



Applying WRF-openLISEM model coupling system to simulate flash flood hazard in Kampala, Uganda

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Flood hazard modeling requires high resolutions hydro-meteorological data to develop flood hazard map that supports decision maker in managing flash floods. Kampala, the capital city of Uganda, is frequently affected by flash flood hazard triggered by extreme rainfall in each rainy season. However, due to poor hydrometeorological data, it is challenging to develop flood hazard modeling in the city. To overcome these challenges, the application of high-resolution atmospheric model (i.e. WRF) coupling to the hydrologic model appears to be a promising alternative for flood flash flood modeling in the data scarce area. This study attempts to evaluate the applicability of one-way coupled WRF-openLISEM modeling system for the extreme precipitation event that caused the 25th June 2012 flash flood event in Kampala, Uganda. WRF model is simulated to produce the spatial and temporal distribution of extreme rainfall event at the spatial and temporal resolutions of 1-km model domain and 10 minutes respectively, which is then used as input to openLISEM for flash flood hazard modeling. WRF model simulation experiments were performed for the total of 32 physics options as a combination of MPS, CPS, and PBL, and the combination of best physics option simulation in reproducing good cumulative daily rainfall events and its spatial and temporal distributions at 1-km WRF domain is selected after comparing with point observed rainfall data. The result indicates that the WRF model simulation able to capture the spatial and temporal distribution of precipitation but underestimated its cumulative amount compared to the observed rainfall event. openLISEM model is set up at the city scale with the spatially distributed rainfall event of 10 minutes temporal resolution and other model input databases at a spatial resolution of 20m. Compared to an earlier simulation that was verified with stakeholders and accepted for drainage system design, and the skill of the model was relatively higher when using the spatially distributed rainfall event than using observed point rainfall data. The simulation results demonstrated the applicability of a coupled WRF-openLISEM for flash flood hazard modeling in Kampala, Uganda.