3.1 INTERACTIVE FORECAST PREPARATION - THE FUTURE HAS COME

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1. INTRODUCTION

The National Weather Service (NWS) has been preparing to introduce Interactive Forecast Preparation (IFP) into its field operations for almost two decades. Evolving versions of IFP systems have been operationally tested at selected NWS field offices for more than 15 years. The commissioning of the Advanced Weather Interactive Processing System (AWIPS) in 1999 provided a platform capable of supporting IFP techniques nationwide. With the year 2000 deployment of the Interactive Computer Worded Forecast (ICWF) by the NWS Eastern Region (Dickman 2002), routine IFP operations became a reality. The Southern and Central regions (Manion and Livingston 2002) followed last year by initiating the deployment of the Interactive Forecast Preparation System (IFPS), the successor to ICWF. NWS plans call for implementation of IFPS at all Weather Forecast Offices by the end of 2003.

IFP represents a substantial change for forecasters (Maximuk 1998). Instead of manually typing a myriad of forecast products tailored for specific user communities (e.g., public, fire weather, marine), forecasters will rely on interactive interpretation and editing techniques (Ruth et al. 1998) to prepare forecasts of weather elements in a common digital database from which forecast products will be automatically composed and formatted (Peroutka et al. 1998). IFP maximizes the human contribution in the forecast process, by enabling NWS field offices to issue new products with more forecast detail in time and space, as well as the existing product suite.

An important outgrowth of the nationwide implementation of IFPS will be the development of a National Digital Forecast Database (NDFD). The NDFD will contain a seamless mosaic of NWS digital forecasts. The database will be made available to all customers and partners--public and private–and will allow those customers and partners to create a wide range of text, graphic, and image products of their own.

2. THE DIGITAL FORECAST PROCESS

The National Weather Service has been developing automated product preparation systems for more than 30 years (Glahn 1970). The Techniques Development Laboratory (now the Meteorological Development Laboratory) developed one of the first interactive systems of this type–the ICWF beginning in 1985. The current system, called IFPS, is a consolidation of the ICWF and the Graphical Forecast Editor developed by the Forecast Systems Laboratory. The integrated system provides components for interactive model interpretation (Ruth 1998), grid editing (Wier et al. 1998), and matrix editing (Ruth and Peroutka 1993).

Fig. 1 illustrates how the interactive components of IFPS enable NWS forecasters to participate in the production of digital forecasts. A more complete description of the digital forecast process including interactive techniques in use outside the United States is provided by Ruth (2000).

3. THE SIGNIFICANCE OF IFPS

In the early days of IFP development, it was thought that the primary benefit of IFP technology would be realized in allowing the forecaster to focus on meteorology by preparing forecasts graphically rather than typing words. However that promise has not rung true–at least not yet. The tremendous amounts of data that need to be viewed and manipulated via IFPS can be overwhelming. Some forecasters complain that they have less time to think of meteorology with IFPS, not more. This problem is expected primarily during the transition to IFPS operations, when forecasters are not yet fully comfortable with digital forecast methodologies (Rezek 2002).

Today, the primary benefit of IFPS is recognized to lie in the digital data themselves. By disseminating NWS weather forecasts in a form providing high resolution with great flexibility, we increase the usefulness of NWS weather forecasts to our customers and partners. These data can not only be used to generate NWS text, tabular, voice, and graphical products, but are expected to drive custom applications developed outside the NWS. Some examples are:

- Decision support systems that fit the forecast to the problem.
- Weather information along a path.
- Text generation in more than one language.
- Forecasts for vehicles and hand-held devices with Global Positioning Systems.
- Controls for smart appliances (e.g., heating, cooling, irrigation).
- Graphics for mass media.

