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TECHNIQUES DEVELOPMENT LABORATORY

TDL OFFICE NOTE 87-4

FORECAST REVIEW, FORREV--TEST REPORT

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1. INTRODUCTION

A new Automation of Field Operations and Services (AFOS) applications program, FORREV, has been developed at the Techniques Development Laboratory (TDL) which facilitates the review and evaluation of public forecasts for individual stations and forecast periods. Previously, in order to analyze the progression of forecasts for a particular period, it was necessary for the forecaster to locate and view a large number of separate products. The Forecast Review software concisely displays forecasts for a particular forecast period from several forecast cycles, along with the corresponding observed weather elements. Two products are produced--one displays a sequence of Local Forecast Products (LFP's) over time for the given forecast period (Fig. 1). A second displays, in tabular form, observed data and actual forecast values of weather elements as determined by Model Output Statistics (MOS) and the Weather Service Forecast Office (WSFO) forecaster (Fig. 2). These products may be used to compare MOS and WSFO forecasts, to compare these forecasts with recorded observations, and to evaluate the consistency of these forecasts, from one cycle to another, leading up to the event.

Program FORREV was tested and evaluated at five WSFO's among the four National Weather Service (NWS) regions. The results were compiled at TDL and decisions were made as to what changes and enhancements were to be added to the program based on comments from the field. This paper presents the results of the WSFO field test of the applications program FORREV.

2. DESCRIPTION OF FIELD TEST

In late November 1986, the Forecast Review software was sent to five WSFO's for testing: Indianapolis, Ind.; Reno, Nev.; Philadelphia, Pa.; Portland, Maine; and Memphis, Tenn. The Western Region Scientific Services Division (WRH SSD) also tested the software. Documentation was provided to each site along with the software, and instructions were given to test the program over a 30-day period. In order to document test results, questionnaire forms (Fig. 3) were also included on which the forecaster could record any problems encountered while running the software or any suggestions or criticisms he/she had concerning the program.

During early 1987, the test results were received from Indianapolis, Reno, Philadelphia, Portland, and Memphis on January 15, January 16, January 28, February 9, and March 2, respectively. Program evaluations were received as summaries, completed questionnaires, and program outputs. In addition, communication by telephone with WRH SSD in early January provided useful comments and suggestions. All test results were compiled and reviewed at TDL.

3. COMMENTS AND CHANGES

A. General Comments

General opinion concerning the overall merits of program FORREV was quite varied. WSFO Portland provided no overall opinion of the program. WRH SSD, WSFO Reno, and WSFO Indianapolis had an overall positive view of the software. Reno felt the program was most useful from a management standpoint, allowing the user to determine if successive forecasts converge toward the observed condition or not. They also suggested that several items be added to product cccTBLREV (Fig. 2). WSFO Indianapolis found the program to be useful in reviewing the consistency of their forecasts; however, they felt the program could be enhanced by incorporating more data and statistics in the output.

WSFO's Philadelphia and Memphis did not find the program to be useful. Forecasters testing FORREV at Philadelphia commented that the program provided no useful information; information given in the two output products is already present in other AFOS products. WSFO Memphis commented that product cccTBLREV was inadequate compared to output produced by several local verification statistics programs which are run at some sites. They did, however, feel that FORREV could be used as a management tool to track the oscillation of forecast temperature and precipitation probabilities for different forecast periods. It should be mentioned here that the Forecast Review software was not designed to provide new data or statistics to the user. FORREV was designed to concisely display information, already available in several AFOS products, in a format which could be more easily used in preparing or reviewing a forecast.

