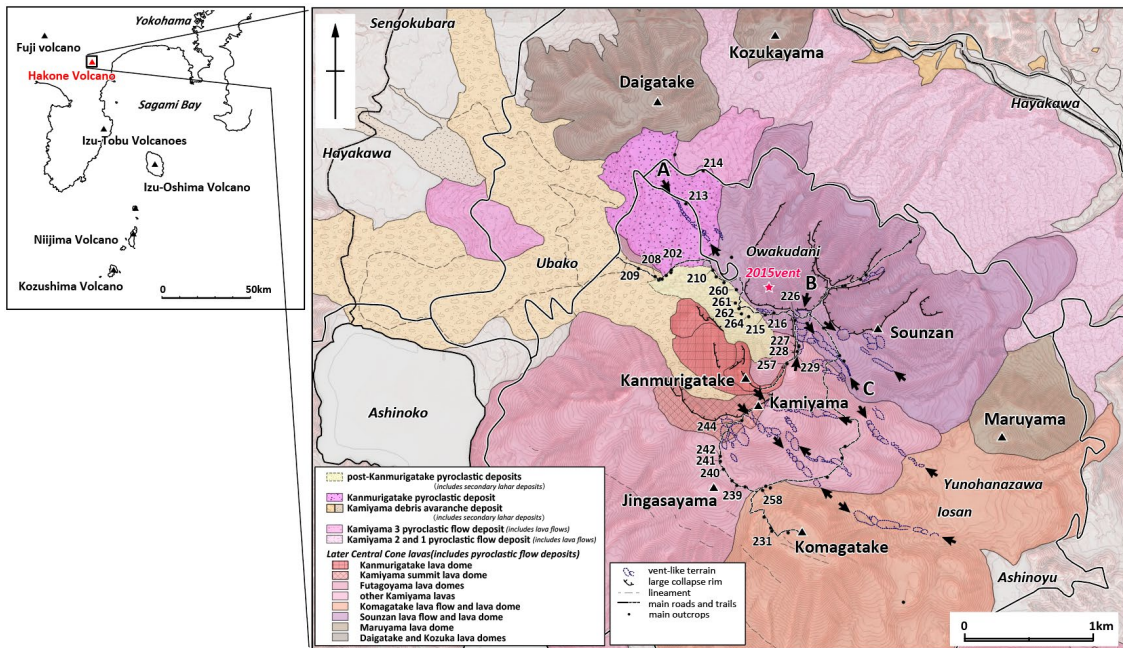


Fig. 1 Map of fissure vents on central cones around Kamiyama and Owakudani. The RRIM was created based on 1m DEM obtained from LP data provided by Kanagawa Prefecture. The RRIM creation method (Patent 3670274, Patent 4272146) of Asia Navigation Co., Ltd. was employed (produced by Mr. Chiba T.).

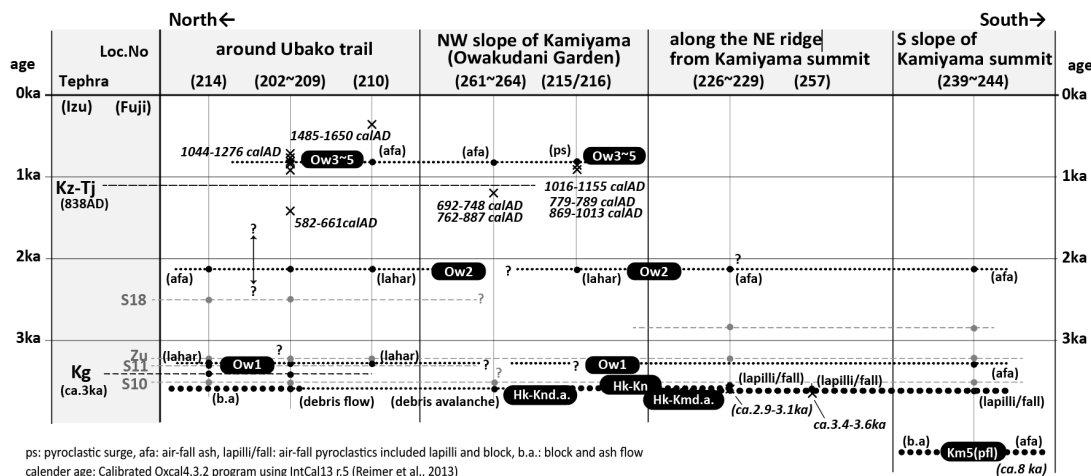


Fig. 2 Space-Time diagram of eruption deposits around Kamiyama and Owakudani.

Chiba T, Suzuki Y and Hiramatsu T (2007) Digital Terrain Representation Methods and Red Relief Image Map, A New Visualization Approach, "MAP", Journal of the Japan Cartographic Association 45-1 2007

Kobayashi M, Mannen K and Okuno M et al. (2006) The Owakidani Tephra Group: A Newly Discovered Post-magmatic Eruption Product of Hakone Volcano, Japan, Bulletin of the Volcanological Society of Japan, doi: 10.18940/kazan.51.4_245

Doke R, Harada M, Mannen K, Itadera K, Takenaka J (2018) InSAR analysis for detecting the route of hydrothermal fluid to the surface during the 2015 phreatic eruption of Hakone Volcano, Japan. Earth, Planets Sp 70:63. doi: 10.1186/s40623-018-0834-4