

Estimation of nutrient transport for long term in river basins of Japan and Korea, using SWAT model

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Nutrient discharge from river basin in flood condition contributes to cause closed water area and enclosed coastal sea to eutrophicate, because a large amount of material is transported. It is important to understand nutrient load from basin that including flood condition, for managing water resource and maintaining ecosystem. Japanese ministry of the environment is monitoring the nutrient concentrations for a long time in various points of Japan. However, the nutrient concentrations are measuring not every day but every month. In addition, there are few studies of nutrient load in flood condition. Consequently, the accuracy of the analysis of nutrient load is not good, therefore nutrient load in flood condition is little known.

The objective of this research is to understand the phenomena of nutrient load (Total Nitrogen, Total Phosphorus) by employing the SWAT model in Asahi River basin and Nakdong River basin. The SWAT model is a physically based continuous time hydrological model. It was designed to predict the impact of land management practices on water, sediment, and agricultural chemical yields in large complex basins (Arnold et al., 1998). The coefficient of determination (R^2) and Nash-Sutcliffe index (NSI) were used to evaluate the model performance.

Asahi River basin which located in western Japan and Nakdong River basin which located in southeastern Korea covers area of 1810km² and 23384km² respectively. Fig.1 shows observed specific discharge of Asahi River and Nakdong River in 2006. This result indicates peak of river discharge has appeared in summer season. There is variation in river discharge because precipitation was different. We estimated nutrient load with calibration using observed data. In Asahi River basin, the best fit for daily stream flow during calibration was on average $R^2 = 0.63$ and $NSI = 0.53$, for daily total nitrogen concentration was on average $R^2 = 0.63$ and $NSI = 0.58$ and for daily total phosphorus concentration was on average $R^2 = 0.51$ and $NSI = 0.49$. The variable trend of stream flow, total nitrogen and total phosphorus concentration was roughly reproduced. Fig.2 shows estimation of nutrient load for long term in Asahi River basin. This result indicates variation of river discharge depends on climatic condition especially precipitation. Nutrient load was also depends on precipitation. N/P ratio has risen in a few years when precipitation was high. Land cover has changed forest and arable land into residential area however, change rate is small in whole basin. Therefore, the influence of changing of land cover on river discharge is small. Result of estimation in Nakdong River basin was also same trend.

Keywords: Nutrient, SWAT model, Long term, Seto Inland Sea, Korea