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Evaluating the predictability of monthly and seasonal dam inflow by using ensemble weather forecasts and hydrologic models

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Reliable monthly and seasonal dam inflow forecasts are valuable for managing water resources, water supply planning, and drought damage mitigation etc. A numerical ensemble dam inflow forecasting combined with monthly weather forecast information and hydrologic dam inflow computation has been known as one of the valuable methods. In this study the ensemble monthly and seasonal dam inflow forecasting system is developed and evaluated for the 7 multi-purpose dam watersheds in South Korea. For the weather forecasting components, Global Seasonal forecast system version 5 (GloSea5) data with 60 time-lagged ensemble forecasts for a month from Korea Meteorological Administration (KMA) and monthly and seasonal forecast data with 18 multi-model ensemble from APEC Climate Centre (APCC) are used. For the hydrologic components, Tank, ABCD and K-DRUM rainfall-runoff models are driven to simulate 1∼3 month forecasts of dam inflow. The predictabilities of the developed ensemble dam inflow forecast system are tested on the various different basin scales for the 2015 and 2016 years. Correlation coefficient (CC) and root mean square error (RMSE) between forecasted and observed dam inflow are used as indicators of the predictability. The results show that the accuracy of weather and dam inflow forecasts is decreased as the lead time increase. The effects of the hydrologic model selection are insignificant, while those of application basin size are more important factor. In other words, the accuracy of the forecast system is decreased as the basin size is decreased. On the other hands, the use of time lagged ensemble from GloSae5 outperforms that of multi-model ensemble of APCC in this study. It can be concluded that for the monthly and seasonal dam inflow forecast the accuracy and spatial resolution of monthly weather forecast are more critical than the selection of hydrologic models and the development of post-process will be useful for improving the accuracy of weather and dam inflow forecast.

Keywords: Time-lagged Ensemble, Multi-Model Ensemble, Dam inflow prediction

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