Petrological monitoring of volcanic ash and evaluation of on-going eruptive activity of Sakurajima volcano, Japan: Characterization of juvenile magma and its evolution since 2006

Akiko Matsumoto[1], Mitsuhiro Nakagawa[1], Mizuho Amma-Miyasaka[1], Masato Iguchi[2]

[1]Department of Natural History Science, Graduate School of Science, Hokkaido University, Japan,
[2]Sakurajima Volcano Research Center, Disaster Prevention Research Institute, Kyoto University, Japan

E-mail: a-matsu@mail.sci.hokudai.ac.jp

Sakurajima volcano restarted vulcanian eruptions in 2006 after a quiet period of nearly ten years. Recently, our petrological examination of juvenile materials of major eruptions during 20th century indicated that basaltic magma had repeatedly input in silicic mixed magma and that the level of eruptive activity had corresponded to the scale of basaltic injection (Ebihara et al., in this meeting). Here, we reveal the relationship between eruptive activity and erupted magma since 2006 to clarify whether magma plumbing system has changed or not. Based on the temporal change of the magmatic system, we also evaluate the geophysical monitoring to forecast future activity. Collected eruptive materials since 2006 consist mainly of volcanic ash, and sometimes lapilli. Lapilli usually have pyroxene phenocrysts with reverse zoning, and sometimes olivine ones with normal zoning. Its whole-rock chemistry shows the most mafic (SiO_2 = 58.5-59.8 wt.%), being consistent with the compositional trends of the 20th century's juveniles. These features suggest that the 20th century's magma plumbing system accompanied with basalt input has continued until now. Based on microscopic and BEI observation, juveniles in ash samples can be identified and are subdivided into two types: Juvenile-A and -B. Juvenile-A are magmatic, essential materials with fresh matrix in each eruption. On the other hand, Juvenile-B are similar to Juvenile-A, but usually contains dull colored matrix. Thus, we recognized that Juvenile-B are slightly altered materials which were related to the previous eruptions since 2006. We focus on Juvenile-A materials to investigate temporal change of magmatic materials. Juvenile-B are occurred in all the samples since 2006, whereas juvenile-A has occurred since September, 2009. The matrix glass compositions of Juvenile-A are wide (SiO_2 = 65-73 wt.%) and become more mafic from Sep. 2009 to Apr. 2010. Then, those have become more silicic again until Sep. 2010. Although such compositional fluctuation has repeated four times until now, those have gradually changed to be silicic as a whole.

If matrix glass compositions of juveniles could reflect the increase of the basaltic input, we can recognize four periods with the increase of basaltic magma (Sep. 2009-Apr. 2010; Nov. 2010-Feb. 2011; Aug-Sep. 2011; Dec. 2011-Feb. 2012). In these periods, the weight of volcanic ash as well as the volume of expansion of possible pressure source beneath the volcano became larger. Thus, we conclude that the scale of the basalt input correlates to the level of eruptive activity as in the case of activity during 20th century. Petrological and geophysical monitoring suggests that the eruptive activity since 2006 reached maximum in the period from Sep. 2009 to Apr. 2010. Although eruptive activity has continued since then, the temporal change of petrological features of volcanic ash suggests that there exists no evidence indicating the increase of the level of eruptive activity.