Evaluation of climate change impacts on discharge and water quality of the Ise Bay watersheds

*Takeo Onishi[1], Jun Yoshino[2], Hiroaki Somura[3], Ken Hiramatsu[1]

1. Faculty of Applied Biological Sciences, Gifu University, 2. Faculty of Engineering, Gifu University, 3. Faculty of Life and Environmental Science, Shimane University

Evaluation of discharge and water quality change due to the terrestrial ecosystem response to the climate change is challenging. To tackle this theme, combined use of detail quantification of each process related to the water and material flow in the terrestrial area and comprehensive hydrochemical modeling approaches are essential. In this study, we attempted to evaluate the impacts of climate change on the discharge and water quality of the Ise Bay watersheds composed of 7 large rivers using the hydrochemical model SWAT (Soil Water Assessment Tool). First, under the present climate condition, discharge and TN concentration was simulated. Calibration and validation period was 2004 –2006, and 2007 –2009, respectively. Using LHS (Latin Hypercube Sampling) method, best fitted parameters for discharge were identified. Since NSE was about 0.6 –0.8, we judged that accuracy of discharge simulation was relatively good. For the simulation of TN, discharge and organic and inorganic nitrogen concentration of agricultural water and domestic water were considered. Though the result shows large uncertainties, it generally tends to overestimate the values, suggesting the importance of denitrification processes. Based on the constructed model, a simulation under the future climate condition along with the AIB scenario of the IPCC 4th report was conducted. Detail climate data with the grid size of 2km was generated by dynamical downscaling of global climate prediction by HadCM3 at 2090. Consequently, according to the prediction that rainfall during the rainy season in the northern part of the Nobi plain was projected to increase as 1.5 –2 larger than the present condition, discharge of the Kiso Three Rivers were also projected to increase significantly. On the contrary to this, precipitation of rivers flowing into the west side of the Ise Bay was projected to decrease. Thus, due to the decrease of precipitation, discharge was also significantly decreased. Though we could not identify the clear tendency in water quality change, change of nitrogen concentration due to the increase of soil organic matter was suggested. Since the anthropogenic impacts such as dam and agricultural drainage is not included in the model, we need to incorporate these effects. Furthermore, denitrification process should also be considered in the model.

Keywords: SWAT, denitrification, climate change

