JP1.11 FOUS_EXTRACTOR: AN AWIPS APPLICATION PRODUCING DATA SIMILAR TO THE FRH BULLETINS

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1. INTRODUCTION

In 1981, the National Weather Service (NWS) began transmitting the Forecast U.S. 60-78 (FOUS) messages, containing direct model output from National Centers for Environmental Prediction's (NCEP's) Limited Fine Mesh Model (NWS 1981). The FOUS messages, hereafter referred to as FRH because of their product headers on the Advanced Weather Interpretation and Processing System (AWIPS), contained analysis and forecast values for a selected set of meteorological variables, interpolated to designated stations across the model domain. Over the past 20 years, through the changes that have been made to NCEP's suite of forecast models, NWS forecasters now have 2 sets of model output bulletins at their disposal. The FRH messages contain output from the Early Eta (ETA) model, while the FRHT messages contain data from the Nested Grid Model (NGM). There are FRH/FRHT data currently available for approximately 100 sites across North America (NWS 1997).

During the days when an NWS office used the Automated Field Observing System (AFOS) to analyze weather data, forecasters had access only to specified model graphics, and not to raw model output, except through the FRH messages. On AWIPS, NCEP's model guidance is processed into files using the Network Common Data Form (netCDF), which is a format used commonly for storing and retrieving scientific data. Software packages on AWIPS are programmed to decode data in this format for display purposes, giving forecasters a way to generate a seemingly endless number of model graphics. The FRH messages are still useful, though, at giving a forecaster a quick glance at the raw model output, and at providing a simple way to do model comparisons for the available variables. Having the netCDF files on the system gives meteorologists another opportunity to view the raw data, given the right platform. From this came the idea for the AWIPS local application called LWX FOUS_Extractor.

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LWX FOUS_Extractor gives a forecaster a way to view raw model data from any of the available models on AWIPS. The version of the program that resides on the AWIPS Local Applications Database is set up to decode and display data from the ETA, NGM, AVN and RUC2 models, but the code of the program can be modified to add access to any other model.

While the FRH bulletins offer information for a rigid set of stations across the model domain, the LWX FOUS_Extractor program gives the forecaster a chance to look at raw data from any location he/she chooses.

The FRH bulletins provide numbers from only a small set of meteorological variables. The netCDF files that are available on AWIPS contain the entire set of model data. Thus, the LWX FOUS_Extractor program is designed to give forecasters access to a wide array of variables. The local site can configure which variables are displayed, so that if a locally-derived model has variables that are not standard in the NCEP models, the local office can still use this program to get a look at the raw data.

2. PROGRAM DESIGN & RESOURCES

The key to being able to write this program was an easy way to decode the netCDF model output files. On the AWIPS Local Applications Database, there is an application called AGRID, written by Timothy Barker (Barker 2001). AGRID is a set of Perl module routines that provide programs a way to read and write netCDF data files. AGRID must be downloaded and installed along with installation of LWX FOUS_Extractor.

The main interface for this application was written in Tcl/Tk version 8.3.2, which is readily available on the AWIPS workstations. The scripts that actually decode and organize the data are written in Perl version 5.6.

The LWX FOUS_Extractor application is available through the AWIPS Local Applications Database at: http://isl715.nws.noaa.gov/LAD . The total package for the program contains six executable scripts, two data files and two documentation files. In all, these files take up only

about 150000 bytes of disk space. Execution of this program and their associated scripts has been shown not to affect performance of other applications running on the system.

3. PROGRAM EXECUTION

The program can be run from a command line, or can be added to the System Control Menu on the AWIPS graphics workstations. When LWX FOUS_Extractor is first started, a blank user interface appears on the screen (fig. 1).

Along the left side of the interface, the user is able to use the buttons to select the computer model of his/her choice. The user must also select a location for which the data will be extracted and decoded. There are two methods for designating this point. The first is enter the latitude and longitude coordinates for the desired point. These coordinates are then fed to the scripts that decode the model data. An easier way to get the coordinates to the supporting scripts is to type in a three-letter METAR identifier. A file that accompanies the software contains a partial list of METAR identifiers and their corresponding latitude and longitude coordinates, which the program will then feed to the supporting scripts. Also along the left side of the interface, the user has the option of selecting the current run or a previous run of the forecast model. This has proven quite useful in doing run-to-run comparisons for a particular computer model.

