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Estimating initial state variables in a physically based distributed hydrological model

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1. Introduction

To get a good rainfall-runoff simulation result, not only to set model parameters precisely but also to give proper initial state variables is important. Initial state variables in most hydrological models are defined as storage amount in a basin and it's spatial distribution. The variables give much effect on result, especially when the model is distributing one and the variables are set again during simulation. If initial state variables are reset during the simulation or after rain started, it may cause severe discrepancy between simulated hydrograph and observed one. Because not small amount of storage is already distributed all over the basin and it's almost impossible to measure that.

In this study, efficient method is introduced to reset initial state variables in distributed model during simulation. Resetting the variables is essential fore-step for data assimilation in real time simulation. When the variables reset properly, even better simulation results than without the resetting are there.

2. Initial state variables adjustment

If there is a big difference between simulated discharge and observed one in real time simulation, resetting parameter or initial state variables is unavoidable. But, these jobs usually cause severe difference to results. It's because of the model structure, which is designed to uniformly distribute the amount of storage. The uniformly distributed state values may different to actual one as examples of the picture 1.

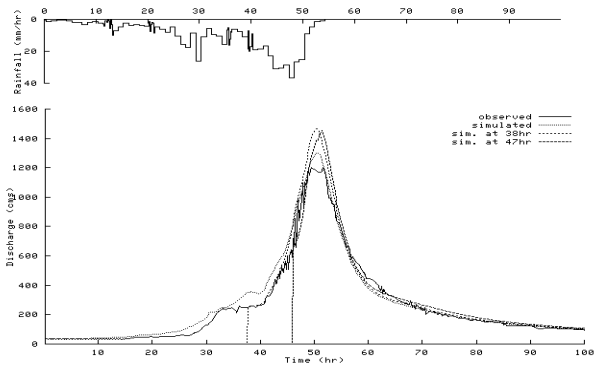

Fig. 1 Different results by resetting the variables

To get rid of this model limitation, fore simulation result right before the resetting is used. Under an assumption of similarity, ratio of simulated discharge to observed one is multiplied to all storage amounts of each cell. So all initial state variables are successfully reset without any change of distribution pattern.

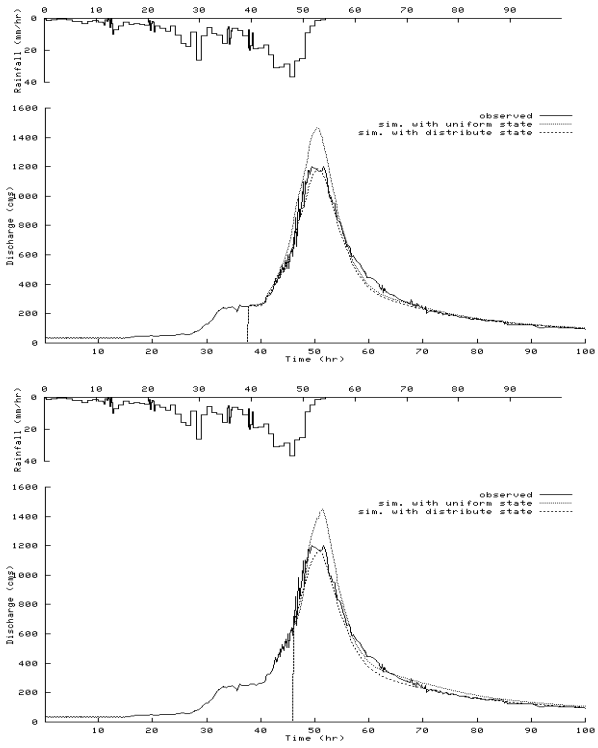

Fig. 2 Effect of distribute initial state variables compare to uniform variables