**Flood Risk Analysis in New York City Applying Nonparametric Simulation on Radar Rainfall Data**

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Flood response in an urban area is the product of interactions of spatially and temporally varying rainfall and infrastructures. Scenarios that properly represent likely storm tracks through the city and the associated space-time patterns of rainfall can help improve the operation of urban hydrologic systems. The goal of this study is to apply simulation based approach to reproduce spatially dependent storm data and use it to quantify the risk of extremes in New York City (NYC) and to compare with the current design criteria. In this regard, radar data stage IV from 2002-2015 is employed to determine extreme rainfall events and examine the spatial consistency between them in NYC. A nonparametric copula-based simulation approach is applied to the spatial fields with arbitrary dependence structures and marginal densities. The nonparametric simulator uses log-spline density estimation in the univariate setting, together with a sampling strategy to reproduce dependence across variables through a nonparametric numerical approximation of the underlying copula function. Results indicate current design criteria of NYC underestimates the extreme rainfall in boroughs of Manhattan and Staten Island while overestimates the events over Brooklyn and Queens area. Therefore, instead of stationary design criteria, we propose a spatially dynamic design criteria for NYC to meet the extremes.