

GENERATING MARINE WATCHES, WARNINGS, AND
ADVISORIES USING INTERACTIVE FORECAST PREPARATION

Brian D. Papa*

Science Applications International Corporation, Beltsville, Maryland

Mark A. McInerney, Matthew R. Peroutka, and John L. Schattel, Jr.
Meteorological Development Laboratory
Office of Science and Technology
National Weather Service, NOAA
Silver Spring, Maryland

1. INTRODUCTION

The National Weather Service (NWS) is implementing nationwide use of the Interactive Forecast Preparation System (IFPS). IFPS is being deployed with the Advanced Weather Interactive Processing System (AWIPS) (Meiggs et al. 1998) and includes the Watch, Warning, and Advisory (WWA) software. At the core of IFPS is a digital database. The database holds digital weather forecasts in the form of grids and digital forecast matrices (DFM). The gridded forecasts are spaced regularly across a Lambert conformal projection and have spacing ranging from 2.5 km to 20 km. DFMs define weather over a geographic region or at a designated point with values specified at 3-hour projections. A variety of techniques can be used to modify the digital database to prepare digital forecasts (Ruth et al. 1998). Among the forecast products which can be generated from the digital database (Peroutka et al. 1998), are text marine forecast products. The marine products include the Coastal Waters (Fig. 1), Nearshore, Great Lakes, and Offshore forecasts.

The WWA interface is used to generate WWAs. WWAs generated with the WWA interface are stored to a relational database (Sperow et al. 2000). The information stored to the database includes the valid time event code (VTEC) event tracking number (ETN). VTEC is a text string placed in select products, including text marine products, to aid with the automated use of these products. A key component of VTEC is the ETN which enables users to easily follow the life-cycle of an event. The WWA interface used to display marine WWAs is composed of the Geographic Viewer and Monitor (Fig. 2). The WWA application is used as a tool for the coordination of WWAs among NWS Weather Forecast Offices (WFO). It also provides a visual display of all hazards including automatically generated marine WWAs.

*Corresponding author address: Brian D. Papa, Science Applications International Corporation, 4600 Powder Mill Road, Suite 400, Beltsville, MD 20705-2675; email: brian.d.papa@saic.com

Forecasters can currently create marine forecasts using IFP techniques (Peroutka and Calkins 2000). Recent enhancements to the IFP software now allow for the automatic generation of marine WWAs. This paper describes the generation and configuration of marine WWAs through the use of IFP software and techniques.

2. ADVANTAGES OF AUTOMATED GENERATION OF MARINE WWA

Automated generation results in consistent, rapidly generated products which are quickly disseminated to the user. IFP techniques, including analysis of the digital database, are easily applied to generate marine WWAs. Marine WWAs are often data-driven. Data-driven hazards are generated solely through the analysis of the digital forecast data and do not require human review. Other hazards can also be suggested through analysis of the digital forecast data, but require human discretion (Peroutka and Calkins 2000).

The nature of marine WWAs permits their threshold criteria to be pre-defined. This quality allows IFP techniques to be used in their preparation. Most marine

```

ANZ656-658-150730-
/NEW.KAKQ.SC.Y.0108.0109141600Z-0109151000Z/
/NEW.KAKQ.GL.W.0013.0109151000Z-0109152200Z/
COASTAL WATERS FROM CAPE CHARLES LIGHT, VA
TO NC VA BORDER OUT 20 NM-
COASTAL WATERS FROM NC VA BORDER TO
CURRITUCK BEACH LIGHT, NC OUT 20 NM-

330 PM EDT FRI SEP 14 2001

...GALE WARNING FOR SATURDAY...

.TONIGHT...SW WINDS 25 KT BECOMING W LATE. SEAS
3 TO 6 FEET. A CHANCE OF SHOWERS LATE.
.SAT...NW WINDS 40 KT. SEAS BUILDING TO 6 TO 12
FEET. A CHANCE OF SHOWERS UNTIL MID-MORNING.
.SAT NIGHT...NW WINDS 5 TO 15 KT BECOMING W LATE
IN THE EVENING. SEAS SUBSIDING TO 2 TO 4 FEET.

$$

```

Figure 1. Sample Coastal Waters forecast with marine WWA headlines and VTEC.

