

8.8 INTERPRETATION AND EDITING TECHNIQUES FOR INTERACTIVE FORECAST PREPARATION

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1. INTRODUCTION

The National Weather Service (NWS) has been developing and testing techniques that support Interactive Forecast Preparation (IFP) for more than a decade. The concept of IFP is key to achieving modernized forecast operations at NWS field offices with the Advanced Weather Interactive Processing System (AWIPS). With IFP, forecasters employ a family of techniques to prepare forecasts of weather elements from which many forecast products can be automatically composed and formatted. This family of IFP techniques is coordinated via a master menu (Fig. 1).

The Interactive Computer Worded Forecast (ICWF) system (Ruth and Peroutka 1993) has been used operationally at several NWS offices since 1988. This system was developed by the Techniques Development Laboratory (TDL) to support the generation of zone and station-oriented forecasts currently produced at Weather Forecast Offices (WFOs) nationwide. Interactive techniques provided in the ICWF enable the forecaster to view and edit forecast elements at forecast locations (e.g., counties, airports) and for time periods (e.g., tomorrow) that are specific to products in the current NWS product suite.

With AWIPS, a much improved data stream is beginning to flow to field offices. Forecasters at WFOs are able to view information from a variety of numerical and statistical forecast models at greater resolutions in time and space than ever before. With IFP, forecasters at AWIPS WFOs will apply their expertise by adding value to high resolution model guidance. Thereby, a new generation of detailed grid-based products will become available to users of NWS forecasts (LeFebvre et al. 1996).

Interactive grid editing techniques developed for the AWIPS Forecast Preparation System (AFPS) at the Forecast Systems Laboratory (FSL) enable forecasters to

draw graphical depictions of predicted weather on spatial and time-series displays which are initialized from model guidance, grids from national centers, or observations (Mathewson 1996). When working with grids, the forecaster need not be preoccupied with geographic subdivisions where particular forecasts are issued, nor with particular products and services. All the forecaster's efforts can be dedicated to understanding and describing the coming weather as an undivided phenomenon over the entire forecast area.

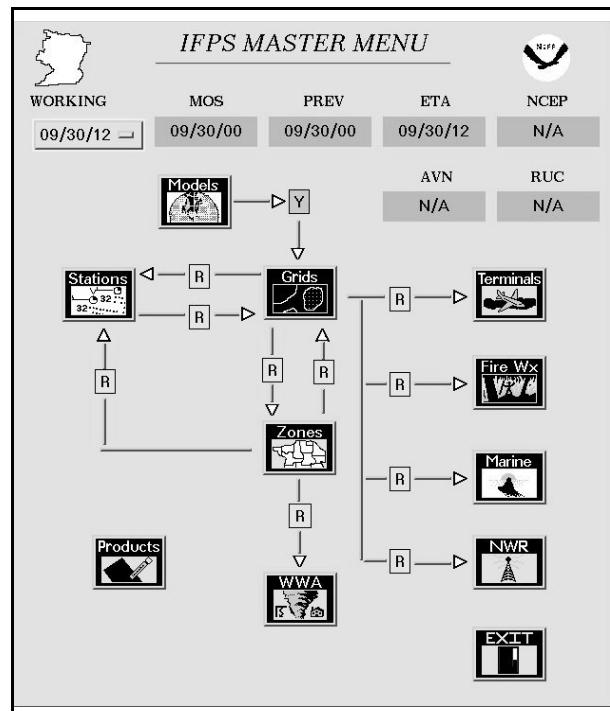


Figure 1: Master menu for IFP.

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Preparing a set of grids which completely describe all forecast elements at every hour can be a daunting task. Model interpretation techniques developed at TDL (Ruth 1998) provide an alternative to drawing forecasts. Initially, the forecaster chooses a model or interactively blends models which provide a reasonable first-guess forecast. The forecaster then adjusts slider bars which control the

timing, location, type, and intensity of weather on grids. The resulting interpretation uses the original model guidance to maintain spatial and temporal details which are consistent with the adjusted forecast.

The NWS is currently consolidating the ICWF and AFPS into a single Interactive Forecast Preparation System (IFPS). This paper describes interactive techniques developed at both TDL and FSL which comprise the consolidated system. These include interpretation and editing techniques to prepare forecast gridfields, as well as interfaces to prepare zone and station forecasts; terminal aerodrome forecasts; and watches, warnings, and advisories. A companion paper in this volume (Peroutka et al. 1998) describes forecast products which are generated via IFP.

