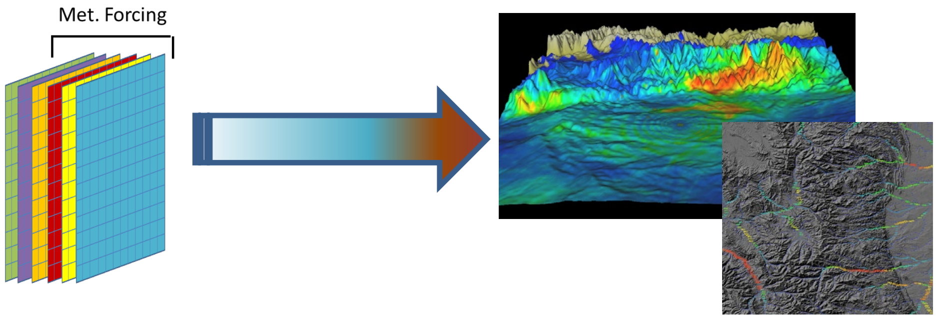
WRF-Hydro Implementation
&
Best Practices

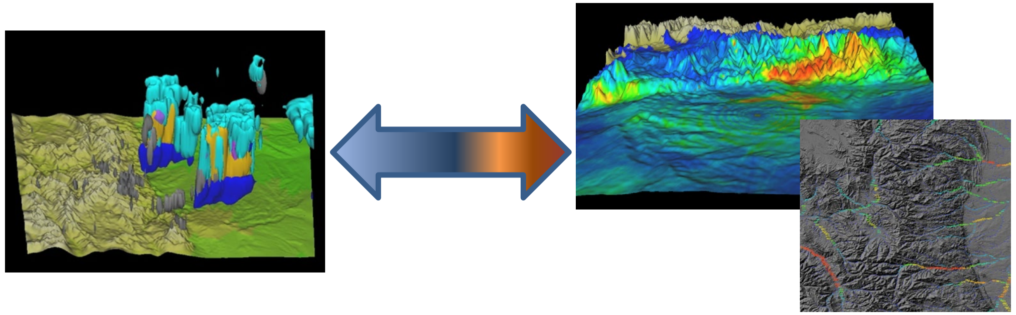
National Center for Atmospheric Research

WRF-Hydro Model Architecture

One-way (‘uncoupled’) →



Two-way (‘coupled’) ↔



- Uncoupled mode critical for spinup, data assimilation and model calibration
- Coupled mode critical for landatmosphere coupling research and long-term predictions
- Model forcing and feedback components mediated by WRFHydro:
  - • Forcings: T, Press, Precip., wind, radiation, humidity, BGC-scalars
  - • Feedbacks: Sensible, latent, momentum, radiation, BGC-scalars

Suggested WRF-Hydro Implementation Steps

Tips from our helpdesk regarding setup and preprocessing

1. See our Frequently Asked Questions (FAQs) webpage
   https://ral.ucar.edu/projects/wrf_hydro/faqs
   - See the requirements and example installation
2. Check that you have the correct NetCDF libraries installed
   - NetCDF C Version 4.4.1.1, NetCDF F Version 4.4.4
   - If coupling with WRF check that the netcdf4 flag is **enabled**
3. For working with the WRF-Hydro ArcGIS Preprocessing Tool
   - Have a valid version of ArcGIS
   - Have Spatial Analyst Extension **enabled**
   - Do not write your files to a geodatabase or network location.
   - Specify that your output file goes to a directory on disk which exists
   - Check your installation: It helps to have 64-bit Background Geoprocessing module installed, and Background Geoprocessing enabled.
   - Check that your directory names and/or file names do not have spaces or special characters in them.
   - Make sure that your DEM encompasses the entire extent of the Geogrid domain
4. When preparing your forcing data make sure that there are **no missing data**

Suggested WRF-Hydro Implementation Steps

This procedure will help isolate problems which may otherwise be difficult and/or timeconsuming to diagnose in many implementations: 1. Derive and QC all inputs…(time mean fields, accumulation fields, screen for anomalies…)

2. Conduct offline simulations…

3. Start with 'idealized' forcing (FORC_TYP = 4)

4. Run WRF_Hydro with no routing

5. Then sequentially add routing components:

    1. Sfc/subsfc
    2. GW/baseflow
    3. Channel flow
    4. Reservoirs

6. If all above works, then non-forcing input grids and components are functional (though not guaranteed accurate!)

7. Do offline runs with FORC_TYP set to data input format

8. After all that and calibration, then run coupled WRF-Hydro

Computational Considerations

- Domain Size - Smaller domains require fewer resources
- Routing Options - Do initial testing with routing off and add options incrementally to isolate problems should they arise
- Output Options - Reduce to only those you need
- Output Timestep - Reduce the frequency to save disk space and improve runtime
- Restart Files - Costly - produce only a couple times during a simulation as needed

WRF-Hydro®
MODELING SYSTEM

WRF-Hydro: http://www.ral.ucar.edu/projects/wrf_hydro/