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Inundation Model Integrating Radar Rainfall for Real-time Scenario Simulations

Ming-Hsi Hsu (1) and Chen-Jia Huang (2)

(1) Department of Bioenvironmental Systems Engineering, National Taiwan University, Taipei, Taiwan (mhhsu@ntu.edu.tw), (2) Department of Bioenvironmental Systems Engineering, National Taiwan University, Taipei, Taiwan (d94622003@ntu.edu.tw)

Although traditional inundation models have been applied with good accuracy in Taiwan, they usually require a long computing time for simulations. However, the meteorological and geographical conditions in Taiwan frequently induce inundation within a short time period when storm occurs. The lead-time for emergency response in too short to indicate the areas with high flood risks for evacuation by using the traditional inundation models.
A simplified spatially-distributed inundation model was developed for the demand of the efficient flood scenario simulations. The whole drainage basin is divided into regular grids. Therefore, the solutions in terms of water levels at the grids and discharges between the grids are obtained by solving the two types of equations. i.e. grid continuity equation and grid discharge equation.
The Quantitative Precipitation Estimation and Segregation Using Multiple Sensors (QPESUMS) System was established by Central Weather Bureau, Taiwan in 2002. It contains 4 Doppler Radars which is developed by U.S. National Weather Service. The temporal resolution of QPESUMS system is 10 min and the spatial resolution is about 561×441 grids with 1.25km$\times$1.25km grid size. The rainfall forecasting estimated by the QPESUMS system is considered in the developing model for real-time simulations.
The Keelung and Bajhang River basins are adopted as the study areas of the newly developing model. The proposed model will be executed periodically to simulate the flood scenarios induced by the occurring and the forecasted rainfalls.
The real-time radar rainfall data are integrated to simulate the inundation extent of 0612 heavy rain in Bajhang River basin. The accuracy and efficiency of inundation model were discussed. The study used the automatic process of integrating radar rainfall data to the inundation model. The relationship between the accuracy and the efficiency of different grid sizes in Keelung River basin was compared. The inundation model successfully combined the radar rainfall, the upland runoff and the water stage as the input on the boundaries in the inundation model. The inundation results will help the emergency managers taking proper strategies for disaster mitigations.

Keywords: Inundation model, QPESUMS system, Real-time simulation.