Analysis of Effects on SWAT Estimation of Warm-Up Period

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Abstract

SWAT is semi-distributed and continuous-time distributed simulation watershed model, which can simulate point and nonpoint source pollutants as well as hydrology and water quality. It was developed to predict the effects of alternative management decisions on water, sediment, and chemical yields with reasonable accuracy. It is able to predict and manage hydrology, sediments, nutrients, and pesticides with Best Management Practices (BMPs) in a watershed. SWAT model also has potential for use in ungauged basins to predict streamflow and baseflow from saturated source area in watersheds. According to various cultivation practices and climate change, SWAT model is available to analyze relative change in hydrology and water quality. In order to establish optimum management of water quality, both monitering and modeling have been conducted actively using SWAT model. As SWAT model is computer program to simulate a lot of natural phenomena, it has limitation to predict and reflect them with on hundred percent accuracy. Thus, it is possible to analyze the effect of BMPs in the watershed where users want to simulate hydrology and water quality only if model accuracy and applicability are assessed first of all and the result of it is well for the study watershed. For assessment of SWAT applicability, most researchers have used R^2 and Nash and Sutcliffe Efficiency (NSE). R^2 and NSE are likely to show different results according to a warm up period and sometimes its results are very different. There have been hardly any studies of whether warm up period can affect simulation results in SWAT model. In this study, how warm up period has a effect on SWAT results was analyzed and a appropriate warm up period was suggested. Lots of SWAT results were compared after using measured data of Soyanggang-dam watershed and applying various warm up period (0 ~ 10 year(s)). As a result of this study, when there was no warm up period, R^2 and NSE were 0.645, 0.602 respectively, when warm up period was 2 years, R^2 and NSE were 0.648, 0.632, and when warm up period was 4 years, R^2 and NSE were 0.663, 0.652 separately. Through this study, sensitive analysis of warm up period in SWAT model was conducted, and this study could give a guideline able to simulate hydrology and water quality for more accuracy than before as users change a lot of warm up periods as well as any simulation parameters.

Keywords : hydrology and water quality, NSE, R^2, SWAT, warm up period

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