2. THE IFPS MASTER MENU

The IFPS Master Menu (Fig. 1) coordinates the execution of IFPS components. Via this menu, the forecaster initiates model interpretation techniques, grid editing, and interfaces specific to products for particular program areas. The forecaster can also control the flow of data between IFPS grid, zone, and point databases by setting color-coded traffic signals.

With the ICWF, forecast preparation strategies vary widely from office to office. A common strategy has been first to prepare key elements by modifying forecasts on

grids. These forecasts are then summarized for locations and periods used in the public zone forecast. Similar zones are combined. The forecaster then employs the zone forecast matrix editor. Changes made with the zone editor can be "sprayed back" to the grids by applying delta fields. Forecasts for stations (e.g., Coded Cities Forecasts) are either taken from the zone database or the grid database. Forecasts for other program areas (e.g., aviation terminals) are extracted from the grids.

A different approach seems more appropriate in areas of diverse terrain. Forecasters in Boise, Idaho, prefer first to prepare station forecasts. Station forecasts are then used to initialize grids in concert with pattern information from high-resolution numerical model guidance. Zone matrices are prepared last and are never used to initialize station forecasts.

3. MODEL INTERPRETATION

IFPS model interpretation techniques enable forecasters to adjust threshold values used in the initialization of categorical weather forecasts from model probabilities. Continuous fields are adjusted by defining significant categories, adjusting category boundaries, and reinterpreting the original model field to fit that adjustment. Forecasters make these adjustments by moving slider bars while viewing a color image of the resulting forecast on the screen (Fig. 2). Adjustments are made at selected

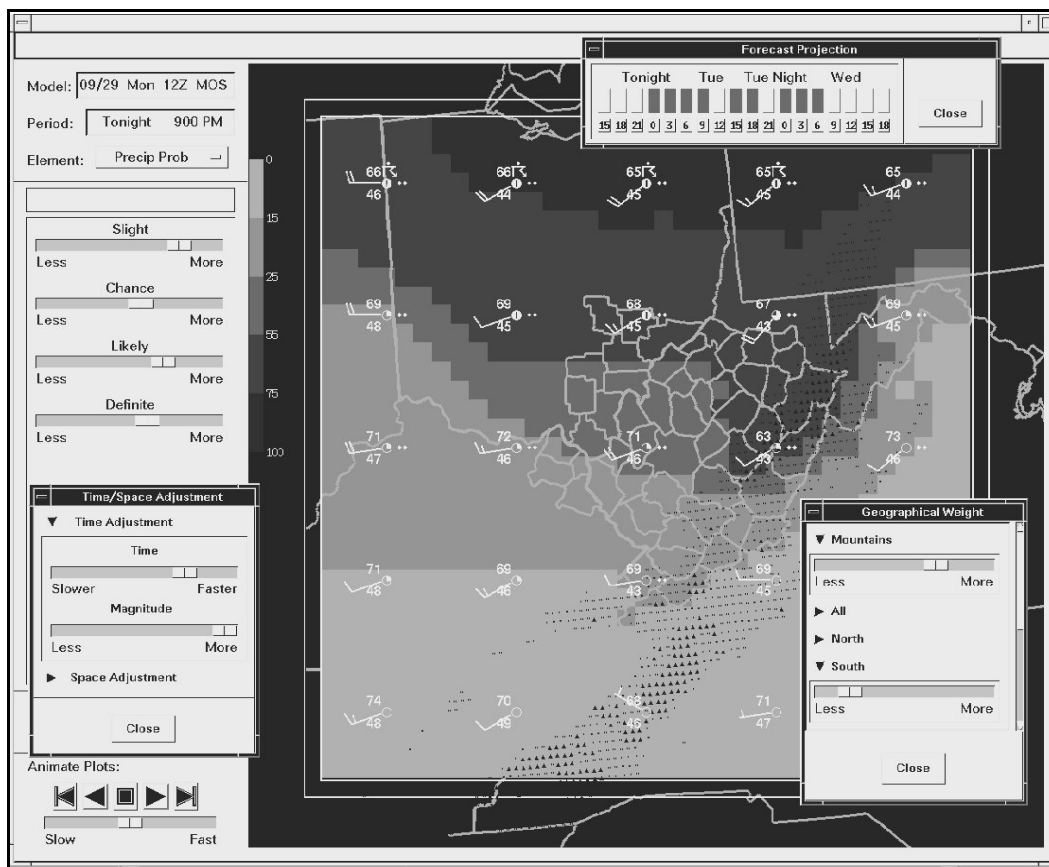


Figure 2: Slider bar interface for model interpretation.

forecast projections, interpolated in time, and then applied to the original model fields at their full-resolution in time and space. Model interpretation gains power and flexibility by weighting slider adjustments according to terrain features, related forecast elements, or forecast model parameters. The fundamentals of model interpretation are described by Ruth and Du (1997).