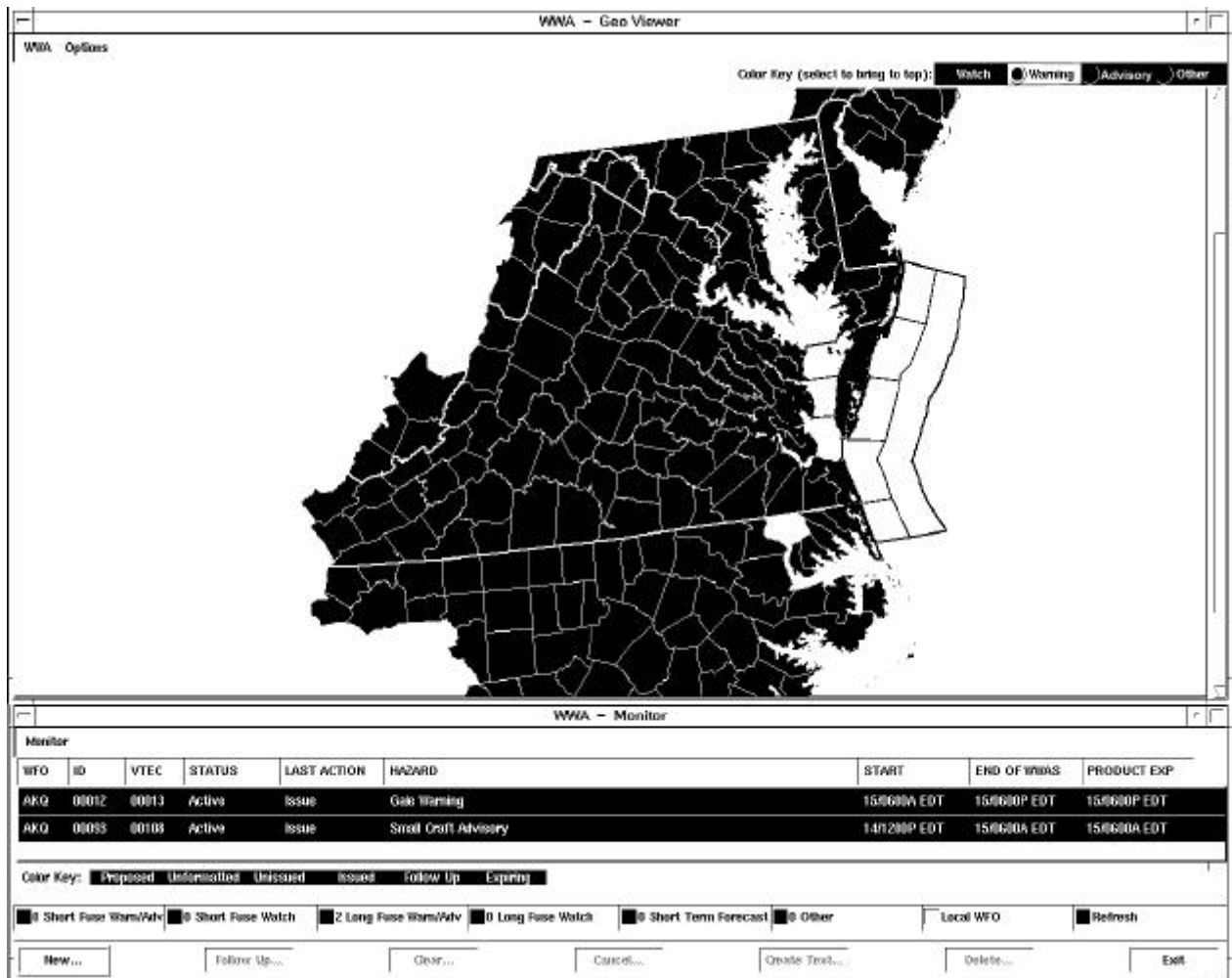


Figure 2. WWA interface including the WWA Monitor and Geographical Viewer.