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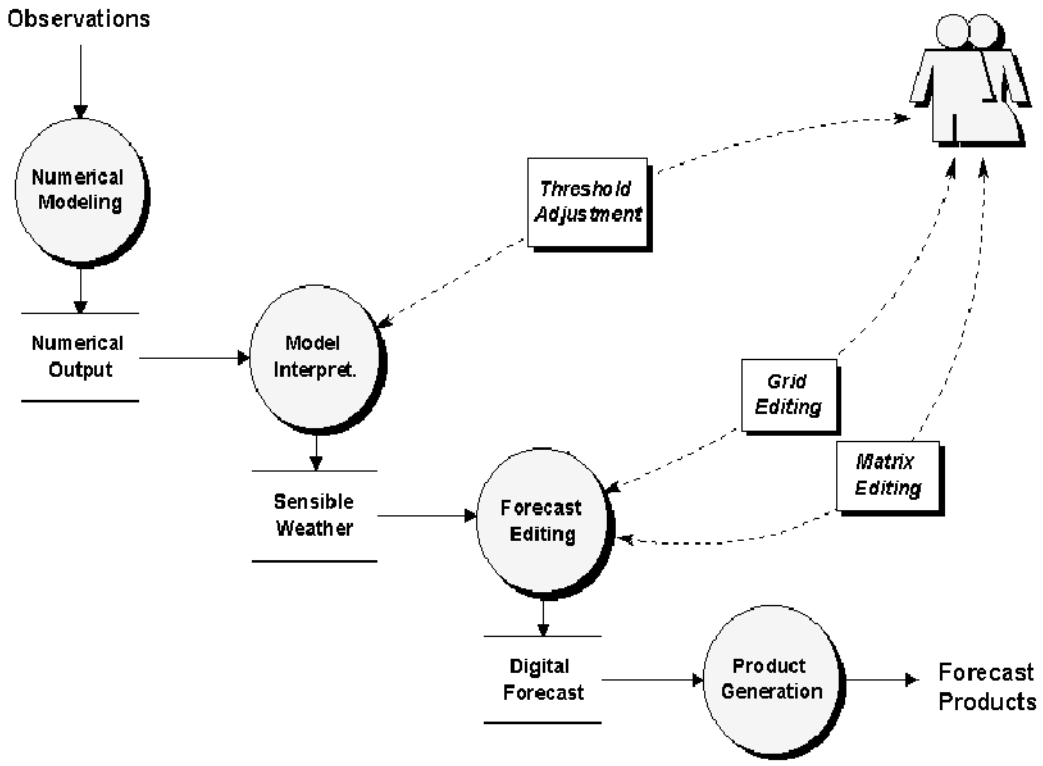

Figure 1: The digital forecast process

In fact, many of the above applications are being developed directly from computer model output today. By enabling the forecaster to produce detailed digital forecasts, IFPS maximizes the human role in the production of weather forecasts of the future.

4. A NATIONAL DIGITAL FORECAST DATABASE

The implementation of IFPS at all NWS Weather Forecast Offices (WFO) by 2003 will enable the creation of a National Digital Forecast Database (NDFD). The NDFD will be a "mosaic" in the sense that the grids from individual WFOs will appear together on a master grid. The database will also contain digital forecasts from National Centers for Environmental Prediction (NCEP) service centers such as seasonal temperature outlooks created at the Climate Prediction Center.

To be of greatest benefit to our customers and partners, the NDFD must be consistent. This means that NDFD gridfields should not contain non-meteorological discontinuities from hour to hour, from gridpoint to gridpoint, or from element to element. In order to facilitate the production of coordinated digital forecasts, the NWS is defining new roles for its NCEP service centers in the IFPS era. In addition to providing digital guidance for key weather elements, NCEP service centers will work collaboratively with WFOs in reaching a consensus on how to update the NDFD based on the receipt of new observations or new model guidance.

A second method to minimize discontinuities is to identify them and correct them as forecasts are being prepared. Each of the three interactive components of IFPS provide for intersite coordination. The IFPS editors enable forecasters to view draft forecasts from adjacent WFOs. The model interpretation technique enables forecasters to start from a common blend of models or selected ensemble members (Boyer and Ruth 2002).

As an adjunct to the coordination techniques described above, software at the central NDFD server is being written to recognize significant discontinuities within incoming grids and automatically notify the source WFOs of potential problems. In some cases, a “consensus” forecast may be used at boundary gridpoints. Specific details are now being worked out at 17 WFOs currently participating in an NDFD prototype (Fig. 2).

5. IFPS – A CATALYST FOR CHANGE

The NWS introduced its first computer system to local weather offices three decades ago. The system was called the Automation of Field Operations and Services (AFOS) system. Over the past decade, the NWS has built and deployed a much more capable system called AWIPS. However, because the information a forecaster can convey to users and partners is still limited to how quickly he or she can type, routine products and services have remained largely the same. When IFPS nationwide implementation is complete in 2003, we will have changed that.

