3.5 THE COMET PROGRAM AND THE U.S. DOD:
A MODEL PARTNERSHIP IN METEOROLOGY EDUCATION

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1. INTRODUCTION

The Cooperative Program for Operational Meteorology Education and Training resides within the University Corporation for Atmospheric Research (UCAR) to serve as a training and education bridge between meteorology research and operations. Since our inception in 1989, The COMET Program has had continuous sponsorship from both the Naval Meteorology and Oceanography Command and the Air Force Weather Agency. More recently, we have also partnered with the Naval Technical Training Unit (NTTU) to create meteorology educational materials to benefit their meteorology school at Keesler Air Force Base (AFB) in Mississippi.

Forecasters in our sponsor communities are expected to complete continuing education training to assist them in improving their forecasts as they strive to meet the high expectations held by users of weather information. The global nature and all-season precise forecast, demands placed on military forecasters can be a tremendous challenge for any meteorologist. Commensurately, the need for state-of-the-art mesoscale meteorology training is equally important.

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2. THE MESOSCALE PRIMER PARTNERSHIP

For several years both the Navy and Air Force have been specifically teaming with COMET employees to create a focused training series on mesoscale meteorology topics. This Mesoscale Meteorology Primer, originally conceived by instructors in the U.S. Navy and Naval Postgraduate School (NPS), is a multimedia Web-based training program designed to improve mesoscale weather predictions made by U.S. military forecasters.

Operationally, military forecasters are adept at accessing and comparing results from mesoscale model output including the Navy's Coupled Oceanographic and Atmospheric Mesoscale Prediction System (COAMPS), the Air Force's application of the NCAR/Penn State Mesoscale Model (AFWA MM5), and the National Weather Service Eta or the Rapid Update Cycle (RUC) models. However, what is missing is an in-depth understanding of mesoscale forcing, terrain interaction and model performance issues. It is for this reason that the Mesoscale Primer effort emphasizes mesoscale processes, model interpretation, and making use of high-resolution satellite imagery and products.

All the training materials in the Mesoscale Primer are freely available to the world via the MetEd Website, at http://www.meted.ucar.edu as well as through the Mesoscale Primer page at http://meted.ucar.edu/mesoprim/index.htm. The

Navy also makes these modules available to Navy forecasters through the Navy E-Learning network. Complementary numerical weather prediction training on both the AFWA MM5 and COAMPS models (and many others) may be found in the Web-based "Operational Models Matrix" at http://meted.ucar.edu/nwp/pcu2/launpcu2.htm.

A team of COMET, Navy, and Air Force personnel as well as members of the academic community are typically involved in creating the content for the Mesoscale Primer modules. Special emphasis is placed on having the most recent scientific understanding possible, actual military model datasets, and explanatory visuals and animations for all topics covered. Accomplishing this at a distance can be quite a challenge. Regular conference calls and extensive use of e-mail is used to keep the ambitious production and review cycle for all the primer modules moving forward.

The modules that comprise the Primer are designed in two main types: 1) short conceptual foundation modules and 2) longer, more elaborate modules that address specific mesoscale weather phenomena. The longer core modules all contain a forecast scenario and an exam. All the primer modules are produced in two formats. The main presentation of each topic is accomplished by a Web-based multimedia version that features accompanying audio. However, to meet other needs, each module is also available as a stand-alone print version.

The shorter conceptual foundation modules provide essential elaboration on important aspects of mesoscale meteorology deemed necessary to delve further into each of the core topic areas. Published foundation modules as of fall 2003 include:

- Definition of the Mesoscale
- Flow Interaction with Topography
- Thermally-Forced Circulation I: Sea Breezes
- Thermally-Forced Circulation I: Mountain/Valley Breezes
- Principles of Convection 1: Buoyancy and CAPE

As previously mentioned, the longer core module topics cover a tremendous variety of mesoscale phenomenon and hazards. They each include a realistic forecast scenario to challenge and motivate the students. Subjects covered to date range from forecasting the significant coastal phenomenon of coastally trapped wind reversals to the obviously relevant challenge of forecasting dust storms.

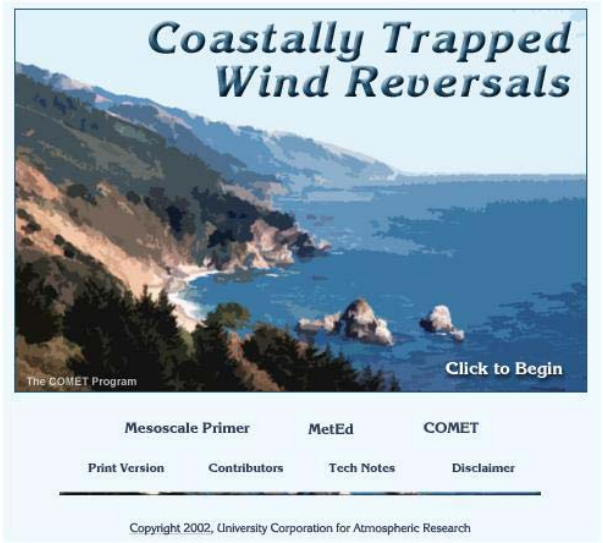

Figure 1. The launch screen for the module on coastally trapped wind reversals available at http://meted.ucar.edu/mesoprim/ctwr/index.htm.

