THE CMAS CENTER USER SUPPORT SERVICES

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1.0 INTRODUCTION

The U.S. EPA has funded the MCNC Environmental Modeling Center (EMC) to establish the Community Modeling and Analysis System (CMAS) Center for supporting Models-3 development, application, and research. To help promote the use and understanding of the Models-3 suite of software, the CMAS Center is building a comprehensive on-line user support system and hands-on training courses. Administered through the World Wide Web, the CMAS user support services include an interactive help desk, an automated bug tracking and enhancement request system, tutorials, model and data clearinghouses, and a bulletin board system for community-based discussions. In addition to the on-line services, the Center also offers hands-on Models-3 training several times per year. We anticipate that the availability of these resources will grow both the range and depth of the understanding about Models-3 within the atmospheric modeling community.

2.0 CMAS AND COMMUNITY MODELING

Models-3 currently includes the Sparse Matrix Operator Kernel Emissions (SMOKE) processing system (Houyoux and Vukovich, 1999) and the Community Multiscale Air Quality (CMAQ) model (Byun and Ching, 1999). Models-3 is the first environmental modeling system to evolve out of the community modeling paradigm. “Community modeling” is the concept that air quality model development should be a collective effort. By adopting a standardized modeling architecture, the air quality modeling community can focus its efforts on developing software enhancements and new science modules. Traditionally, a few small groups dominated the model development arena. In the world of community modeling, there are many research groups engaged in development and testing on a common architecture for the mutual benefit of the community. For Models-3, the common architecture is the Input/Output Applications Programming Interface (I/O API), a progressive set of libraries providing standardized data storage and access that promote modularity and portability.

Development of the Models-3 software components proceeded with modularity and flexibility in mind. While both SMOKE and CMAQ are fully functional emissions and air quality models, respectively, by design they are also modeling frameworks that allow easy integration of code and science enhancements. With the establishment of these tools, there also needed to be an entity to facilitate and organize the efforts of the air quality modeling community. In response, the U.S. EPA established the CMAS Center to address the common needs to cooperate in research and development efforts and to learn to utilize models in a consistent manner (MCNC, 2001).

Models-3 user support services are one of the major focus areas of the Center. The objectives of the CMAS support services include technology transfer of Models-3 and information exchange. Serving as a clearinghouse of information, the CMAS Center distributes data sets, models, application experience, documentation, and training to the global modeling community. The Center is fulfilling these objectives by establishing a comprehensive on-line support system that will be freely accessible over the World Wide Web.

3.0 CMAS SUPPORT SERVICES

The four primary CMAS user support services include application support, hands-on training, a model clearinghouse, and data resources. These are summarized below and then discussed in more detail in Sections 3.1 through 3.4.

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- CMAS Center application support consists of a tiered Web-based approach that uses frequently asked questions (FAQs) pages, on-line tutorials, a user bulletin board, and an interactive help desk that employs an automated support request system.
- The Center offers multiday hands-on training courses for both SMOKE and CMAQ that provide students with the basics of obtaining, installing, and executing the Models-3 components.
- The CMAS model clearinghouse is a centralized resource for obtaining information about and downloading all Models-3 related software. Data utilities and visualization tools are also available through this clearinghouse. In addition, the clearinghouse provides an interactive release calendar with details about historical and future releases of Models-3 and its related software, and a Models-3 source code archive.
- CMAS data resources include tutorial datasets, observational data, data analysis tools, discussion on the establishment of a national environmental data grid, and resources for sharing data with other members of the community.

3.1 Models-3 Application Support

Using a tiered approach to user support, the CMAS Center help desk leverages the expertise of the entire modeling community to contribute to the support functions (Figure 1). The tiered support approach refers to the multiple layers of information available to a Models-3 user through the Center, from general FAQs up through one-on-one, case-specific support from Models-3 experts.

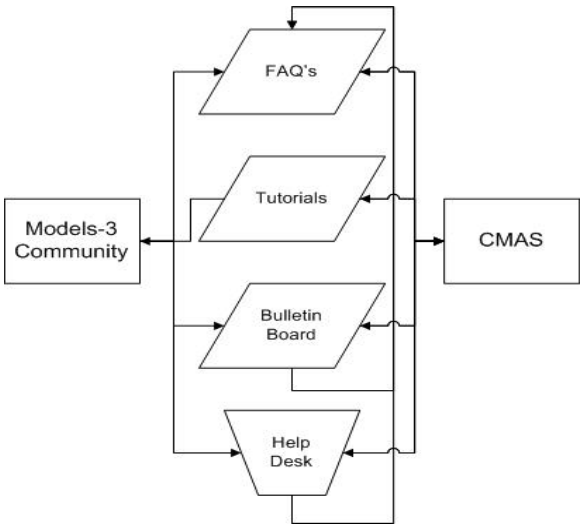

Figure 1. CMAS user support flowchart

At the most general level, FAQs pages for all of the CMAS-supported software supply commonly requested information gleaned from the e-mail help desk and the bulletin board. Second, on-line tutorials for Models-3 software and support utilities provide free hands-on training courses covering installation and model applications. Third, an interactive bulletin board service allows Models-3 users to open discussions with and pose questions to the modeling community at large. The final type of application support offered by the Center is an e-mail help desk. With a Web interface and fully searchable database, the CMAS help desk uses an e-mail ticket system that tracks support requests and records them for future reference. The automated system forwards requests about specific components of Models-3 directly to the respective experts. We designed the CMAS Center application support services to maximize accessibility and efficiency from the standpoints of both the users and the support administrator.

