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JP1.3 VISIT INTEGRATED SENSOR TRAINING: USING AWIPS SATELLITE PRODUCTS AND CAPABILITIES

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1. INTRODUCTION

This paper describes the recent training efforts of the Virtual Institute for Satellite Integration Training (VISIT). The VISIT project -- with its emphasis on distance learning -- was developed to provide cost-effective training for the National Weather Service (NWS) operational weather forecaster in the Advanced Weather Interactive Processing System (AWIPS) era.

The NWS has undergone many changes as new remote sensing systems and analysis workstations have been deployed. One of the most dramatic changes has been the increased satellite data utilization and new satellite products. To address the resulting training needs, the National Environmental Satellite, Data, and Information Service (NESDIS) and the NWS have established the VISIT. The VISIT has produced computer-based learning modules to highlight imagery and products from the Geostationary Operational Environmental Satellites (GOES). In addition, interactive teletraining materials addressing the integrated use of data sources in the NWS Warning and Forecast Office (WFO) environment have been developed. The content from VISIT has been integrated into the overall NWS Professional Development Series (PDS) training structure. In general, PDS efforts are directed at job-specific performance objectives and organized under one "umbrella" (Lamos, 1997). The Integrated Sensor Training PDS is directed at the efforts to combine information useful to forecasters throughout the range of space and time scales. This paper summarizes recent teletraining sessions as examples of the success that VISIT has demonstrated with interactive distance learning.

2. SPECIALIZED SOFTWARE FOR DATA INTEGRATION TRAINING AND STUDIES

VISIT learning materials have been developed on Internet web sites to allow ready access to these training materials. In an effort to provide improved functionality for interactive learning sessions, many of the current capabilities have been collected into an Internet-based distance learning application called VISITview (Whittaker, 1999).

Typically, AWIPS graphics are captured to illustrate integrated data usage and display concepts. When possible, various AWIPS utilities and capabilities are used and shown. For instance, use of previously-developed satellite and radar color tables, display procedures, window configurations, load modes, feature tracking, and volume display capabilities have been shown during the training sessions.

3. RECENT TRAINING

A number of training sessions were offered in 2001 using AWIPS graphics with the VISITview interactive training software. A complete list of training sessions, including web-based versions and talking points, can be found on the VISIT homepage at http://visit.cira.colostate.edu

Training sessions taught during 2001 included:

1) Diagnosing the Potential for Surface Boundaries to Initiate Convection,
2) QuikSCAT Winds,
3) Lake Effect Snow,
4) Using AWIPS to Evaluate Model Initializations/00 HR Forecasts,
5) An Ingredients-based Approach to Forecasting Winter Season Precipitation,
6) Lightning Meteorology I,
7) Precipitation Type Forecasting,
8) Using Near-storm Environment Data in the Warning Decision Making Process,
9) GOES Sounder Data and Products,
10) GOES High Density Winds,
11) Mesoscale Analysis of Convective Weather Using GOES Rapid Scan Imagery, and
12) Forecasting Mesoscale Convective Systems

The following sections will briefly summarize these training sessions.

3.1 DIAGNOSING THE POTENTIAL FOR SURFACE BOUNDARIES TO INITIATE CONVECTION

The goal of this session is to acquaint forecasters with AWIPS tools which can be used to objectively analyze and assess the most relevant boundary characteristics which are considered influential in initiating deep moist convection. The forcing in and near boundaries is shown to be related to the potential for convective initiation in, along and near the boundaries. Advanced topics in boundary analysis are examined with a goal of producing a better short-term convective forecast. Forecasters are shown a variety of examples from across the United States and are asked to determine:

1) which boundaries (or parts of boundaries) are important,
2) the effects of boundary-relative flow, and
3) where new convection will form.

AWIPS data sets used include radar data, rapid scan GOES satellite imagery, surface, and other data. Of particular interest is the use of different radar base data/products to detect boundaries and their characteristics.

3.2 QUIKSCAT WINDS

The goal of this teletraining session is to review the availability and use of QuikScat wind data in (and out of) the AWIPS environment. The training covers basic satellite and sensor characteristics as well as the usage of the wind retrievals. The QuikSCAT data are also compared with model and observed data to show differences. Factors which may affect the quality of the wind retrievals (such as heavy rain) are also discussed. This data is available via the AWIPS Local Data Access and Dissemination (LDAD) system or via the Local Data Manager (LDM). At this writing, QuikSCAT data were not available via the AWIPS Satellite Broadcast Network (SBN).

3.3 LAKE EFFECT SNOW

The goal of this session is to present a comprehensive introductory treatment of Lake Effect Snow (LES) events. Case studies from the eastern and western Great lakes are used to demonstrate the theoretical and practical LES forecasting issues. Synoptic, mesoscale and microphysical aspects of LES events are discussed. Operationally-available data and imagery show the various types of LES bands using both GOES, Polar Operational Environmental Satellite (POES) imagery, and Doppler radar. Lake surface temperatures and the role of the coastline are among other aspects covered in this training.