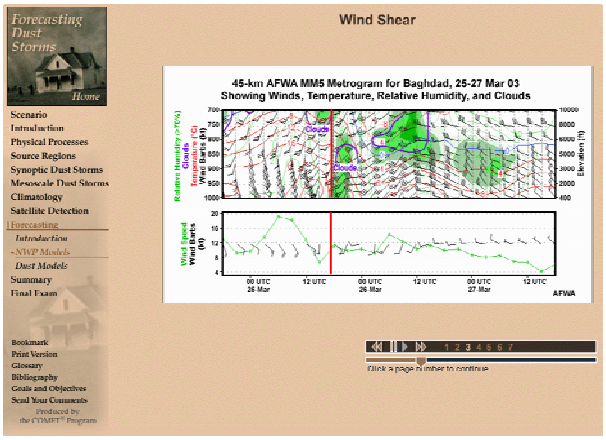

Figure 2. An internal screen from the *Forecasting Dust Storms* module discussing model performance during a dust event in Iraq. The module is available at http://meted.ucar.edu/mesoprim/dust/index.htm.

Published topics as of fall 2003 include:

- Forecasting Radiation Fog
- Coastally Trapped Wind Reversals
- Cold Air Damming, and
- Gap Winds
- Forecasting Dust Storms

Because of their global importance in forecasting the weather in often otherwise data void regions, the primer is also making available a special series of satellite-focused modules appropriate to other primer topics.

Published modules in this area as of fall 2003 include:

- Feature Identification from Environmental Satellites
- Feature Identification Exercises: Clouds, Snow, and Ice Using MODIS
- Determining Visibility, and
- Dust Enhancement Techniques Using MODIS and SeaWiFS

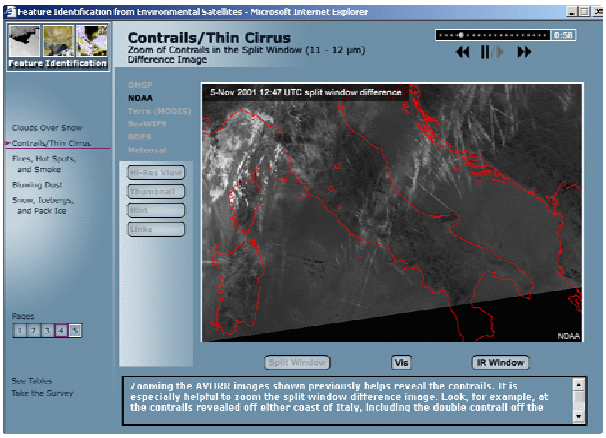

Figure 3. Internal page from the *Feature Identification from Environmental Satellites* module featuring Tom Lee. This module is available at http://meted/npoess/nrlsat/index.htm.

Although the Mesoscale Primer materials are designed to be appropriate for military forecasters, we also find strong interest from NWS forecasters, even those with a decade or more of experience. Primer modules have also been incorporated into university courses. Survey results indicate that learners appreciate the scenario storylines, operational focus, rich graphics, and the non-jargon explanations.

3. THE NTTU PARTNERSHIP

Another recent addition to the COMET/DoD partnership is one in which COMET Program staff (along with many others, Conlee et al. 2003) have assisted the NTTU in modernizing their Aerographer's Mate (Weather Forecaster) school for young Sailors and Marines. Until it's recent revision, this 7-month course was both outdated and largely paper-based. COMET's contributions to the revamping of the Aerographer's C-school curriculum included providing instructive graphics and animations, sharing expertise in convective severe weather and other mesoscale meteorology topics, providing historical case data, and harnessing other resources from the meteorology community as a whole. With a theme of "scientifically correct, operationally relevant", a vastly modernized electronic course of instruction has been fielded. The first class of students to undertake this superior course graduated in June 2003. These students are now actively engaged in military forecast operations and can continue to enhance their meteorology knowledge by making use of the additional training provided by the Mesoscale Primer modules.

4. FUTURE PLANS AND SUMMARY

At any given time multiple Mesoscale Primer modules are in various stages of production. Other subjects that will be covered by modules in the coming year include downslope winds and mountain waves, mesoscale rainbands, coastal jets, and various aspects of convection and fog forecasting.

Military forecasters are required to provide timely, precise, environmental forecasts that often determine safety of flight and navigation or just possibly when and where specific weapons can be successfully employed. Complex mesoscale processes govern the success rate for all precision-guided weapons as well as determination of exactly which sites are environmentally applicable for consideration. The COMET Program, through its continuously expanding suite of materials available 24/7 on the MetEd Website, is working to help meet the needs of these forecasters in the area of mesoscale meteorology education.

5. ACKNOWLEDGEMENTS

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6. REFERENCES

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