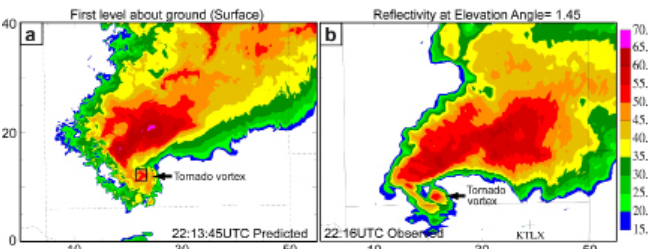




NOAA's Warn-on-Forecast research project aims to create computer forecasts that accurately predict when and where severe weather will occur in the next hour. If Warn-on-Forecast is successful, forecasters will be able to make history by issuing tornado, severe thunderstorm, and flash flood **warnings** based on that computer **forecast**. Our goal within the next five years is to accurately predict the formation of a tornado in an existing storm, although the ultimate vision is to be able to forecast the development of severe thunderstorms and associated tornadoes even before the storms form.

Warn on detection (The Present)

Today, NOAA National Weather Service (NWS) forecasters rely heavily on tools such as radar to detect severe weather so they can issue warnings. Right now, U.S. residents have an average of 14 minutes lead time between when a tornado warning is issued and a tornado is confirmed on the ground. Detection-based warning lead-times for severe thunderstorms are currently 18 minutes, 64 minutes for flash floods, and depend upon a signature in the radar data indicating the presence of a severe storm.

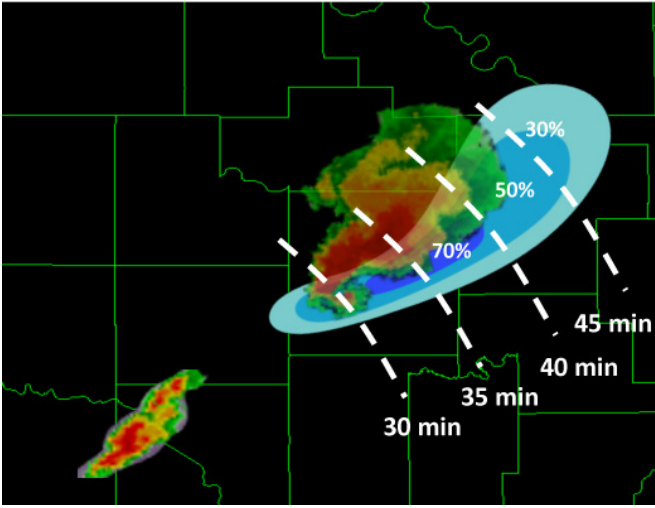


A Warn-on-Forecast model (left) predicts a tornado will form in 33 minutes. (Right) Actual radar observation showing the tornado did form. Image provided by Warn-on-Forecast partners at the Center for the Analysis and Prediction of Storms.

Warn-on-Forecast (The Future)

Warn-on-Forecast researchers want to create highly detailed computer weather forecast models that predict what the atmosphere will look like in the future. These models

are unique because they will use the latest weather observations and radar scans, including those from the fast scanning Multi-function Phased Array Radar, to continuously re-compute forecasts. Eventually the models will be able to predict what the weather will do every few minutes up to an hour in advance, down to a scale of about the size of a neighborhood. Forecasters will be confident enough in the forecast of hazardous weather to issue a warning.



A Warn-on-Forecast conceptual model that will predict the path of a potentially tornadic supercell over the next hour. The confidence level that the tornado will follow the centerline track is highlighted in shades of blue. White dashed lines indicate forecast times.

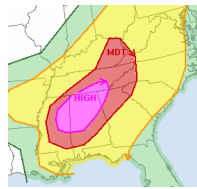
What are the chances?

