Urban pluvial flood risk assessment based on scenario simulation

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ABSTRACT

In this study, urban pluvial flood risk is studied in an actual study area using scenario simulation method based on hydrodynamics. Real weather data and GIS (Geographic Information System) data are adopted to make the results reliable. A region in Haidian District of Beijing is selected as the study area. All the rainfall scenarios (about 200 scenarios) during an 8-year period (from January 1, 2008 to December 31, 2015) are obtained from hourly precipitation data. These rainfall scenarios are used as input for numerical simulations. Spatial-temporal distributions of water depth are obtained through numerical simulation base on SWEs (Shallow-Water Equations). GPU computing technique is applied to increase simulation speed greatly. Influence of rainfall parameters on flood water depth is analyzed. The results show that water depth becomes higher if rainfall duration and average rainfall intensity increase. Moreover, situation of water depth is not only related to overall parameters like rainfall duration or rainfall intensity, but also related to other details of rainfall. Water depth exceedance probability curves of every location and every building are obtained, and different characteristics of the curves are discussed. Finally, the effect of water depth exceedance probability curves of buildings on designing building foundation height is shown. This study is helpful to the risk assessments of urban pluvial flood.

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