



# NOAA ARL Monthly Activity Report



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## Contents

1. ***HIGHLIGHT – CO<sub>2</sub> Sequestration Studies***
2. ***HIGHLIGHT – WMO Conference on Women in Meteorology and Hydrology***
3. ***HIGHLIGHT – NARSTO Particulate Matter Assessment.***
4. ***HIGHLIGHT – Mercury in the Arctic***
5. ***Comprehensive Test Ban Treaty Support***
6. ***Gaussian Dispersion Model Now Available in READY***
7. ***Atmospheric Transport and Deposition of Mercury to Aquatic Ecosystems***
8. ***Global Temperature Updated Through DJF of 2002-03***
9. ***SURFRAD/ISIS***
10. ***CUCF***
11. ***Urban Dispersion***
12. ***Air Quality***
13. ***Canaan Valley.***
14. ***Italian National Research Council Sky Arrow***
15. ***U. S. Air Force Model Validation Program (MVP)***
16. ***USDA Forest Service National Fire Plan***
17. ***Community Multiscale Air Quality Modeling System***
18. ***Secondary Organic Aerosol***
19. ***Emissions Processing***
20. ***Fugitive Dust Emissions***
21. ***Community Modeling and Analysis System Center***
22. ***Air Quality Forecasting Initiative***
23. ***New York City World Trade Center (WTC) Modeling***
24. ***Multilayer Biochemical Model***
25. ***Vegetation Change Scenarios***
26. ***Ammonia Emissions Modeling***
27. ***Sun Glint Removal for Pamlico Sound AVIRIS Images***
28. ***JOINT URBAN 2003 (JUT)***
29. ***CBLAST-High***
30. ***Extreme Turbulence Probe***
31. ***SERA Instrument Development***
32. ***INEEL Support***
34. ***Air Quality Forecasting Research Plan***
35. ***Network of Airborne Environmental Research Scientists (NAERS)***
36. ***NOAA Cooperative Institute for Atmospheric and Terrestrial Applications (CIASTA) – Mesoscale Modeling***
37. ***Computer Programming/Surface Data Plots***

## Highlights

**1. CO<sub>2</sub> Sequestration Studies.** ATDD has been a central player in the development of the national and international programs to monitor CO<sub>2</sub> sequestration by terrestrial ecosystems. Through activities at ATDD, NOAA operates several sites of the AmeriFlux network, and is leading efforts to expand the number of measured variables so as to facilitate spatial interpolation. In March, soil CO<sub>2</sub> sampling and work with the spectral reflections. The data system is now automated. The sites call in, process data, and upload information to the ftp server. You can view the data for each of the sites at the new GEWEX Site Information web site: <http://neon.atdd.noaa.gov/gewex/> This site will soon be accessible from the new ATDD web site that will “go live” sometime next month. [meyers@atdd.noaa.gov](mailto:meyers@atdd.noaa.gov), Heuer

The Walker Branch Watershed site operated by ATDD is a major measurement facility AmeriFlux. Due to developments at the nearby Oak Ridge National Laboratory, the historic tower studies will soon be moved to a new site – referred to as the CHESS site (the CHEStnut Ridge Site). Excavation for the tower base, and shallow trenching for the grounding electrodes (lightning protection) are complete. Additional materials required to install the grounding system have been acquired. ATDD continues to work with EASC in processing the RFP for the support building. The guy wires have been fabricated and are on hand. Additional custom tower hardware is being built. [meyers@atdd.noaa.gov](mailto:meyers@atdd.noaa.gov)

**2. WMO Conference on Women in Meteorology and Hydrology.** The 2<sup>nd</sup> World Meteorological Organization (WMO) Conference on Women in Meteorology and Hydrology, held 24-27 March 2003 in Geneva, Switzerland, examined the underrepresentation of women in these fields, and developed strategies for increasing the participation of women both in the profession and in the activities of the WMO. U.S. representatives joined 130 delegates from over one hundred countries at the Geneva conference. General Jack Kelly, U.S. Permanent Representative with WMO headed the American delegation, which included representatives from the private, academic, and government sectors.

Delegates at the Geneva meeting reviewed and reaffirmed recommendations set forth at the first WMO conference on this subject (Bangkok, 1997). However, they voiced the concern that the Bangkok recommendations did not include provisions for followup activities. Therefore, the Geneva conference adopted recommendations to promote ongoing efforts and to assess the results. These recommendations will be discussed at the next WMO Congress (May 2003).

