Evaluation of Uncertainty in Long-term Rainfall-Runoff Forecast for Development of Long-term Prediction Based Water Management System

*SooHee HAN[1], Chanyoung SON[1], Younghyun CHO[1], Aesook SUH[1]

1. Hydrometeorological Cooperation Cenetr

The needs for probabilistic long-term forecast is growing more urgent than ever recently with climate change, because of the greater uncertainty in precipitation, the heightened frequency and intensity of natural disasters such as flood and draught, and the increased social demand for stable water supply. Korea Meteorological Administration, a governmental agency, is currently running a long-term forecast using GloSea5, a global seasonal prediction system, but few research has been done on utilization and application of said system in water management. In this study, we focused on Yongdam Dam and Namgang Dam, the most notable multipurpose dams in Korea’ s Geum and Nakdong river watershed, respectively; extracted GloSea5’ s long-term rainfall forecast data (for max. 6 months) for these areas; compared the data with observations and conducted bias correlation on the quantitative differences by the quantile delta mapping (QDM) method; and thereby assessed and measured the accuracy of and the uncertainty in the GloSea5 predictions. In addition, we conducted a long-term runoff analysis taking into account the uncertainty in long-term forecasts, by means of K-DRUM, a distributed rainfall-runoff model generally adopted in dam operations, seeking to establish a long-term plan for dam operation. Our analysis results suggested we could considerably mitigate the quantitative gap between observations and long-term forecasts using the QDM method. The outcome also showed representable patterns comparatively similar to observations. And the result of long-term runoff verification included the observation data within its confidence interval after considering the uncertainty, sufficiently supporting the feasibility of a long-term operation plan for dams. This study concludes it is possible to maintain stable water storages and to plan for water level management by utilizing long-term forecast techniques.

Keywords: GloSea5 Model, Long-term Prediction Forecast, Distributed Rainfall-Runoff Model, Evaluation of Uncertainty

