

Process of migration of magma toward Sakurajima volcano, Japan

Masato Iguchi^{1*}, Tomoki Tsutsui³, Sadato Ueki⁴, Kenji Nogami⁵, Shuhei Okubo⁶,
Toshiya Mori⁷, Haruhisa Nakamichi⁸, Takahiro Ohkura⁹, Hiroshi Shimizu¹⁰,
Hiroki Miyamachi¹¹, Mitsuhiro Nakagawa², Taketo Shimano¹²

¹DPRI, Kyoto Univ., ²Hokkaido Univ., ³Akita Univ., ⁴Tohoku Univ., ⁵TIT, ⁶ERI, Univ. Tokyo, ⁷Univ. Tokyo,
⁸Nagoya Univ., ⁹Kyoto Univ., ¹⁰Kyushu Univ., ¹¹Kagoshima Univ., ¹²Fujitokoha Univ.

Eruptive activity of Vulcanian type has repeated at the summit crater, Minamidake of Sakurajima volcano since 1955. Annual numbers of explosions exceeded 200 from 1974 to 1999; however the explosive activity declined from 2000. On the other hand, eruptive activity at Showa crater located at eastern flank of the Minamidake resumed in June 2006 after 60-years dormancy from lava effusion in 1946. Although the eruptive activity started with small phreato-magmatic eruption, the eruptivity increased step-by-step in 2007, 2008 and 2009. Number of explosions exceeded 500 in 2009. It is estimated that main magma reservoir is located at depth of 10 km beneath Aira caldera, north of the Sakurajima. Ground observation revealed that the magma reservoir deflated during the active period from 1974 to 1992; however, deflation of magma reservoir turned inflation in 1993. The inflation volume amounted to 90 million m³ during the period from 1995 to 2009. Due to inflation of magma reservoir, seismicity of volcano-tectonic earthquake increased beneath the Minamidake and the seismic zone extended, especially at SW of Sakurajima and NE of Aira caldera from 2003. Therefore, it is expected that eruptive activity of the Sakurajima will become violent near future, and our group started study on process of magma migration toward the Sakurajima volcano.

Our study composed of 4 topics; 1) mechanical process of magma migration as revealed by seismic and ground deformation observation, 2) Detection of magma migration path and their temporal change as revealed by artificial seismic experiment by using dynamite and MT survey for imaging of internal structure of volcano, 3) temporal change of magma flux from the magma reservoir beneath the Aira caldera to Sakurajima and 4) chemical analysis of volcanic ash and lapilli ejected from the Showa crater, as precursory product prior to a future larger eruption.

It is estimated that magma flux beneath the Sakurajima to be 3 million m³/year in 2009 from tilt change and volume of volcanic ash emitted from the crater. The amount is much larger than the flux in 2008 (<0.3 million m³/year).

Keywords: Sakurajima volcano, magma supply, prediction of volcanic eruption