es allows for higher-end severe weather episodes reminiscent of those witnessed in the Great Plains given a favorable mesoscale and synoptic-scale environment for convective initiation. Identification of flow regimes favorable for advection of EML air into the Northeast are therefore of interest and utility to the region's operational forecasters.

Ekster's presentation focused on an ongoing research project that will help identify these rare Northeast EMLs and their contribution to higher-end severe weather episodes. In greater detail, he discussed the origin, advection, and maintenance of the EML. He also showed how EML characteristics allow "normal" severe weather soundings in the Northeast to become more representative of what might be observed in the Great Plains. Normally, soundings in severe weather environments in the Northeast are characterized by much weaker midlevel lapse rates (on the order of 5° to 6°C km^{-1}).

He concluded by presenting a number of case studies to illustrate specific Northeast warm-season EML occurrences and their suspected contribution to higher-end severe weather episodes.

—Mark L. Kramer
NYC/LI chapter

ESSAY

BROADCAST METEOROLOGY
Real Science or Data Shoveling?

by Lee Grenci

Editor's Note: *The magazine* Popular Science *recently published a list of the worst jobs in science. With positions such as worm parasitologist, sewage ecologist, and tick dragger appearing in the top 10, there was a certain amount of cheekiness to the list. But the deeper issue is that the jobs on the list are supposedly perceived negatively by other scientists, even if many of those who hold one of the "worst" jobs actually enjoy their work. We were taken aback to find television meteorologist at number 17 on the list. The magazine explained that the pressures of television ratings have taken the scientific substance out of the job. Was this indictment fair? We asked Lee Grenci, a senior lecturer and public-television meteorologist for 16 years at The Pennsylvania State University, for his take on the evolving role of the TV meteorologist.*

AFFILIATION: Grenci—Department of Meteorology, The Pennsylvania State University, University Park, Pennsylvania
CORRESPONDING AUTHOR: Lee Grenci, Department of Meteorology, The Pennsylvania State University, 503 Walker Building, University Park, PA 16802-5013
E-mail: grenci@ems.psu.edu
DOI:10.1175/BAMS-86-11-xxx

While channel-surfing last April 3, I serendipitously landed on a 24-hour news channel just in time to hear a weathercaster glibly pronounce, "Now that we set our clocks ahead one hour, we'll have more sunlight." In my younger years, I probably would have cringed over such loose language on television, but in the modern-day world of broadcast meteorology, when science seems to be taking a back seat to ratings, showmanship, and self-promotion, nothing surprises me any more.

If the truth be told, the popular and frequently unscientific language used by television weather presenters no longer irks me. Prepackaged mantras such as "clouds act like a blanket at night" and "warm air holds more water vapor than cold air" seem to be so ingrained into the popular culture of broadcast meteorology that I no longer challenge them. Although they lack scientific underpinning, these "catchy" phrases evidently qualify as "good" communication and thus continue to flourish. With regard to the loose language used on weathercasts, I stopped shouting at the moon a long time ago.

I have bigger fish to fry. As far as I'm concerned, the real cancer growing in the profession of broadcast meteorology is the scientifically flawed yet accepted

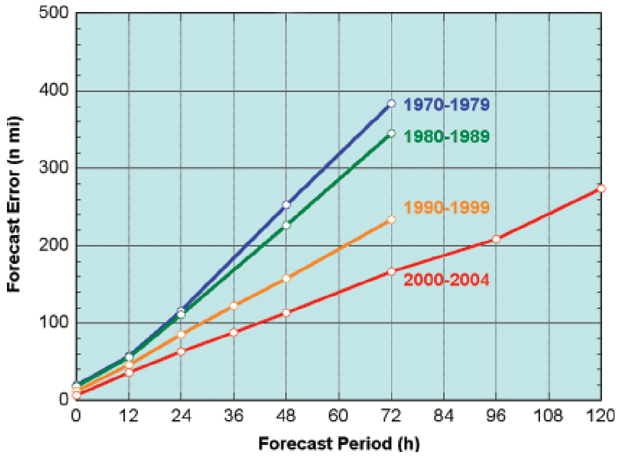

FIG. 1. The official track errors, by decade, for hurricanes and tropical storms that form over the North Atlantic Basin. Courtesy of the National Hurricane Center.

practice of using model data to generate a deterministic[1], medium-range[2] forecast for which there is little or no demonstrated skill.

On Thursday, 12 August 2004, nearly 24 h before Hurricane Charley even made landfall in western Florida, deterministic weekend forecasts for very heavy rain and flooding over the northern Middle Atlantic States had already begun to flood the airways. On the nationally televised evening news, at least one television meteorologist issued specific predictions for 6 to 10 inches of rain over the region, along with the unqualified promise of catastrophic flooding.

Although rightfully showing the standard "cone of uncertainty" for the predicted track of Hurricane Charley, the weathercasters I watched ignored the prevailing uncertainty and focused on deterministic weekend forecasts for heavy rains and flooding from the Appalachians eastward. Despite the uncertainty, they apparently treated quantitative precipitation forecast (QPF) guidance as if it were gospel.

