WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: FL4361

Title: Development of a Multi-Scale, Multi-Process Hydrologic Model

Focus Categories: Hydrology, Surface Water

Keywords: Hydrologic Models, Ground Water Hydrology, Watershed Management

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Abstract

The natural hydrology of south Florida has been extensively altered though channelization to provide adequate water for urban growth and agriculture, and to provide flood protection to the area (tarboton et at., 1999). Currently, water resource management in south Florida is governed by a number of federal, state, and county agencies. These agencies have developed or adopted hydrologic models to address a diverse set of needs. These range from large-scale models used to estimate impacts of alternative water management practices across all of south Florida, to field-scale models used to predict local impacts such as flooding or agricultural production. At present, there is no mechanism in place for dynamically conveying feedback of information across the wide range of scales addressed by this spectrum of models. Instead, static methods are used, where results from larger-scale models are used as boundary conditions for smaller-scale models. This ignores both the problem of upscaling parameters (such as hydraulic conductivity) that may be highly variable over small scales, as well as the problem of aggregating a variety of coupled hydrologic processes occurring over a wide range of temporal and spatial scales into a coherent and accurate model of a hydrologic system.

This research will result in a greater understanding of the interrelation of hydrologic processes across a range of spatial and temporal scales. A variety of deterministic and stochastic methods for upscaling hydrologic parameters will be investigated and tested. A hydrologic model incorporating a variety of coupled processes and interactions will be developed using domain decomposition and multigrid techniques. The end result of this investigation will be a sophisticated hydrologic model that will be able to predict the effects of changes in water management structures, water management policies, extreme weather events, or gradual changes in weather patterns on urban, agricultural, and natural systems.