

Distribution and character of the 2011 Shinmoedake eruption deposits at Kirishima Volcano, Japan

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Shinmoedake Volcano, in the Kirishima Volcanic Complex, southern Kyushu in southwestern Japan, began a series of eruptions on January 19, 2011. Activity started with a phreatomagmatic eruption, but shifted on January 26 to magmatic eruptions characterized by subplinian eruptions. Lava appeared in the summit crater on January 27, and filled the crater completely by February 2. Multiple vulcanian explosions occurred in the lava-filled crater, and the number of eruptions declined after February 9. The largest vulcanian explosion occurred on March 13, after which relatively small eruptions took place intermittently until September 7, 2011. After April 2011, the frequency of eruptions at Shinmoedake declined to a few times a month. The last eruption occurred from August 31 to September 7, 2011. Subsequent surface unrest has been mild to the present.

The tephra-fall deposits distributed southeast of the vent are divided into five units (unit 1 to 5 in ascending order). Unit 1 is a lithic-rich fine ash-fall deposit occurring on 19 January 2011. Unit 2, formed by subplinian pumice-fall deposits from the evening of January 26 to the early morning of January 27, is the main product of the 2011 eruption. The unit-2 deposit was dispersed throughout an area extending more than 20 km SE of the source crater. Unit 3 comprises tephra-fall deposits related to the January 27 15h41m explosion, and is subdivided into lower (3L) and upper (3U) parts. Unit 3L is a lithic-rich well-sorted coarse ash-fall deposit from the initial stage of the January 27 15h41m eruption, whereas unit 3U is composed mainly of coarse-grained pumiceous lapilli. Unit 4 is a fine ash-fall deposit occurring on January 28-29, and consists mostly of fresh lithic fragments and crystal grains. Unit 5 originates from multiple vulcanian explosions after early February, but most of it derives from the largest vulcanian eruption deposit on March 13. The unit-5 tephra is a lithic-rich medium-to-coarse ash-fall deposit. The 31 August 2011 ash-fall deposit extended 19 km southwest of the Shinmoedake crater; it is fine grained and contains abundant lithic fragments. Temporal variations in grain size and components of the 2011 eruption deposits reveal the eruption sequence and the conditions of the crater, conduit and magma chamber.