# The 2011 eruptive activity of Shinmoedake volcano, Kirishimayama, Kyushu, Japan

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Shinmoedake volcano is one of the Kirishimayama volcanoes group located southern Kyushu, Japan and the previous magmatic eruptions occurred in 1716-1717. This time, small phreatic eruptions which repeatedly ocurred in 2008 and 2010 were followed by magmatic eruptions in 2011. The 2011 eruptive activity started with a small phreatomagmatic eruption on 19 January 2011. On 26 January, purely magmatic activity began with subplinian eruptions, effusive activity inside the summit crater and frequent explosive eruption. With these eruptions, large amounts of tephra-fall and shockwaves damaged municipalities located around Shinmoedake. During the subplinian eruptions and lava growth between 26 January and the beginning of February, deflation of the magma chamber beneath north-west of Karakunidake caused by magma movement to Shinmoedake was observed by tiltmeters. Although eruptions including explosive ones had occurred repeatedly since then, the eruptive activity had gradually declined since March 2011, and then has ceased on 7 September 2011. Besides, seismic activity had also declined during March 2012, and in May 2012, had reached pre-eruption levels. As for magmatic activity, since the beginning of February inflation caused by magma supply to the magma chamber had been detected by GEONET again, but had declined during December 2011 and has almost stopped on January 2012.

For the sake of the disaster mitigation of the 2011 Shinmoedake eruptive activity, Japan Meteorological Agency (hereinafter JMA) issued various information, including the Volcanic Alert Level corresponding to the countermeasures of the local governments. JMA was unable to raise the Volcanic Alert Level before the initial subplinian eruption because of a lack of clear precursory signals. And then, after the start of the magmatic eruption, JMA raised the Volcanic Alert Level from Level 2 to 3 and widened the target area in response to the eruptive activity. To the contrary, tilt changes and an increase in seismicity probably caused by magma intrusion beneath Shinmoedake were often observed about 60 hours in advance of eruptions which had repeatedly occurred since the beginning of February 2011.

Taking into account geodetic, seismic, and infrasonic data observed during the subplinian eruptions, we conclude it was after magma eruptions started that a large amount of magma in the magma chamber located at northwest of Karakunidake moved to Shinmoedake. This result indicates that it is difficult to predict the subplinian eruptions with sufficient lead time. The 2011 Shinmoedake eruptive activity underscores the importance of detection and correct interpretation of magma movement with which to anticipate eruptive phenomena quickly and to mitigate the impacts of volcanic activity.

In this presentation, we provide an overview of the 2011 eruptive activity of Shinmoedake and discuss application of the Volcanic Alert Level for the 2011 Shinmoedake eruption.