Observations of sediment discharge in the Hayakawa River basin in 2011 and 2012 using aerial photographs and airborne LiDAR data

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INTRODUCTION

The Hayakawa River basin is located along the Itoigawa -Shizuoka Tectonic Line (Refer to figure.1) and many large collapsing sites spread over the area. The soil of the area is very fragile. And the river bed gradients are very steep and carry out a huge amount of soil.

Fujikawa sabo office has been constructing check dams and channel works, and conducted the sediment discharge monitoring to reduce and prevent disasters.

The previous way of the estimation of the sediment discharge volume by using cross sections and vertical sections has difficulty on the estimation of large collapses in field. So in this study, we tried to make it more precise to estimate the sediment discharge volume and sediment volume caught by the check dams by using Airborne LiDAR data.

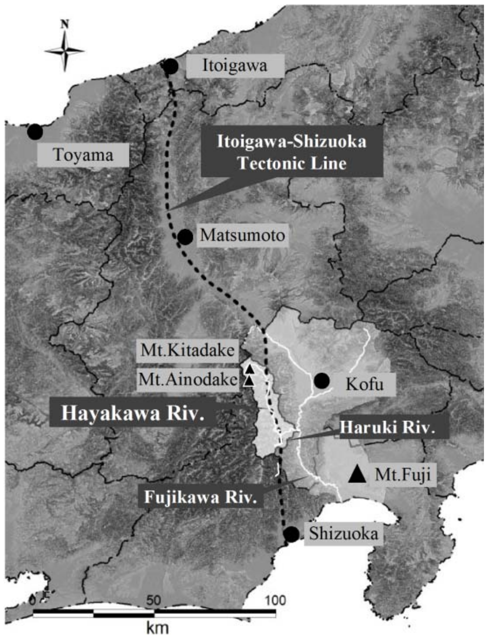


Fig.1 The geographical region considered in this work

METHOD

The Hayakawa River basin was hit by typhoons in 2011 and 2012 and heavy rainfall was recorded (Refer to figure.2). The sediment volume that had been produced during the events was calculated by comparison of two Airborne LiDAR data. One was taken before the events and another was obtained in 2012 after the events. The density of LP data is a 1-m mesh. The aerial photographs which were taken before and after the events were also used to define the change of collapses such as newly occurred, expanded,

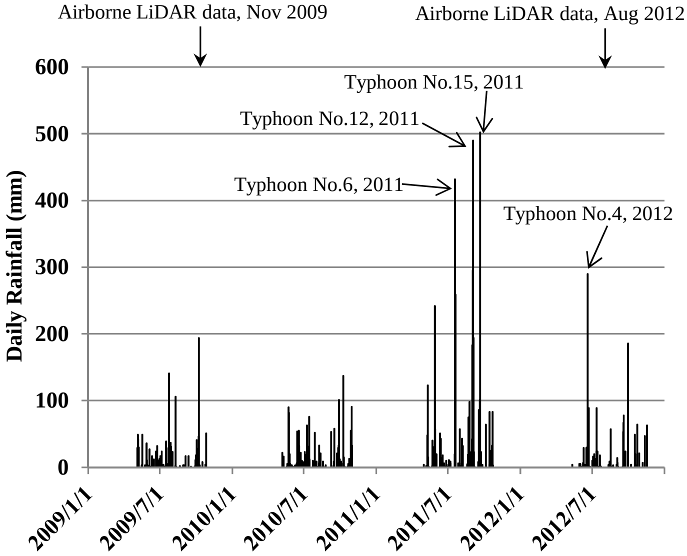


Fig.2 Daily rainfall at the Shichimenzan observation station

remained or reduced. The Hayakawa River basin was divided into 19 tributaries and calculations were made in each tributary.

RESULTS

Approximately 4.47 million m^3 sediment had been produced in total, and 3.58 million m^3 sediment of it had run out to the Fujikawa River. The main tributary of sediment production was the Haruki River (1.85 million m^3) where “the great landslide in Mount Shichimenzan” located at the upper of it. In the collapse riverbed degraded more than 25 m and gully erosion progressed. (Refer to figure.3, 4) And series of check dams located middle stream of the Haruki River trapped 1.19 million m^3 sediment of it.