B. General Program Changes

Several recommendations were made for general modifications to the program:

a. It was suggested that the software be modified to produce forecast reviews for greater than three stations. This change will not be implemented, however, because it would most likely increase the length of product cccTXTREV (Fig. 1) to greater than five pages. This would aggravate a known difficulty on AFOS of not being able to view previous pages of a product greater than five pages in length. The program can, however, be run quickly and simply more than once to produce forecast reviews for three more stations.

b. The version of FORREV issued for testing did not easily allow the program to be run at headquarters sites. In order to run the program, a headquarters site had to rename product cccPVMxxx to reflect the ccc of the WSFO for which they were producing reviews rather than the actual ccc of their site. Several headquarters sites indicated that they would like to run the program if it were changed to allow the user to enter the two different ccc's needed. In order to implement this change, a switch has been added to the command line, similar to the headquarters switch used by AEV program VERIFY (see Ruth and Alex, 1987). When the command RUN:FORREV ccc/H is entered at the ADM, FORREV will produce forecast reviews for stations covered by WSFO ccc. Headquarters sites which are not presently running VERIFY and which do not have the verification files available must run the program with the /T switch to produce only product cccTXTREV (see section C.g., below).

c. Several test sites indicated that they would like to see an option to have the program run for a default date, time, and stations. This would allow the program to be run without requiring the user to fill out a run preformat prior to each run of the program. It would also allow the WSFO to run the program in a more automated fashion. An option of this kind will be provided in the version of FORREV released to the field. When the program is initiated by RUN:FORREV/D the program will automatically update the run preformat to the next forecast period. This period and those stations previously entered in the preformat will be used by the software in preparing the forecast reviews.

C. Changes to Product cccTXTREV

The following are problems noted by test sites concerning output product cccTXTREV and suggested program modifications.

a. Several test sites noted problems which FORREV had in handling holiday forecast periods. The code has been altered to allow the software to more accurately pick out LFP forecasts with holiday period designators.

b. A major problem with FORREV, noted by all test sites, was its inability to acknowledge the existence of duplicated forecasts in the AFOS data base, causing each version to be repeated in product cccTXTREV. The program has been modified to correct this problem. If more than one version of product cccLFPxxx has the same issuance time, only the first version will be output to cccTXTREV. In addition, if there exists an official corrected version of an LFP, only the corrected version will be output, not the original. Elimination of duplicate and corrected versions will help to minimize the chances of cccTXTREV being greater than five pages in length.

c. A suggestion was made that within cccTXTREV, LFP's from each station should begin on a new page of the product. This change will not be made because it will increase the likelihood that product cccTXTREV will have a length greater than five pages. This produces problems on AFOS when the user tries to access previous pages of the product.

d. One test site recommended that the order of LFP's output in cccTXTREV progress to successively later forecasts. This change will not be implemented. Coding and program structure is less complex if the LFP's are output in the same order as they are accessed from the data base.

e. It was suggested that cccTXTREV include advisory statements in addition to the actual forecast statements. Because there is no one set format for an advisory statement and the text varies widely, it is difficult to design code to search for these statements and to determine whether they apply to the designated forecast period. Program run time would also increase with the search for these advisory statements. If widespread need for this enhancement is indicated from the field, this modification may be implemented at a later time.

f. One test site mentioned that it may be useful to see a product similar to cccTXTREV for zone forecasts instead of local forecasts. Although FORREV was not designed to handle zone forecasts, this could be an enhancement considered for the future if further interest is expressed by the field.

g. Lastly, a switch to have only product cccTXTREV produced was suggested at one site. This change will be implemented. When the command RUN:FORREV/T is entered at the ADM, only product cccTXTREV will be created. Product cccTBLREV will not be produced. Because product cccTBLREV relies on output from AEV program VERIFY, use of this switch will allow headquarters sites, not presently running VERIFY, to make use of the Forecast Review software.

D. Changes to Product cccTBLREV

The WSFO test sites noted several problems with product cccTBLREV or suggestions for improvement.

a. Several questionnaires noted that observed values were sometimes missing in product cccTBLREV. FORREV obtains these values from product cccPVMxxx. This product must have been incomplete when FORREV was run. In testing FORREV at TDL, no values present in the PVM were found to be missing in cccTBLREV. In order to ensure a complete product cccTBLREV, WSFO's should run VERIFY at a time, well into the cycle being verified, when all needed observations are resident in the AFOS data base.

