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Developing an integrated urban inundation flood model for extreme rainfall events with complex sewer system

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One of the major consequences of the changing climate is more intense rainfall episodes in climate vulnerable countries, specifically the Philippines. For over the last 10 years, extreme rainfall events had occurred in the country's capital city, Metro Manila, which resulted to severe urban flooding occurrences. The intense rainfall combined with the domain's low elevation, close proximity to large water sheds and river basins, lack of proper urban planning and the un-systematized drainage system had aggravated the flood inundation. Numerous studies were conducted that had used flood models, but none of these had incorporated the effect of water drainage network, which is an integral part of simulating realistic urban flood inundation. Therefore, this research 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 quadtree shallow water method, a model that provides flexible grid generation that utilizes adaptive quadtree grid and cut method. 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.