

## **Implementing a two-dimensional flood model under Titan environment**

Tigstu Dullo, Alfred Kalyanapu, Kao Shih-Chieh, Valentine Anantharaj, Sheikh Ghafoor,  
Ryan Marshall, Joe Tatarczuk

The objective of this study is to implement a two-dimensional (2D) flood model called Flood2D-GPU on Titan to streamline the workflow and improve the computational efficiency. The final optimized flood model will be used to simulate flood regimes under the probable maximum flood scenarios for the conterminous United States. The model is based on shallow water equations (SWE) and uses an upwind-finite difference numerical formulation to simulate flood events. The GPU based implementation has been developed, using NVIDIA's Compute Unified Development Architecture (CUDA) programming model. The increase in the computational performance would permit simulation of larger domain sizes, more refined spatial and temporal resolutions and more simulations (ensembles). For this study, these implementations are being applied to simulate a dam break event at the Taum Sau k pump-storage hydro-electric power plant in Missouri, which occurred on December 14, 2005. In addition, we are simulating flood maps for a selected urban area in Carrollton city, Georgia for probable maximum flood scenarios. A single GPU implementation provides a significant speed up, up to two orders of magnitude compared to CPU version of the model.