Article

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Temporal Variations of the Petrological Features of the Juvenile Materials during 2006 to 2010 from Showa Crater, Sakurajima Volcano, Kyushu, Japan

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On June 2006, Sakurajima volcano in Japan resumed its eruptive activity at Showa crater in Minamidake. We investigated dated ash samples, including lapilli ejecta of several eruptions, to evaluate the temporal relationship between their petrological features and eruptive activity. The activity is characterized by low frequency of explosive eruptions accompanied with small, periodic inflation from June 2006 to August 2009. No juvenile materials existed in the ash during this period (1st period). Frequent explosive eruptions accompanied with large, continuous inflation had continued from September 2009 until March 2010 (2nd period). Juvenile materials such as unaltered scoria and pumice with fresh glass have been recognized since late September 2009. The whole-rock chemistry of these juvenile materials is similar to those from AD 1955 to AD 2000 but is the most mafic (SiO_2＝58.5−59.1 wt.%), indicating that the magma system, in which mafic magma was injected into silicic magma, has not changed. The matrix glass compositions of the juvenile materials are dacitic (SiO_2＝67.2−72.7 wt.%). During the 2nd period, the proportion of juvenile materials in eruptive ash increased and the SiO_2 contents of glass decreased with time. These temporal changes suggest that the high level of eruptive activity during the 2nd period was caused by the increase of mafic components in eruptive magma. During April to May 2010 (3rd period), the number of eruption had become small without inflation, and the proportion of juvenile materials also decreased. From June 2010 (4th period), although the mode of crustal deformation has changed to deflation, eruptive activity has increased again and the juvenile materials have been mainly ejected. The glass compositions during this period have become slightly higher in SiO_2 content. These temporal changes of eruptive style and glass compositions suggest that the eruptive activity since AD 2006 has not been directly affected by the addition of mafic components in the magma system, but has occurred because of the silicic (andesitic) magma already-supplied beneath the volcano. In this way, the monitoring of the petrological features of dated eruptive materials could provide us useful information to evaluate ongoing eruptive activity as well as geophysical monitoring.

Key words: Sakurajima volcano, volcanic ash, Showa crater, juvenile material, temporal variation

1. Introduction

Sakurajima volcano, located in southern Kyushu, is one of the most active volcanoes in Japan (Fig. 1). Four large historical eruptions have been recorded at Sakurajima (AD 764−766, AD 1471−1476, AD 1779, and AD 1914−1915), in each of which vigorous lava flows had effused after a plinian eruption (Fukuyama and Ono, 1981; Kobayashi, 1982; Kobayashi and Ishihara, 1988). After the AD 1914−1915 eruption, the eruptive style of the volcano changed. Small scale of eruptions occurred at the east-southeast flank of Minamidake during AD 1935−1945, followed by lava effusion in AD 1946 from Showa crater, which is situated on the eastern slope of Minamidake, ca. 500 meters southeast of Minamidake crater (Fig. 1). Since AD 1955, small but explosive eruptions (vulcanian explosions) have frequently occurred at Minamidake crater. The number of explosive eruptions increased especially in the AD 1970s and 1980s. In the 21st century, however, the frequency of explosions has decreased drastically (Iguchi *et al*., 2008b).

On June 2006, a small phreatic eruption occurred at Showa crater. Thereafter, small eruptions intermittently took place until AD 2008. Since AD 2009, explosive eruptions have often occurred, and their frequency has been increasing significantly until now. These activities have been monitored by a well-developed geophysical monitoring network in the area of Sakurajima volcano to obtain high-quality data sets (*e.g.*, Iguchi *et al*., 2008a,

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