Applicability of EUROSEM for surface runoff in forested slope plain

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Sediment yield in agricultural area has been environmental and economic problems in many countries. In order to restrain sediment yield and to conserve water resource, scientific watershed managements are required in many watersheds. In USDA (United State Department of Agriculture), USLE model (Universal Soil Loss Equation) was developed and applied to many sites. USLE model is empirical model, and requires long term observation data. Then, physical based models, such as WEPP (Water Erosion Prediction Project) and EUROSEM (EUROpean Soil Erosion Model), were developed and applied to watersheds where long-term observation had not been conducted.

In some Japanese forest, forest management, such as thinning, has not been conducted fitly in these years. In poorly managed forest area, sediment yield with surface runoff has occurred and supplied suspended solids into stream, reservoir and coastal area. However, in forested watersheds, application of these models has not been conducted frequently, and it is required to validate and apply these models based on observation of meteorology, forestry, pedology and hydrology.

EUROSEM model is one of the useful tools for evaluation of sediment yield in forested area. In this study, hydrological applicability of EUROSEM is discussed. EUROSEM is a prediction model for sediment yield, which was developed by European Union in 1990s. It consists of hydrological and sediment sub-models, those are physical-based process models in non-steady state. EUROSEM has been applied to agricultural areas in Europe and China, for example in watershed of Three Gorge dam, Yangtze River. On the other hand, it is not applied to Japanese forest area frequently, where sediment yield is reported recently.

In Central Research Institute of Electric Power Industry (CRIEPI), we have been conducting observation for sediment yield since June 2010 in Akagi testing center, located in north Kanto plain. The observation system consists of 3 sites, one open field and two forest stands. For open field, precipitation was observed using Laser Precipitation Monitor (LPM,THEIS, FRG) consequently. For in two forest stands, vegetation, meteorology and hydrology survey were conducted. In vegetation survey, canopy analyzing and forest floor survey were conducted in every months. In meteorology survey, precipitation was observed using LPM consequently. In hydrology survey, surface runoff was observed in experimental area with 2m length and 0.5m width using tipping gauge continuously. Soil moisture and temperature were observed in every 10 minutes in experimental area.

In these two forest stands, EUROSEM hydrological sub - model was applied in 35 storm events, and siumlated surface runoff was validated based on observed data. EUROSEM hydrological sub model was applied to 10 storm events in previous study and appeared to simulate surface runoff for storm events with rainfall intensity between 2.0 - 5.0mm / 10mim. In this study, surface runoff was simulated well in storm events with rainfall intensity larger than 5.0mm/10min using infiltration rates lower than those in laboratory experiments.

Keywords: Forest, Surface Runoff, Sediment Yoelds, Prediction Method, EUROSEM, Storm - Runoff