

## Estimation of the suspended sediment source in a Japanese cypress plantation forest watershed using radioisotope

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### Introduction

The surface erosion in Japanese cypress plantation forest has been recognized since 1960s in Japan. Especially in poor management condition, splash and overland flow could accelerate the yield of fine sediment, which is transported by stream water downstream.

Fingerprinting of suspended sediment by radioisotopes such as cesium-137, lead-210 excess and beryllium-7, has been conducted to clarify the contribution of sources in a watershed. In this study, to clarify the contribution of forest floor of poor management Japanese cypress plantation forest as sediment source to the suspended sediment, we collected the suspended sediment during the rain fall events, and measured Cs-137 of suspended sediment and potential sediment source.

### Material and Methods

The study area is located in the Katsuragawa River Watershed, a tributary of the Shimanto River, southern part of Japan, with 18.8 km<sup>2</sup> area. Annual precipitation is 2734.9 mm (Taisho). The landscape of forest area is roughly divided by vegetation to three groups, which are Japanese cypress (*Chamaecyparis obtusa*) plantation forest, Japanese cedar (*Cryptomeria japonica* D.Don) plantation forest and broad leaf natural forest. To clarify the contribution of the surface of forest floor as sediment source to the suspended sediment in a Japanese cypress plantation forest watershed, we collected the soil samples from the surface of potential sediment source, which are forest floor, stream bank, and forest road. The suspended sediment in flood events is collected by suspended sediment samplers at the end of watershed, from Jun to November in 2004. The collected soil and sediment samples are dried and packed in the plastic bottles for radioisotope analysis. Gamma ray spectrometry was conducted to quantify Cs-137 and Pb-210ex activity of each sample. The particle size distribution and ignition loss are also analyzed.

### Results and discussion

The Cs-137 activities of forest floor soil and old land slide scar are 80 and 78 Bq/kg, respectively, while forest road is 1 order lower than forest floor. No Cs-137 was detected from the soil of the stream bank. The Cs-137 activities of the suspended sediment are varied between 6.6 and 29 Bq/kg. It is assumed that the forest floor and stream bank were easy to erode, the Cs-137 laden sediment had been lost, and little Cs-137 activities were detected on the surface. If the suspended sediment was composed of the soil of forest floor and stream bank, the contributions of forest floor during 7 rainfall events were estimated as 8 to 36 % by the end-members of Cs-137. In field observation, turbid water running through the forest road and collapse of stream bank had been found during the heavy rainfall event. Relatively high contribution of forest floor to the suspended sediment could be found during small and medium rainfall events, and lower contribution of forest floor maybe resulted from the erosion of forest road and stream bank.