4. GRID EDITING

Interactive grid modification tools were introduced into the ICWF in 1993. These tools, described by Ruth (1993), enable forecasters to prepare forecasts for key elements, primarily by adjusting the position of contours on the screen. Forecast grids are then computed with the Systematic Interpolative Radial Search (Ruth 1992).

In the consolidated IFPS, the AFPS Graphical Forecast Editor (GFE) replaces ICWF grid modification. The GFE provides maps and graphs on which the forecaster "draws" the weather for all forecast elements. Three interactive components are shown on the GFE screen in Fig. 3. The grid manager, in the upper left, represents the forecaster's view of the grid database. It is used to select a grid initialization from either model guidance, observations, or the previous forecast. The

forecaster can also copy grid data, interpolate forecasts for intermediate hours, or adjust a grid's valid times here. The spatial editor, on the right, presents the gridfield on a planar surface. The temporal editor, in the lower left, presents a time-series for a single point or a collection of gridpoints. These components are described in detail by LeFebvre (1995).

5. MATRIX EDITING

IFPS matrix editors (Fig. 4) enable forecasters to view and edit information for the forecast elements, locations (points or zones), and time periods that are specific to NWS tabular and textual products. A single screen provides coordinated spatial, temporal, station model, product text, and model guidance displays relevant to the matrix under the forecaster's cursor.

Digital Forecast Matrices (DFMs) are derived from forecast grids. DFMs prepared in a matrix editor are used directly in IFP product formatters. Forecasters rely on this interface because the edits they make here have a well understood influence on formatted products. The matrix editor is also used to prepare DFMs for station, fire weather, marine, and NOAA Weather Radio forecast products within IFPS.