WWA criteria are internationally defined. For example, the criteria for a Gale Warning is defined as “sustained winds or frequent gusts from 34 to 47 knots inclusive not generated by a tropical cyclone” (National Weather Service). Similarly, criteria are also pre-defined for Small Craft Advisories, Storm Warnings, and Hurricane Force Wind Warnings. Many sites may have local criteria for Small Craft Advisories that require modification of the upper criteria for sea/wave conditions (National Weather Service). Each site may configure local variations to the marine WWA criteria, if local conditions mandate.

Generation of marine WWAs and the marine forecast products from the same digital database guarantees consistency among the products without additional work. Consistency between the marine forecast and marine WWA is important because marine WWAs are not issued as separate products. Relevant marine WWA headlines are inserted in the marine forecast, such as the Coastal Waters product. Fig. 1 shows an example marine product (Coastal Waters forecast) with marine WWA headlines and VTEC inserted. The marine WWA headline is indicated as “GALE WARNING FOR SATURDAY.”

3. CREATING MARINE WWA

Marine WWAs are generated by comparing site-configured marine WWA threshold criteria with the digital database from which the marine forecast is created. For example, a common threshold equation is the following:

$$W \text{ SPD.GE.34.AND.W SPD.LE.47}$$

This defines the threshold for a Gale Warning and can be read as, “wind speed greater than or equal to 34 knots and less than or equal to 47 knots.” In addition to the threshold equation, the site defines the forecast projections to review and the minimum length of time for each hazard. The criteria for the threshold equation, valid times, and minimum length must all be met for the marine WWA to be generated. Fig. 3 shows an example of the digital data, marine WWA configuration, WWA configuration, and resultant marine WWA generated from this information.

<p><u>DIGITAL DATA</u> Hour: 00 03 06 09 12 15 18 21 00 03 W Spd: 05 10 10 40 40 40 40 10 10 05</p> <p><u>MARINE WWA CRITERIA</u> Weather Hazard Name: Gale Type: Warning Minimum duration: 6 hours Starting projection to review: 4 (Hour 09) Ending projection to review: 10 (Hour 03-Day 2) Threshold Equation: W SPD.GE.34.AND.W SPD.LE.47</p> <p><u>WWA INFORMATION</u> WWA Mode: Active</p> <p><u>RESULTS</u> Unissued Active Gale Warning is created Start Time: 0900 End time: 2100</p>
--

Figure 3. Example digital data, marine WWA configuration, WWA configuration, and resultant marine WWA.

The IFP software also has the ability to follow-up, clear, cancel, and update previously generated marine WWAs. It is necessary for marine WWAs stored in the database to be analyzed and updated to maintain the proper life cycle of each WWA. Temporal and/or spatial modifications to the digital data result in a follow-up of existing issued hazards and an update of existing unissued hazards. A clearing occurs when the digital data are modified until they no longer meet the marine WWA criteria for specific marine zones within the hazard area. A cancellation is done when the digital data for all the marine zones no longer meet the marine WWA criteria. The VTEC line formatted in the marine product represents the current status of the WWA.

Marine WWAs are prepared with an initial unissued status. This allows the forecaster to review the final marine product for quality control purposes. Once the final text marine product, including marine WWA headlines and VTEC, is disseminated, the marine WWAs become officially issued. Upon issuance, a digital representation of the WWA is sent to adjacent offices for coordination purposes as described by Sperow et al. (2000).

The WWA interface is used by the forecaster to view various information about the marine WWA. The WWA Monitor displays the issuing WFO, VTEC id, last action (issue, follow-up, clear, or cancel), type of marine hazard, geography, start time, expiration time, product expiration time, and current status (issued, unissued, or proposed). The WWA Geographic Viewer displays the geographical area covered by the hazard and the type

of hazard (Sperow et al. 2000) (Fig. 2). The WWA interface also displays WWAs from adjacent WFOs for inter-site coordination purposes.

