SIMULATION OF THE MINAMATA DEBRIS FLOW DISASTER IN 2003

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There was a continuous heavy rain in the southern part of Kyushu, Japan on July 20, 2003. Especially in Minamata City, Kumamoto Prefecture, maximum hourly and accumulated rainfalls were 91 mm/h and 323 mm, respectively. During this heavy rain a large-scale landslide occurred on the slope of the right-hand side of river bank of the Atsumari River. It changed into the debris flow and moved down the river valley. The debris flow eroded river bed and bank significantly during the movement in the middle reach at steep slope. On the other hand, it deposited a large amount of sediment and overflowed the river bank in the downstream reach at gentle slope. As a result the debris flow broke several houses on the river bank and killed 15 people of residents. The situation of the debris flow disaster in Atsumari River is shown in Photo 1.

When we consider the countermeasures, we have to know velocity and depth of the disaster by the simulation.

There are a few studies on a debris flow simulation model. Nakagawa et al. [2000] developed a numerical model that simulates the behavior and depositional processes of a debris flow.

Satofuka [2004] proposed 2-D hybrid debris flow model and applied to the debris flow disaster.

Hashimoto et al. [2000] introduced a numerical simulation method for one-dimensional bed level variation and discussed a discharge of the debris flow.

The purpose of the present study is to propose a simulation model for the debris flow and investigate the characteristics of the overland debris flow by numerical simulation. Firstly, we determine a hydrograph of the debris flow at the upstream end of the depositional area in the downstream reach. Secondly, we simulate overland debris flow in the downstream area. Finally, we compare the results of simulation with the investigation of Kumamoto Prefectural Government.
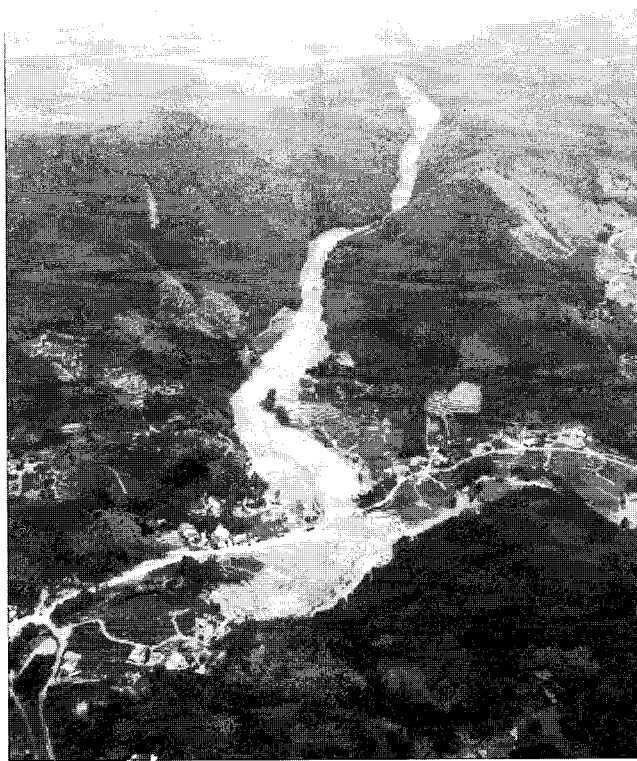
Photo 1. The debris flow disaster in Atsumari River, Minamata City, Japan

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