Session: 2-2-2

Prediction of Landslide Dam Breach for Kii-Mountains in 2011

Takahisa Mizuyama*, Isao Mori, and Miki Chiba****

*Graduate School of Agriculture, Kyoto University
**Sabo Frontier Foundation
E-mail: mizuyama@kais.kyoto-u.ac.jp

Extreme rainfall events have occurred more frequently in the past few years than they have done previously. Shallow landslides and debris flows occur as a result of intensive rainfall. Deep-seated, large-scale landslides often occur as a result of large accumulating rainfalls. The Wanizuka-yama landslide and the Mimi-kawa landslides that occurred in the Miyazaki Prefecture, Kyushu, in 2005 are typical examples of deep-seated landslides. In 2011, Typhoon No. 12 produced a large amount of rain in the Kii mountains and caused many large-scale, deep-seated landslides. Some of these blocked rivers and formed landslide dams. The landslide dams that formed along the main rivers were quickly topped and overflow water eroded the dams. The landslide dams that formed in tributaries are currently still present (as of June 27, 2012) because there has not been sufficient inflow water to fill the dam reservoirs. Many people have expressed concern that flow over these landslide dams could cause debris flows and damage downstream. We used our LADOF model [1] to estimate the flow discharge that would occur if these landslide

dams were breached. **Fig. 1** provides an example estimation, using the Nagatono landslide dam. The topographic information of the landslide dams is taken with Lidar. The results of the modeling indicate that sever damage would not occur if the landslide dams were breached.

The Ministry of Land, Infrastructure, and Transport (MLIT) estimated the amount of rainfall required to fill the landslide dam reservoirs. It used the storage function method with the parameters that are used downstream and concluded that 10 mm of rainfall would fill the reservoir of the Akatani landslide dam. Typhoon No. 15 produced more than 130 mm of rainfall in the area, but overflow did not occur. We collected rainfall data and estimated inflow water to the dam reservoirs from water level data provided by measurement buoys that were dropped from helicopters by MLIT. We [2] calculated the rainfall loss (total rainfall minus outflows) and found that most rainfall is lost, as shown in **Fig. 2** This is a characteristic of mountainous areas. By analyzing rainfall event data, a diagram for estimating the amount of rainfall that would fill a landslide dam reservoir for a given pre-rainfall water level was developed for the five major landslide dams (**Fig. 3**).

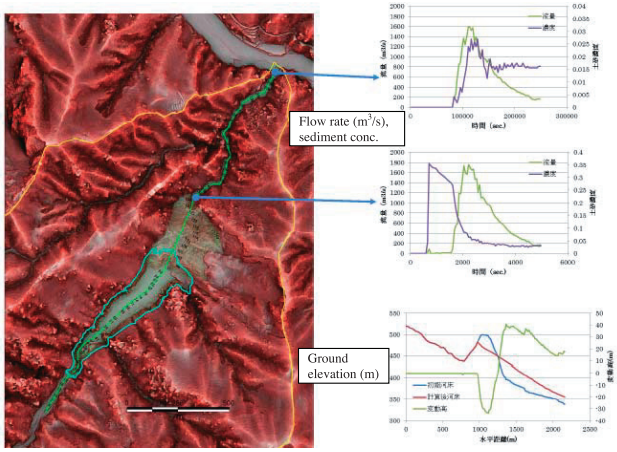

Fig. 1. Calculated outflow discharge and erosion for the Nagatono landslide dam.

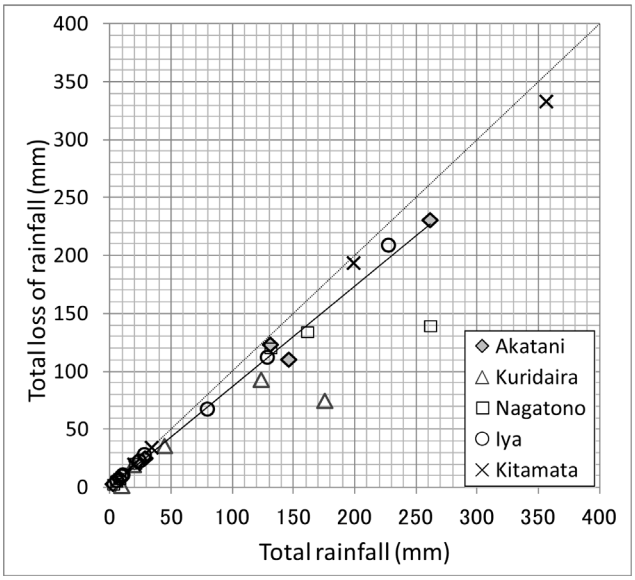

Fig. 2. The relationship between total rainfall and the total loss of rainfall.

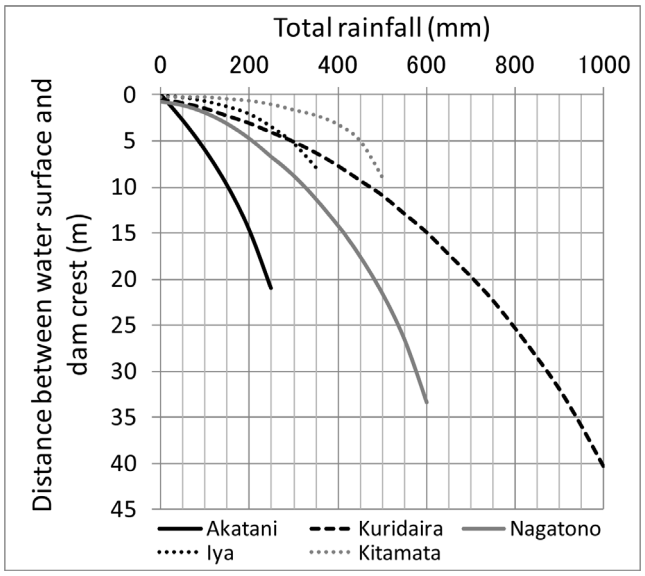

Fig. 3. A diagram to estimate the amount of rainfall that fill the landslide dams and cause.

References:

[1] Y. Satofuka, et al., "Prediction of floods caused by landslide dam collapse," Jour. Of Disaster Research 5-3, pp. 307-314, 2010.

[2] M. Chiba and T. Mizuyama, "An estimation method to predict rainfall to fill landslide dams," Jour. of Japan Society of Erosion Control Engineering, 2012, in press.