12.2 CHALLENGES AND REWARDS OF PREPARING GRIDDED FORECASTS

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1. INTRODUCTION

At the beginning of 2002 the National Weather Service (NWS) began a demonstration in which forecast offices prepare a gridded forecast database as the primary way to present weather forecast information. The demonstration included 17 Weather Forecast Offices (WFO) in three clusters (Figure 1), and the Hydrologic Prediction Center (HPC). These gridded forecast databases will become a part of a National Digital Forecast Database (NDFD) which is designed to contain a seamless mosaic of NWS digital forecasts. The NDFD will be available to all customers and partners, and will allow them to create a wide range of text, graphic and image products. The NDFD will serve as a "one stop shopping" location which will contain a forecast database that is updated continually as events dictate. In this way both "push" and "pull" customers will have access to the most current forecast information, and it will be possible to prepare forecast information displays consistently across a variety of media.

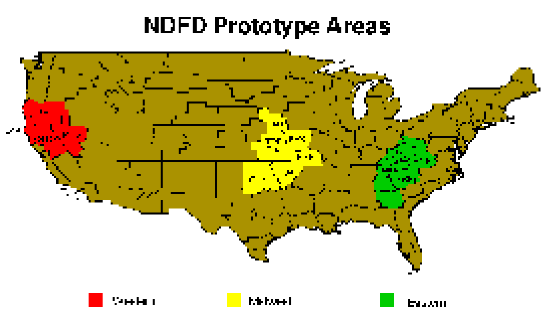

Figure 1

As the NWS begins the implementation of a gridded forecast database in the CONUS by October 1, 2003 WFOs will prepare a suite of core text forecast products from the database. It is also envisioned that an initial mosaic of gridded forecast fields will be available in at least an experimental mode. While the NDFD demonstration is ongoing, this paper will present the preliminary findings and experience of forecasters at WFO Kansas City/Pleasant Hill, MO.

2. FORECAST PROCESS CHALLENGES

The forecast staff at WFO Kansas City/Pleasant Hill (EAX) began using versions of the Interactive Forecast Preparation System (IFPS) operationally in October 1997. Prior to the beginning of the NDFD demonstration the forecasters became adept at using the Graphical Forecast Editing (GFE) component of the IFPS to prepare gridded forecast information.

One of the first challenges that forecasters faced was that of changing the forecast process paradigm to one in which the forecast grids are the primary product and they drive the other products. That is, updating of the forecast grids is the action that drives updates of textual forecasts and web pages rather than vice versa. In the office the forecast grids are monitored continuously and updated as events dictate. Events may be local, regional or national in scope and include things such as observations that do not match short term forecast grids, new model data interpretation which requires that mid and longer range grids be modified, collaboration with surrounding forecast offices or national centers, or customer demands.

The next challenge was rather than starting to prepare a local forecast database from scratch based upon the major forecast model runs at 00Z and 12Z, WFO forecasters work from the perspective that the current local forecast database is accurate and is not changed unless an event dictates. Following this perspective at WFO EAX has led to more consistent forecasts through time and has helped make the workload associated with preparing highly detailed forecast grids manageable. However, for some forecasters it was difficult to change the forecast paradigm that one did not have to start from scratch at each major

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model run cycle.

Other challenges in this new forecast paradigm are collaboration of forecast grids, coordination of grid updates to ensure a seamless gridded forecast database, and distribution of workload under varying weather conditions.

Traditionally NWS forecasters have been heavily dependent upon coordinating forecast solutions which were determined for the most part independently in WFOs and national centers. After forecast solutions were developed, offices coordinated to ensure consistency along forecast area boundaries, and to lesser extent coordination between local and national products. When forecast products were primarily generalized depictions of the expected weather in either words or low resolution graphical products this method was effective. Soon after beginning to prepare high resolution (5 km) forecast grids in the NDFD demonstration areas it became apparent that an enhanced level of collaboration during the forecast process would be necessary to ensure a seamless mosaic of forecast grids.

The NWS forecaster toolbox did not include tools to efficiently complete collaboration early in the forecast process. For the NWS to provide a high quality, consistent NDFD it was obvious that new collaboration and coordination tools were required and the NDFD demonstration clusters have experimented in this area. The challenge in this regard was to find ways to share meteorological reasoning with other offices as they developed their solution to the problem of the day.

The forecasters at WFO EAX and the other NDFD central cluster offices found that a continually open “chat room” type forum proved effective in assisting in the collaboration of a common meteorological solution. That forum, when combined with a voice communication system, and the ability to view graphical products and preliminary grid forecasts provided the tools necessary to produce local gridded databases that, when put into the NDFD provided a seamless, meteorologically consistent gridded forecast.

As offices begin to produce a gridded forecast database forecasters will be challenged to develop effective collaboration techniques. WFO EAX forecasters have found that it is important to open communication with other forecast offices early, and frequently during the forecast process. As soon as an event that requires a database update is identified, offices should begin discussion/collaboration. During this discussion meteorological reasoning should be shared, and a consensus solution should be reached. Inter-site coordination grids (ISC) should be exchanged between offices early in the development of the forecast solution. When a collaborative solution has been determined the offices must coordinate the forecast grids along forecast area borders and determine a time when the forecast grids will be updated. The procedure above is considerably different from the traditional NWS forecast process and will be a challenge for several forecasters. However, collaboration must become a part of the forecast process, and the time necessary to complete collaboration must be accounted for in developing workload distribution schemes.

