

Abstract of Doctoral Thesis

Title : Moisture changes in the riverbed deposit and the processes of the sediment discharge in the headwater basin

Doctoral Program In Advanced Architectural, Environmental and Civil Engineering
Graduate School of Science and Engineering
Ritsumeikan University

ふりがな はやみ さとし
氏 名 HAYAMI SATOSHI

To prevent debris-flow disasters or control the resulting damage, it is necessary to unravel the mechanism wherein a debris-flow breaks out and starts flowing downstream, followed by the accumulation of debris on the riverbed. The outbreak of a debris-flow originating in the deposit on the riverbed is presumed to be greatly influenced by the water flow inside the sediment and the overspill of rainwater supplied from the upstream.

This study aims to analyze the flow of water in the riverbed deposit and the course of debris starting to flow downstream.

From our observation of the sediment flowing downstream, we found that portions of the sedimentary layer close to the substratum became saturated with water. However, the entire layer was not saturated even under a relatively strong rainfall. We analyzed the observed rainfall data and found that the downstream deposit flow was significantly influenced by short-term rainfall intensity. Moreover, we found that although surface flow was created on the deposit on the riverbed, part of that deposit remained unsaturated. This finding concluded that the consideration of the interaction between the surface and layer infiltration flows is necessary to predict a downstream debris-flow.

We performed numeric calculations using a model designed to simultaneously analyze the infiltration flow inside the layer and the unsteady flow on the riverbed. On comparing the results of the on-site experiments to the numeric calculations, we found that the model could well reconstruct the course of the riverbed debris beginning to flow downstream.

From these findings, we conclude that it is very important to know the water flow in the riverbed deposit to predict the outbreak of a downstream debris-flow at a headwater basin in the mountains because rainwater supplied from the upstream infiltrates into the layer through selective paths.