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Development of Grid-Based Flood Inundation Analysis System in Urban Area

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This study developed a grid-based model for fast and efficient calculation of flood inundation analysis in urban areas. A new grid-based model was developed by the improvement of 2D diffusion hydrodynamic model applying a parallel computing, reflecting topographic data and enabling hydraulic analysis through linkage with SWMM and FLDWAV model respectively. The developed model was validated by applying to actual flooding cases such as urban flood, levee-break flood and dam-break flood. The accuracy and usability of the model were verified by comparing with observed data and examining the resolution of the topographic data, the number of sub-grid, the building/road effect, and roughness coefficients.

In order to verify the model for urban flood, the various flood events were considered on Seoul, Ulsan and Gyeongju area. The results of inundation analysis using the estimated overflow from manhole and breached levee were compared with actual flood conditions. In the case of urban river flood, inland inundation from surcharge by drainage network and the levee breached flow were simultaneously considered. It can be concluded that the higher resolution of sub-grid, the more accurate the simulation results compared with observed data.

The GIS based GUI system for 1D-2D flood inundation analysis is established combining the pre-processor for 2D mesh generation and post-processor for the displaying the 2D simulation results. The flood hazard map in urban area prepared with the GUI system can provide various and useful information for the preparation of evacuation plan through accurate flood hazard. This study will contribute to establish disaster preparedness, response and recovery plan against urban flood.