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Decision making for urban drainage systems under uncertainty caused by weather radar rainfall measurement

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With the rapidly growth of urbanization and population, the decision making for managing urban flood risk has been a significant issue for most large cities in China. A high-quality measurement of rainfall at small temporal but large spatial scales is of great importance to urban flood risk management. Weather radar rainfall, with its advantage of short-term predictability and high spatial and temporal resolutions, has been widely applied in the urban drainage system modeling. It is recognized that weather radar is subjected to many uncertainties and many studies have been carried out to quantify these uncertainties in order to improve the quality of the rainfall and the corresponding outlet flow. However, considering the final action in urban flood risk management is the decision making such as flood warning and whether to build or how to operate a hydraulics structure, some uncertainties of weather radar may have little or significant influence to the final results. For this reason, in this study, we aim to investigate which characteristics of the radar rainfall are the significant ones for decision making in urban flood risk management. A radar probabilistic quantitative rainfall estimated scheme is integrated with an urban flood model (Storm Water Management Model, SWMM) to make a decision on whether to warn or not according to the decision criterions. A number of scenarios with different storm types, synoptic regime and spatial and temporal correlation are designed to analyze the relationship between these affected factors and the final decision. Based on this, parameterized radar probabilistic rainfall estimation model is established which reflects the most important elements in the decision making for urban flood risk management.