

Characteristics of landslide disaster induced by the 2016 Kumamoto earthquake in and around Minamiaso Village, southwestern Japan

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The Kumamoto earthquake (Mj7.3) on April 16, 2016 triggered numerous landslides in and around Minamiaso Village, the western part of Aso caldera, central Kyushu, southwestern Japan. The landslides were divided into two types: landslides occurring at steep caldera walls and landslides generated on the slopes of the post-caldera central cones of Aso Volcano. Several landslides occurred on slopes steeper than 25° at the northwestern to western caldera walls, which comprise pre-Aso volcanic rocks (lavas and pyroclastics). The largest landslide (ca. 300 m high, 130-200 m wide) occurred on the western caldera wall, and damaged the National Route 57 and the Hohi line of the Japan Railway. Because any clear rupture surface could not be observed, unstable blocks which had been divided by cracks were likely to be collapsed due to the intense earthquake on April 16. At the post-caldera central cones of Aso Volcano, the April 16, 2016 earthquake-induced landslides occurred not only on steep slopes but also on slopes gentler than 10°. They occurred in unconsolidated superficial tephra deposits overlying lavas and agglutinates, and the thickness of the slides usually ranged from 4 to 8 m. The sliding masses traveled long distances (<600 m), comparing to small differences in elevation. The deposits were composed of tephra blocks of a few meters and there was no evidence that they were transported by water. These facts suggest that some landslides mobilized rapidly into debris avalanches, traveling a few hundred meters. The associated debris avalanche resulted in five casualties and severe damages of houses at the foot of Takanoobane lava dome.

The characteristics of the April 16, 2016 earthquake-induced landslides are different from those of rainfall-induced landslides in July 2012, June 2001 and July 1990 at Aso Volcano, and provide important information for preventing or mitigating future landslide disasters in the Aso caldera region.

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