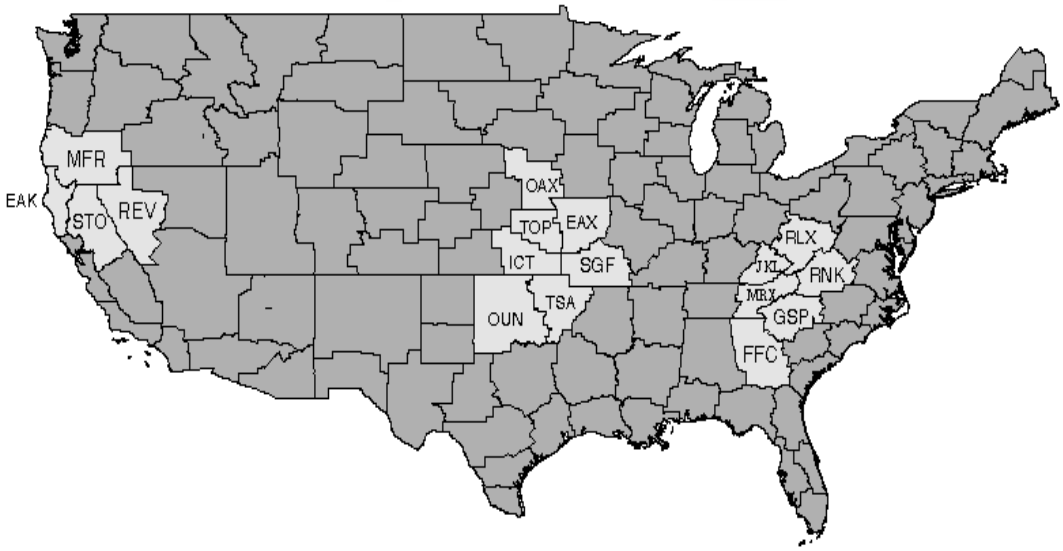

Figure 2: NDFD prototype areas.

6. REFERENCES

Boyer, T. R., and D. P. Ruth, 2002: Tools for model interpretation in the Interactive Forecast Preparation System, *Preprints Interactive Symp. on AWIPS*, Orlando, Amer. Meteor. Soc., elsewhere in this volume.

Dickman, I. R., 2002: NWS Eastern Region Interactive Forecast Preparation System (IFPS) implementation, *Preprints Interactive Symp. on AWIPS*, Orlando, Amer. Meteor. Soc., elsewhere in this volume.

Glahn, H. R., 1970: Computer-produced worded forecasts. *Bull. Amer. Meteor. Soc.*, **51**, 1126-1131.

Manion, J. D., and R. L. Livingston, 2002: Implementing the Interactive Forecast Preparation System in the Central Region of the National Weather Service, *Preprints Interactive Symp. on AWIPS*, Orlando, Amer. Meteor. Soc., elsewhere in this volume.

Maximuk, L. P., 1998: Preparations for the integration of the AWIPS Interactive Forecast Preparation System at WFO Kansas City. *Preprints 14th Int. Conf. on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Phoenix, Amer. Meteor. Soc., 342-344.

Peroutka, M. R., R. K. Meiggs, and M. B. Romberg, 1998: The generation of products in Interactive Forecast Preparation. *Preprints 14th Int. Conf. on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Phoenix, Amer. Meteor. Soc., 350-354.

Rezek, A., 2002: Changing the operational paradigm with Interactive Forecast Preparation System--IFPS. *Preprints Interactive Symp. on AWIPS*, Orlando, Amer. Meteor. Soc., elsewhere in this volume.

Ruth, D. P., 1998: Model interpretation using slider bars in Interactive Forecast Preparation. *Preprints 14th Int. Conf. on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Phoenix, Amer. Meteor. Soc., 464-468.

_____, D. P., 2000: Models, forecasters, and interactive forecast preparation in the new millennium. *Preprints 16th Int. Conf. on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Long Beach, Amer. Meteor. Soc., 82-85.

_____, D. P., and M. R. Peroutka, 1993: The Interactive Computer Worded Forecast. *Preprints 9th Int. Conf. on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Anaheim, Amer. Meteor. Soc., 321-326.

_____, M. A. Mathewson, T. J. LeFebvre, and P. K. Wu, 1998: Interpretation and editing techniques for Interactive Forecast Preparation. *Preprints 14th Int. Conf. on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Phoenix, Amer. Meteor. Soc., 345-349.

Wier, S., M. Mathewson, and T. J. LeFebvre, 1998: Grid editing for the Interactive Forecast Preparation System. *Preprints 14th Int. Conf. on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Phoenix, Amer. Meteor. Soc., 469-473.