Volcanic eruptions at Aso Nakadake after 1928 based on volcanic tremor, eruption records and deposits

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The Aso Nakadake is one of most active volcanoes in Japanese Island. Seismic wave data associated with volcanic activity were recorded by Aso Volcanological Laboratory, Kyoto University from 1928 to 2000. Volcanic tremor data related to large -scale eruption events were analyzed, however, most data have been still not analyzed. One of targets in this study is analysis of all of volcanic tremor data from 1928 to 2000. Geological and petrogical descriptions of volcanic products after 1930 were carried out. On the basis of these data, the relationship between volcanic tremors and eruption events will be discussed.

1. Analyses of volcanic tremors and eruptions from 1928 to 2000. The activities are divided into the following four types. (A) Large scale phreatic eruption suddenly took place without any precursor. Then the activity was increasing and Strombolian eruption occurred. An amplitude of volcanic tremor shows less than 1mm before eruption, and it increased more than 10 mm with phreatic eruption, and then is increasing and shifted to continuous tremors with Strombolian eruption. (B) Phreatic eruption suddenly took place without any precursor and then eruption ceased. An amplitude of volcanic tremor is les than 1mm before eruption, and it increased less than 3 mm with phreatic eruption, and then returned to less than 1 mm with termination of eruption. (C) This type eruption started as phreatic eruption at hot crater lake, and then proceeded to Strombolian eruption through eruption of sediments from bottom of lake and cinders. The volcanic tremors corresponding to the eruption show the following records; firstly an amplitude was increasing and shifted to continuous tremors with increasing of eruption of sediments and cinders. Finally the tremors reached maximum with Strombolian eruption. (D) This type eruption process shows the following sequences; phreatic eruption at hot crater lake, eruption of sediments from bottom of pond and cinders and then associated with rest of eruption. Followed these sequences, finally Strombolian eruption took place. An amplitude of the volcanic tremor is gradually increasing with proceeding of eruption of sediments and cinders, then became to nearly zero at rest of eruption. After then an amplitude is increasing more than 3 mm with development of Strombolian eruption.

2. Geological and petrochemical features of erupted products of1930 eruption from the site 1 at the fourth crater, 1933 eruption from the site 2 of 1 first crater, and 1989 eruption from the site 4 at shelter near first crater were investigated. The results are as follows; (1) the deposits from these sites show similar sequences, i. e., white-colored silt-size to medium-grain volcanic ash beds, scoria bearing black-colored ash beds and scoria beds in ascending order. Concentration of sulfur is very high, S=12.6-1.3wt%, in the volcanic ash beds of the lowest part which contain gypsum. The sequence corresponds to the eruption histosry; phreatic eruption with sediments at the bottom of the lake, volcanic ash with scoria and Strombolian eruption of scoria with time.

Volcanic flagments from eruptions of 1930, 1933 and 1989 are basaltic andesite with 52.9-53.5 wt% of SiO2 content. FeO∗/MgO ratios vary from 1.95 to 2.56. FeO∗/MgO - element variation diagrams show similar trend in the volcanic fragments from each stage, indicating that fractionation of olivine, clinopyroxene and plagioclase took place in the similar basaltic magma in each stage.