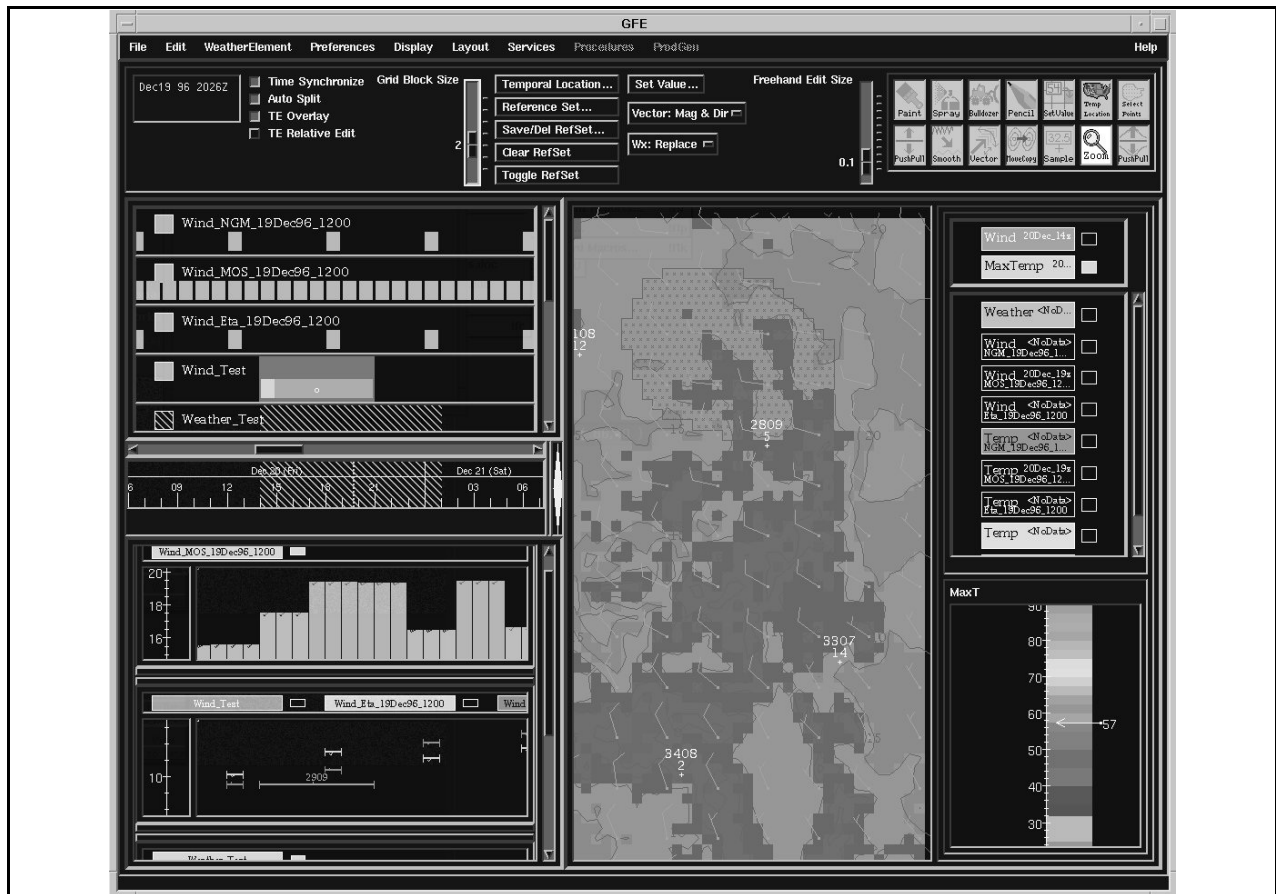


Figure 3: Graphical Forecast Editor.

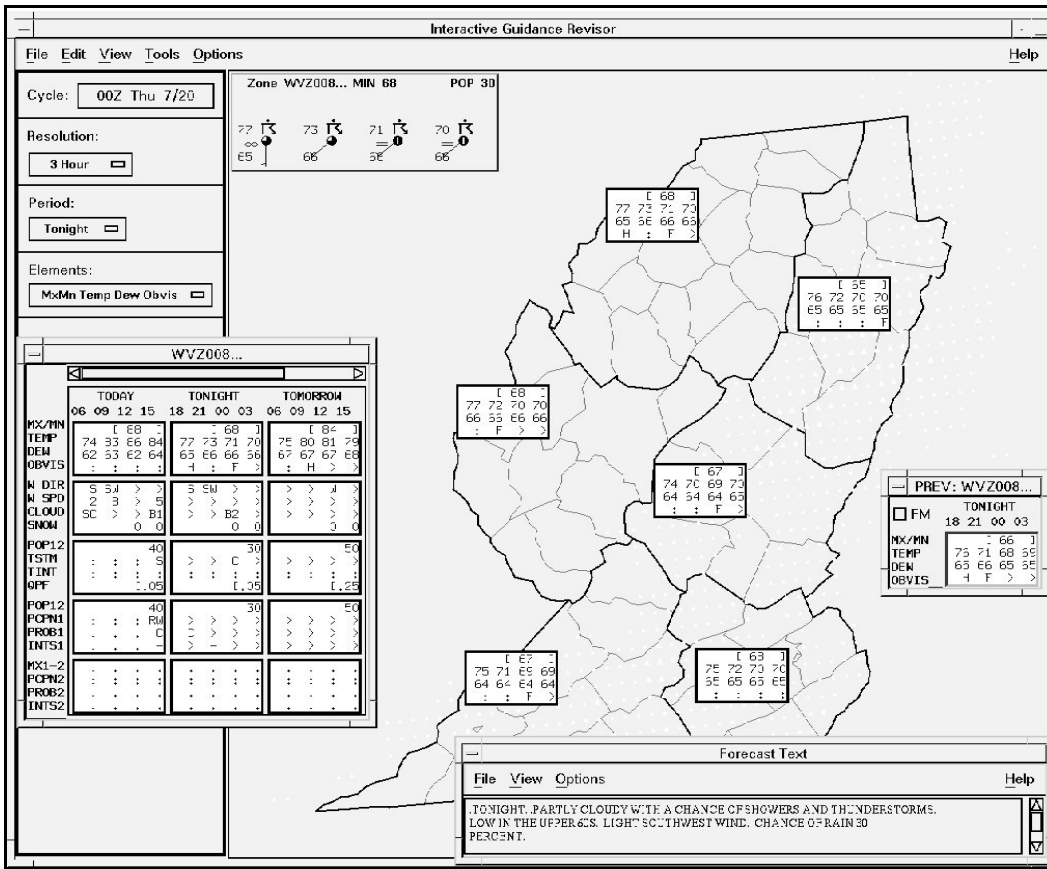


Figure 4: Matrix editor for public zones.

