The braking effect of mountain forests on large-scale avalanches

*YUKARI TAKEUCHI[1]

1. Tohkamachi Experimental Station, Forestry and Forest Products Research Institute

Mountain forests have two major roles in snow avalanche protection: preventing avalanche release, and decelerating and stopping flowing avalanches. Although the disaster reduction effects of forest braking have long been known empirically, they have not been known in detail down to recent. In this study, we ascertained forest braking effect by numerical simulations using the avalanche dynamics program, TITAN2D, to model large-scale avalanches. One of these avalanches occurred in the Makunosawa valley, Myoko, and damaged a cedar forest; the others occurred on Mt. Iwate and damaged a subalpine forest. All avalanches damaged many trees and terminated within the forests. In our simulations, the resistance of the forests to avalanches is simulated using a larger bed friction angle. Fitting the observations from the Makunosawa avalanche by trial and error, a bed friction angle of 13°–14° in the non-forested area and of 25° in the forested area is obtained. We conducted simulations of the Mt. Iwate avalanches using the same method as for the Makunosawa valley avalanche, and obtained good agreement between observations and simulations. Simulations reveal that without the forest, the avalanche would have traveled at least 200 m farther than the forest's actual end in the Makunosawa valley, and at least 200 m and possibly up to 600 m farther on Mt. Iwate. This study therefore clearly shows that forests provide a braking effect for avalanches.

Keywords: snow avalanche, forest