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Contribution of forest floor to suspended sediment in conifer (Japanese cypress) plantation and broadleaf forest watersheds

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Soil surface erosion by splash and overland flow in forest floors of monoculture Japanese cypress (*Chamaecyparis obtusa*) forest has been recognized as serious problem in flood control, water resources and environment concern. However, very few studies focused on the contribution of surface erosion to suspended sediment in catchment scale in Japan. Recently, fingerprinting technique with fallout radionuclides (FRNs) has been successfully adopted to assess the source type of suspended sediment. In this paper, to evaluate the effect of surface erosion on forest floor on suspended sediment, field monitoring of soil surface erosion and fingerprinting fluvial sediment were conducted in unmanaged Japanese cypress plantation and broadleaf forest watersheds in the Tsuzura River basin, southern Japan.

We installed 33 splash cups and 2 runoff plots (0.5 m x 2 m) for assessing overland flow and soil surface erosion on hillslopes in Japanese cypress plantation with skid trail network (JCP1: 0.33 km^2) and broadleaf forest (BLF: 0.45 km^2) watersheds. Runoff discharge was monitored at outlets of the watersheds. Suspended sediment samples were collected with time-integrated sampler at the downstream end of three watersheds, which were JCP1, BLF and unmanaged Japanese cypress plantation without skid trail networks (JCP2: 0.56 km^2), in June to September 2004. Surface and subsurface soil were collected from potential sources, such as forest floor, landslide scar, skid trails and stream bank, for fingerprinting with fallout radionuclides. The activ-

ities of FRNs such as Cs-137 and Pb-210ex associated with collected samples were measured by gamma ray spectrometry. Activities were corrected to take account of the enrichment or depletion due to particle size and organic matter content of samples.

Comparison of FRNs activities between potential source materials and mobilized sediment indicated that the forest floor and the stream bank can be primary sources of suspended sediment. The simple mixing model using Cs-137 showed that the average contributions of forest floor to suspended sediment were 46 %, 63 % and 37 % for JCP1, JCP2 and BLF watersheds, respectively. Such high contribution shown in JCP2, but slightly lower in JCP1 due to skid trail erosion, suggests the existence of extensive surface erosion in forest floor. Based on the field monitoring, amount of splash erosion significantly correlated to rainfall intensity in JCP1 ranging from 80 to 560 g/m^2, but exhibited up to 10 g/m^2 in BLF due to the existence of litter cover. Overland flow generation on hillslopes was observed in both JCP1 and BLF, and increased with precipitation more sensitive in JCP1 than in BLF. From these results, surface erosion in forest floor is found to be important process to provide the fluvial sediment in unmanaged Japanese cypress plantation watershed.