

Geomorphological analysis of Niijima and Kozushima Volcanoes using high-resolution LiDAR DEM

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During the eruptions of the AD886 (Mukaiyama event) and AD 838 (Tenjosan event) on the Niijima Volcano and Kozushima Volcanoes, pyroclastic flow and pyroclastic surge occurred, following by formations of pyroclastic cones and lava domes, respectively. These pyroclastic surges covered in each island (Ito, 1999). The eruptive activities of these volcanoes are characterized by the phreatomagmatic eruption reflecting the geographical conditions of the islands. In order to evaluate future volcanic disasters properly, it is important to collect not only the latest eruptions but also past eruptions in the longer-term data that are available in making assumptions corresponding to various eruption phenomena.

In this study, we conducted geomorphological analysis of Niijima and Kozushima Volcanoes using the IN-YOU-ZU (Patent (Pat. No. 4379264) of Aero Asahi Corporation) generated from 1m resolution LiDAR DEM acquired by Geographical Survey Institute (GSI).

1. Niijima Volcano

The southern part of Niijima Island consists of surfaces of pyroclastic flow and pyroclastic surge deposits, pyroclastic cones and a lava dome resulting from Mukaiyama event. Many flow units were distinguished at the lava dome, and explosion craters are recognized at the end of them. Around Wakago area in northern part of Niijima Island, we recognized 6 tuff ring-maar craters formed at the Kudamaki-Atchiyama event (AD856-AD857, after Tsukui et al., 2008), and Atchiyama lava dome in a tuff ring facing Awai-ura was erupted in the formation of those tuff ring-maar craters. From these topographical features, we concluded that various style of eruption occurred one after another during a few years.

In the central and northern part of Niijima Island, we estimated the sequential order of lava domes on the basis of degree of dissection. Mineji-yama is the oldest one, followed by Niijima-yama and Akasaki-mine. Miyatsuka-yama showing a flat and horizontal top was the latest one. Around the contact region of Miyatsuka-yama and Akasaki-mine, mounds with 20-30m height were recognized. Lavas constituting those lava domes were covered with thick pyroclasts deposits, and the mounds on these edifices consist of pyroclasts including volcanic blocks. Considering that, eruptions of each lava dome accompanied by pyroclasts and had continued for a prolonged period (Kobayashi et al., 2018).

2. Kozushima Volcano

The center of Kozushima volcano are occupied by Tenjozan pyroclastic cone and lava dome. On the north and south of the island, there are two lines composed of monogenetic volcanoes with northwest to southeast direction: the Kobeyama-Ananoyama-Hanatateyama line in the northern part, and the Takodoyama-Osawa-Matsuyamahana line in the southern part, respectively.

From north to west side of Tenjosan, a double structure is recognized, which consists of

semi-circular-shaped or arc-shaped ridges with a constant height. Both of which consist of pyroclastic flow and pyroclastic surge deposits (Nishizawa et al., 2018), are partially covered with the pyroclasts from Tenjosan. Regarding Jogoyama (corresponding to Kushiga-mine pumice cone and Jogoro-yama after Taniguchi (1977)) located in northeast of Tenjosan, its degree of dissection is lower than that of these ridges. This suggested that Jogoyama would consist of newer ejecta.

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