P-07

Rainfall-runoff Prediction Considering Error Structure of the Predicted Rainfall

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1. Introduction

Rainfall-runoff phenomenon is one of the most esoteric mechanisms among many nature behaviors. The phenomenon is related not only to geographical and geological characteristics, but also to atmospheric or meteorological characteristics. Within several decades of development in hydrology, lots of research efforts to solve or simulate the rainfall-runoff phenomenon are focused on understanding of basin characteristic with a geographical and geological view point.

Currently, there are many hydrological models, whether these are distributed or lumped models, which can properly simulate basin characteristic. If parameters of the model are optimized to specific basin, because the basin characteristics are not drastically change, the most effective element to simulation results is its input data. The accuracy of the simulation results which usually represent as a discharge hydrograph is mostly affected by accuracy of rainfall data. This accuracy effectiveness is more severely appear when we forecast discharge with predicted rainfall. When we consider an uncertainty of predicted rainfall, it is important to provide prediction accuracy of discharge for real-time rainfall-runoff simulation.

This research is to evaluate propagation of the predicted rainfall error to the discharge prediction and to use the error structure for improving discharge prediction accuracy. Translation model (Shiiba et al., 1984) is used for short-term rainfall prediction. The translation model is for identifying a movement of horizontal rainfall distribution using radar observed data.

2. Overview

Previous research (Tachikawa et al., 2003) statistically analyzed the prediction error fields by comparing predicted rainfall fields to the radar observed rainfall fields. And it is founded that the distribution of a relative prediction error, $\boldsymbol{E_r}$, fits to a lognormal distribution having a positive spatial correlation within 10km.

$$\mathbf{E_r} = (\mathbf{R_o} - \mathbf{R_p}) / \mathbf{R_p} \qquad (1)$$

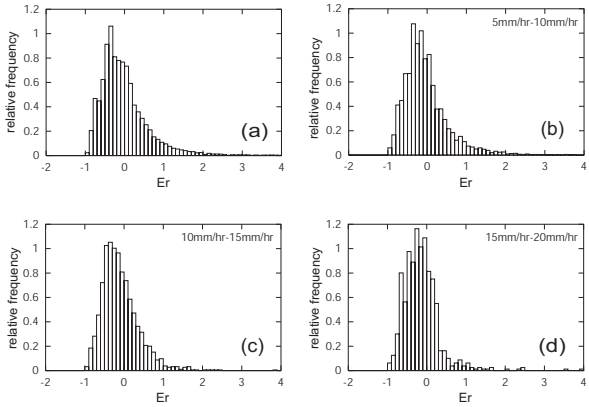

図 1 Frequency distribution of relative prediction error $\mathbf{E_r}$ of 5 minute ahead prediction. (a) Frequency distribution of $\mathbf{E_r}$ for grid-cells in which predicted rainfall intensity is larger than zero, (b) the one between 5 and 10mm/hr, (c) the one between 10 and 15mm/hr, and (d) the one between 15 and 20mm/hr.

3. Objective

In this research, the error structure of predicted rainfall data is considered when discharges are predicted using Kalman filter coupled distributed hydrological model (Kim et al., 2005). If proper error variances are given, when we assume the other error sources are defined or minimized, the Kalman filter coupled distributed hydrological model is expected to trace the true value. Final objective of this research is to improve the perdition accuracy of the discharge with a given input error structure.