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FX-NET FOR AIR QUALITY RESEARCH AND FORCASTING

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1.0 INTRODUCTION

The NOAA Forecast Systems Laboratory (FSL) has been actively involved with state and local air quality forecasters across the U.S. through the use of FX-Net. FX-Net is a weather forecasting workstation that provides access to operational NOAAPort data using an Internet connection. FSL has been developing this system since 1997.

Previous versions of the workstation (Madine, et al, 2002) have provided a solid, operational system that continues to expand with new tools and data sets. The most recent version of FX-Net leverages the latest AWIPS server developments to deliver a full suite of National Weather Service (NWS) data. FX-Net file server and client automatically update client menus when specialized data sets are added to the data servers.

FX-Net provides state agencies and other air quality forecasters access to an expansive tool, which can help create timely warnings and accurate forecasts. With the addition of new data sets, FX-Net has become an indispensable tool to the air-quality forecast community. FX-Net is also a valuable to air quality researchers and is used for support of numerous air quality programs.

2.0 SYSTEM OVERVIEW

The FX-Net client displays NWS data with a Java developed user interface that emulates the AWIPS D2D user interface and display capability. Products are requested during a http request over the Internet to the FX-Net servers. Improved data compression techniques, along with a multithreaded client-side processing and communication are used to overcome limited communications bandwidth. The FX-Net Client is easily installed on a desktop or laptop PC. The FX-Net server software is built based on modified AWIPS data and file servers. A single FX-Net server system can support 35 to 45 users simultaneously.

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Since the FX-Net architecture allows for the relatively easy addition of spatially related data sets, it provides researchers with a real-time environment in which experimental observing systems and model output can be evaluated, verified and modified. Examples of spatially related additions are the experimental air quality forecasts, EPA AIRNOW observational data, and university experimental air quality observations.

3.0 EPA PILOT PROGRAM

FX-Net is currently involved in a pilot program within the Environmental Protection Agency (EPA). The FX-Net Pilot Program is designed to provide a strong technical program to support the technology transfer of data delivery systems to state and local air quality forecasters. During the first phase of the pilot program, around 15 state and local agency air quality forecasters are evaluating the value of FX-Net for producing forecasts and as an air quality tool. The EPA will extend the pilot program to 60-75 users in second phase. FSL is working closely with these forecasters to improve FX-Net's capability and add any potential data sets valuable to air quality forecasting.

4.0 BENEFITS TO AIR QUALITY FORECASTERS

Through the EPA pilot program, many state and local air quality forecasters are using FX-Net to produce operational ozone and PM2.5 forecasts, discussions, and ozone action days when ozone season starts. Along with the NOAAPort data, forecasters now have EPA AIRNOW data, air quality model output (WRF/Chem, and CMAQ), and experimental air quality observations.

Increased demands on air quality forecasters to produce timely air quality forecasts forced many to spend extra time searching web sites and developing their own analysis tools to keep up with current conditions and new data sets. The automated, spatially and time matched data sets provided to FX-Net users gave forecasters more data in less time with more analysis and display flexibility. Prior to their use of FX-Net, forecasters accessed needed data from multiple web sites and online applications. With FX-Net, more time is spent on information analysis instead of information gathering.

With overlay capabilities, FX-Net is useful for looking at chemical species transport. A user can overlay model winds or station winds with actual AQ observations and determine if transport will be factor in the forecast. The capability of cross sections and time height graphics allow users to dissect the entire 3-D volume.

In addition to air quality forecasts, forecasters with the Texas Commission on Environment Quality (TCEQ) use FX-Net to make agricultural burn forecasts for different regions across the state and brief mobile monitoring crews on what the winds are going to be and if its going to rain. FX-Net is a good visual aid tool for providing others with information.

One big advantage for FX-Net is the customizability. A user can create custom color bars for graphic products to emphasize a range of values of interest, or to better visualize the atmospheric conditions. For contour products, users can change the line size or color. Additionally, FX-Net users can create procedures that allow you to load several products with the click of one button. This is useful for users who have a set of products they overlay often.

5.0 BENEFITS FOR AIR QUALITY RESEARCHERS

As a research tool, FX-Net is used by the University of New Hampshire (UNH) and Plymouth State University (PSU) as a part of the AIRMAP program. The system is the central teaching tool used by professors at PSU to teach air chemistry and meteorology courses. Data sets added to FX-Net to customize it specifically for air quality researchers include the UNH's experimental observations, the EPA's AIRNOW observations, the CAPS profilers, and the experimental WRF/Chem forecast model.

A FX-Net capability valuable to the research community is the ability to add new experimental data sets. These data sets can be used in tandem with operational data for evaluation or operational use.

During the Summer 2004 New England Air Quality Study- Intercontinental Transport and Chemical Transformation project, FX-Net was used by the NOAA researchers to forecast flight tracks, and by Plymouth State University to forecast weather conditions affecting chemical transport to provide guidance to researchers in other aircraft and aboard the NOAA ship, Ronald H. Brown.

6.0 ACKNOWLEDGEMENTS

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