

Eruptive history at Ponmachineshiri in Meakan volcano during the last 1000 years: Implication from trench surveys

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Eruptive histories established solely by geological records around the near-vent area are always incomplete, because the preservation potential of the volcanic deposits vary according to local conditions such as altitude, climate, and geomorphology. On the contrary, the static flank of a volcano can have a high potential for preserving volcanic deposits. Undertaking an excavation survey at a static flank, therefore, is critical to observe a more complete depositional sequence of volcanic products in order to establish the eruptive history of an active volcano.

This study focuses on volcanic activities at Ponmachineshiri in Meakan volcano during the last 1000 years. 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, Pon-2, Pon-3, and Pon-4.

The deposit of the Pon-1 is yellowish brown to dark brown tuff breccia in the summit area (< 15 m thick) and lapilli tuff on the flank (8 cm thick). The deposit is characterized by the presence of abundant breadcrust bombs. The component analysis in the matrix of the deposit (250 –600 μm) revealed that the deposit consists of fresh scoria (50 vol.%) and altered lithic fragments (40 vol.%) with a minor amount of free crystals (10 vol. %). Lenticular or patch-like intercalation of Ma-b (ca. 10th century AD) was observed at the basal part of the deposit.

The Pon-2 deposit is 3.5m thick in the summit area and less than 4 cm on the flank. The deposit consists of scoria (50 vol.%) and altered fragments (40 vol.%) with a minor amount of free crystals (10 vol.%). The deposit shows reddish brown tuff breccia or lapilli tuff facies in the field. The radiocarbon ages of paleosol layers immediately underlying the Pon-2 are 710 ± 20 yrBP and 670 ± 20 yrBP and indicate that the eruption age of the Pon-2 is 13th-14th century AD.

The Pon-3 deposit is yellowish brown lapilli tuff consisting of abundant hydrothermally altered fragments (90 vol.%) with minor amounts of scoria (3 vol.%), gray-pumice (2 vol.%), and free crystals (5 vol.%). The thickness of the deposit is 2 m in the summit area and 6 cm on the flank. The radiocarbon age of a paleosol layer immediately underlying the Pon-2 is 380 ± 20 yrBP, which indicates that eruption of the Pon-3 occurred at 16th-17th century AD.

The deposit of the Pon-4 is blueish gray lapilli tuff. The thickness of the deposit in the summit area is 0.5 m and 3 cm on the flank. The deposit is characterized by the features of containing abundant hydrothermally altered fragments (92 vol.%) with minor amounts of accidental lithic fragments (2 vol.%) and free crystals (6 vol. %). The Pon-4 deposit overlies Ko-c2 (AD1694) and Ta-a (AD1739), thus suggesting that the eruption occurred after AD1739.

Excavation surveys at the volcanic flank revealed that at least four eruptions occurred at Ponmachineshiri in Meakan volcano during the last 1000 years: namely Pos-1 at ca. 10th century AD; Pon-2 at 13th-14th century AD; Pon-3 at 16th-17th century AD; and Pon-4 after AD1739. The products of these eruptions were preserved as geological units. Thus, these eruptions were relatively large-scale eruptions compared with other historical eruptions which have been eroded already. Coexistence of hydrothermally altered materials and magmatic materials such as scoria in the Pon-1, Pon-2, and Pon-3 indicates that these deposits were sourced from phreatomagmatic eruptions. On the contrary, the absence of magmatic fragments in the Pon-4 deposit suggest that the eruption was phreatic event.

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