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Eco-hydrological modeling in a tropical area of Vietnam using SWAT model

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The tropical area of Vietnam is suffering from mismanagement of water and land resources which leads to rising floods, surface runoff and soil erosion. We used an eco-hydrological model based on SWAT (Soil and Water Assessment Tool) in Aluoi district as a representative case study of Central Vietnam. In addition to water balance calculation we simulated the flooding behavior on a single severe event (16th October 2007) by SWAT model. The model was calibrated based on multi-objective functions for stream flow and actual evapotranspiration (ETa). Nevertheless, observed stream flow was predicted by a regionalization approach and Eta-data were derived from MODIS time-series. The results of calibration and validation of model were pretty good with a high Nash-Sutcliff coefficient of 0.72 and 0.82 for river discharge and 0.77 and 0.79 for ETa, respectively. The monthly average of eight-year simulation (2006-2013) showed that the highest surface runoff occurred in October while the ratio of ETa /rainfall is the lowest, and the lowest surface runoff happened in February when the ratio of Eta /rainfall is the highest. The flooding behavior revealed that the peak flow was under predicted about 10 percent, roughly 1331 m3/s. However, the water depth was estimated approximately 7.5 m in the Main River. This water-level generated overflow of the river banks and led to inundation of land and endangered infrastructure and human life in downstream areas. Hence, best management practices (e.g. Terracing) are recommended to reduce surface runoff and flooding forces in Aluoi district of Vietnam.