18B.1 NEW TRAINING COURSE ON USE OF NWP IN FORECAST OPERATIONS

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1. INTRODUCTION

The Cooperative Program for Operational Meteorology, Education and Training (COMET®) Program has been developing forecaster training on numerical weather prediction (NWP) for ten years (e.g., see Bua and Jascourt (2005), Jascourt and Bua (2004) and references therein). COMET training on NWP is free and available online. Most items are listed on the MetEd web page at http://meted.ucar.edu under the topic "NWP".

In recent years, the COMET Operational Model Matrix at http://meted.ucar.edu/nwp/pcu2 and other COMET training, such as webcasts (see http://meted.ucar.edu then select NWP from the topics menu) and VISITView teletraining (see http://rammb.cira.colostate.edu/visit/topic_nwp.html) on the ensemble forecast systems and on the National Centers for Environmental Predication (NCEP) North American Mesoscale Model (NAM) transition from Eta to the Weather and Research Forecast (WRF) – Nonhydrostatic Mesoscale Model (NMM), among others, helped translate model changes into the context of the field forecaster, facilitating better use of the models.

However, most of this training has focused on particular models, model changes, and new model products. Some of the details on general NWP have become outdated, though many of the principles presented still hold. More importantly, NWP training is needed to integrate the suite of models and products together in the context of the forecast process, rather than focusing on specific models or types of products.

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Meanwhile, National Weather Service (NWS) forecasters now create grids of sensible weather forecasts at 5-km or 2.5-km grid spacing. The application of NWP products has been correspondingly extended from conceiving of the forecast to using a grid editor to create the forecast, but our training has until now considered the former to be the endpoint. Good scientific practice would not allow the mechanics of the gridded forecast process to drive how model data are utilized in creating a forecast. Nonetheless, training must extend through the creation of the end product in order to optimize the use of NWP in the final forecast.

These factors led NWS to prioritize development of a new forecast training course on the effective use of NWP in the forecast process. This article focuses on the contents and development of this new course. A needs assessment survey conducted to identify more precisely what the course should contain is described in our companion article in this preprint (Jascourt and Bua 2009).

2. COURSE ORGANIZATION

We followed the NWS Warning Decision Training Branch (WDTB) Advanced Warning Operations Course – Winter Track design (Winter AWOC; see http://www.wdtb.noaa.gov/courses/winterawoc/index.html for course description and links to webcast lessons), with an overarching structure of instructional components (ICs), based on groupings from the needs assessment survey. Each IC was broken down into topical lessons covering relevant aspects of NWP recommended by the needs assessment survey participants.

Lessons are provided mostly by subject matter experts (SMEs) who volunteered through the needs assessment survey. Each lesson has a few essential learning objectives, to which lesson content must adhere. These have been developed by the SMEs in

consultation with COMET staff, including instructional designers.

To facilitate their use in WFO and other training, each IC is a self-contained module with a logical progression of webcast lessons and related small Weather Event Simulator (WES) cases. Each lesson will be short enough (one hour of less) to accommodate the scheduling demands of a typical NWS or similar forecast operation.

An additional feature of the course organization is its structure, which allows the "plug in" of new training content. As new NWP models and forecast methods become operational, this structure should be able to accommodate the new information without requiring major course renovations.

3. COURSE CONTENT

The first IC will be an **introduction and orientation** to the course itself. Included will be an explanation of the course motivation, rationale and purpose; course structure and navigation via the course interface; how to obtain course credit through the NWS Learning Management System (LMS); and other relevant items.

The second IC (IC2), Overview of NWP Models, contains basic model content from the previous NWP course, both for deterministic and probabilistic NWP. This content is being reviewed and shortened to allow it to better fit into forecast office training schedules. Also, information on current NWP model and ensemble forecast system (EFS) infrastructure will reside in IC2, in the Operational Model and Ensemble Forecast System Matrices. These are organized and periodically updated for quick reference to current NWP and EFS model architecture. Training material on new applications using emerging tools, such as bias-correction of model output, model downscaling, and high-resolution modeling will appear in this section as well.

IC3, NWP in the Forecast Process, contains all new material and will illustrate through webcast lessons and small WES cases where NWP fits in a defined forecast process. Development of this IC is taking place during the 2009 Fiscal Year. The first lesson presents an overview of NWP in the forecast process itself, and brief NWP examples for each element to introduce the students to the process. **Lesson 2, Preparing to Evaluate NWP Models and Forecasts**, will discuss diagnosis of the current atmospheric state, forecast problem(s) of the day, and expected atmospheric flow evolution, ***before*** assessing the model forecast. In **Lesson 3, Analysis and Model Initialization** (12-24 hour time frame) elements of Lesson 2 are applied to the model forecast, and diagnostic techniques, the impact of bad initial conditions on a NWP forecast, and limitations in using model analysis beyond 12-to-24 hours are described. **Lesson 4, Determining Plausible Forecast Outcomes**, uses NWP model physics, EFSs, and recent model performance as elements of a strategy to determine what forecast outcomes are both plausible and most likely. **Lesson 5, Optimizing the Use of Model Data Products**, will identify possible underutilized NWP products, and describe the strengths and limitations of those products. In **Lesson 6, Understanding the Role and use of Deterministic versus Probabilistic NWP Information**, deterministic versus probabilistic NWP products will be compared and contrasted, along with the strengths and limitations of such probabilistic products. Finally, **Lesson 7, Recognizing Where and When the Human Can Add Value to NWP**, will discuss opportunities where the human forecaster can improve on NWP products in their forecasters, and where it might be best to go with the forecast and not waste effort on attempting to make improvements where success is unlikely (or unimportant). There will be a WES case that integrates places all seven lessons into the forecast process.

4. COURSE NAVIGATION AND STYLE

One of the requirements in the needs assessment survey was for ease of use for the new NWP Course. To that end, we will design a navigation page that will allow the user to:

- Find desired content quickly
- Leave a placeholder so that the student can start easily from where s/he left off

- Work across multiple browser types

There will be a consistent "look and feel" across all lessons and ICs to help the student feel comfortable in the virtual learning environment.

5. FUTURE ADDITIONS TO NWP COURSE

Beyond the 2009 fiscal year, **IC4, NWP in the IFPS Era**, including lessons on using NWP in gridded digital guidance will be developed. Additionally, IC5 will examine Specific Topics in NWP, including use of NWP in complex terrain, land/sea interfaces, convective situations and so on.

The development of AWIPS2 and its implementation is also expected to result in a big need for training. In particular, forecasters will be choosing to pull in NWP data rather than having it pushed at them in the new AWIPS system. As a result, there will be a need for training development and delivery on what data (out of the huge amounts available) is most useful to deal with the forecast problems of the day.

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7. REFERENCES

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