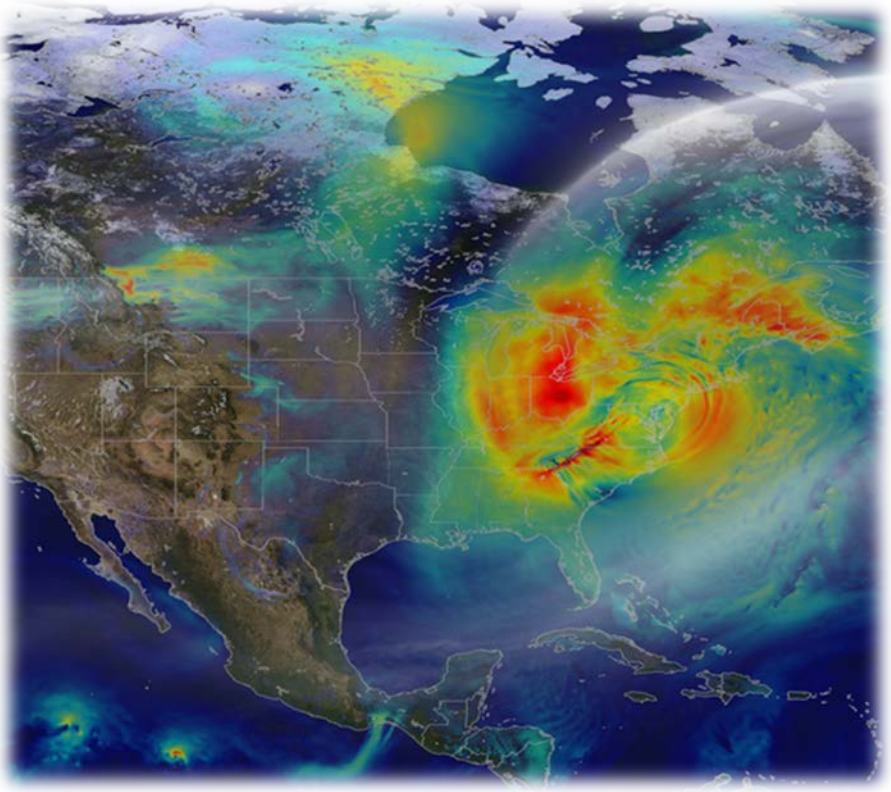
Hydroinformatics Research



Credit: NASA's Goddard Space Flight Center and NASA Center for Climate Simulation

Our research is focused on advancing water resource management through the application of computational and information sciences. Looking primarily at regional-scale water resources systems, we use tools such as computer simulation models and Geographic Information Systems (GIS) to better understand how these water resource systems function. We then apply this knowledge to aid decision makers in managing water resources under current and projected conditions.

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"Leveraging novel computing approaches to improve water resources management."

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Hydroinformatics

As the quantity of data available for digitally describing water systems grows, so does the need to formally organize the data so that it can be made assessable for scientific studies and decision-making. Many approaches and tools have been developed in the broader information science community. We are interested in applying these approaches and tailoring them to best accommodate water systems. This effort includes merging approaches for geospatial data developed in the geographic information sciences and for observed and modeled hydrologic data. The ultimate goal is to advance our ability to digitally describe real-world water systems with the motivation that this will lead to improved predicative capabilities.

Integrated Environmental Modeling

Water scientists and engineers have developed many models for predicting the behavior of water systems. We are interested in developing methods for integrating these various models into modeling systems that are transparent and easily extended to accommodate new models and methods. The computer science and software engineering communities have developed many approaches for creating such modeling systems. Our goal is to identify which of these approaches is most appropriate for the specific problem of water resource systems integration, and to show how they can be applied to create more robust water modeling systems. The hypothesis we are testing is that the organization of computer code using approaches that have been applied in software engineering (object-oriented design, component-based architectures, service-oriented architectures, etc.) will allow for improved predictions of water system behavior.

Watershed Management Decision Support Systems

Ultimately we are interested in applying research in informatics and systems integration to the specific problems in watershed management. The watershed is a common unit for implementing water resources management and policy actions, and there are many efforts underway to create decision support systems to support watershed management. We hope to, through our research, develop techniques and approaches that can advance these watershed decision support systems to (1) be more transparent to stakeholders, (2) easier to apply by modelers, and (3) provide more accurate predictions and more complete quantification of uncertainties.

RECENT RESEARCH DEVELOPMENTS

- Elag, M. and Goodall, J. .L. (2013), An ontology for component-based models of water resource systems. *Water Resources Research*, doi:10.1002/wrcr.20401, 49(8), 5077-5091, 2013.
- Goodall, J. L., K. D. Saint, M. B. Ercan, L. J. Baily, S. Murphy, C. DeLuca, R. B. Rood (2013), Coupling climate and hydrological models: Interoperability through Web services. doi:10.1016/j.envsoft.2013.03.019, *Environmental Modelling & Software*, 46, 250-259, 2013.

RECENT GRANTS

- National Science Foundation - SI2-SSI: An Interactive Software Infrastructure for Sustaining Collaborative Community Innovation in the Hydrologic Sciences
- National Science Foundation - Using the Cloud to Model and Manage Large Watershed Systems

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