b. One site commented that cccTBLREV indicated a forecast of frozen precipitation while the Local Forecast Product for the area indicated liquid with possibly freezing precipitation. They felt this must be in error. It must be emphasized here that data present in cccTBLREV is obtained directly from product cccPVMxxx. No other product is used to compile these data. Erroneous data in this table reflects similarly erroneous data in cccPVMxxx.

c. Nearly every test site commented that the wind average and wind peak values were found to be equal a suspiciously large number of times. The information provided in cccTBLREV was found to be incorrect. The two wind values provided are the observed wind taken at the verifying hour and the highest sustained wind reported in a 6-hour window about the verifying hour. The label of "WIND AVG" is incorrect and will be modified to read "WIND OBS" in the version of FORREV released to the field.

d. It was commented that the observed sky cover value given in cccTBLREV is only a spot forecast and is of little value in evaluating the forecast over a 12-hour period of time. It is true that more accurate or descriptive values of this information could be retrieved from other products; however, in the interest of simplicity, the value provide in cccPVMxxx will be used because the PVM provides all of the data needed to produce cccTBLREV.

e. The most common request from the test sites was that more data and/or statistics be provided in product cccTBLREV. There were requests to include minutes of sunshine, snowfall accumulation, QPF, a thunderstorm

indicator, time of the peak wind, the division of cloud cover and precipitation type into 6-hourly intervals, WSFO forecaster number, and WSFO improvement over MOS forecasts. To include all of this additional data would be to stray from the original intent of FORREV, which was to provide a concise display of observed and forecast values of the major weather elements. The only values which will be included in cccTBLREV at this time are those which are easily retrieved from product cccPVMxxx. It has been decided to include the WSFO forecaster number alongside the WSFO forecast values in cccTBLREV (Fig. 4). Because the field found the greatest use of FORREV was as a management tool, it was felt that this information would enhance the program's utility for this purpose.

f. The use of a time series graphic to show trends in MOS and WSFO forecasts was suggested by one test site. Time series displays have been recognized by TDL to be a favorable enhancement to FORREV. The addition of graphics will most likely be a TDL project for the future. Plots of statistics such as WSFO improvement over MOS forecasts, as mentioned in section e, may also be better suited to this kind of graphic display.

g. Major changes will be made to the program code which produces product cccTBLREV. FORREV will no longer directly access product cccPVMxxx. This information will instead be taken from the RDOS disk files VERccc, VERDIR, and VERIT produced by program VERIFY. Thus, any future changes to the format of cccPVMxxx will not adversely affect FORREV. This change should not affect the way FORREV is run or used. The user must only ensure that the RDOS files created by VERIFY exist, before running FORREV.

4. SUMMARY

As a result of the field testing of program FORREV, some changes to the software will be implemented. The program will include a switch to allow FORREV to use default stations and a default cycle time in producing the forecast reviews. Switches have also been added which allow a headquarters site to more easily run FORREV, and which allow only product cccTXTREV to be produced. Product cccTBLREV will include a corrected label ("WIND AVG" is changed to "WIND OBS") and will now include the WSFO forecaster number. Transparent to the user will be another change to the program. The software will no longer directly access product cccPVMxxx, but will derive the same information from the more stable RDOS files produced by program VERIFY: VERIT, VERDIR, and VERccc.

Changes to FORREV which may be considered in the future include adding a review of zone forecasts in addition to LFP's and including more statistics in product cccTBLREV or displaying this information in the form of a graphic output display.

5. REFERENCES

Ruth, D. P., and C. L. Alex, 1987: AFOS-ERA forecast verification. NOAA Techniques Development Laboratory Computer Program, NWS TDL CP 87-2, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 50 pp.

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WBCTXTREV


WBC


1115 AM EDT MON SEP 29 1986
.THIS AFTERNOON...PARTLY SUNNY WITH HIGHS IN THE MIDDLE 80S. SOUTH
WINDS 10 TO 15 MPH.


1000 AM EDT MON SEP 29 1986
.THIS AFTERNOON...MOSTLY CLOUDY BUT WITH SOME SUNSHINE LATE. HIGHS
IN THE LOW AND MIDDLE 80S. SOUTH WINDS 10 TO 15 MPH.


