# Comparison of soil erosion simulation between empirical and physics-based models

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## Abstract

In recent years, soil erosion has come to be regarded as an essential environmental problem in human life. Soil erosion causes various on- and off-site problems such as ecosystem destruction, decreased agricultural productivity, increased riverbed deposition, and deterioration of water quality in streams. To solve these problems caused by soil erosion, it is necessary to quantify where, when, how much soil erosion occurs.

Empirical erosion models such as the Universal Soil Loss Equation (USLE) family models have been widely used to make spatially distributed soil erosion vulnerability maps. Even if the models detect vulnerable sites relatively well by utilizing big data related to climate, geography, geology, land use, etc. within study domains, they do not adequately describe the physical process of soil erosion on the ground surface caused by rainfall or overland flow. In other words, such models remain powerful tools to distinguish erosion-prone areas at the macro scale but physics-based models are necessary to better analyze soil erosion and deposition and eroded particle transport.

In this study, the physics-based Surface Soil Erosion Model (SSEM) was upgraded based on field survey information to produce sediment yield at the watershed scale. The modified model (hereafter MoSE) adopted new algorithms on rainfall kinematic energy and surface flow transport capacity to simulate soil erosion more reliably.

For model validation, we applied the model to the Doam dam watershed in Gangwon-do and compared the simulation results with the USLE outputs. The results showed that the revised physics-based soil erosion model provided more improved and reliable simulation results than the USLE in terms of the spatial distribution of soil erosion and deposition.


Keywords : Soil erosion, empirical soil erosion model, Physics-based soil erosion model


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