4. INSERTING MARINE WWA HEADLINES

Marine WWA headlines must be formatted in the marine forecast product. The marine forecast product has the VTEC code formatted for each marine WWA that exists for a particular marine zone combination; however, only the most important marine WWA is headlined in the product. For example, there may be VTEC coding for a Small Craft Advisory and a Gale Warning that occur during the forecast period. Only the highest priority "Storm Warning" headline is formatted (Fig. 1).

5. CONFIGURING MARINE WWA

Marine WWA configuration is performed through the existing WWA Setup graphical user interface (GUI) (Fig. 4). The GUI allows the site to configure marine WWA criteria. This includes the type of marine hazard, generic and specific hazard names, the minimum duration of the event, the starting and ending hours to begin searching for event criteria, and the threshold equation. In addition, the marine WWA characteristics can also be configured using the GUI as described by Sperow et al. (2000). Use of the WWA Setup GUI keeps marine WWA criteria and characteristics synchronized.

6. CONCLUSION

Techniques for generating marine WWAs have been smoothly integrated into the IFPS application. The pre-defined quality of data-driven marine WWAs allows them to be automatically generated from the digital database. Automatic generation of marine WWAs benefits the forecaster and user in several ways, including consistency among products, rapid creation and dissemination, and the ability to add additional information to marine products. All this is achieved without extra work for the forecaster.

7. REFERENCES

- Meiggs, R. K., M. R. Peroutka, and D. P. Ruth, 1998: Implementing Interactive Forecast Preparation nationwide. *Preprints 14th International Conference on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Phoenix, American Meteorological Society, pp. 359-363.
- National Weather Service, 1991: *Weather service operations manual chapter D-07*, National Weather Service, NOAA, U.S. Department of Commerce, section A-1.
- Peroutka, M. R., R. K. Meiggs, and M. B. Romberg, 1998: The generation of products in Interactive Forecast Preparation. *Preprints 14th International Conference on Interactive Information and Process-*

Type: Watch Warning Advisory Statement

Generic Name: Specific Name:

WWA Composer

Create in Composer Short Fuse

Time Options

Default Lifetime: :

Follow up Interval: :

Expiration Lead Time: :

Start Rounding Time: :

Optional Durations (min):

End Rounding Times (min):

Product Purge Offset (hours):

Formatting Options

UGC Format: Zone County

Geography Lists

Issuance: Clearing:

FollowUp: Cancelling:

VTEC Codes

Phenomena: Significance:

Identifiers

Issuance: Clearing:

FollowUp: Cancelling:

Headline in Product: ZFP SAF AF

NOAA Weather Radio: Send to CRS by default?

Condition for recommending this WWA...

Recommendation Condition

Type:

Generic Hazard:

Specific Hazard:

Minimum Duration (Hours):

Start Time Offset (Hours):

End Time Offset (Hours):

Threshold Equation:

Figure 4. WWA Setup GUI including marine WWA criteria configuration GUI.

ing Systems for Meteorology, Oceanography, and Hydrology, Phoenix, American Meteorological Society, pp. 350-354.

Peroutka, M. R., and J. E. Calkins, 2000: Generating marine forecasts using Interactive Forecast Preparation. *Preprints 16th Int. Conf. On Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Long Beach, American Meteorological Society, pp. 98-101.

Ruth, D. P., M. A. Mathewson, T. J. LeFebvre, and P. K. Wu, 1998: Interpretation and editing techniques for Interactive Forecast Preparation. *Preprints 14th International Conference on Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Phoenix, American Meteorological Society, pp. 345-349.

Sperow, K. S., R. K. Meiggs, W. J. Goodman, and W.D. Jiang, 2000: Generating watches warnings and advisories using Interactive Forecast Preparation. *Preprints 16th Int. Conf. On Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology*, Long Beach, American Meteorological Society, pp. 86-89.