RECONSTRUCTION OF HURRICANE HARVEY FLOODING FOR HARRIS COUNTY, TX USING A GPU-ACCELERATED 2D FLOOD MODEL FOR POST-FLOOD HAZARD ANALYSIS

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Hurricane Harvey that made landfall in the southern Texas this August is one of the most destructive hurricanes during the 2017 hurricane season. During its active period, many areas in coastal Texas region received more than 40 inches of rain. This downpour caused significant flooding resulting in about 77 casualties, displacing more than 30,000 people, inundating hundreds of thousands homes and is currently estimated to have caused more than $70 billion in direct damage. One of the significantly affected areas is Harris County where the city of Houston, TX is located. Covering over two HUC-8 drainage basins (~2702 mi^2), this county experienced more than 80% of its annual average rainfall during this event. This study presents an effort to reconstruct flooding caused by extreme rainfall due to Hurricane Harvey in Harris County, Texas. This computationally intensive task was performed at a 30-m spatial resolution using a rapid flood model called Flood2D-GPU, a graphics processing unit (GPU) accelerated model, on Oak Ridge National Laboratory's (ORNL) Titan Supercomputer. For this task, the hourly rainfall estimates from the National Center for Environmental Prediction Stage IV Quantitative Precipitation Estimate were fed into the Variable Infiltration Capacity (VIC) hydrologic model and Routing Application for Parallel computation of Discharge (RAPID) routing model to estimate flow hydrographs at 69 locations for Flood2D-GPU simulation. Preliminary results of the simulation including flood inundation extents, maps of flood depths and inundation duration will be presented. Future efforts will focus on calibrating and validating the simulation results and assessing the flood damage for better understanding the impacts made by Hurricane Harvey.

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