

**MARCH
2008**

CMAS Quarterly

The Quarterly Newsletter of the Community Modeling and Analysis System

Upcoming Events

*(All are at UNC unless
otherwise indicated)*

7th Annual Conference:

- October 6-8, 2008

SMOKE Training:

- April 14-16, 2008
- July 21-23, 2008
- October 1-3, 2008

CMAQ Training:

- April 17-18, 2008
- July 24-25, 2008
- October 9-10, 2008

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Credits

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us on the Web!**
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7th Annual CMAS Conference October 6-8

CMAS has issued the call for papers for its 7th annual conference, to be hosted by the University of North Carolina at its Friday Center in Chapel Hill, NC. The conference will include seven sessions for oral and poster presentations of papers on various aspects of air quality, emissions, and meteorological modeling and analyses:

- Air Quality Forecasting
- Air Quality Measurements and Observational Studies
- Air Quality Model Developments

- Climate Variability/Air Quality
- Emissions Inventories, Modeling and Analyses
- Integrated Modeling Systems for Environmental Decision Support
- Model Evaluation and Analysis

The second session shown above is this year's special session. It will focus on observational studies and field measurements based on both conventional and remote-sensing platforms. Papers on data assimilation methodologies and the use of NASA and NOAA

satellite measurements are encouraged. We are inviting a guest speaker from NASA to talk about the availability and potential applications of satellite data in air quality studies.

For more information on the conference, please visit <http://www.cmascenter.org/conference.cfm>. Note that presenters need to register by June 6.

Two New CMAS Releases: AMET and BenMAP Features & Training

Working with EPA, CMAS has released two important environmental analysis tools on the Center's web site: *AMET* and *BenMAP*. The Atmospheric Model Evaluation Tool (AMET) version 1.0 was released on February 15. The Environmental Benefits Mapping and Analysis Program (BenMAP) version 2.4.8 was released on October 16, 2007. CMAS has had over 100 downloads each of AMET and BenMAP by the CMAS user community.

Atmospheric Model Evaluation Tool. AMET is currently designed to ana-

lyze outputs from the PSU/NCAR Mesoscale Model (MM5), the Weather Research and Forecasting (WRF) model, and the Community Multiscale Air Quality (CMAQ) model. The three main software components of AMET are MySQL (an open-source database software system), R (a free software environment for statistical computing and graphics), and perl (an open-source cross-platform programming language). AMET matches air quality and meteorological observations with model-estimated values in space and time, and then stores the observation-model

CMAS Training in Europe This Summer?

The CMAS Center is seeking interest for a two-week training program in Europe this summer that will cover SMOKE, CMAQ, and WRF. Tentative plans are to hold the training August 25 through September 5 at the Bulgarian Academy of Sciences in Sofia. CMAS conducted similar European training programs in the summers of 2006 and 2007; more than 90 European engineers and scientists attended. The 2008 workshop will be held if there is sufficient interest. To express interest in attending or to obtain further information, please contact us at cmas@unc.edu.

New CMAS Releases: AMET and BenMAP Features & Training (cont'd.)

pairs in a MySQL database. Once the database is populated, various statistical analysis tools can be accessed through easy-to-use Unix scripts and then utilized to examine aspects of model performance. One of these tools is a utility that allows the observation-model pairs to be partitioned according to various criteria, such as date, time, region, state, land use, elevation, observation network, variable range, and model error. Other analysis capabilities include spatial plots of model performance metrics, time series plots of observed and simulated values, and diurnal-based statistics.

While CMAS provides some sample analyses that can be performed, the tool is designed so that other statistical and plotting analysis techniques can easily be added. Users are encouraged to enhance AMET's functionality by developing such capabilities and contributing them to CMAS. Additionally, the application-friendly AMET database allows users to ingest the matched observation-model pairs into almost any data analysis application (e.g., Excel, SAS, R, MATLAB) for customized inspections of model performance.

Another significant feature of the database structure is the ability to link datasets, specifically the

meteorology with the air quality. For example, a user could query the database for instances where the air quality model over-predicts ozone, and then extract the temperature data (obs-model pairs) along with the ozone data. A statistical analysis could then be performed on the specific subset of data to see if correlation exists between meteorology errors and errors in the simulated air quality.

In summary, the AMET system provides efficient, effective feedback for model development as well as evaluating model applications.

The current AMET release includes a test dataset that has both observed and modeled data (MM5, WRF, and CMAQ outputs), and a sample script to perform model evaluation using observational data for 2002 from several monitoring networks, including AIRS, CASTNET, NADP, IMPROVE, STN, MDN, and SEARCH. The air quality observational data are provided from 2001 to 2006. The meteorological observation data are not provided, but AMET does include a capability to download them dynamically, based upon the modeling duration, from NOAA's Meteorological Assimilation Data Ingest System (MADIS). For further information on this aspect of AMET, please see the following paper: Gilliam R.C., W. Appel,

and S. Philips, The Atmospheric Evaluation Tool (AMET): Meteorology Module, presented at the 4th Annual CMAS Conference, September 26-28, 2005; see http://www.cmascenter.org/conference/2005/abstracts/6_1.pdf.

The Environmental Benefits Mapping and Analysis Program.

BenMAP is a Windows-based computer program that estimates the health and economic benefits from improvements in air quality. BenMAP is powerful enough to perform a comprehensive benefits analysis but also simple enough to be used after just a short tutorial, using predetermined configuration files. The tool includes nearly all of the information users would need to start performing a benefits analysis; advanced users can customize the program to meet their analytical needs. Because BenMAP is based on a GIS, results can easily be mapped to facilitate communicating them to others.

Some of the purposes for which BenMAP is used are the following:

- Generating population/community-level ambient pollution exposure maps;
- Comparing benefits across multiple regulatory programs;
- Estimating health impacts associated with exposure to existing air pollution concentrations;

- Estimating health benefits of alternative ambient air quality standards;
- Performing sensitivity analyses of health or valuation functions, or of other inputs; and
- Performing hypothetical, or "what-if," types of analyses.

BenMAP is intended primarily as a tool for estimating the health impacts, and related economic values, associated with changes in ambient air pollution. It accomplishes this by running health impact functions, which relate a change in the concentration of a pollutant to a change in the incidence of a health endpoint. Inputs to health impact functions typically include:

- (a) the change in ambient air pollution level,
- (b) health effect estimate,
- (c) the baseline incidence rate of the health endpoint, and
- (d) the exposed population.

Recently, EPA has used BenMAP for regulatory impact analyses to support revisions of the NAAQS for PM_{2.5} and 8-h O₃. By this summer CMAS expects to release on its web site a new version of BenMAP (2.4.9) with accompanying documentation.

To assist the user community, the CMAS Center intends to offer training programs on the use of both AMET and BenMAP.