J3.18 INTEGRATION OF NEW DATA SETS INTO AWIPS FOR USE IN AN OPERATIONAL FORECAST ENVIRONMENT

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1. INTRODUCTION

As technology, data communication speeds and the science of meteorology advance at an ever-increasing rate, the demand for integration of new and evolving data sets by the operational forecaster increases. From new passive and active remote sensing platforms to locally run numerical models, the operational forecasters are gaining access to many of these data sets via the Internet. Unfortunately, integrating these evolving data sets into the baseline AWIPS software builds takes time. Fortunately, the flexibility of the AWIPS software allows for the local integration of almost any new or expanded data set into the AWIPS environment.

Many groups within the National Weather Service (NWS), primarily regional and field offices, have taken advantage of broadband communications and the Local Data Acquisition and Dissemination (LDAD) component of AWIPS to ingest these new data sets. The NWS Forecast Office in Upton, NY (OKX) and Eastern Region Headquarters (ERH) have worked together to integrate a few of these new data sets into AWIPS in support of both operational and collaborative research activities. These local activities have included:

- Local real-time runs of NCAR / Penn State Mesoscale Model (MM5) (Colle et al. 2001).
- Scatterometer derived wind fields (Weissman et al. 2001).
- Surface mesonet observations collected from the Internet (Gaddy 2000).

2. INTEGRATION OF MESOSCALE NUMERICAL MODEL DATA

Advances and improved capabilities, along with the reduced cost of computer processing, has allowed for near real-time numerical model simulations on smaller and smaller scales. The State University of New York at Stony Brook (SUNYSB) recently began production of multiple real-time nested forecast integrations of the MM5. The MM5 nested forecast grids have horizontal resolutions of 36, 12 and 4 km. The Eta model forecast grids are used for boundary conditions. Additional forecast integrations are performed using the Aviation model forecast grids as boundary conditions and by varying the convective parameterization scheme used in the 36- and 12-km forecast grids.

Originally, the movement of the approximately 100 megabyte-sized files for each grid for each separate from SUNYSB to OKX via the Internet became a problem. Despite T1 and T3 connectivity, Internet routing slowed transfer rates to the point where the transfers would time out. This made the timeliness and reliability of the new data sets initially unusable in the operational environment. Through perseverance, the connectivity problems were resolved, but it still took many months for the operational forecasters to trust and assimilate MM5 data into the forecast process.

The operational use of high-resolution models, such as the MM5 allows forecasters to expand and verify the mesoscale conceptual models are used in forecasting. Mesoscale features such as land-sea breeze circulations are being resolved in the MM5 forecast grids and the effects of surface roughness and terrain appear much more evident as model resolution increases. For example, as seen in figure 1, the 4 km horizontal resolution of the SUNYSB MM5 run shows the affect of surface roughness by depicting higher wind speeds over water on the local forecast scale.

3. SCATTEROMETER DATA

Remotely sensed high-quality surface winds are available over the world's oceans from SeaWinds,, the latest scatterometer launched by NASA aboard the QuikSCAT satellite. Its wide swath (1,800 km) and high resolution (25 km within the swath)

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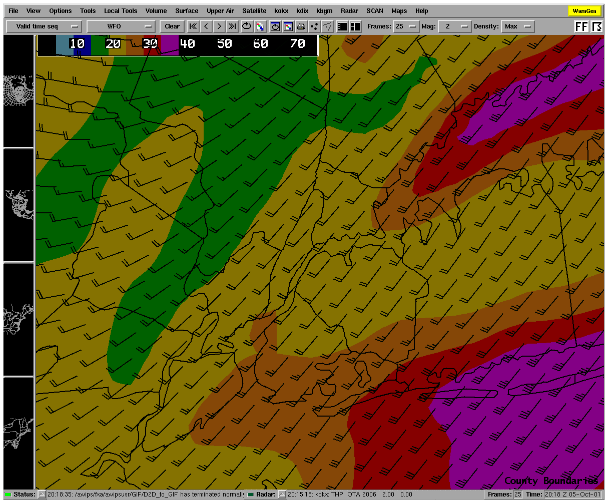

