



# University of Mississippi



## Development of an Integrated Simulation Tool for Predicting Disastrous Flooding, Water Contamination, Sediment Transport and their Impacts on the Environment

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Prevent, Protect, Respond, Recover

### Homeland Security Challenge:

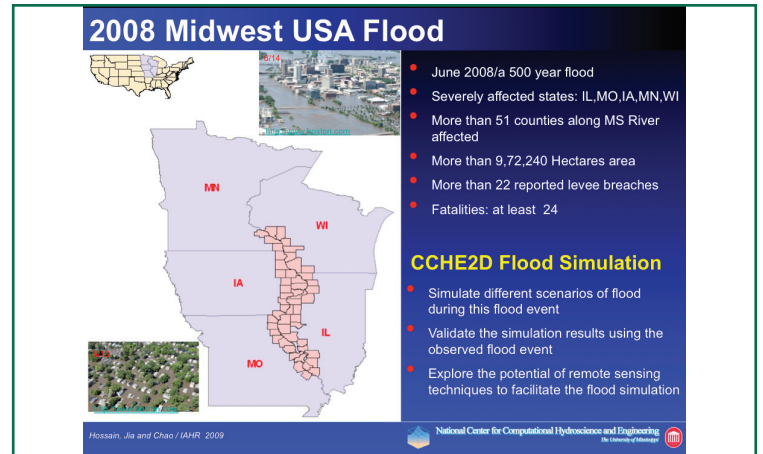
Breaches in levees can cause severe flooding leading to a catastrophic disaster resulting in loss of lives, property, and critical infrastructures. Floods can also result in chemical/sewage spills, sediment erosion and transport, and environmental degradation. The ability to predict these events and their impact is critical to designing resilience plans for water infrastructures and flood zones.

### Research Project Solution:

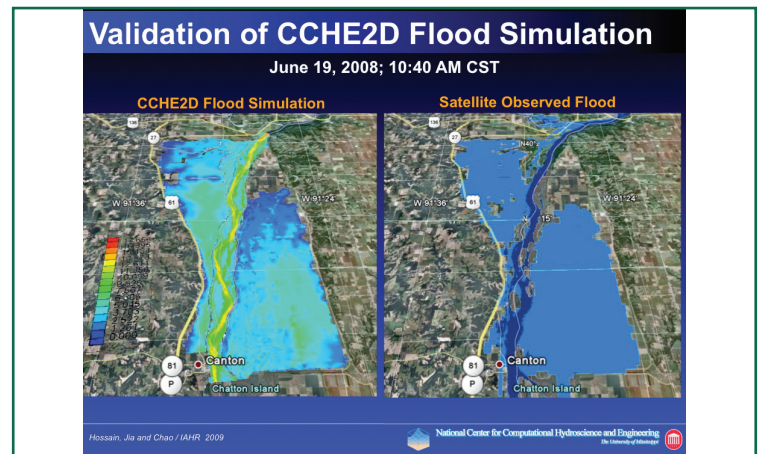
The objective of this research project is to develop a computational model and associated databases to simulate the processes of dam/levee breaching, flood propagation, sediment transport, and the movement of contaminants/pollutants in water. The model will also assess the impact of these threats on the environment and aquatic ecosystems. The model will integrate computational fluid dynamics models with databases of key information (hydrological, geographical, sources of pollutants, and water infrastructures) to simulate the effects of these water related threats.

### National Implications:

The products of this research are intended to help improve flood control management. The computational model and associated databases developed by this project were successfully applied to study the 2008 Midwest flood of the Mississippi River. The model's predictions for levee breaching, flood propagation, and pollutant transport were consistent with those observed from satellites during the 2008 Midwest flood. Thousands of miles of levees are spread throughout highly populated areas and are used to protect critical infrastructure in the US. Many of these levees have been found to have significant deficiencies and are subject to failure which may induce catastrophic flooding. The products of this project can be used to study the impacts of floods, to update flood zones, and to design response and recovery plans and mitigation strategies to reduce the impacts and minimize the consequences of water related threats. The technology developed by this project can play an extremely important role in infrastructure protection and human safety from floods due to levee breach.



Map showing areas in the Midwest affected by flooding in 2008.



Simulation tool provides a model consistent with actual flooding shown in satellite photos.

[www.serri.org](http://www.serri.org)

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SERRI is managed by the Department of Energy's Oak Ridge National Laboratory for the U.S. Department of Homeland Security