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A Development of Multi-Site Rainfall Simulation Model Using Piecewise Generalize Pareto Distribution

A DEVELOPMENT OF MULTI-SITE RAINFALL SIMULATION MODEL USING PIECEWISE GENERALIZE PARETO DISTRIBUTION

Byung-Jin So[1] and Hyun-Han Kwon[2]

In this study, a stochastic generation framework for simulation of daily rainfall at multiple sites is presented. The limitations of existing Markov chain model for reproducing extreme rainfalls are a known problem, and the problems have increased the uncertainties in establishing water resources plans. Especially, it is very difficult to secure reliability of water resources structures because the design rainfall through the existing Markov chain model is significantly underestimated. In this regard, aims of this study were to develop a new daily rainfall simulation model which is able to reproduce both mean and high order moments such as variance and skewness using a piecewise Kernel-Pareto distribution. In addition, the algorithm to reproduce the spatial correlation was combined. The algorithm can be considered characteristics of kernel density function and the GPD distribution at the same time. As a result Kernel-Pareto distribution based Markov chain model has been shown to perform well at reproducing most of statistics such as mean, standard deviation and skewness while the existing Gamma distribution based Markov chain model generally fails to reproduce high order moments. It was also confirmed that the proposed model can more effectively reproduce low order moments such as mean and median as well as underlying distribution of daily rainfall series by modeling extreme rainfall separately.

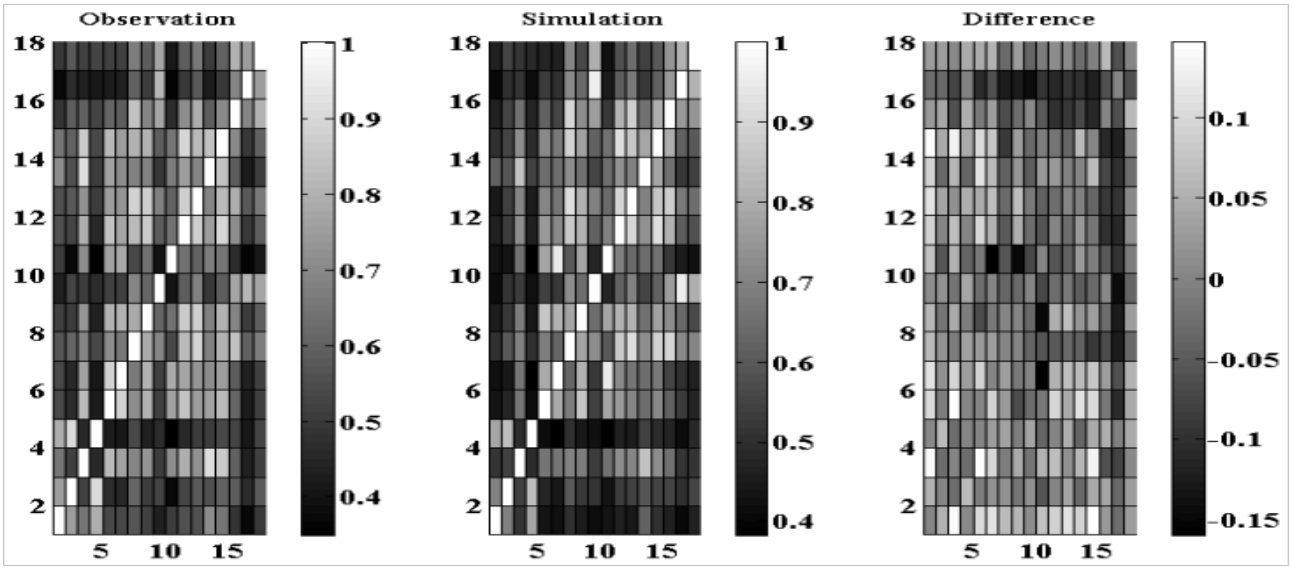

Figure 1 Correlation matrix for stations.

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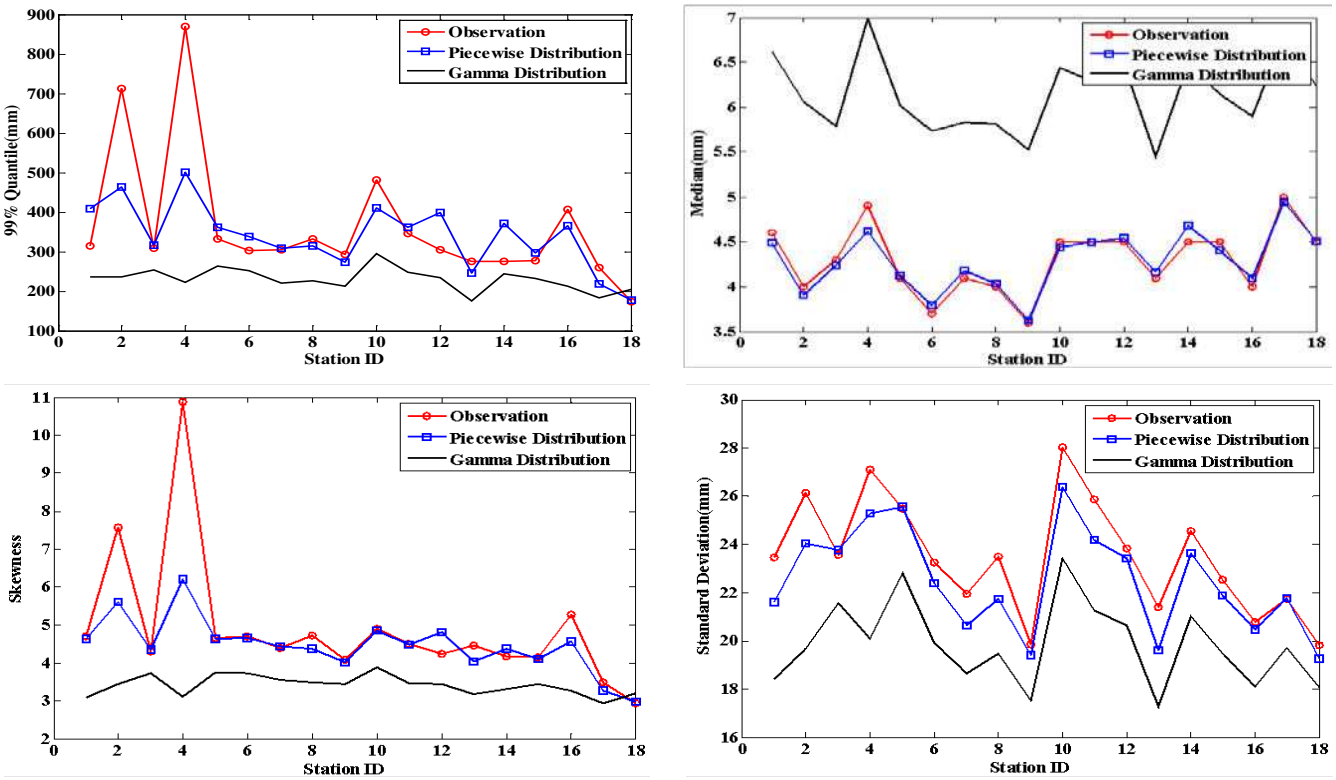

Figure 1 Assessment of simulation performance of MPKPD based Morkov Chain Model.

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