Figure 1. Example of real-time SUNYSB MM5 4- km horizontal resolution surface wind plots and contoured wind speed image (knots) over the New York City, NY Metropolitan area.

provide valuable observations of wind speed and direction over the data-sparse oceans. Through a collaborative effort between OKX, Hofstra University and the Center for Ocean-Atmospheric Prediction Studies (COAPS), these data are now being ingested and plotted in AWIPS.

Scatterometer-derived surface winds are currently only available twice a day, yet the data provide previously unavailable details in the surface wind field (Fig. 2). These new data greatly complement convectional data sets and are useful in resolving and validating mesoscale features that numerical models predict. For example, in November 2001, the Eta model will have a horizontal resolution of 12 km.

Future models, such as the Weather Research and Forecast model, will run at resolutions of 1 km or perhaps less. With higher and higher model resolutions, mesoscale features such as the intensity of the coastal low off the mid-Atlantic coast seen in figure 3 as forecast by the experimental 10 km Eta would be near impossible to validate using conventional ship and buoy data.

It is envisioned that ingest of scatterometer data will become a baseline AWIPS data set in the near future. In addition, scatterometer data will become a key data set for the AWIPS Local Analysis and Prediction System.

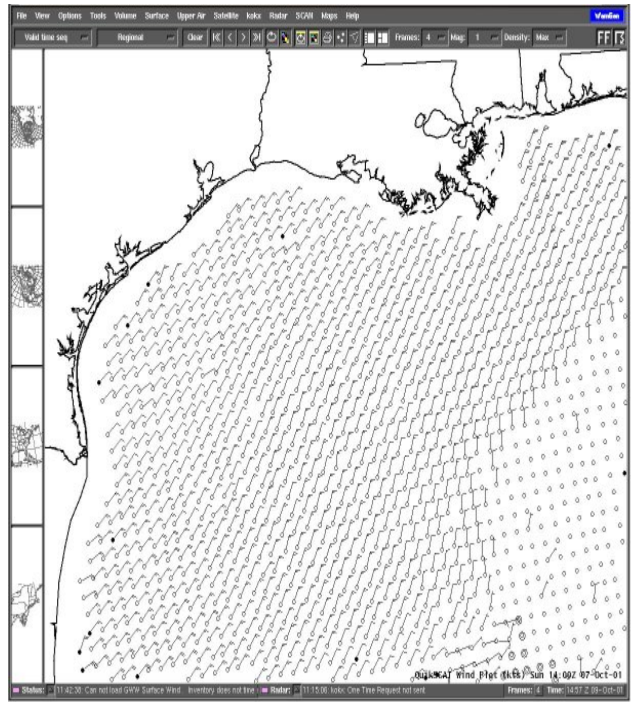

Figure 2. Example of near real-time scatterometer winds ingested and displayed by AWIPS.

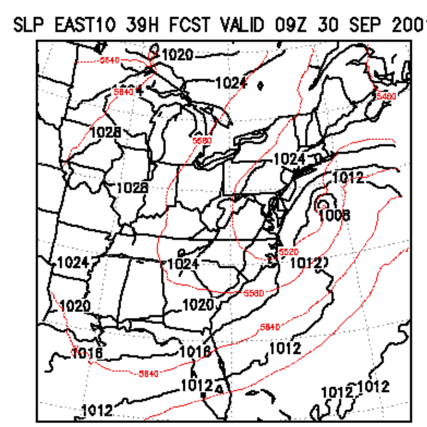

Figure 3. An example of 10-km horizontal resolution experimental NCEP Eta sea-level pressure (mb) forecast showing mesocale detail on Sept 30, 2001.

