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1. INTRODUCTION

Since the deployment of the Weather Event Simulator (WES) (Ferree et al. 2002) to National Weather Service (NWS) offices in fall of 2001, forecasters have been able to review historical case studies using the Linux version of the Advanced Weather Interactive Processing System (AWIPS) Display 2-Dimensional (D2D) software (Davis et al. 2001). Science and Operations Officers (SOOs) within the NWS have taken advantage of the supporting WES hardware configuration to integrate Display 3-Dimensional (D3D) software into their local training and research activities. This software has allowed forecasters to interrogate the 3-D characteristics of meteorological datasets and to examine and evaluate conceptual models associated with weather phenomena.

The D3D software provides a way to view gridded numerical weather prediction model data in three dimensions by using Vis5D technology with an interface similar to that of AWIPS D2D (McCaslin et al. 1999).

WES capability has been used extensively in laboratory exercises in the [Cooperative Program for Operational Meteorology, Education and Training \(COMET\)](#) classroom. Students in the 2002 COMET Mesoscale Analysis and Prediction Course (COMAP) used D3D with D2D for their research projects and other classroom activities. Lessons learned during these projects have been shared with other NWS offices in an effort to explore ways of best utilizing the software.

2. INTEGRATING D3D INTO COMET CLASSROOM

The COMET classroom has been designed to support laboratory exercises during residence courses (Spangler et al. 1994). Classroom hardware and software have evolved with the science and training needs of the operational meteorological community. Laboratory equipment now includes both UNIX and Linux workstations for efficient playback of case study data.

During the COMAP 2002 course, both AWIPS D2D and D3D were made available to students and

integrated into laboratory exercises. The availability of Linux workstations facilitated the use of D3D software, which performs well on the faster Linux workstations.

Each day during the course, selected students prepared a real-time forecast for discussion. Many students took the opportunity to use D3D during these presentations to bring a three-dimensional view to the current meteorological situation and to illustrate concepts discussed in class, which allowed for immediate application of the course material to real-time weather.

The COMAP students reviewed archived cases during the various laboratory exercises. Combinations of D2D and D3D perspectives were examined, which allowed the students to build upon conceptual models of atmospheric features and patterns covered during lecture. A good example of visualizing a conceptual model using D3D is the trowal (trough of warm air aloft) airstream (Martin 1999), which is evaluated using the airflow along a surface of equivalent potential temperature wrapped around an extratropical cyclone (see Figure 1).

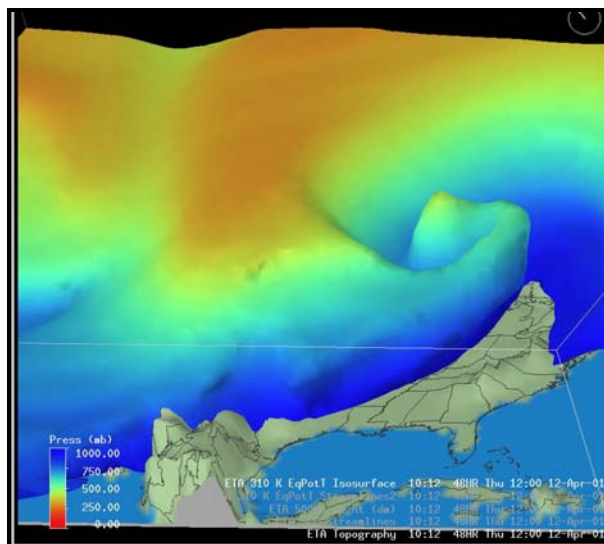


Figure 1. D3D view of Eta model 310K equivalent potential temperature isosurface from 12 UTC on 12 April 2001. The image is colored according to pressure.

Another part of the COMAP course required the students to develop a research project by working with a

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scientific mentor. Many of these mentors are associated with NOAA and NCAR or UCAR and located in Boulder. These projects gave the students another opportunity to use D3D.

3. USES OF D3D IN NWS OFFICES

Although many NWS offices have obtained the D3D software (see Figure 2), active use of D3D is still evolving. SOOs have found D3D can be a valuable tool in both local training and research activities.

