Evaluation of Spatial Rainfall Data Uncertainties in Distributed Rainfall-Runoff Model Using Meta-Gaussian approach

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Rainfall-runoff model is the most commonly used tool for water resources planning and management. The model has been used for prediction of extreme events such as flood and drought or analysis of water balance. In the last decades, hydrologists have strived to improve the rainfall-runoff model. However, uncertainties over rainfall-runoff simulation remain a major hydrological issue and finding accurate quantification of the model is a major research topic in the field. Uncertainties in simulations that apply the rainfall-runoff model involve the following: (1) hydrological input data, (2) parameters of rainfall-runoff model, and (3) the structure of the rainfall-runoff model. Recently, rapid developments of GIS technology and computer computation capacity have enabled the use of complex distributed rainfall-runoff model to run runoff simulations. Amid this trend, uncertain data set supplied to hydrological models has emerged as the most important factor that negatively affects prediction.

To contribute to the recent research trend in hydrology, this study has tried to quantify uncertainties of spatial rainfall data—a major source of uncertainty in rainfall-runoff models that affects runoff simulations. To process spatial rainfall data, the following four methods were applied: (1) Thiessen method, (2) Inverse distance method, (3) Radar rainfall, (4) and adjusted radar rainfall. In this study, Vflo ^{TM} model, a

physically based distributed rainfall-runoff model, was selected as the rainfall-runoff model. To quantify uncertainties over rainfall-runoff simulation, Meta-Gaussian approach (Montanari and Brath, 2004) was applied. Hydrologic data used in this study were collected from Dongyeonggyo and Pyeongtaek water station in Anseongcheon basin where comparatively reliable observed streamflow data have been accumulated. We analyzed uncertainties of spatial rainfall input data at 95% confidence interval and were compared to results of spatial rainfall data previously mentioned