Variation of hydrothermal mineral associations and characteristics of volcanic activity at Ponmachineshiri Volcano during the last 1000 years, Meakan volcanic group, Eastern Hokkaido, Japan

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Meakan volcanic group consists of post-caldera active volcanoes located on the south-eastern rim of Akan caldera. Recent activities of Meakan volcanic group occurred at Ponmachineshiri Volcano in 1955-1960, 1988, 1996, 1998, 2006, and 2008. These events indicate that Ponmachineshiri Volcano has a high potential for future eruptions. In order to better understand the hazards posed by this volcano, this study focused on eruptive activity at Ponmachineshiri in Meakan volcano during the last 1000 years to characterize the modern volcano system. As a result, at least four layers of fall deposits were observed at outcrops in the summit area and five excavation sites on the volcanic flank. In chronological order, the fall deposits consist of Pon-1 (10^{th} century; VEI=2), Pon-2 (13^{th} to 14^{th} century; VEI=2), Pon-3 (16^{th} to 17^{th} century; VEI=1), and Pon-4 (after AD1739; VEI=1). The ash fall deposits of Pon-1, Pon-2, Pon-3, and Pon-4 can be traced at least 2 km from the summit, indicating they were produced by relatively large-scale eruptions. On the contrary, phreatic- and phreatomagmatic eruption deposits intercalated within Pon-1, Pon-2, and Pon-3 deposits were only observed in the proximal region. These intercalated eruptive products provide a record of intermittent and relatively small-scale eruptions. Presence of scoria and minor pumice in the Pon-1, Pon-2, and Pon-3 is evidence that these eruptions were magmatic and/or phreatomagmatic events. On the other hand, the absence of magmatic fragments in the Pon-4 deposit suggests that the eruption was phreatic event.

To assess the contribution from the sub-volcanic hydrothermal system for the eruptions, we determined hydrothermal mineral associations within the Pon-1, Pon-2, Pon-3, and Pon-4 deposits and intercalated eruptive products. The mineral associations can be divided into three types based on their equivalent temperature as; (1) Silica minerals + pyrophyllite + Kaolin group minerals indicative of relatively high temperature; (2) Silica minerals + Kaolin group minerals indicative of moderate temperature; and (3) Silica mineral ±smectite indicative of relatively lower temperature. Mineral associations of Pon-1, Pon-2, Pon-3, and Pon-4 deposits and intercalated eruptive products show several trends, such as the appearance of the lower temperature mineral association (3) in the (phreato-)magmatic eruption products and subsequent phreatic eruptive deposits. Alternatively, the higher temperature mineral association (1) appears in the proximal phreatic eruption products that preceded magmatic events. Following the intense magmatic activity of Pon-2, the hydrothermal mineral association changed from lower temperature to higher temperature, which indicates that the hydrothermal system related to these eruptions became a higher temperature system. The decreasing proportion of juvenile material in eruptive deposits over the last 1000 years is consistent with a reduced magma contribution and indicates that the hydrothermal system is likely to play an important role in future eruption scenarios.

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