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# Degassed-magma volume estimated from melt inclusion analysis: Kirishima 2011 eruptions and Nishinoshima 2014 eruptions

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Magma ascent and degassing process is essential in order to know how eruption occurs and what controls eruption styles. Melt-inclusion analysis is a powerful method for estimating volatile content of melt in magma before eruption. Combining the melt-inclusion analysis with observation of volcanic gas, we can estimate degassed-magma volume. In this study, degassed-magma volume of recent two eruptions in Japan, Kirishima 2011 eruptions and Nishinoshima 2014 eruptions, was estimated from melt inclusion analysis. Comparing the degassed-magma volume with geological and geophysical observations, magma ascent and degassing processes is discussed.

(1) Kirishima 2011 eruptions. Eruption activity of Shinmoedake began with phreatomagmatic and subplinian eruptions in January 2011, followed by lava effusion within the summit crater, vulcanian explosions, and ash emissions from February-September 2011. The amount of degassed magma was estimated, based on sulfur and chlorine contents of melt inclusions of the mafic and felsic magmas, $SO_2$ flux and volcanic gas composition during the period of January 2011 to September 2012. The amount of degassed magma was larger than that of eruptive products in 2011, indicating the degassing of magma in the chamber due to convection in a conduit. Considering the mixing ratio of mafic and felsic magmas (0.4), the estimate of degassed mafic magma ($19x10^6$ $m^3$) is of the same order of magnitude as the observed inflation of the magma chamber during February-November 2011 ($10x10^6$ $m^3$), suggesting injection of mafic magma into the chamber from deeper down is likely to have caused the inflation and eruption activity of Shinmoedake in 2011.

(2) Nishinoshima 2014 eruptions. The Nishinoshima eruptions started on 20 November 2013 and lava effusion has continued up to present (February 2015). The amount of degassed magma ($3x10^6$ $m^3$/d) was estimated, based on sulfur content of melt inclusions in products by eruption on 6 June 2014 and $SO_2$ flux (500 t/d) on 29 January 2014. The amount of degassed magma is similar to lava effusion rate ($3x10^6$ $m^3$/d, Earthquake Research Institute, The University of Tokyo), suggesting that gas-melt separation did not occur during its ascent from a magma chamber before the eruption.

Keywords: magma, degassing, volatile, melt inclusion, kirishima volcano, nishinoshima volcano