THE WEATHER RESEARCH AND FORECASTING MODEL (WRF) DEVELOPMENT FOR THE UNITED STATES AND FLORIDA

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High-resolution estimates of climatic and hydrologic variables are of value to water-resource managers. The Weather Research and Forecasting Model (WRF) is a dynamical model used for operational weather forecasts and regional climate simulations. It requires initial and boundary conditions which are supplied by global- or regional-scale climate models. Output is typically at an hourly timestep with a spatial resolution from kilometers to tens of kilometers. Computational timesteps are much shorter. WRF incorporates a land-atmosphere model that simulates the hydrologic cycle, including runoff, infiltration, evapotranspiration, and groundwater recharge. The U.S. Geological Survey (USGS) Water Resources Mission Area is using WRF to run a reanalysis for water years 1980–2021 at a 4-kilometer (km) spatial resolution for a rectangular domain that includes the conterminous U.S. (CONUS). The model is referred to as CONUS404 (40 year, 4-km). Model output is at a 1-hour timestep with precipitation at a 15-minute timestep. The reanalysis is currently underway and is expected to be completed in early 2022. This will be followed by a projected climate simulation, possibly using the pseudo-global-warming method. Boundary conditions for the reanalysis are from the European Centre for Medium-Range Weather Forecasts (ECMWF) Reanalysis v5 (ERA5, 30-km resolution). The CONUS404 model uses the Noah-Multiparameterization Land-Surface Model (Noah-MP LSM) to simulate surface hydrology. In collaboration with the University of Alabama in Huntsville, the USGS Caribbean-Florida Water Science Center is also using WRF to simulate the weather of Florida at a 2-km spatial and hourly temporal resolution. Reanalysis runs for Florida started in 2016 and are updated daily. Boundary conditions are taken from the NOAA Rapid Refresh Model (RAP). Output from the CONUS404 and Florida models could provide an alternative to the common practice of interpolation of weather station observations to compute high-resolution grids of meteorological and hydrologic data for Florida.

PRESENTER BIO: Dr. John Stamm is a Supervisory Hydrologist with the U.S. Geological Survey Caribbean-Florida Water Science Center. His expertise includes statistical and dynamical downscaling of climate, stream hydrology, geomorphology, hydrogeology and geostatistics.