330 AM EDT MON SEP 29 1986
.TODAY...MOSTLY CLOUDY TIL MID MORNING. GRADUAL CLEARING THEREAFTER.
WARMER WITH HIGHS IN THE LOW OR MID 80S. SOUTH WINDS 10 TO 15 MPH.

900 PM EDT SUN SEP 28 1986
.MONDAY...MORNING CLOUDINESS THEN BECOMING SUNNY AND WARMER IN THE
AFTERNOON. HIGHS 84 TO 88. WINDS GRADUALLY BECOMING SOUTHWEST AROUND 10
MPH.

400 PM EDT SUN SEP 28 1986
.MONDAY...MORNING CLOUDINESS THEN BECOMING SUNNY AND WARMER IN THE
AFTERNOON. HIGHS 84 TO 88. WINDS GRADUALLY BECOMING SOUTHWEST AROUND 10
MPH.

10 AM EDT SUN SEP 28 1986
.MONDAY...MOSTLY SUNNY VERY WARM AND HUMID. HIGHS IN THE MID OR UPPER
80S. SOUTHWEST WINDS 10 TO 15 MPH.

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Figure 1. Sample output product, cccTXTREV, from program FORREV. The product shown here contains LFP products for Monday, September 29, 1986 - daytime. The succession of forecasts shown are from increasingly earlier projections. Forecasts for a second or third station will be appended one after the other within the same product.

EXFMCPTBL
TTAA00 KEXF 171926

FORECAST REVIEW: 09 / 29 / 86 DAY

WBC	PROJECTION	TEMPERATURE WSFO	TEMPERATURE MOS	POPT WSFO	POPT MOS	POP WSFO	POP MOS
	12-24	82	84			30	40
	24-36	72	82			40	40
	36-48	85	84	L		40	40
	48-60	85	85				

OBSERVED: MAX : 82 PRECIP: AMT: 00.00

AVG CLD COVER: OVC WIND AVG: 0808 WIND PK: 0709

PRECIP TYPE: Z-FREEZING F-FROZEN L-LIQUID

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Figure 2. Sample output product, cccTBLREV, from program FORREV. The product shown here contains forecast and observed data for September 29, 1986 - daytime. For four projections, values of MOS and WSFO forecast temperature, precipitation type, and probability of precipitation are given, along with observed values of temperature, precipitation type and amount, cloud cover, and wind characteristics. A revised version of this product is shown in Figure 4.

Date: _____

Applications Program FORREV
Questionnaire

1. Did you encounter any difficulties running the program and if so, what were they?

2. Did the program adversely impact other activities running on AFOS and if so, in what way? (ADM hangs, AFOS crashes)?

3. Did the instructions (Parts A and B of the CP documentation) clearly explain all information needed to install and run the Forecast Review software? If not, list items which need further explanation.

4. How and when did you use the program? Did you use it to prepare a forecast or review forecasts after the fact?

5. Did the program provide correct information?

6. Is there any information, not included in the output products, which you feel should be included, to make the Forecast Review software more useful?

Figure 3. Questionnaire form sent to WSFO test sites for testing of applications program FORREV.

ATLTBLREV
TTAA00 KEXF 291317

FORECAST REVIEW: 05 / 28 / 87 DAY

ATL PROJECTION	FORECASTER NUMBER	TEMPERATURE WSFO	TEMPERATURE MOS	POPT WSFO	POPT MOS	POP WSFO	POP MOS
12-24	24	90	89	L	L	30	20
24-36	23	88	90	L	L	20	05
36-48	32	90	89	L	L	10	05
48-60	23	89	91				

OBSERVED: MAX : 87 PRECIP: L AMT: 00.02

AVG CLD COVER: SCT WIND OBS: 1407 WIND PK: 1308

PRECIP TYPE: Z-FREEZING F-FROZEN L-LIQUID

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Figure 4. Same as Fig. 2 except this is the revised version which includes the WSFO forecaster number and a corrected observed wind label.