Low-flow simulation and forecasting for efficient water management: case-study of the Seolmacheon Catchment, Korea

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Abstract

Low-flow simulation and forecasting is one of the emerging issues in hydrology due to the increasing demand of water in dry periods. Even though low-flow simulation and forecasting remains a difficult issue for hydrologists better simulation and earlier prediction of low flows are crucial for efficient water management.

The UN has never stated that South Korea is in a water shortage. However, a recent study by MOLIT indicates that Korea will probably lack water by 4.3 billion m3 in 2020 due to several factors, including land cover and climate change impacts. The two main situations that generate low-flow events are an extended dry period (summer low-flow) and an extended period of low temperature (winter low-flow). This situation demands the hydrologists to concentrate more on low-flow hydrology. Korea's annual average precipitation is about 127.6 billion m3 where runoff into rivers and losses accounts 57% and 43% respectively and from 57% runoff discharge to the ocean is accounts 31% and total water use is about 26% . So, saving 6% of the runoff will solve the water shortage problem mentioned above.

The main objective of this study is to present the hydrological modelling approach for low-flow simulation and forecasting using a model that have a capacity to represent the real hydrological behavior of the catchment and to address the water management of summer as well as winter low-flow. Two lumped hydrological models (GR4J and CAT) will be applied to calibrate and simulate the streamflow. The models will be applied to Seolmacheon catchment using daily streamflow data at Jeonjeokbigyo station, and the Nash-Sutcliffe efficiencies will be calculated to check the model performance. The expected result will be summarized in a different ways so as to provide decision makers with the probabilistic forecasts and the associated risks of low flows. Finally, the results will be presented and the capacity of the models to provide useful information for efficient water management practice will be discussed.

Keywords : Low-flow, Simulation, Lumped model, Model efficiency, Water management

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