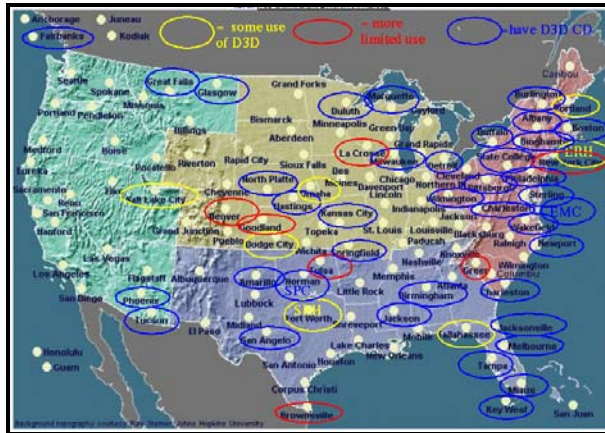


Figure 2. Offices with D3D software onsite.

Some offices also use D3D in pseudo real time. The software has been loaded on a Linux PC and placed in the operations area. Forecasters use the opportunity to view model data in D3D to help evaluate the synoptic situation. D3D is especially useful in focusing on critical areas within the office's responsibility that can then be interrogated in greater detail using D2D. For instance, D3D can be used to view the jet stream in three dimensions (see Figure 3) and to determine the most appropriate 2-D level to examine further (see Figure 4). Figures 3 and 4 show the jet stream depiction from the Eta model at 18 UTC on 11 April 2001 during an outbreak of tornadoes over Iowa (Nietfeld 2003).

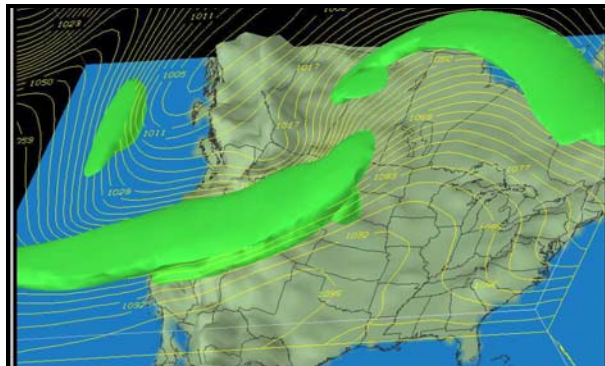


Figure 3. D3D view of Eta model 100-knot wind isosurface and 250 hPa heights at 18 UTC on 11 April 2001.

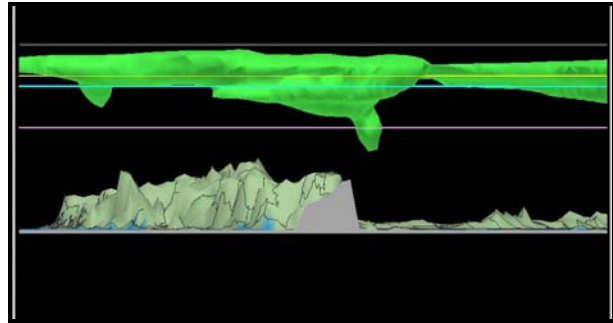


Figure 4. Same as Figure 3 except looking north. Note the solid yellow horizontal line is the 250 hPa line, the cyan line is the 300 hPa line, and the purple line is the 500 hPa line.

Many forecasters using D3D have had experience with Vis5D as university students. SOOs have also started introducing 3-D depictions of events in office training exercises. They have found D3D helpful in illustrating conceptual models and in teaching new forecasting techniques. D3D has also been utilized in reviewing past events.

4. STEPS TO EXPAND USE OF D3D

Currently, COMET distributes case study data in support of the WES (Kieissling 2001). Since D3D uses the same data structure as AWIPS, cases built for WES can also be viewed in D3D (Nietfeld 2003). Several cases have been developed and distributed nationally by COMET, and individual forecast offices have begun building and sharing data from locally archived events. To facilitate the use of D3D on WES cases, support pages will be added to the WES page on the [SOO Science and Training Resource Center \(SOO/STRC\)](#).

Simulation guides are produced to support the use of WES cases in NWS offices (Magsig and Page 2003). In future guides, examples of using D3D will also be included to encourage use of the software in the training environment.

Future plans include developing a graphical user interface (GUI) to integrate D3D with D2D and the WES software to simplify the use of case study data.

5. SUMMARY

D3D software is available to NWS offices, and many have begun incorporating it into training, research, and in some cases, operational forecasting activities. The COMET classroom has provided the opportunity for SOOs to experiment with the software to find applications to their office activities. NWS offices have downloaded the software and use it with archived AWIPS data. These cases include locally archived events as well those distributed in support of WES.

6. ACKNOWLEDGEMENTS

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7. WORLD WIDE WEB LINKS

Display 3-Dimensional (D3D) Software

<http://d3d.fsl.noaa.gov/>

Weather Event Simulator

<http://www.comet.ucar.edu/strc/wes/>

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