



Application of a flood hazard model in the Susquehanna River basin in Pennsylvania, USA

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The flood hazard model presented here includes TOPNET, a modified version of TOPMODEL, for hydrologic modeling, and a 2D finite volume model to simulate flood propagation efficient for large scale flood modeling. TOPNET expands on TOPMODEL through the addition of a soil zone component that provides infiltration excess runoff generation capability through a Green-Ampt like parameterization. Further added representations of other hydrologic processes include a potential evapotranspiration component, and a canopy storage component to model interception. Moreover, the model includes a snow melt component, as well as a water management module for a more realistic streamflow computation. The model is implemented with parallel computing to increase the speed of computation.

The model is automatically calibrated for its parameters against nine streamflow gauges within the 1000-catchment Susquehanna River basin. Extreme-value distributions are fit to modeled streamflow to obtain Q100 for each reach in the river basin. Hydraulic computations are performed using a computationally-efficient 2D finite-volume, first-order, Godunov-type model. Flood propagation is simulated by forcing the hydraulic model with the Q100 to generate a 100-year return period flood elevations and extent.