

## Estimate of erosion process in Japanese cypress plantation based on spatial distribution of fallout Cs-137 and Pb-210ex inventory

# Taijiro Fukuyama[1]; Yuichi Onda[2]; Shigeru Mizugaki[3]

[1] none; [2] School of Life&Envirom. Sci., Univ. of Tsukuba; [3] JST

Soil erosion has posed a serious problem in Japanese cypress (*Hinoki*; *Chamaecyparis obtusa* Sieb. et Zucc.) plantations without thinning of high-density stands. Many studies on soil erosion have been conducted at forest floor to identify the effect of ground surface coverage and vegetation on erosion using hillslope plot. Recently, natural and anthropogenic fallout radionuclide, especially Cs-137 and Pb-210ex have been used as environmental tracer for assessment of surface soil movement. These techniques are based on the high affinity of fallout radionuclide for soil particles at the ground surface, relative uniform distribution of the fallout input at the local scale, the difference of vertical distribution among these radionuclides in soil profile, and the information on the time of Cs-137 fallout or deposition flux of those radionuclides. Based on a deviation of inventories of sampling point for local reference inventory and its spatial variation, approximate redistribution rate have been estimated successfully. In this study, we predicted sediment yield from hillslope and headwater catchment at Japanese cypress plantation. In order to valid predicted sediment yield, we observed sediment yield and runoff discharge at hillslope and at headwater catchment outlet. Based on DEM and vane infiltration rate, aerial distribution of both erosion rate and shear stress of overland flow were estimated. We surveyed spatial distribution of radionuclide inventory to valid estimated erosion rate and shear stress. Based on comparison between estimation and observation, we estimated dominant sediment production process in Japanese cypress plantation catchment.

Samples were collected from a small headwater catchment dominated by Japanese cypress plantations in Taiki town, Mie Prefecture, central Japan. The catchment has an area of 0.36 ha; its altitude ranges from 146 to 222 m and its slopes are steep with an average angle of 42.9 degree. The climate is typically Humid Subtropical (Cwa) with a mean annual rainfall of 2094 mm at the nearest weather station (Kayumi, Matsusaka city, Mie Prefecture). The soil type is brown forest soil formed in-situ from crystalline schist. Japanese cypress was planted in the 1960s after clear cutting of the pre-existing forest. The stand density is 4000 stems/ha and the canopy is closed. At the headwater catchment outlet, a Parshall flume and water level sensor were set for storm flow discharge measurement. Below the Parshall flume, a 300-l storage tank was installed to settle and collect the sediment. A hillslope plot was installed and both overland flow discharge and sediment yield were observed. Precipitation was recorded by tipping bucket rain gauges in the study catchment. 42 soil cores were collected in the study catchment and measured radionuclide (Cs-137 and Pb-210ex) inventory. Using Digital Elevation Model, slope angle and upslope area for each cells were calculated to derive spatial distribution of shear stress of overland flow and erosion rate. Tendency of spatial distribution of shear stress and radionuclide inventory were generally similar to each other. These results confirmed the occurrence of overland flow and surface soil erosion in Japanese cypress plantation catchment. It was suggested that overland flow observed at hillslope plot scale could contribute to the soil erosion at headwater catchment scale. Applicability of spatial distribution of radionuclide inventory to valid the soil erosion was also suggested.