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Assessing the Performance of a Spatially Distributed Soil Erosion and Sediment Delivery Model for Han River Basin of South Korea

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Abstract: When assessing the total sediment yield of a watershed through sediment transport from soil erosion process, the ratio of sediment delivery is a critical and uncertain factor during modelling. This study is to estimate watershed scale sediment yield with the evaluation of RUSLE (Revised Universal Soil Loss Equation) rain erosivity R factor for 15 years (2000 ~ 2014) using 1 minute data from 16 rainfall gauging stations in Han River basin (34,148 km²) of South Korea. The average R value in this study was evaluated as 4,708 MJ/ha mm/year with range of 1,652 ~ 10,143 MJ/ha mm/year while the average R value of 60 minutes rainfall data were 4,450 MJ/ha mm/year (2,500 ~ 8,000 MJ/ha mm/year) from the previous other study using 24 years of 1988 ~ 1996. A sediment delivery model based on RUSLE R, K, LS factors was adopted, and the sediment delivery ratios of subwatersheds in the basin, KTC (transport capacity coefficient) were determined by comparing MUSLE (Modified USLE) - based SWAT (Soil Water Assessment Tool) simulated sediment yield. The SWAT model was calibrated and validated with average R² (determination of coefficient) of 0.72 using 15 years observed SS (suspended solid). Using the SWAT sediment yields from 181 subwatersheds of the basin, the KTCs of sediment delivery model were determined at each subwatershed. In general, the KTC was used as a fixed value of 100 as an empirical constant. In the study basin, the KTC showed wide range of 0.16 ~ 142.6 with average value of 12.7 for the whole basin.

Keywords: Soil erosion, Sediment delivery, RUSLE (Revised Universal Soil Loss Equation), Transport capacity coefficient, SWAT

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