NCAR

Weather and Risk - WRF-Hydro

Description
Flood forecasts depend on knowledge of the state of atmospheric features that trigger heavy rain as well as the state of surface and subsurface water, including the heights of rivers and reservoirs and the amount of soil saturation. Although both meteorological and hydrological models have improved in detail and accuracy over recent years, they can be difficult to operate in a simultaneous and integrated (i.e., coupled) fashion.

The hydrological extension of the Weather Research and Forecasting model (WRF-Hydro) is a new community-based framework designed to link models of the atmosphere and terrestrial hydrology. The goal is to improve the skill of hydrometeorological forecasts, including flood stages and other critical information for society. The system provides the capability to perform coupled and uncoupled simulations of water cycle processes and their impacts on a wide range of spatial and temporal scales.

Stage of Research
Version 2.0 of the WRF-Hydro system released in April 2014. It includes an expanded suite of hydrological model components and improved data preparation and model output visualization tools, with the intent of integrating more components as the system evolves. WRF-Hydro development is guided in a community-based manner, with open and participatory working groups. NCAR is now collaborating with other federal, university entities and with the National Science Foundation on a support structure for WRF-Hydro that includes model documentation; public, online code repositories and utilities; and a library of user cases.

Advantages
• Seamless end-to-end data assimilation and hydrologic prediction
• Compatible with high-performance computing
• Data formats based on accepted international standards
• Modular, extensible software for hydrologic physics

Funding Sources
Primary: NSF, NASA, NOAA, DOE, international sponsors

Research Partners
• Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI)
• NOAA Office of Hydrology
• NASA Goddard Space Flight Center U.S. and foreign universities
• Bierknes Center, Bergen Norway
• Karlsruhe Institute of Technology, Garmisch-Partenkirchen Germany
• NOAA Earth Systems Research Laboratory

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Simulated floodwaves over Boulder County from the historic September 2013 Colorado flood event overlain on GoogleEarth imagery. Color markers indicate streamflow values ranging from 0 to over 200 m^3/sec with red values being higher.

Colorado flood of 2013. The underlying goal of WRF-Hydro development is to improve prediction skill of hydrometeorological forecasts using science-based numerical prediction tools.

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