

Eruption history, conduit migration, and steady discharge of magma for the past 50,000 yr at Esan Volcanic Complex, northern Japan

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We have undertaken a detailed field, petrological, geochronological, and modeling study of Esan Volcanic Complex (EVC), northern Japan, in order to establish its eruptive history over the past 50,000 yr. The EVC includes seven lava domes, which are endogenous domes developed without basal edifices. Each dome was produced by intermediate to silicic magmas with 57-67 wt% SiO₂ that were erupted in magnitude 4-5 eruptions. Five explosively erupted pyroclastic units cover the aprons of these lava domes. The spatial and temporal relationships of the domes and the pyroclastic units have been determined in order to constrain the eruptive sequence of the EVC.

A simple elastic model, assuming a hydraulic connection state, was utilized to study variations in long-term magma discharge at the EVC, which have been attributed to changes in magma storage conditions. The stepwise change in magma discharge with time, which is 4.2 to 5.3 x 10⁴ m³/yr, is interpreted to reflect a change between magma chamber radius (R_c) and magma depth (H_c) caused by an upward migration of magma. Assuming a continuous input of magma from a deep source at a constant supply rate, the magma storage system that existed during the early stage of the EVC has been renewed, which will result in a shorter recurrence interval between eruptions rather than a long period of dormancy (22,400 yr). Given this finding, and the fact that the most recent eruption occurred at 9,000 yr ago, there is currently a risk of a large eruption at the EVC.