A MULTI-SCALE FRAMEWORK FOR THE INTEGRATED HYDROLOGIC MODEL

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The Integrated Hydrologic Model (IHM) dynamically couples HSPF with MODFLOW to simulate the surface water and groundwater systems, respectively, and feedback between these systems. A multi-scale framework is applied to the Integrated Northern Tampa Bay (INTB) model which is a well-calibrated application of the IHM. Decision-makers can employ the multi-scale framework to obtain simulation results at an appropriate spatial scale for effective water resources management. The transition efficiency between model spatial scales is improved by developing C# Windows Forms Applications and Python tools to automate the process of model input preparation for different subdomains and scales. The comprehensive set of applications and tools include: (1) Spatial Window Selection and Extraction facilitates selection and extraction of shapefile data for all scales within a subdomain of the primary (e.g., INTB) domain through GIS operations and database queries; (2) Database Table Population Application populates tables within the model input database; (3) Boundary Condition defines and applies boundary condition inputs for HSPF and MODFLOW; (4) Climate and Irrigation defines and populates time series data for spatial flux inputs including rainfall, potential evapotranspiration, and irrigation; and (5) Point Inputs and Calibration Targets assigns calibration target time series (e.g., observation wells and streamflow gauges) and point location inputs (e.g., production wells and diversions) to the appropriate simulation unit for each spatial scale. As a demonstration, the applications and tools are employed to extract the Anclote Watershed subdomain within the primary model (INTB) domain as a separate model, referred to as the ANCLOTE model. Simulation results for flows, heads, and evapotranspiration in the Anclote Watershed are compared and evaluated between the INTB model and the ANCLOTE model. The multiscale framework can provide locally-focused water resources assessments, with regional hydrologic support, for land use change, climate change, sea-level rise, wellhead protection, and more.

PRESENTER BIO: Yu Zhang is a Ph.D. Candidate in Water Resources Engineering at University of Central Florida, and her research interests include quantifying anthropogenic impacts on hydrology and understanding the roles of surface water and groundwater interactions in hydrology using the Integrated Hydrologic Model.