

主 論 文 要 旨

論文題名

Predicting and Controlling Sediment Runoff caused by Heavy Rain in a Mountain Watershed

ふりがな のりお はらだ
氏名 Norio Harada

主論文要旨

In Japan, there have been numerous problems associated with sediment runoff processes, including countermeasures against flooding caused by landslide dam collapses. To control sediment runoff, structures have been built in our rivers; however, problems in managing these structures often arise. Recently, it has been reported that new facilities to control sediment runoff have not functioned correctly. In addition, there have been reports of flood hazards caused by the failure of old irrigation levees due to heavy rainfall and earthquakes. Furthermore, deposition of sediment in dam reservoirs in a mountain watershed is a significant problem, and control measures are required to maintain these facilities.

To control sediment runoff, accurate predictions of the runoff are required, which take the prevailing conditions (e.g., climate and geographical features) into account. This thesis aims to develop methods to predict and control the sediment runoff in a mountain watershed area, using experimentally measured and simulated data. First, the deformation and flood outflow processes accompanying landslide dam failure were investigated using field experiments with a small-scale artificial landslide dam. The effects of moisture content on erosion of landslide dams were investigated using a numerical model that incorporated both erosion and infiltration processes. In addition, the dependence of the flood runoff to the downstream area on the characteristics of the inflow hydrograph from the reservoir was analyzed, and a new index of flood risk was arrived at. We developed an existing numerical model to create a novel technique to predict flooding and sediment deposition, and the validity of this model was assessed via comparison of observations and simulated data. Finally, an ideal structure to control sediment runoff was identified, examining the function of multiple grid SABO dam design parameters, and the function of grid SABO dams constructed under different design guidelines was evaluated considering the grain-size distribution of the sediment. This thesis describes methods to predict and control sediment runoff in the design of these structures.