Manuscript for individual articles (one-page manuscript)

Study on Run-off Condition of Recent Debris Flows using LP Data

MATSUMOTO Naoki, Researcher, KUDO Tsukasa, Guest Research Engineer, UCHIDA Taro (Dr. Agr.), Senior Researcher, SAKURAI Wataru, Head
Sabo Planning Division, Sabo Department

(Key words) debris flow, run-off condition, LP data

1. Background

It is one of the most important techniques for debris flow control to forecast the scale, run-off status, and deposition range of debris flow. Accordingly, information data concerning the condition of debris flow is important for debris flow control, but accumulation of such data is not necessarily proceeding due mainly to the difficulty in obtaining detailed topographic information before occurrence of debris flow. In recent years, however, topographic changes due to run-off of debris flow can be grasped spatially and precisely using the topographic survey data based on the aerial laser profiler ("LP data") before and after disasters. Accordingly, Sabo Planning Division has been surveying the scale and run-off condition of debris flow using LP data in order to contribute to the review and revision of the technical guidelines for debris flow control planning.

2. Outline of study

(1) Scope of study

In recent years, LP data before and after the occurrence of debris flow is increasingly acquired for the mountain streams where debris flow occurred causing serious damage (see Table below). Then, Sabo Planning Division has been studying the following concerning the mountain streams that caused debris flow and for which LP data is available.

Table: Mountain streams covered

Date	Location	Number of target mountain streams
July 21, 2009	Hofu-shi, Yamaguchi	5 streams
July 27-30, 2011	Minami-Uonuma-shi, Niigata	5 streams
July 11-14, 2012	Minamiaso-mura, Aso-shi, Kumamoto	5 streams
Sep. 18, 2012	Inabe-shi, Mie	2 streams
Aug. 9, 2013	Senboku-shi, Akita	1 stream
July 9, 2014	Nagisomachi, Nagano	1 stream
Aug. 20, 2014	Hiroshima-shi, Hiroshima	2 streams
Total		21 streams

(2) Study items

Typical items under examination are as follows.

- Relations between grain size composition and shape of sedimentation in debris flow.
- Grasping the actual width and depth of erosion by debris flow.
- Analysis of the factors (rainfall, topography, catchment area) that affect the amount of sediment run-off.
- Estimation of the peak rate of debris flow and analysis of the factors (rainfall, topography, catchment area) that affect the peak rate of debris flow.
- Study of effect of the conditioning method of numerical computation on the reproducibility of run-off condition.

(3) Example of study results

We measured the erosion width and depth before and after debris flow by determining the area of debris flow run-off using LP data and aerial photographs taken before and after debris flow (see Figure below). As the result, approx. 83 percent of the cases of mean erosion width were within 10-30 m, and approx. 80 of the cases of mean erosion depth were within 0.75-2.5 m. It was also shown that in survey of debris flow, sampling typical profiles appropriately is important since there is large variation even in the same mountain stream.

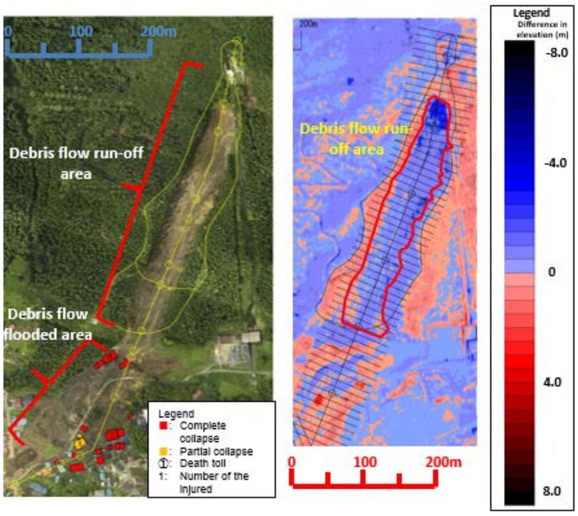

Figure: Example for measurement of the width and depth of erosion by debris flow

3. Conclusion

We intend to continue data accumulation and more detailed analysis to improve techniques for forecasting the scale and run-off condition of debris flow.

[Reference]
1) KUDO Tsukasa, UCHIDA Taro, MATSUMOTO Naoki, SAKURAI Wataru: Analysis of Eroded Width and Depth Due to Debris Flow using LiDAR Data, Civil Engineering Journal, Vol.57, No.11, pp.22-25, 2015