

Recent progress and perspective in studies for eruption history of Quaternary volcanoes in north Izu Islands

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Many active Quaternary volcanoes distribute in north Izu Islands, the northern part of Izu-Bonin Arc. Comparing to other Quaternary volcanoes in the Japanese Islands, geomorphological and geological data are not sufficient because most of them are submarine volcanoes or volcanic islands with limited land areas. Nine volcanic islands with residents (Izu-oshima, Toshima, Nijima, Shikine, Kozu, Miyake, Mikura, Hachijo, and Aogashima Islands) are active volcanoes, requiring volcanic disaster measures for future eruptions such as continuous geophysical observations, hazard map, evacuation plan, and reconstruction of past eruption properties (eruption succession, mode of eruption, magnitude, age, and so on). Geological maps and eruption histories for volcanoes above have been published. However, their progresses of these mapping and studies are different, showing insufficiencies in volcanological studies. Here, we review previous studies and show perspectives in studies on eruption history of north Izu Islands.

Nijima and Kozu Islands are originated from rhyolite magma. On both volcanoes, explosive eruption occurred in 9th century, followed by dormant period until present. For this, the eruption history for these volcanoes have been explored through geomorphological and geological methods by previous studies. Sequence of volcanic products during last 30 krys on both islands has been proposed using widespread AT tephra (30 ka; Smith et al., 2013) (Yoshida, 1992; Suga et al., 2003). However, different histories in the southern part of Kozushima Islands composed of monogenetic volcanoes were proposed by several authors such as Suga et al. (2003) and Yokoyama et al. (2003). Other problems left in the island are: scarcity of reliable radio metric ages before 30 ka, unclear relation between many monogenetic volcanoes and tephras, suggesting advantages of geomorphic analysis using the airborne laser survey and detailed description of tephras. Here, we report recent studies on both islands, that is, landforms of both islands, and tephra sequence in middle to north Nijima Island (Kobayashi et al., 2018), eruption history of Kozushima Island (Nishizawa et al., 2018; Ito et al., 2018).

Izu-oshima and Miyake Islands have frequently erupted recently, suggesting next eruptions in near future. Due to the large number of eruptions, eruption history studies have been carried out since 1960s (Izu-oshima: Nakamura, 1964; Koyama & Hayakawa, 1996; Miyake: Tsukui et al., 2005), still publishing new data (Kawanabe, 2012; Oikawa & Geshi, 2010), remaining problems unsolved. For example, precise age of N1 (9 to 11 century) of the Izu-oshima Volcano has not been determined, indicated by different ages among literatures (e.g.: Tsukui et al, 2006; Kawanabe, 2012). Additionally, precise ages of products roughly erupted from 20 ka to 1.7 ka has not been determined. Moreover, Fudeshima and Okata Volcanoes preceding Oshima Volcano has not well known. Detailed history of Miyake Volcano was also established, however older history of the Miyake Volcano is not clear despite of recognition of AT (Nanri & Suzuki, 2014). The history of Hachijo Volcano during longer period of ca. 50 ka was well established (Sugihara, 1998).

Studies of eruption history on Toshima, Mikura, and Aogashima Islands have not well done, reflected by older eruptive events such as 4 ka and 6 ka occurred on Toshima, and Mikura Islands, respectively. New

data are required for volcanic disaster measure because of difficulties in the evacuation.

In conclusion, the ages constructed for eruption history of each volcano is variable. For longer eruption history, it will be sufficient to survey underground geology although it is limited. Moreover, identification of tephra covering on distant islands will be effective. Especially, rhyolite tephra derived from Nijima and Kozu Volcanoes have already been identified on not only north Izu Islands (Sugihara et al., 2005; Sato et al., 2006) but also on further main Japanese Islands such as the foot of Mt. Fuji (Kobayashi et al., 2007) and Suigetsu Lake in Fukui (McLean et al., 2018) where Kozushima-Tenjo Tephra (AD838) was found. It is needed to focus on distal tephra from Izu Islands to revise eruption history. For this, fundamental studies on marine tephra in and around Izu Islands, preparation of tephra database (Aoki et al., 2018), and discrimination of similar tephra (e.g. from Nijima and Kozu Islands) (Suzuki et al., 2017) are significant.

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