Estimation of groundwater recharge and phosphorus transport under different precipitation conditions in a suburban catchment, using SWAT model

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The quantification of the groundwater recharge and phosphorus transport in water is one of the most important indicators of the water cycle in lakes because these processes are related to the transport of large nutrient loads. The Yasu River is one of the important water sources of the Biwa Lake. In this paper, Geographic Information System technology is used to analyze and predict the land use change in the Yasu River Basin. The water balance was simulated using the Soil and Water Assessment Tool. Simulations of different years in different precipitation seasons were carried out. The correlation coefficient and the Nash Sutcliffe coefficient are higher than the reference values. The sensitivity analysis of the parameters reveals the different degrees of sensitivity of the parameters in different water seasons, CN2 always has a high sensitivity during all kinds of water season. The total groundwater recharge and discharge are 180 million m^3 and 179 million m^3 in the normal precipitation season, respectively. The trends differ in the dry and wet seasons. In the dry season of 2007, the groundwater recharge was below 140 million m^3, while it exceeded 240 million m^3 in the rainy season in 2003. In addition, the process of phosphorus loss in the basin and release into Lake Biwa are explained from the perspective of space and time. This is closely related to the spatial distribution of the main channel and the time distribution of precipitation. The total amount of nonpoint source pollution of phosphorus in three years is equivalent to 4.08 kg/ha of paddy fields in the watershed. The spatial distribution of phosphorus loss is related to the stream flow, it is mainly concentrated in the area with paddy fields and urban. The time distribution is related to the distribution of the precipitation. With increasing precipitation, the nonpoint source pollution of phosphorus slightly increases. This is due to the driving effect of precipitation on the phosphorus transfer and erosion of soil.

Keywords: Phosphorus transport, Groundwater recharge, Different precipitation conditions, SWAT model

