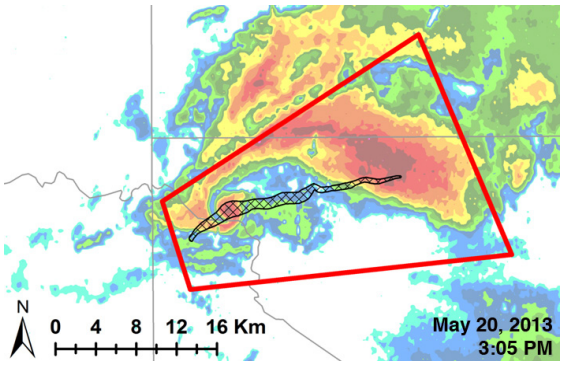
NOAA National Severe Storms Laboratory

FACETs Forecasting a Continuum of Environmental Threats

Forecasting a Continuum of Environmental Threats (FACETs) is a proposed next-generation, severe weather forecasting concept that is modern, flexible, and designed to communicate user-specific, understandable weather threat information.

Imagine being able to tap into a continuous flow of highly-credible information on any communication device that answers standard end-user severe weather questions, "Will this impact me? What is the damage from the storm so far? How bad will it get? When will it arrive? When will it end? How confident is the forecaster? What should I do?" FACETs is designed to deliver these capabilities through real-time, hazard probability information supported by cutting-edge forecasting science and applied social and behavioral sciences.



Radar data showing the tornadic supercell that struck Moore, OK on May 20, 2013. The red polygon is the tornado warning issued by the NWS, and is updated every 10-30 minutes. The black hatched area is the actual path of the tornado.

Why FACETs?

The current NOAA National Weather Service (NWS) watch and warning process has not fundamentally changed in more than 50 years. Society, technology and science, however, have made great advances. The FACETs paradigm proposes to modernize the high-impact weather forecasting and communication processes by adapting it to evolving technology. To achieve this, FACETs addresses seven interrelated functions or "facets" of the high-impact watch and warning process.

Facet #1 The nature of hazardous weather forecasts

FACETs changes the underlying nature of hazardous weather forecasts from watches and warnings to grid-based probabilities of hazards. With current NWS messages, you are either in a watch or warning, or you are not, and they typically apply to a large area that might be unaffected by the specific weather event. FACETs relies on rapidly-updated, site-specific weather hazard information that conveys grid-based probabilities of a severe weather event occurring. Armed with such information, decision-makers requiring more advanced notice, such as hospitals, schools and large venues, could set their own threat thresholds based on their specific needs. Probabilistic hazard information would also support the development of new messages that address high impact but non-severe weather events such as lightning and small hail.

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Facet #2 Observations and guidance

FACETs will adjust to advances in satellite, radar and surface observation technology that already aid the forecasters' decisions. It will also serve as a "delivery mechanism" for NOAA's new Warn-on-Forecast predictions of storm-specific hazards such as tornadoes, large hail, and extreme local rainfall. Forecasters will receive real-time statistical projections of a storm's longevity, intensity and hazards from NSSL's climatological database of storm-scale behavior. FACETs intends for grid-based hazard information to be available on a seamless continuum from the NOAA Storm Prediction Center broad national and regional forecasts such as outlooks and watches, to the local NWS warnings

Facet #3: Forecaster decisions

Forecasters are essential to the warning process. FACETs will study how forecasters make decisions and look for ways to help them be even more effective in predicting and communicating the weather threat in this new paradigm.

Facet #4: Forecast generation tools

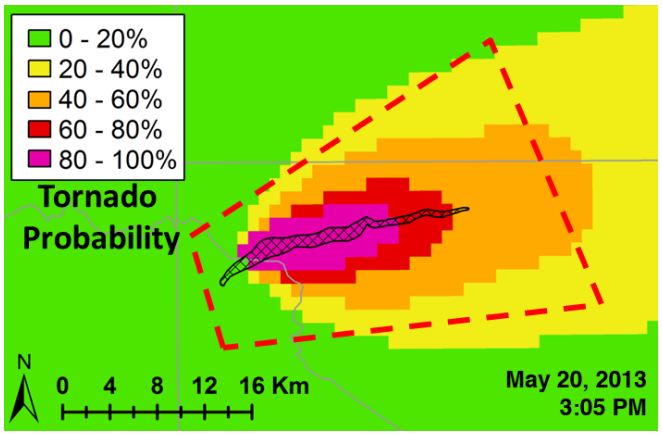
A "Hazard Services" tool is being developed by NOAA's Earth Systems Research Laboratory, in collaboration with NSSL researchers, with the FACETs threat grid concepts in mind. This tool could help simplify the forecasters' many tasks during severe weather operations to help them focus on the potential weather threat and its impact.

Facet #5: Useable output

Under FACETs, the NWS will still issue standard watches and warnings, but for smaller, focused areas and in ways that follow the movement of specific weather threats. Text-based messages of the current system will be augmented by more impact-specific information including urgency, confidence, and variability. The grid-based threat information would be transferable to a wide variety of formats and media to streamline and enhance decision support services. Neighborhood-level, minute-by-minute trends of hazardous weather probabilities and impacts, would be accessible via mobile phone apps, TV, and NOAA Weather Radio. The private sector of the Weather Enterprise could use the specific forecast information to develop new products and services for their customers.

Facet #6: Effective response

FACETs will use social and behavioral sciences to study a person's behavior towards threat information. Researchers will look at a person's understanding of storms, preparedness, situational awareness, understanding, response, and recovery. Based on this information, communication about the threat can be revised so people will choose to implement their safety plan. FACETs will also explore the steps the forecasters take to adapt the contents of the threat information to meet the needs of their community.



FACETs proposes rapidly updating, site-specific weather hazard information that conveys grid-based probabilities of a severe weather event occuring. In this example, a tornado threat value is assigned every half mile and updated as often as every minute.

Facet #7: Verification

This facet focuses on quantitative and qualitative measures that validate the scientific integrity and effectiveness of the hazardous weather forecasting program, and the appropriateness of response to the communicated information. By placing hazardous weather information on the same geospatial grid as the reported severe weather events, the analysis of severe weather forecasting can be improved. Metrics such as false alarm duration, false alarm area, and site-specific lead-time and end-time could provide greater insight into the effectiveness of threat forecasts and the threat forecasting process.

Facet binding: Fully-integrated social/behavioral science

Because hazardous weather forecasting is a physical science done by humans for humans, FACETs research and development includes the application of social and behavioral science disciplines within (and at the interface of) each of the seven facets. The ultimate goal is to ensure the tools and practices used throughout the forecast process will result in understandable and actionable information for the decision maker.