Another significant challenge is defining and maintaining an “always current” database. As customer demands move from a society where forecasts were pushed out at scheduled times, to one where the customer pulls data at times that meet their needs, NWS forecasters are challenged to develop an update process where the database is updated as soon as significant changes in the forecast solution are determined. Short term updates, in the one to six hour time frame or through the end of the first forecast period, will be primarily driven by observed weather or meso-scale forecasts. In the mid to long range portion of the forecast database, from the second forecast period through day seven, updates will generally be driven by new forecast model data which provides strong support for changing the current forecast database. Mid to long range forecast updates will normally be confined to time periods following the release of new model data, so that planning for that workload will be less of a challenge.

Updates to the short term weather will be more challenging. During periods of significant weather, such as convective storm development, or frontal passage, WFOs will need to prioritize work, and manage resources to provide adequate personnel to keep the forecast database up to date as quickly as possible. To facilitate this update process the NWS will need to develop guidelines as to when forecast databases need to be updated, that is how much of a difference between the new solution and the existing database must occur before the forecast is updated. As the NWS moves deeper into the gridded forecast arena alternate methods of updating the short term grids during significant weather should also be examined. Keeping up with short term forecast updates promises to be the most significant challenge NWS forecasters will face.

By striving to keep the database current at all times the distribution of work and resources became a challenge. Forecasters quickly noted that maintaining a continuum of familiarity with the current forecast database and meteorological situation was nearly impossible under the conventional staff scheduling. When all forecasters with knowledge of the status of the weather and the database left the office at the same time the oncoming forecast team required considerable time to spin up to a point where they could keep the database up to date. As a result the forecasters recommended to management that an overlap be built into the forecasters schedule. In this way the transfer of meteorological knowledge could be facilitated and the staff would be able to keep the database continually updated. While this may seem a trivial matter, the change to traditional staffing patterns often meets with resistance. At WFO EAX this resistance was lessened somewhat as the forecast staff made the recommendation.

3. REWARDS OF PREPARING GRIDDED FORECAST INFORMATION

While changing the forecast paradigm from scheduled text products to an event driven updated gridded forecast database presented many challenges to the forecasters at WFO EAX, it also provided many rewards. Forecasters closely monitor forecast grids due to the specificity included, and as a result have experienced a feeling of getting more involved in the meteorology of the day, especially in the short term forecast grids. During the process of learning the knobology of the new forecast tools it was difficult to be deeply involved in meteorology at times, so this change has brought about a heightened sense of professionalism.

The gridded forecast database has provided high resolution meteorological information which may be extracted and formatted in ways that provide superior service to our customers. Experimental text, graphic and tabular information provided on the WFO EAX web site (www.crh.noaa.gov/eax) has been well received by customers and has enhanced the office's ability to meet the mission of the NWS. The gridded forecast database also offers expanded opportunity for third party companies to provide value added services to meet needs of customers with specific local requirements. Dissemination of raw forecast grids to customers is scheduled to begin in an experimental mode in the fall of 2002. The sense of improved meteorology and service became apparent to the WFO forecasters when they could finally see some payback for their efforts to produce the grids.

WFO EAX forecasters have relayed a perception that their forecasts are more accurate after they started a continuous grid update approach and the collaboration process. While the data sample for the period of new operations is small (July 2001 - July 2002), local verification statistics indicate that their perception is accurate. Using traditional verification schemes both local temperature and precipitation accuracy has improved at a rate greater than average since the office assumed forecast responsibility in 1995.

WFO EAX forecasters have noted an increase in sharing of forecast techniques, expertise and references both in the office and between NDFD demonstration offices involved in the collaboration process. The move to a more formalized collaboration has provided a forum for forecast staffs in multiple offices to work together to arrive at a consensus forecast solution. When reviewing the chat room collaboration discussions one frequently sees references to forecast techniques and sources of data. This exchange of science was not prevalent during the traditional coordination process.

Customers and partners have been rewarded with a more frequently updated suite of forecast information. As the transition from a scheduled, push forecast operation evolved into an event driven update process where forecasters have focused on meeting the needs of the pull customers, all customers have been able to receive forecast information more timely. The forecasters are encouraged to updated the forecast grids as soon as sufficient information indicates an need for the update, rather than to focus update efforts around scheduled times. This has led to increased lead times for significant changes to the forecast, and greater temporal and spacial resolution. An especially noteworthy event was the major ice storm in the central plains in January of 2002. NDFD central cluster demonstration offices provided outstanding lead time on that storm and agree that the collaboration tools and process played a large part in providing that service.

Forecasters at WFO EAX report a feeling of improved teamwork in the forecast process as a result of focusing on an always current evolving forecast database. Once the forecasters began viewing the current forecast database as being correct until there was overwhelming information pointing to a need for revision they seemed to become more appreciative of the work of their peers. This strengthened teamwork has also resulted in a more consistent forecast through time.

5. CONCLUSIONS

The NDFD demonstration offices have shown that the provision of a higher resolution, more frequently updated suite of forecast information is possible, but there are several challenges that NWS offices will face in the process. Forecasters must become familiar with the tools to produce a gridded database, and the efforts to improve the versatility of those tools must continue. Gridded forecast information provides the opportunity for improved service to customers and partners. The NWS must maintain an open dialog with all stakeholders to ensure that customer and partner feedback is received and addressed as this forecast methodology matures. Along the way it is important for NWS forecasters to be able to see the benefits possible as a result of their efforts to provide a gridded forecast database.