Figure 1: Start-up screen from the LWX FOUS_Extractor application

```
OUTPUT FROM ETA 06Z AUG 28 01
TTPTTR1R2R3 VVVLI PSDDFF HHT1T3T5
DCA//925849 -0198 122407 71221811
06000915050 -0600 132808 71211811
12000583530 -2798 122706 72271913
18000554727 -0398 112406 73292113
24000747052 02599 143414 71241912
30002815843 00202 153407 70211811
36000526028 -0401 163603 70261811
42000524030 -1801 151701 71271911
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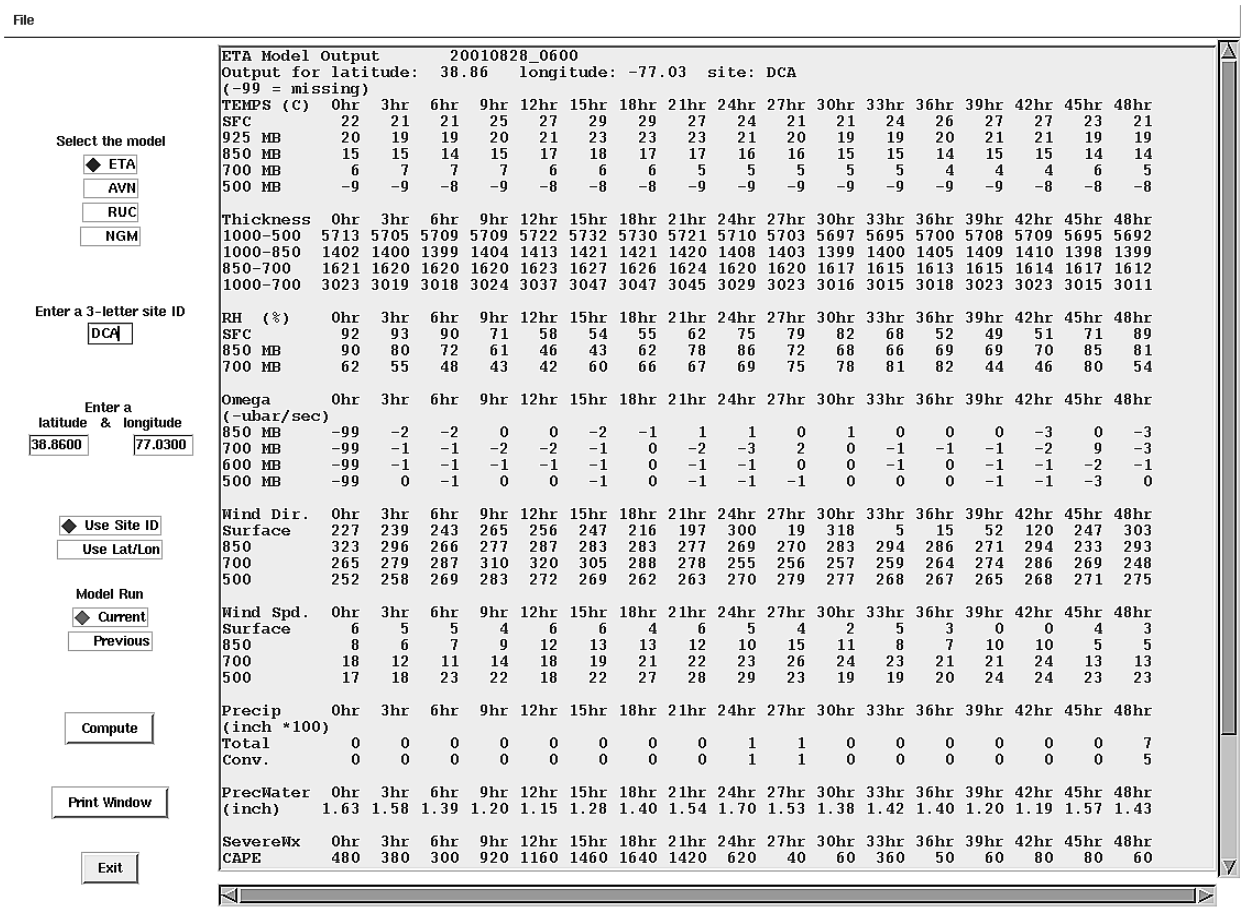

Figures 2 and 3: An example from NCEP's FRH62 Bulletin from the ETA model of 06 UTC, 28 August 2001 for Reagan National Airport (DCA), and an example of output from the same forecast model, time and station from the LWX FOUS_Extractor application.

4. PROGRAM OUTPUT

Figures 2 and 3 provide a comparison between an FRH message generated by NCEP from the ETA model and the output from the LWX FOUS_Extractor application for the same date, time and station. The FRH message from NCEP contains a limited amount of data, and the data that is available is coded so that understanding the message is not straight-forward. While an experienced operational forecaster may be able to quickly decode this message, someone without as much practice may need to seek a key to decipher the data.

The model output from the LWX FOUS_Extractor incorporates wind, temperature, lifted index, precipitation, relative humidity and vertical velocity like the FRH bulletins. However, data for these variables can be produced for any level that the model contains, giving a forecaster a more complete data set to evaluate. The output that is posted to the screen can be configured locally, so that only the most important data sets to a particular office are shown. In addition to the variables available from the FRH messages, the LWX FOUS_Extractor application can display any other variables available from the model netCDF file. Thus, fields like thickness (derived from heights), precipitable water and CAPE can be presented.

One of the nice features of this application is that it can be easily re-configured to meet an office's needs. It only takes simple modifications or additions to the code of the supporting Perl scripts to enact a change in the forecast output, and anyone with a basic knowledge of Perl should be able to make these changes in just a few minutes.

5. SUMMARY

The LWX FOUS_Extractor program was written as an enhancement to the FRH messages that are produced by NCEP for the ETA and NGM models. This application gives a forecaster access to raw model output from any forecast model available on AWIPS, as long as the data is in netCDF format. While the output from the FRH messages is limited to a fixed set of stations, the LWX FOUS_Extractor can produce output from any point in the model grid. The data provided from this application are displayed in a format that is easier to read than the code used in the FRH bulletins. The users also have configuration options with regards to what variables are displayed. Thus, in addition to the added graphics capabilities that AWIPS provides, forecasters now have a way to take a quick look through a more complete set of raw model output.

6. BIBLIOGRAPHY

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