4. WEB-BASED MESONET DATA

There is an abundance of surface observations available via the Internet not routinely utilized by the operational forecaster. These include data from automated observation equipment operated by various local, state and federal government agencies, schools, commercial companies and private individuals. It would be impossible for a forecaster to evaluate and integrate all these data into the forecast process due to the time

involved to "visit" via the Internet and assimilate each individual station.
To gather these diverse sets of surface observations available via the Internet, ERH and OKX formulated a partnership with SUNYSB to develop a program to automatically collect these data (Gaddy 2000). Using the Python programming language, a program was developed to automatically visit web sites and strip out the pertinent weather parameters. These data are then compiled into a comma delimited format for ingest into AWIPS.

The number of surface weather stations available on the web is generally a function of population density. Currently, the number of stations in the New York City area is approximately five to ten times the number of the relatively dense Automated Surface Observing Systems (ASOS). An example of these data from local mesonets is seen in figure 4.

While data from these stations are generally inferior in accuracy to ASOS and contain erroneous data due to site location problems and a lack of calibration, they are still useful to the forecast and verification processes. With additional effort and time, data from the mesonets could be improved with calibration checks. Also, software could be developed to account for site location problems. To date, the temperature and rainfall data from the mesonets have proved more valuable; as dew point and, particularly, pressure data is more erroneous.

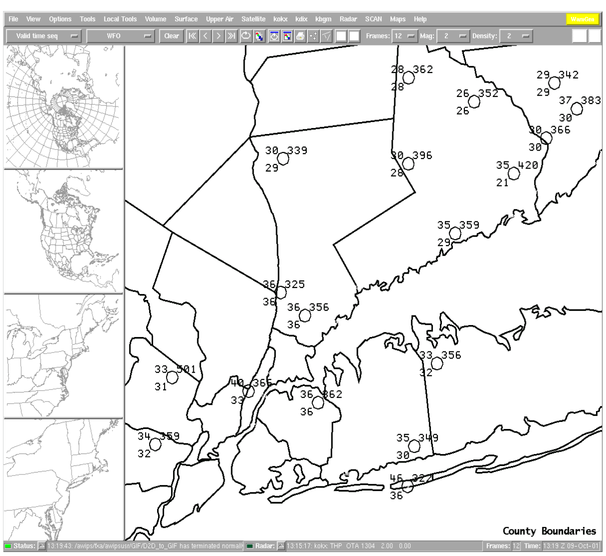

Figure 4. Example of mesonet surface observations available from the Internet and plotted in AWIPS.

5. CONCLUSIONS

The integration of new data sets into AWIPS for use by the NWS field offices and National Centers will continue given the flexibility of the AWIPS software. The ingestion of these data into AWIPS will allow for additional new discoveries and improved forecasts.

It is imperative for these new data sets to be both reliable and timely for successful integration into the forecast process. Even the most robust new data set will fail if it is not timely and routinely available to the operational forecaster.

The use of new data sets such as those discussed here are also allowing for new partnerships to form between the operational, research and private meteorological communities. Continued use and expansion of these partnerships will benefit all involved.

6. ACKNOWLEDGEMENTS

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7. REFERENCES

Colle, B.A., J. Olson and J. Tongue, 2001: Evaluation of high-resolution MM5 and Eta forecasts over the northeast United States. *9th AMS Conference on Mesosacle Processes*, 30 July – 3 August 2001, Fort Lauderdale, Florida.

Weissman, D.E., J. Tongue and M. Bourassa, 2001: Utilization of satellite scatterometer wind measurements and NEXRAD precipitation data to improve regional ocean forecasts. *18th AMS Conference on Weather Analysis and Forecasting*, 30 July – 3 August 2001, Fort Lauderdale, Florida. pp 278-282

Gaddy, J., 2001: Collecting automated weather data from the Internet and displaying it in D2D. *NWS Eastern Region AWIPS Technical Note,* **5.0-27,** http://www.werh.noaa.gov/ssd/erps/atn/atn5_0-27.pdf