6. TERMINAL EDITING

Because of their complexity, viewing and editing Terminal Aerodrome Forecasts (TAFs) graphically in IFPS has been a challenge (Oberfield and Ruth 1997). Figure 5 shows the TAF time line editor. Clouds, up to three layers for each forecast group (i.e., prevailing, TEMPO, PROB40, PROB30), are plotted in a height-vs-

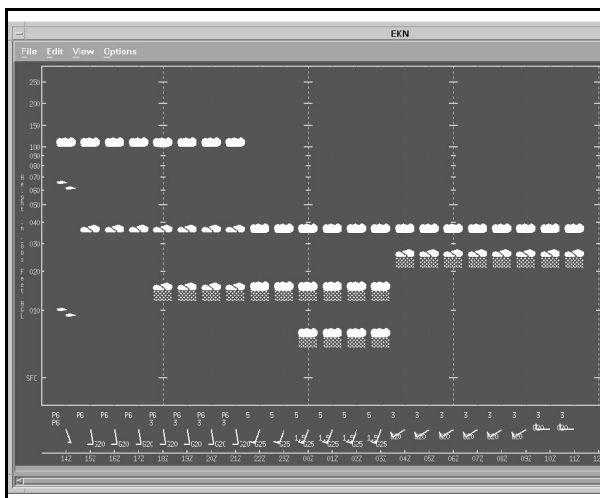


Figure 5: TAF time line editor.

time plane. Station model plots of wind direction and speed, obscuration, and visibility for each group are drawn near the bottom of the screen. Precipitation, if any, is depicted as falling from the lowest cloud layer. Weather is edited via pop-up menus which are invoked by clicking on an object on the screen.

7. WATCH/WARNING/ADVISORY INTERFACE

The graphical interface the forecaster uses to issue watches, warnings, and advisories (WWA) is central to WFO operations. Storm information can be provided from the IFPS digital database (e.g., recommended Winter Storm Warning) and, in the future, from the System for Convective Analysis and Nowcasting (Smith et al. 1998). Recommended actions are graphically displayed along with all WWAs which are currently in effect. The forecaster has the option to convert the recommendations to actual WWAs, issue new WWAs, cancel current WWAs, or clear portions of current WWAs. For most actions, the forecaster first specifies the hazard and then indicates the issuance area on the screen with the mouse. The AWIPS WWA graphical interface will be a combination of FSL's WARNGEN program and the current ICWF WWA interface. Hazards are specified via the WWA composer (Fig. 6).

Mode	Active <input type="checkbox"/>	Type	Warning <input type="checkbox"/>
Generic	Severe Thunderstorm <input type="checkbox"/>		
Specific	None <input type="checkbox"/>		
Starts	03 : 50 PM CDT	Tue Sep 30	Now
Round UP to Nearest:			
Length	01 : 00	30 min	45 min 60 min 90 min
Expires	04 : 50 PM CDT	Tue Sep 30	
Round UP to Nearest: 5 min 15 min 30 min 60 min			
Basis			
Radar indicated SVR/TOR			
Spotter report			
Police report			
Call(s) to Action			
NOAA Weather Radio			
Severe Thunderstorm Warning Means			
Severe Thunderstorm Warning Safety			
Tornado Alert			
Save & Format...		Save Only	
Abort			

Figure 6: WWA composer.

8. CONCLUSION

IFPS provides an integrated array of interpretation and editing tools. The actual use of these tools depends on local forecast problems and preferences. IFP techniques are currently being prepared for implementation nationwide (Meiggs et al. 1998). As techniques for preparing grid forecasts mature and grid-based forecast products become predominant within the NWS, it is expected that forecasters will spend the majority of their time interpreting and editing gridfields. The continued need for specific editors in IFPS will largely depend on the ability of IFPS to derive, from grid data alone, product specific information including zone combinations, local effects, and TAF sentences to the forecaster's satisfaction.

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