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Estimation of sediment concentration hydrograph and its prediction interval at catchment outlet using an integrated modeling approach

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In this study, we developed an integrated framework which enables the determination of sediment concentration hydrograph at the catchment outlets during a rainstorm event. The framework integrates the mechanisms and modeling techniques of rainfall-runoff, landslide, soil erosion, and sediment transportation. The framework was applied to estimate the sediment concentration hydrographs at Lofou, the outlet of Shihmen Reservoir Catchment, during Fongwong, Jangmi, and Tanmei Typhoons. The comparison in sediment concentration between TDR (Time Domain Reflectometry) measurement and simulation indicates that the developed framework is accurate and applicable. Furthermore, the sensitivity analysis was adopted which showed that the soil cohesion, friction angle, CN value, and Manning's n are the most sensitive parameters in estimating the sediment concentration hydrograph. The first-order second-moment method was applied to account for the uncertainties from the four uncertain parameters and estimate the prediction interval of sediment concentration hydrograph.