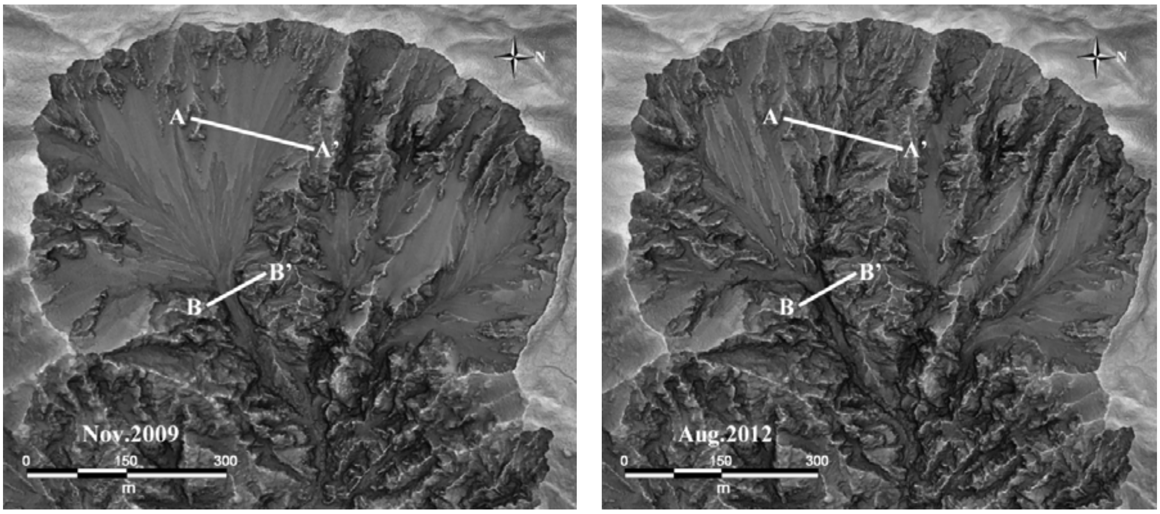
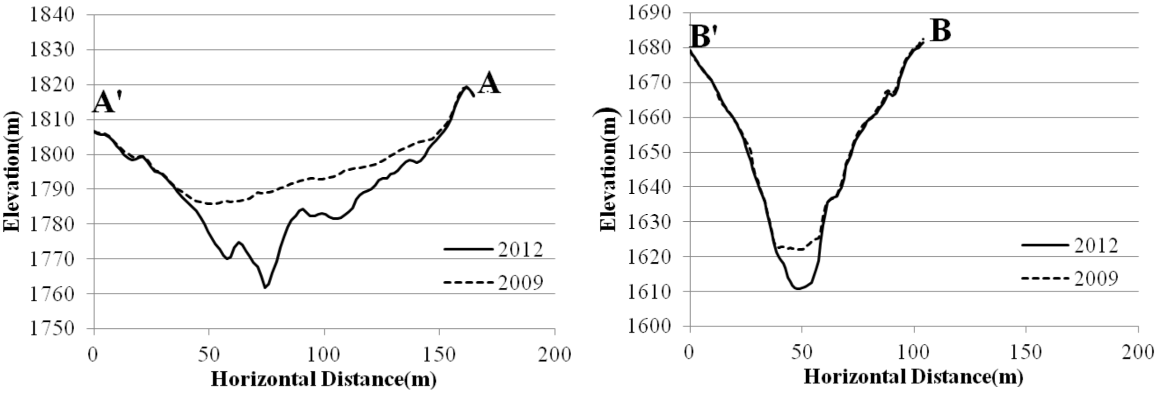


Fig.3 Red Relief Image Maps of “the great landslide in Mount Shichimenzan” at the head of the Haruki River



CONCLUSIONS

By using Airborne LiDAR data and aerial photographs, we were able to read geographical feature and obtained quantitative date widely. The sediment migration showed the effect of the check dams. We will use these data for more effective sabo planning. For example comparison of the discharge volume shows which tributary should be improved.

Keywords: Airborne LiDAR data, aerial photograph, sediment discharge