マグマ貫入速度による桜島火山における噴火事象分岐論理
Forecasting Volcanic Eruption of Sakurajima Volcano Based on Magma Intrusion Rate

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In order to find an empirical event branch logic from abnormal phenomena to following volcanic activity for forecasting scale and type of eruption, the magma intrusion rate prior to eruptions of Sakurajima volcano is examined using ground deformation mostly from observation data and partially based on legends, for eruptions after the 20th century: the 1914 eruption starting with plinian eruption followed by effusion of lava, the 1946 eruptions with lava effusion, eruptions at the summit crater of Minamidake during the period from 1955 to 2005, and vulcanian eruptions at Showa crater east of the summit from 2006 to 2017. Prior to the 1914 eruption, it is estimated that the magma intrusion rate attained a level of approximately 10^8 m^3/day and was on the order of 10^6 m^3/day during the effusion of lava in the 1946 eruption. During the eruptive period of Minamidake summit crater, three types of eruption occurred: vulcanian eruption, strombolian/lava fountain and continuous emission of volcanic ash. In cases of intrusion of magma forming a new conduit, the intrusion rate immediately before the 1914 eruption exceeded 10^8 m^3/day, but only 10^6m^3/day in the dyke-forming event of August 15, 2015. Magma intrusion rate into a pre-existing conduit prior to eruptions at Minamidake summit crater are ordered as follows: vulcanian eruption ($1x10^5$ to $8x10^5$ m^3/day) > continuous emission of volcanic ash (approximately $1x10^5$m^3/day) > strombolian/lava fountain ($0.2x10^5$ to $2x10^5$ m^3/day). The magma intrusion rate prior to vulcanian eruptions at Showa crater is smaller (approximately 10^4m^3/day) than for eruptions at Minamidake summit crater. However, the rate reached an order of 10^5m^3/day prior to lava fountain on August 22, 2017. Magma intrusion rates well correspond to the scale and type of eruption. In the case of magma intrusion under detection, the change of volcanic gas and increase in the heat discharge rate are available for the empirical event branch logic.

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