Development of the technology to measure sediment transportation on mountainous river

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1. Introduction

As the mountainous rivers have remarkable fluctuation regarding the flow rate and river bed spatiotemporally, implementation of continuous hydrologic and sediment measurements (water level, suspended load and bedload etc.) have been tentative in limited area due to various difficulties such as damage and loss of the observation instruments. SABO Division has been conducting the technological development on the hydrologic and sediment measurements. Moreover nationwide MLIT SABO offices implement the hydrologic and sediment measurements in recent years. In the revised part for investigation of Technical Criteria for River Works, the hydrologic and sediment measurements are stipulated to implement and edit the results as chronological table.

2. Manual on hydrologic and sediment measurements on the mountainous river

SABO Division has released the Technical note of NILIM No.686 "Manual on hydrologic and sediment measurements on mountainous river". It describes the purpose, concept and standard methods of hydrologic and sediment measurements based on the research results such as the Project research "Research on the method for general sediment management for national land conservation" (fiscal year 2008 to 2010) and the measurements of MLIT SABO offices. Four significant purposes of hydrologic and sediment measurements are shown in the manual as follows.

(1) Monitoring sediment transportation

Establish the future monitoring method to detect the occurrence of the sediment production and urgency of the sediment disaster by using real time monitoring data

(2) Establishing SABO master plan and evaluation of SABO works

Establishing SABO master plan and setting parameters of runoff analysis and numerical simulation for river bed deformation based on the monitoring data

(3) Disaster management for landslide dams

Setting parameters of runoff analysis to predict the timing of overflow at landslide dam

(4) Establishing the general sediment management plan

Estimation for sediment volume and particle size from mountainous area to downstream

Moreover the manual shows the standard methods of the hydrologic and sediment measurements as follows.

(1) Hydrologic measurements: precipitation, flow rate (by measuring water level and flow velocity)

(2) Suspended load observation: Turbidity meter, extraction of suspended load from flow directly

(3) Bedload observation: Acoustic bed load meter

3. The example of analyzing the data of hydrologic and sediment measurements

Figure shows the analysis example of the comparison between the bedload volume obtained by the acoustic bedload meter, per catchment area and total periodical precipitation and the volume of sediment discharge estimated by the survey data of sedimentation in check dam which has almost same catchment area of former measurement, per catchment area and total periodical precipitation. Both volumes are approximately same. This result suggests the capability of the acoustic bedload meter which is able to estimate the bed load volume favorably.

Research Trends and Results

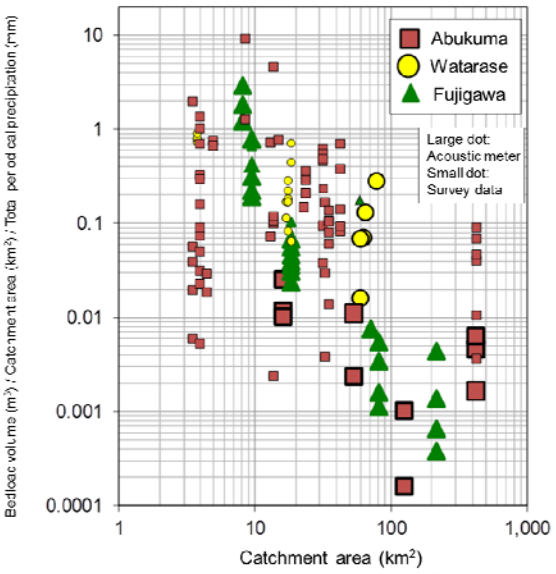

Fig. The analysis example of the relation between the volume obtained by the acoustic bedload meter and the volume estimated by the survey data of sedimentation in check dam

4. Future plan

We continue to gather and analyze the data of hydrologic and sediment measurements to clarify the factors which control sediment transportation that varies depending on the place and flood. Then we conduct the study to clarify to the conditions (e.g. topography, sediment production in upstream) which control the factors.

【Reference】

The Technical note of NILIM No.686 “Manual on hydrologic and sediment measurements on mountainous river”
http://www.nilim.go.jp/lab/bcg/siryou/tnn/tnn0686.htm