WRF-Hydro MODELING SYSTEM

Version 5 Announcement

The NCAR WRF-Hydro Development Team is pleased to announce the official release of the Community WRF-Hydro Modeling System Version 5. Through collaborations with operational federal entities, University partners, the Department of Defense, and International aid organizations, new improvements and capabilities are continuously driving advances in the WRF-Hydro modeling system. In this new version, the Community WRF-Hydro code base has been merged with the NOAA National Water Model (NWM) code base to create a single, unified code base. On the 'back end' this means that there is now one unified code base supported by both the NCAR WRF-Hydro Team and the NOAA Office of Water Prediction. On the 'front end', the Community now has access to many of the features developed for the NWM, the first operational, high-resolution, hydrologic prediction model to be implemented across the continental United States. Some of these features include: additional methods for spatial transformation, enhancing the Noah-MP land surface model physics, and improving usability of model output files as described below.

Spatial transformation additions

In addition to improvements in rectilinear grid-to-grid mapping, the ability to map between different spatial frameworks and utilize standard hydrographic datasets was added providing the capability to aggregate and route streamflow from WRF-Hydro model grids onto NHDPLUS catchment polygon and river vector networks for the National Water Model (NWM).

Land surface model enhancements

Several enhancements were added to the Noah-MP land surface model that improve WRF-Hydro model performance and allow users to customize simulations. To improve representation of spatial heterogeneity, the capability to specify fully-distributed parameter specifications of important hydrologic and vegetation parameters has been added to the modeling system. The same parameter specification capabilities have also been added to allow the soil properties in the system to vary spatially and with depth as opposed to as just functions of soil textural class. These capabilities facilitate optimization of these parameters and also allows users who have local knowledge of these parameters to more easily incorporate them into the system. The Noah-MP model physics have been upgraded by adding a new surface resistance formulation that improves snowpack simulation by calculating resistance to sublimation or evaporation differently for snow and no-snow surfaces. Model stability has been enhanced for fast-draining sandy soils by modifying the solver time step increment when high-intensity rainfall occurs.

Improved model output routines and files

The usability of model output routines and files has greatly improved. Model output routines are now fully NetCDF CF compliant with metadata that provide a description of what the data in each variable represents, and the spatial and temporal properties of the data. Built-in coordinate metadata information in model output files now allows users to read outputs natively in GIS environments. Also, users can now apply internal scale/offset and compression to reduce model output file sizes.

For detailed information on the changes to the model source code see the v5.0 Release Notes.

In addition to the release of the WRF-Hydro Version 5 model code, we provide an updated Technical Description and user guides for running the model in stand-alone mode, as well as coupled to the Weather Research and Forecasting (WRF) system. We also provide an example test case for users to test their model builds and familiarize themselves with different configurations of the model. The test case and documentation are available from our website: https://ral.ucar.edu/projects/wrf_hydro. Here, we also provide guidance on how to report bugs users may find with the model code, as well as guidance on how one may contribute code to the model.

Along with the updated model code and example test case that we provide, we have updated and documented the following preprocessing utilities to assist users in preparing model input and data:

- WRF-Hydro GIS Preprocessing Toolkit V5 - to assist users in creating hydrologic routing inputs
- Five ESMF regridding script packages - to assist users with regridding meteorological forcing data
- Three preprocessing utility scripts- for users to generate initial model conditions and model soil properties

And lastly, for users wanting to interactively learn about the WRF-Hydro Modeling System we now have a full Version 5 training suite available which includes pdfs of lecture slides, online lessons which walk users through model compilation and various model simulations with different configurations for an example test case, an additional containerized WRF Preprocessing System (WPS) tool to create input for domains within the Continental United States, and a video demo walkthrough of creating hydrologic routing input with the WRF-Hydro GIS-Preprocessing Tool. These training materials can be accessed from https://ral.ucar.edu/projects/wrf_hydro/training-materials.

For more information or inquiries regarding WRF-Hydro please contact us using the contact form on our website: https://ral.ucar.edu/projects/wrf_hydro/contact.

To receive notifications regarding the WRF-Hydro Modeling System please subscribe to our email list https://ral.ucar.edu/projects/wrf_hydro/subscribe.

For more information on the operational implementation of WRF-Hydro as the NOAA National Water Model, and access to operational input and output data files, please refer to the official NOAA National Water Model website http://water.noaa.gov/about/nwm.