The track record for predicting the path of hurricanes and tropical storms more than 48 h in advance, while steadily improving since the 1970s (Fig. 1), is far from perfect. Throw in the relatively low threat scores for pinpointing the areas that will receive heavy precipitation (Fig. 2), and it becomes pretty obvious why the deterministic forecasts for Hurricane Charley were grossly unwarranted and premature. For reference in Fig. 2, a threat score of 0.2 means that, in regard to regions predicted to receive 2 inches or more of precipitation, forecasters typically get approximately 33% of the area correct (a threat score of 1.0 qualifies as a perfect forecast). Clearly, forecasting skill decreases with increasing lead time for a heavy rain or snow event.

I admit that hanging my hat on a single event is not a compelling argument, but it demonstrates the degree to which the lack of a scientific approach in broadcast meteorology interferes with communicating the correct probabilistic tenor of such high-profile forecasts.

Alas, the general public expects and, to a large degree, demands deterministic—not probabilistic—forecasts. Such expectations are as exasperating as they are understandable. After all, almost every weathercaster in America routinely gives viewers 5-, 7-, or even 10-day forecasts in neatly packaged, easy-to-interpret daily icons (which typically resemble a "tombstone") that provide sky conditions, and two numbers that represent the predicted high and low temperatures for the day. Given that the industry sends the daily message that television weathercasters can routinely predict details about weather conditions a week or so in advance, is it any wonder that the public expects specific snowfall forecasts two, three, or more days before the arrival of the storm?

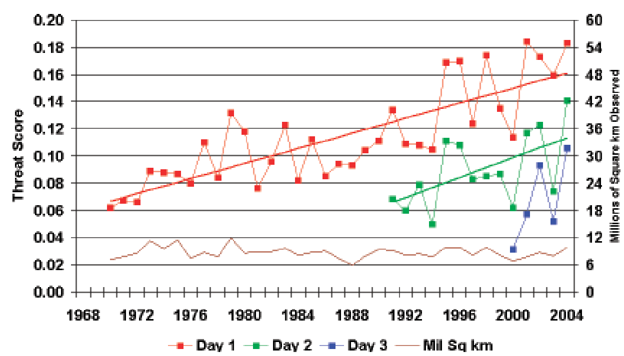

FIG. 2. The yearly threat scores for predicting 2 inches of precipitation on Day 1, Day 2, and Day 3. A threat score of 0.2 means that, in regard to regions predicted to receive 2 inches or more of precipitation, forecasters typically get approximately 33% of the area correct (a threat score of 1.0 qualifies as a perfect forecast). (For a complete threat score definition, go to www.hpc.ncep.noaa.gov/html/scorcomp.shtml.) Courtesy of the Hydrometeorological Prediction Center.

[1] In this context, a "deterministic forecast" is one in which the forecaster provides only a single solution. This procedure stands in contrast to the more realistic approach in which forecasters recognize that there is often great uncertainty in the forecast. In turn, they convey this uncertainty by providing probabilities of the various possible outcomes.

[2] In this context, "medium range" is a forecast of 3 to 10 days.

Sometimes I think that the amazingly well-forecasted Blizzard of 1993 was one of the worst things to ever happen to broadcast meteorology. For nearly a week, computer guidance was nearly unanimous that there would be a memorable storm in the East. I cannot help but think that news producers and directors started to salivate at the idea of increasing their ratings by beating competitor stations to the punch by correctly forecasting such big storms.

At Penn State, my fellow forecasters and I try to impress upon our students to wait as long as possible to go public with specific predictions of snowfall or rainfall amounts in high-profile situations like snowstorms and tropical cyclones. Although relatively low threat scores support such a pedagogical approach, the competitive nature of the industry does not. One of my former students, who tried to apply what he learned at Penn State, was told by his news director, in no uncertain terms, that he had to forecast specific snowfall totals far in advance of the expected big storm of 4–6 March 2001. The big storm never materialized in the metropolitan areas of the Northeast, and the credibility of television broadcasters like my former student took a huge hit.

I draw an important distinction between making broad but informative statements about a storm looming in the medium-range period and issuing detailed predictions for a specific times and locations. It is reasonable (and we have an obligation) to inform the public that heavy snow may affect portions of a large region (the Gulf Coast, the mid-Atlantic, the Great Lakes, the northern Rockies, etc.) in 5 or 6 days, but it is not reasonable to explicitly state exactly how much snow will fall at specific cities on Days 5 or 6.

In defense of news directors and producers, they repeatedly see the 7-day tombstone forecasts. So predicting heavy precipitation 3 or more days in advance probably doesn't seem like a big deal to them. After all, they are television people "doing meteorology," not meteorologists "doing television." If they were meteorologists, then they would know that medium-range, deterministic forecasts of details (such as precipitation type and total, high and low temperatures, wind speed and direction, etc.) have little, if any, skill, particularly beyond 5 or 6 days.

Yet, such a deterministic philosophy is the hallmark of modern television broadcasts. Why do we continue to default to a format that has virtually no skill?

