DEVELOPMENT OF RAINFALL RUNOFF FORECASTING MODEL FOR WATER RESOURCES MANAGEMENT IN A CATCHMENT SCALE

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The hydrologic streamflow analysis is most fundamental and important problem in water resources planning and management. Particularly, long- and short-term quantitative assessment of streamflow is essential for effective use of water resources.

Since 2001, as a part of 『21st Century New Frontier National R&D Projects』 which have been planned to overcome the water shortage problems in our country, the real-time integrated water management operating systems have been developed to maximize the efficiency of water use by predicting the behavior of water resources such as surface water, subsurface water, etc. These systems consist of 1) the basin scale rainfall runoff forecasting system, 2) the real-time integrated water resources information system, 3) the real-time simulation and optimization system for the conjunctive operation of dams, and 4) the water quality prediction system for decision-making support in water management. In this paper, among these systems above, we present only the development of the real-time rainfall runoff forecasting system (RRFS) in a large basin scale.

The RRFS is developed to perform effectively the rainfall runoff analyses with the prediction technology for the real-time or short-term (< 10days) water demand and supply by using meteorological-forecasting data. As base technologies for this, it needs to develop the water information management technology to acquire and manage immediately the amount of water demand (the amount of intake), the real-time water balance analysis technology to optimize the water distribution and supply in a basin, and the continuous runoff prediction technology to predict the long- and short-term streamflow with meteorological information. In addition, by introducing the Ensemble Streamflow Prediction (ESP) which is a stochastic streamflow prediction technique to consider the uncertainty of the long-term rainfall prediction in the decision-making process to establish water distribution plans, the decision-making process including the risk level can be carried out.

In this study, one of principal technologies introduced to the development of RRFS is the long- and short-term prediction of the natural streamflows used as input data. As a result of the comparison between various continuous lumped runoff models such as

SSARR model, NWSRFS model (Burnash et al., 1973), Tank model (Sugawara et al., 1974), etc., the SSARR (Y2K) model (U.S. Army Corps of Engineers, 1991), as a base rainfall-runoff analysis model in this study, was adopted. The RRFS developed was combined with the real-time integrated water management system and Hydro Web Data System (HWDS), and was also applied to Geum river basin where is situated on the west of the central part in the Korean peninsula.

HWDS is operated by real-time data acquisition method which can update automatically existing data. The sub-system for acquiring data in HWDS can simulate with data required from the data acquisition, calibration, and analysis systems. All of meteorological data can be used directly by RRFS.

The water level of reservoir and river observation data are used in HWDS to present and calculate the total inflow required in HWDS and the real-time natural inflow used in RRFS. The total inflow or total discharge transfers as fixed or variable values from point to point and thus this is based on results obtained from more precise flow routing between control points in a river.

Consequently, the basin discharge prediction is used to design basically a short-term optimal operating plan of hydrologic facilities. This plan includes constraints for hydrologic facility operation, dam gate control, channel routing, etc.

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