There will always be a need for NWS warnings that call for immediate action. NWS forecasters believe the public would also benefit from knowing the confidence associated with a predicted severe weather event. Warn-on-Forecast computer models will produce information on the confidence level of the forecasts every 33 minutes. Additional information on whether or not the threat level is increasing would aid decision-makers requiring longer lead-times to move people to safety. If the confidence level is low regarding what the storm will do, hospitals may initially choose not to move high-risk patients which would likely result in injury, but stadium staff may decide to move fans to safety.

Warn on Forecast

Engaging social scientists

Severe weather hazards and priorities vary across the U.S. Social scientists are working with Warn-on-Forecast researchers to learn what weather information decision-makers use and need, and how to best present weather information to the public so they take appropriate action.



NOAA's April 27, 2011 severe weather outlook shows the high risk in the south.

A successful first step

As a first step, researchers have developed a system that integrates observations from multiple radars into a single analysis. Forecasters testing the system in the NOAA A Hazardous Weather Testbed found the products provided a clear picture of the severe weather situation and gave them more confidence in the warning process. NWS meteorologists will continue to test advancements in Warn-on-Forecast techniques and technologies until the system is ready for operational use.

Teaming up

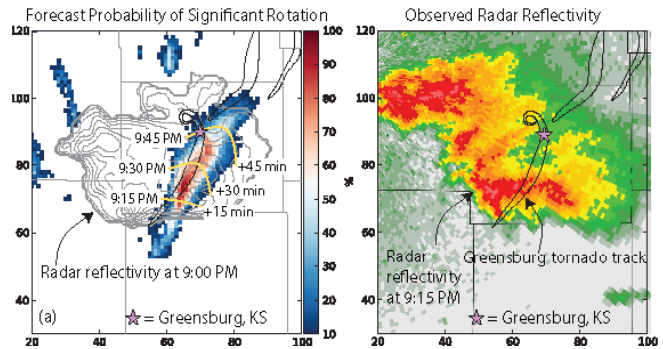
The second workshop for the Warn-on-Forecast project was held in February, 2012 on the University of Oklahoma campus in Norman, Okla. The event brought together more than 60 participants from across the U.S. Workshop results confirmed the project is moving forward with high-quality research that will lead to improvements in lead time for severe weather warnings.

Supporting a Weather Ready Nation

The Warn-on-Forecast research project targets NOAA's strategic goals to increase tornado, severe thunderstorm and flash flood warning lead times to help support a Weather Ready Nation. Warn-on-Forecast is led by the National Severe Storms Laboratory and represents a collaborative effort across several NOAA groups including the Earth System Research Laboratory, the Storm Prediction



NOAA Administrator Dr. Jane Lubchenco surveys the damage in Alabama along with NWS staff.



(Left) A model's 45 minute forecast of the track of strong rotation associated with the Greensburg Kan. 2007 strong EF5 tornado.

(Right) The observed track of the Greensburg tornado.

Center, and the Norman NWS Forecast Office. Academic collaborators are the Center for Analysis and Prediction of Storms, and the Cooperative Institute for Mesoscale Meteorological Studies at the University of Oklahoma.

Potential benefits

Warn-on-forecast has the potential to benefit many weather information user groups that require longer warning lead times to minimize life-threatening weather impacts on their communities.

- Cities and towns may need more than 30 minutes to evacuate residents from low-lying areas threatened by flash flooding.
- Large venue operators such as sports stadiums require at least 30 minutes to move thousands of people from exposed locations to safety.
- Renewable energy operators will benefit from improved 10-30 minute wind and weather forecasts as they balance the power load on the electrical grid.
- Aviation and surface transportation will benefit from improved information on weather threats when forced to reroute traffic to avoid the hazards and minimize the economic cost of adverse weather.
- State and local governments will have up to an hour to correctly position emergency response resources.

Impacts from severe storms in the U.S. cost hundreds of millions of dollars, and result in 150 to 250 lives lost per year. Flash floods caused by severe storms kill more than 130 people per year, and before April 2011, tornadoes killed more than 50 people per year on average.

Visit: www.nssl.noaa.gov/projects/wof