I once attended a forecasting symposium at Penn State during which a representative from a large weather company suggested that the presentation of the forecast should be "easier" for viewers to understand. I believe the opposite. We now offer the general public mostly deterministic forecasts that, in effect, remove individual responsibility for making daily life decisions based on the uncertainty of the forecast. The viewing public wants a "yes" or "no" answer and often—especially when the weather becomes nasty—we just shouldn't give it to them. But we do anyway. Advertising and ratings, I believe, drive the system. There's no escaping these money-driven facts of life.

HOT BET

Russian solar physicists Galina Mashnich and Vladimir Bashkirtsev are so convinced that Earth will cool again that they're willing to bet $10,000 on it. Believing global temperatures are driven by changes in the sun's activity—which they predict will go into a less active phase—and not greenhouse gases, they've challenged British climate expert James Annan. To determine the winner, the scientists plan to compare average global surface temperatures from 1998 to 2003 and 2012 to 2017. If temperatures drop as Mashnich and Bashkirtsev predict, they'll pocket the money. "There isn't much money in climate science and I'm still looking for that gold watch at retirement," comments Annan. "A payoff would be nice to top-up my pension."

As a profession, we have failed to teach the viewing public how to interpret and use probabilistic data. Then again, perhaps this failure is not so disappointing when you consider how successful we have been in converting the nation to the metric system.

Let's face it: Although some science probably goes on behind the scenes at many stations, the on-air component of most weathercasts usually has very little to do with science. The format just doesn't lend itself to a scientific approach. Although some weather presenters may try to "squeeze" in some science, the primary product of a weathercast is communication. And the overwhelming voice of this communication is deterministic, not probabilistic.

The AMS shares complicity in the current state of affairs. For years, its Seal of Approval has served as a standard for quality broadcast meteorology. But it has granted the Seal of Approval to weathercasters who follow the prevailing deterministic philosophy for medium-range forecasting. Indeed, the AMS has passively accepted the 5-to-7-day tombstone forecasts submitted by candidates, rubber-stamping them with their seal. Some colleagues argue that such tombstone forecasts are harmless, but I maintain that they establish a deterministic mindset that then extends to predicting big storms. That's where we really can get into big trouble with the viewing public.

Perhaps the greatest offender of using model data in an unscientific way is the Internet, where detailed, deterministic forecasts can extend out beyond 10 days. Want to know what the wind direction and wind speed will be on Day 8 at a given hour? It's out there. At 2 P.M. EDT, 8 days from now, the wind at city Y will be blowing from 290° at 8 knots. In my opinion, such medium-range detail qualifies as disinformation.

But such data are out there without any disclaimer for the general public. Forecasters know that there is no skill in predicting the details for such long lead times, but the public does not. Thus, the public makes decisions based upon skill-less forecasts, sometimes incurring losses after they made plans based on expectations of a specific weather outcome. That's what bothers me so much about the current state of the industry.

If you buy a cup of coffee at a fast-food restaurant, the styrofoam cup comes with a clear warning: "Caution! The coffee is hot!" Although practically every consumable product in this country comes with some sort of disclaimer, warning, or label, information does not. And there is an explosion of information that's readily accessible on the Internet.

The easy access to medium-range models on the Internet allows television weathercasters to quickly create their 5-, 7-, or 10-day tombstone forecasts and get them onto the airways. As far as the viewing public knows, there is a solid scientific basis for the numbers and sky-condition icons they see on Day 7. In my opinion, the common practice of deterministically displaying medium-range forecasts on television does not fall under the umbrella of science. Unfortunately, it boils down to shoveling data to the viewing public without any disclaimer that computer guidance has increasingly limited skill as forecast time increases.

Real scientists are more careful about how they use their data.

CONFERENCE NOTEBOOK

Deriving Seasonal Variation in the Arctic Oscillation

The Arctic Oscillation (AO), characterized by a pronounced see-saw fluctuation in air pressure between the polar and middle latitudes that alters weather patterns primarily during the cold season, is the leading mode of extratropical climate variability in the Northern Hemisphere (NH). The AO bears great similarity to the North Atlantic Oscillation (NAO), which can be regarded as the regional expression of the AO. Dynamic origin and seasonal variation of the AO/NAO has been the subject of many studies. Using a dynamic model with synoptic eddy and low-frequency (SELF) interaction, we show that the AO/NAO is a dynamic-mode oscillation that can be generated through internal dynamics. Synoptic eddy and low-frequency flow feedback plays an important role in its origin and in its seasonal variation. This result may benefit the forecast of the AO/NAO variation.

Data show that both the climatological background flow and synoptic eddy activity (or storm track) are strongest in winter, decrease in strength in spring, and are weakest in summer. The AO/NAO is also known to have substantial seasonality, with the strength of the signal at its peak in winter, then decreasing in spring, and at a minimum in summer. We propose that the observed seasonality of AO/NAO may be attributed to the seasonal changes in the background climate state and the two-way interaction between synoptic eddy and low-frequency flow, which depends on climatological cycles of the background flow and the synoptic eddy activity. Our research shows that that the SELF interaction has a pattern-selective effect and a positive