



HS13-D4-PM1-318B-017 (HS13-A010)

An Analysis on Pollutant Loads in Kinokawa River Basin by Using Hydrological Prediction for the Environment (HYPE) Model

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In this study, HYdrological Prediction for the Environment (HYPE) model is applied for Kinokawa river basin in Kii peninsula, Japan in order to evaluate applicability of HYPE model for nutrients analysis in a mixed watershed of urban, cultivated land and forest. As a first step, a GIS database to set up HYPE model was constructed by aggregated and processed readily available GIS data provided by Japanese government such as land cover, soil map, basin polygon and digital elevation model. Secondly, a river flow simulation was performed, calculated flow rate at Kinokawa river mouth was compared to an observed flow rate in order to evaluate reproducibility of the model. As a result, a Nash-Sutcliffe model efficiency coefficient of flow rate (NS) was lower than 0.5, it was especially indicated that HYPE model tended to underestimate flow rate in flooding conditions. In order to increase the accuracy of model simulation, the Markov chain Monte Carlo methods was applied. As a result of calibration, NS was increased to 0.592. It should, however, be noted that underestimations of flow rate under heavy flooding condition remained even in calibrated HYPE model. Improving flow rate accuracy in flooding condition could be a future issue. Finally, total nitrogen (T-N) and total phosphorus (T-P) were calculated by constructed HYPE model. As a result, temporal averages of T-N and T-P concentrations in river water were calculated as 1.18 mg/L and 0.14 mg/L. Although the model overestimated T-N and T-P compared with observation, the extent of overestimation was small. It was therefore considered that the results of nutrients runoff calculations were reasonable. Consequently, it was indicated that HYPE model was applicable for an analysis on pollutant loads in a mixed watershed of urban, cultivated land and forest.