Weather Forecast Accuracy Gets Boost with New Computer Model

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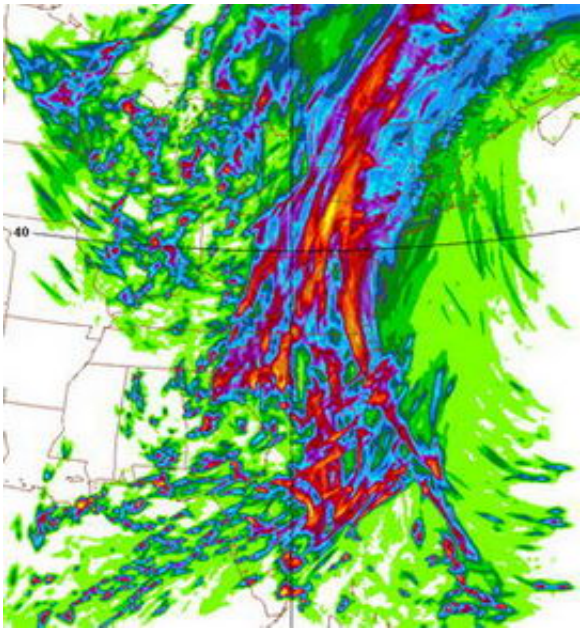

Prolonged and intense rainfall produced extensive flooding from Maryland to New York in late June. This image shows the 48-hour forecast of rainfall issued by the operational WRF model for the period June 26 to 28. The corridors of heaviest rain are shown in red, orange, and yellow. WRF successfully depicted many of the small-scale features in this heavy-rain event. Image courtesy NOAA

An advanced forecasting model that predicts several types of extreme weather with substantially improved accuracy has been adopted for day-to-day operational use by civilian and military weather forecasters.

The new computer model was created through a partnership that includes the National Oceanic and Atmospheric Administration (NOAA), the National Center for Atmospheric Research (NCAR), and more than 150 other organizations and universities in the United States and abroad.

The high-resolution Weather Research and Forecasting model (WRF) is the first model to serve as both the backbone of the nation's public weather forecasts and a tool for cutting-edge weather research. Because the model fulfills both functions, it is easier for research findings to be translated into improved operational models, leading to better forecasts.

The model was adopted for use by NOAA's National Weather Service (NWS) as the primary model for its one-to-three-day U.S. forecasts and as a key part of the NWS's ensemble modeling system for short-range forecasts. The U.S. Air Force Weather Agency (AFWA) also has used WRF for several areas of operations around the world.

"The Weather Research and Forecasting model development project is the first time researchers and operational scientists have come together to collaborate on a weather modeling project of this magnitude," says Louis Uccellini, director of NOAA's National Centers for Environmental Prediction.

By late 2007, the new model will shape forecasts that serve more than a third of the world's population. It is being adopted by the national weather agencies of Taiwan, South Korea, China, and India.

"WRF is becoming the world's most popular model for weather prediction because it serves forecasters as well as researchers," says NCAR director Tim Killeen.

Multiple benefits

Tests over the last year at NOAA and AFWA have shown that the new model offers multiple benefits over its predecessor models. For example:

--Errors in nighttime temperature and humidity across the eastern United States are cut by more than 50%.

--The model depicts flight-level winds in the subtropics that are stronger and more realistic, thus leading to improved turbulence guidance for aircraft.

--The model outperformed its predecessor in more than 70% of the situations studied by AFWA.

--WRF incorporates data from satellites, radars, and a wide range of other tools with greater ease than earlier models.

Advanced research

NCAR has been experimenting with an advanced research version of WRF, with very fine resolution and innovative techniques, to demonstrate where potential may exist for improving the accuracy of hurricane track, intensity, and rainfall forecasts. A special hurricane-oriented version of WRF, the HWRF, is now being developed by scientists from NOAA, the Naval Research Laboratory, the University of Rhode Island, and Florida State University to support NOAA hurricane forecasting. The high-resolution HWRF will track waves and other features of the ocean and atmosphere, including the heat and moisture exchanged between them. Its depiction of hurricane cores and the ocean below them will be enhanced by data from satellites, aircraft, and other observing tools.

WRF also is skilled at depicting intense squall lines, supercell

thunderstorms, and other types of severe weather. Although no model can pinpoint hours ahead of time where a thunderstorm will form, WRF outpaces many models in its ability to predict what types of storms could form and how they might evolve.

Approximately 4,000 people in 77 countries are registered users of WRF. Many of these users suggest improvements, which are tested for operational usefulness at a testbed facility based at NCAR and supported by NOAA.

"WRF will continue to improve because of all the research and development pouring into it from our nation's leading academic and scientific institutions," said AFWA commander Patrick Condray.

Source: National Center for Atmospheric Research (NCAR)