Developing an integrated urban inundation flood model for extreme rainfall events for Metro Manila, Philippines

LEA DASALLAS[*1], HYUNUK AN[1]

[1]*Chungnam National University*

The Philippines is one of the most vulnerable countries affected by the consequences of the changing climate. In recent years, extreme rainfall events had occurred in Metro Manila, the Philippines' capital city, that has resulted to severe damages in infrastructure, economy, and lose of lives. Aside from the excessive precipitation events, Manila is susceptible to recurring flooding due its low elevation, close proximity to large water sheds and river basins, rapid urbanization and lack of proper urban planning, and the un-systematized drainage system. The previous flood maps simulated for early warning, uses rain-runoff methods, direct-rainfall methods or 2D flood routing models. These models were applied to simulate the flood overflow generated in the Pasig-Marikina river basin. However, these models do not incorporate the drainage network, which is an integral part in simulating accurate urban flood inundation. This research therefore aims to develop an integrated urban inundation model based on digital surface model that assimilates the sewer system applicable for urban domains with complex pipe network. The research used the quadtree shallow water method, a model that provides flexible grid generation that uses adaptive quadtree grid and cut cell method. The method is proven to have improved computational efficiency in 2D simulations. The results were analyzed and compared with the validation data obtained from previous extreme rainfall events. The integrated model was also compared to the existing flood inundation methodologies being used for the present flood early warning system. Research results show that present methodology is closer to the validated results as compared to the previous models. The developed model is also perceived to be best applicable for short term flood events. This shows the efficiency of utilizing integrated urban flood modeling in the Philippines, which can be used for extreme and conventional urban flood events in the future.

Keywords : flood modeling, extreme rainfall events, urban inundation