# Petrological monitoring of the eruptive activity since AD 2006 of Sakurajima volcano, Japan

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Sakurajima volcano, located in southern Kyushu, is one of the most active volcanoes in Japan. The large explosive eruptions occurred at the flank in 1471-1476, 1779 and 1914-1915. After the lava effusion in 1946, the vulcanian and strombolian eruptions have occurred repeatedly at the summit crater since 1955. Our previous petrological investigations suggest that the 15th and 18th juvenile materials are the mixing products between dacitic and andesitic magmas, and that basaltic magma has newly intruded into the magma plumbing system in the 20th century. We also indicate the possibility that vulcanian eruptions in the 20th century were induced by the repeated injection of basaltic magma. Recent activity started at Showa crater in June 2006. Since 2009, the volcanic explosions have occurred every day. The volcano became much higher level of eruptive activity accompanied with clear inflation and dyke intrusion in 2015. In order to reveal the magma plumbing system since 2006, we have carried out the petrological monitoring of the dated juvenile lapilli and ash for 6 years since 2009.

The juvenile lapilli (lithic, scoria, and pumice) have plagioclase, orthopyroxene, clinopyroxene, and magnetite, and a small amount of olivine as phenocrysts. The core compositions of olivine phenocrysts are Fo80-81, compositionally disequilibrium with the co-existed pyroxenes (Mg#64-76 for opx and Mg#66-78 for cpx). Several phenocrysts of pyroxenes also have thin magnesian rims (<10 $\mu$m), some of which exhibit repeated reverse zoning. On whole-rock chemistry, all the juvenile lapilli are the most mafic since 20th century, and are plotted on the one linear trends on Harker diagrams, which agree with the compositional trends of the 20th juveniles. The $SiO_2$ content of juvenile lapilli slightly increases from 2009 (58.5 wt.%) to 2013 (59.6 wt.%), and clearly decreases in 2015 (58.3-59.0 wt.%). On matrix glass chemistry of juveniles from lapilli and ash samples, there exists the similar temporal variation to whole-rock chemistry. The silica content decreases from 2009 to 2010, and increase gradually until 2013, and again decrease clearly in 2015.

The co-existence of high-Fo olivine and pyroxene showing reverse zoning, as well as the linear trends of whole-rock chemistry agreeing with the juvenile materials of the 20th century suggest that the magma plumbing system of the 20th century has continued since 2006, and that the basaltic magma has mixed with the pre-existed mixed andesitic magma repeatedly. Therefore, it is interpreted that the $SiO_2$ contents in whole-rock and matrix glass chemistries reflect the ratio of basaltic magma in erupted magma. Comparing to the geophysical monitoring data, as the ratio of basaltic magma increased, the number of explosions became larger and the volcanic edifice inflated clearly. Estimated volume of input basaltic magma is much larger in 2015. Based on the calculated Fe-Mg diffusion times from the zoning profiles of high-Fo olivine phenocrysts in the 2015 juvenile materials, the timing of the latest input of basaltic magma is estimated at the period during late of 2014 to May 2015, being consistent with the beginning of the inflation of volcanic edifice. It is concluded that activation of the eruptive activity since AD 2006 has been controlled by intermittent injections of basaltic magma.

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