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Numerical simulation of snow avalanches on the west-facing slope of Mt. Iwate, Japan

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Large-scale avalanches occurred on the west-facing slope of Mt. Iwate during the winter of 2010-11, which damaged 7 ha of subalpine forest in the two paths. Both were likely to be dry-slab avalanches, with starting zones higher than the tree line at around 1730 m a.s.l., because they seem to have penetrated the forest at high speed according to the investigation (Takeuchi et al., 2014). In this study, avalanche flow was simulated over the terrain of Mt. Iwate using the numerical model TITAN2D, in order to verify the position of the starting zone of the avalanches and the effect of forests on reducing velocity and stopping the avalanches of Mt. Iwate. Firstly, we simulated where the avalanches have started by changing the position of starting zone in the model and compared the results with actual positions of the paths and the farthest end of the avalanche. As a result, when the starting zone was regarded as an ellipse with the major axis of 300 m at around 1950 m a.s.l., the avalanche separated in the middle of the runout zone and flowed in the two paths as same as the actual avalanche. Although Takeuchi et al. (2014) supposed that the two avalanche paths are due to two avalanches of which starting zones are different, the model simulations suggested that the two avalanche paths can be due to the one avalanche which started from the one wide starting zone. Secondly, the best fit bed friction angle was examined. In the simulations, forest was distinguished from open area without forest by giving the larger bed friction angle. The bed friction angle were regarded as 25 - 26 degrees in the forest and 12 - 14 degrees without forest through trial and error according to the actual position of the farthest end of avalanche. As a result of the simulation, if the forest had not existed, the avalanche would have traveled quite farther than the actual end in the forest. The distinct stopping effect of forest was shown.

Keywords: Mt. Iwate, snow avalanche, subalpine forest, numerical simulation