3.4 USING AWIPS TO EVALUATE MODEL INITIALIZATIONS OR 00 HR FORECASTS

The goal of this session is to review the current use of satellite and other data in the critical model initialization evaluation step of the forecast process. This highly-interactive training session leads forecasters to critically examine what they do to evaluate model output/guidance. Because of the time lag after data cutoffs in availability of new numerical model output, using new data and updating forecasts in the intervening period can be very important when trying to meet operational forecasting deadlines. Winter snowstorm data are used to show the importance of identifying model errors and tracking them with time. Important findings in recent literature, research being done at NCEP, and the NESDIS Advanced Satellite Products Team showed the impact that GOES sounder data can have on such events. The sensitivity of operational data assimilation systems to different data sources is also shown and discussed. The use of satellite imagery interpretation, NCEP products, and newly-available GOES sounder multi-channel water-vapor imagery are used to show continuing model errors in the day previous to the actual snowstorm event. Successfully diagnosing these errors in the model guidance were the key to forecasters being able to successfully forecast this high-impact weather event. GOES sounder Derived Product Imagery is now available via the AWIPS SBN. Individual sounder channel imagery is also available via LDAD/LDM.

3.5 AN INGREDIENTS-BASED APPROACH TO FORECASTING WINTER SEASON PRECIPITATION

The goal of this session is to review the basic ingredients involved in winter season precipitation events. The ingredients include forcing, instability, moisture, precipitation efficiency, and temperatures. The diagnostics which have been found useful in revealing these ingredients are shown. Analysis scripts are employed in the GEMPAK and AWIPS environments for a variety of winter precipitation events. Differences between GEMPAK and AWIPS diagnostic capabilities are also presented and discussed.

3.6 LIGHTNING METEOROLOGY I

This session examines thunderstorm electrification and cloud-to-ground lightning activity in isolated thunderstorms and mesoscale convective systems. Cloud-to-ground lightning is shown to be useful in monitoring the thunderstorm lifecycle and inferring rainfall location and intensity (both convective and stratiform). Basic understanding of the ice-ice charging mechanism, identifying minimum thresholds in vertical reflectivity structure and cloud-top temperature associated with CG lightning, use of lightning polarity, and integration with other data sets are all covered. All displays used show AWIPS lightning displays with other AWIPS data sources.

3.7 PRECIPITATION TYPE FORECASTING

This session examines the use of operationally-available data sets for use in determining current and forecasted precipitation types. A review of microphysics and operationally-useful techniques are covered. Participants responded with very favorable reviews and requests for encore presentations. This very popular training was unanimously-rated as excellent and the most-operationally-relevant to forecasters. Participants are tested at the end with a graphical exercise to reinforce the theoretical and practical concepts covered in the training.

3.8 USING NEAR STORM ENVIRONMENT DATA IN THE WARNING DECISION MAKING PROCESS

This session covers the increasing array of graphical data sets to analyze the mesoscale environment with AWIPS. Issues such as determining which fields or parameters are most important, the possibility of becoming radar-centric in perspective, and the use of the Local Analysis and Prediction System (LAPS) are among the topics covered. Analyzing mesoscale data with systems such as LAPS can help reduce false alarms by enabling the warning forecaster to distinguish between favorable and unfavorable environments for severe storms.

3.9 GOES SOUNDER DATA AND PRODUCTS

This session covers an introduction to the GOES Sounder instrument, data, and products. Derived Product Imagery (DPI) have recently become available to the NWS in AWIPS. The product generation and applications to operational forecasting are shown. While this material has been covered in classroom training in the past, there have been several changes since earlier versions of the product and related training.

3.10 GOES HIGH-DENSITY WINDS

This session covers the basic techniques used to generate the GOES High-Density Winds. Some NWS offices currently ingest the GOES winds into their AWIPS systems. Other aspects of the data including the target selections, height assignments, quality control, and sources of error are covered. The display of the winds on AWIPS is also explained so that they may be used correctly with other types of observations or model output.

3.11 MESOSCALE ANALYSIS OF CONVECTIVE WEATHER USING GOES RAPID SCAN OPERATIONS IMAGERY

This session continues where previous

training ended. It focuses on the use of GOES visible imagery and other data sets in the short-range forecast, nowcast, and warning decision-making processes. Among the topics covered are the complementary use of radar and satellite imagery, identification of boundaries in the pre-storm environment, importance of GOES Rapid Scan Operations for convective initiation, and satellite interpretation for severe convection.

3.12 FORECASTING MESOSCALE CONVECTIVE SYSTEMS

This session presents some of the key characteristics of Mesoscale Convective Systems (MCS). These include MCS initiation, synoptic scale pattern recognition and parameter evaluation, precipitation distribution and movement. The objectives of this teletraining class are to illustrate how forecasters can better predict MCS development and evolution. The training can help forecasters anticipate potential heavy rain situations and severe thunderstorm development often associated with MCS events. This training includes an exercise which uses AWIPS ETA displays, Rapid Update Cycle (RUC) displays, AWIPS radar composited displays, Interactive SKEW-T analysis, and LAPS, lightning plots and surface data.

4. CONCLUDING REMARKS

The VISIT has been using AWIPS case studies to develop interactive learning opportunities for the NWS PDS on Integrated Sensor Training. Although AWIPS configurations can vary by NWS region and office, new data can be added at the office, regional and national levels. As new products and capabilities are added, VISIT seeks to provide education and training opportunities for operational forecasters.

Significant interaction with NWS staff takes place during the development/instruction of these training sessions. We look forward to continuing those interactions. The Integrated Sensor Training/VISIT team also plans to facilitate training developed at WFOs to assist in the expansion of distance learning efforts.

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