

Characterization of the Small-volume Pyroclastic Flows from the Kuchinoerabu-jima Volcano during 2018-2019, Southwest Japan

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A small-scale pyroclastic flow which flows several hundreds meters to several kilometers is a frequent phenomenon in volcanic eruptions. However, since pyroclastic flow often appears in short period of time, there are not many reports of direct detailed observation. Such the small-scale pyroclastic flows occurred at Kuchinoerabu-jima volcano on 18 December 2018, 17 and 29 January 2019. Images by JMA monitoring camera and aerial observation allow us to analyze these pyroclastic flows in view of aerial extents, depositional feature and flow velocity.

For the pyroclastic flows occurred at Kuchinoerabu-jima volcano at 18 December 2018 and 17 January 2019, partial collapse of eruption column resulted in pyroclastic flow just after the onset of these eruptions. The pyroclastic flow on December 18, 2018 ranged from the Shin-dake Crater (center) to 1.1 km northwest, 0.9 km southwest and 0.9 km east. The pyroclastic flow had flowed downward around the crater and descended to the foot of the volcano, lobate topography along the valley was observed. There were no signs of burning nor falling down trees due to pyroclastic flow passage. The pyroclastic flow on January 17, 2019 extends 1.9 km northwest, 1.5 km southwest and 1 km(+) east side. Pyroclastic flow extent can be identified with 3 regions: area of thick accumulated pyroclastics, thinly deposited pyroclastics with abundant collapsed trees and thin pyroclastics recognized by vegetation discoloring. The second and third regions occasionally have white smoke by forest fires as the result of hot pyroclastic material. For the pyroclastic flow of January 29, 2019, it can be identified up to about 600 m to the west from the Shin-dake Crater and there is no observation on the east side of the crater. These pyroclastic flows show similar or smaller extents compared with them of the distribution of pyroclastic flows occurred in 2014 to 2015. Most of the pyroclastic flows flowed down to the west side of Shin-dake Crater. Detailed examination of pyroclastic flow deposits in the field is expected.

Analyses of volcano-monitoring camera images of the Japan Meteorological Agency may measure the flow velocity of the pyroclastic flow occurred between 2015 and 2019. The average flow velocity of the pyroclastic flow ranges of 5 - 47 m/s and mean values of about 20 - 30 m/s. The pyroclastic flow of May 29, 2015 which flowed the furthest, was the fastest and the shortest distance was January 29, 2019 is the latest. In general, the pyroclastic flow with higher speed tends to have a longer travel distance. The pyroclastic flow that occurred on May 29, 2015, December 18, 2018, January 17, 2019 occurred by partial column collapse immediately after the eruption. The pyroclastic flow on January 29, 2019 occurred by overflow from the crater suggesting different mechanisms of generation. Multiple mechanisms of generation and flowage can be help us to understand small-scale pyroclastic flows.

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