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Geological map of Zao volcano

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We present new geological map of Zao volcano, as Geological Map of Volcanoes 18 by GSJ.

Zao volcano is a Quaternary stratovolcano located in the middle part of the volcanic front of northeast Japan arc. The volcanic activity started at ca. 1 Ma, and has continued to the present. The activity can be divided into six stages.

Stage I: The eruption products of ca. 1 Ma are hyaloclastites and dikes. These eruptions would have taken place under lake water. Rocks are tholeiitic basalt to andesite. Stage II: Around 0.5 Ma, activities of mainly lava effusion were taken place in the northern part. Stage III: During ca. 0.35 to 0.25 Ma, several small to middle sized andesitic to dacitic edifices were formed at the central part. At the end of this stage, small sized ediffice of basaltic andesite lavas was formed. Stage IV: During ca. 0.25 to 0.20 Ma, andesitic to dacitic lavas were swelled out in the southern area, and formed middle sized volcanic ediffice. Stage V: From ca. 0.13 to 0.04 Ma, andesitic lava flows with pyroclastic materials erupted from several vents in the northern to central part, which constitute middle sized volcanic ediffice. Stage VI: The most recent stage of the Zao volcano began at ca. 35 ka, when the horseshoe-shaped erosion caldera (1.7 km in diameter) was formed in the central part. Numerous small- to medium-sized explosive eruptions of calc-alkaline basaltic andesite magmas have occurred since then. The youngest small ediffice Goshikidake building activity started at about 2ky. In this stage, small sized lava flows were rarely effused.

Systematic temporal change in petrologic characteristics can be observed. All eruption products of stage I belong to low-K tholeiitic series, while the others belong to medium-K calc-alkaline series. The potassium levels of stage II products are lower than those of stage IV and V products. Geologic units with both of those two potassium levels can be observed in stage III. The stage VI products show compositional trends crossing the boundary between low and medium-K series. More in detail, temporal and special variation in compositional trends within each stage can be observed. Especially, the variations are relatively intense in stage IV and V products.

From the record of AD 1230, many historic activities were recorded in written accounts. All were generated at the Okama crater lake. From 17th to 19th century, the eruptions continued for ca. 100 years with intermittent dormancies. In 17th, the eruptions have occurred in 1620-1625, 1641, 1668-70, 1694. From late 18th to 19th, the eruptions were taken place in 1794-96, 1809, 1831-33, 1894-1897. The activities are characterized by outbreak of lahar. Among the activities from AD 1894 to 1897, phreatic eruptions occurred. The latest volcanic activity in Okama occurred during 1939 to 1943.

Keywords: Zao, Volcano, Geological map