

City flood disaster scenario simulation based on 1D-2D coupled rain-flood model: A case study in Luoyang, China.

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Abstract

In order to realize the reproduction and simulation of urban rainstorm and waterlogging scenarios with complex underlying surfaces. Based on the Mike series models, we constructed an urban storm-flood coupling model considering one-dimensional river channels, two-dimensional ground and underground pipe networks. Luoyang City was used as a pilot to realize the construction of a one-dimensional and two-dimensional coupled urban flood model and flood simulation. where is located in the western part of Henan Province, China. The coupled model was calibrated and verified by the submerged water depths of 16 survey points in two historical storms flood events. The average relative error of the calibration simulated water depth was 22.65%, and the average absolute error was 13.93cm; the average relative error of the verified simulated water depth was 15.27%, The average absolute error is 7.54cm, and the simulation result is good. Finally, 28 rains with different return periods and different durations were designed to simulate and analyze the rainstorm inundation in the downtown area of Luoyang. The result shows that the R2 of rainfall and urban rainstorm inundation is 0.8776, and the R2 of rainfall duration and urban rainstorm inundation is 0.8141. Therefore, rainfall is the decisive factor in the formation of urban waterlogging disasters, which is actually the rainfall duration. The study results have important practical significance for urban flood prevention, disaster reduction and traffic emergency management.

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