Application support for Models-3 at the CMAS Center uses World Wide Web distribution to provide free and efficient access to the support services. The use of the Web provides equal access to modelers in all areas of the world. In only its first month of operation, the e-mail help desk, which is based in Research Triangle Park, NC (USA), addressed questions from Europe, Southeast Asia, Canada, and throughout the United States. Combining a breadth of information with an automated e-mail tracking system, the CMAS support services maximize the interactions between Models-3 experts and the modeling community. By limiting redundancy and standardizing the lines of communication, the design of the CMAS support services is already paying dividends in the form of efficiency and accessibility.

3.2 Models-3 Hands-on Training Courses

The CMAS Center is developing Models-3 training based on the needs of the modeling community. Initially the Center will offer multiday SMOKE and CMAQ training courses covering both the basic concepts of the software and hands-on application. The Center will ensure that these introductory courses always contain the most current materials and content. Development of additional courses will proceed based on the needs and requests of the community. If there is a growing interest in learning about the plume-in-grid features of CMAQ, for example, then the Center will create and offer a course on

that topic. Centralizing training development at the Center maximizes the community resources by standardizing the course format (thus providing templates for future classes) and by using information obtained from surveys of the community to determine course topics and content.

Additionally, the CMAS Center is developing the courses with a "train-the-trainer" goal of distributing the course materials to other organizations. The expertise of our training staff coupled with current and intuitive training materials create an environment that will enable graduates of the CMAS courses to pass on their knowledge to others in their organization, region, or community. This will enable the administration of the Models-3 training outside of the Center.

The CMAS hands-on Models-3 training classes supplement the Web-based tutorials (see Section 3.1) by providing specific, systematic instruction on how to install, apply, and evaluate the models. The Web tutorials assume that a modeler already has working knowledge of the software and operating system and simply wants to run through a "benchmarking" of the model. The training courses, on the other hand, are equally accessible to beginners and experienced modelers.

3.3 CMAS Model Clearinghouse

A goal of the CMAS Center is to provide a centralized resource for obtaining Models-3 software. Through the establishment of a Web-based model clearinghouse, the Center can provide model source code and scripts for all Models-3 related software, and circulate information on past, current, and future releases. While the Center will directly distribute only Models-3 (currently CMAQ and SMOKE), the model clearinghouse will link to other modeling components necessary for using Models-3. These components include the Mesoscale Model version 5 (MM5), I/O API, the Network Common Data Form (netCDF), the Package for Analysis and Visualization of Environmental data (PAVE), and the Multimedia Integrated Modeling System (MIMS). If the community is interested in other components, these could be added to the clearinghouse later. In addition to current source code, release information and archived model code are also available through the CMAS model clearinghouse.

An interactive release calendar and a source code archive provide access to historical information about Models-3 and its components.

- The release calendar allows Models-3 users to learn about important features of Models-3 and its component software releases. When available, information about future releases will also be contained in the calendar.
- A Models-3 source code archive distributes past releases of the software for research and historical applications. Several recent requests for old versions of CMAQ made to the CMAS help desk prompted the creation of the Models-3 code archive.

To supplement the software and modeling resources provided by the Center, a data clearinghouse (described below) is also being built.

3.4 CMAS Data Resources

The CMAS Center is in the early stages of establishing a large-scale resource for model input/output data, observational data, and data manipulation and evaluation tools. As shown in Figure 2, this data clearinghouse will initially be housed at the Center. In the future, the Center envisions expanding upon the concept of the centralized clearinghouse by establishing a national data grid for emissions, meteorology, and air quality data (Figure 3). By facilitating the formation of an environmental metadata standard, the CMAS is building the infrastructure to allow a data grid to serve the environmental modeling community. As with the other features of the Models-3 user support services, the CMAS Center will coordinate the efforts of the entire modeling community to contribute to a shared data resource.

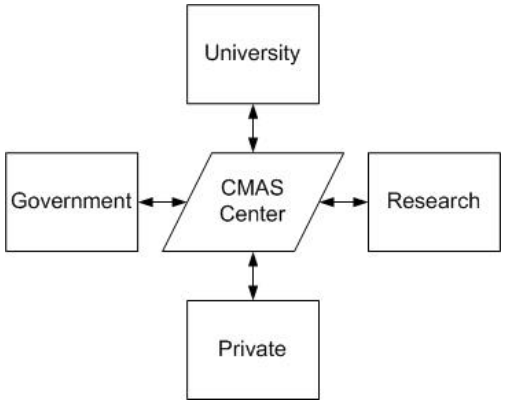

Figure 2. Initial centralized data clearinghouse

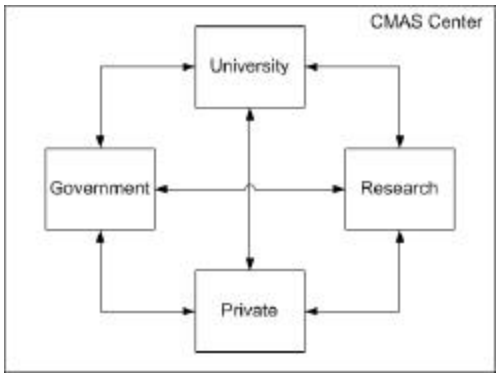

Figure 3. Future CMAS-supported data grid

4.0 USING THE CMAS SUPPORT SERVICES

All of the CMAS user support features are accessible through http://www.cmascenter.org. The Help Desk section of the Website contains the FAQs, bulletin board, Web tutorials, and e-mail support services. The CMAS Services page contains information on future hands-on training sessions, on the data and model clearinghouses, and on other features of the CMAS Center user services. Except for the hands-on training courses, all of the services available through the Center are free. Many of these services, such as the bulletin board and FAQs pages, grow stronger as they are used, and the Center encourages extensive interaction. As this is a community resource, the CMAS Center welcomes all comments about the quality, content, and accessibility of its services.

5.0 REFERENCES

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