For more information, check online at [www.wmo.ch](http://www.wmo.ch) and select “women in meteorology and hydrology” from the drop-down menu). [dian.seidel@noaa.gov](mailto:dian.seidel@noaa.gov)

**3. NARSTO Particulate Matter Assessment.** Forty-two air quality scientists from Canada, the United States and Mexico have completed a 3-year review of the current state-of-knowledge on airborne particles, a major component of smog in North America. The NARSTO coordinated report, *Particulate Matter Science for Policy Makers*, provides a comprehensive overview of the situation across the continent, identifies problem areas, and provides guidance for effective action to reduce this health concern. The NARSTO review was released at the opening of the annual conference of the American Association of Aerosol Researchers, March 31- April 4, 2003, Pittsburgh, Pennsylvania.

The NARSTO report was produced to provide science-based guidance for governments and other agencies working to reduce air pollution throughout North America. The study concludes with a summary of current knowledge for nine key regions in North America, including smog-prone areas such as Los Angeles, Mexico City, the U.S. East Coast, the lower Fraser Valley of Southern British Columbia, and the Windsor to Quebec City corridor. These descriptions provide a template for communicating science to air quality managers. The NARSTO report demonstrates that the science is a key input in developing the most effective strategies to reduce airborne particles. These strategies will have to take into consideration both local and distant sources of air pollution, as well as prevailing weather conditions, topography, and seasonal variations. Management plans will have to be tailored specifically to each region, and actions that are effective in one area may not be applicable to another. Funding and in-kind support for the NARSTO assessment was provided by the governments of Canada, the United States, and Mexico, as well as the North American Commission on Environmental Cooperation, and members of the U.S. energy and motor vehicle industry. (Jeff West, 919 541 4635)

**4. Mercury in the Arctic.** Our measurements of atmospheric mercury at Barrow AK have yielded a surprise this month. It is generally accepted that gaseous elemental mercury (GEM) and ozone are depleted from the near-surface air by halogen (most likely Br) chemistry. Ozone is destroyed while mercury is oxidized and deposited to the snow. We have known these depletions to be restricted to the boundary layer. We were surprised, however, to find how shallow the layer of depletions really is: on the order of a few meters. Three observations support this conclusion.

1) The measurement height for reactive gaseous mercury concentration in the years 2000 - 02 was 5 m. This year it was 1 m. Measured concentration this year was roughly 40% higher than during the same period in each of 2000 - 02, a strong indication that reactive gaseous mercury production is concentrated very near the surface.

2) For the first time we have two sampling sites at Barrow, both on the coast, about 2km apart. GEM concentrations mirror each other within 10% for long periods, except during depletion events, when the variation can reach 50%. With variation this strong over horizontal distances as short as 2 km, the scale depth for GEM depletion is unlikely to be as large as the boundary layer's thickness.

3) Measurement of the GEM concentration at 1 m simultaneously with the ozone concentration's gradient over 20 m have shown the mercury concentration and the ozone gradient to be in proportion. Gaseous elemental mercury and ozone are oxidized and destroyed, respectively, by the same halogen chemistry. We conclude that this chemistry is occurring within meters of the surface.  
[brooks@atdd.noaa.gov](mailto:brooks@atdd.noaa.gov)

## **Silver Spring**

**5. Comprehensive Test Ban Treaty Support.** A full-scale CTBT test was conducted on March 24-26 for a hypothetical measurement at several locations over the period of 3 days. The test required 23 independent "backward dispersion" calculations each of 6 to 8 day duration. The CTBTO used the model results to identify the possible source location. Due to lack of staff and resources to participate, an automated procedure was developed to intercept the CTBTO email notification and automatically configure HYSPLIT for the requested source locations, run the model, and upload the results to their secure server. The process worked perfectly and each day's test calculations were done by 0600 EST.

Note that four out of the ten meteorological centers participated in the test used HYSPLIT. [roland.draxler@noaa.gov](mailto:roland.draxler@noaa.gov)

**6. Gaussian Dispersion Model Now Available in READY.** A Gaussian plume model is now available for use by HYSPLIT registrants from the Dispersion Models page of READY (<http://www.arl.noaa.gov/ready/dispersion.html>). For some time we have made available a simple gaussian dispersion forecast using the NWS Model Output Statistic (MOS) product as meteorological input on READY. Now the model has been enhanced to produce a graphic image of the plume along with a display of important parameters in addition to the dispersion factors with downwind distance given previously. In addition, the plume can be output as a GIS shapefile for easier interpretation in a GIS environment. Finally, the program was modified to allow a user to enter his/her own meteorology instead of using the MOS forecasts. Future work may allow access to the latest surface observation as input to the model. [glenn.rolph@noaa.gov](mailto:glenn.rolph@noaa.gov)

**7. Atmospheric Transport and Deposition of Mercury to Aquatic Ecosystems.** Work has continued on an EPA- and CEC-funded project to estimate the atmospheric transport and deposition of mercury to the Great Lakes, the Gulf of Maine, and a number of selected receptors in the northeast, mid-atlantic, and southeastern U.S. Recent activity has involved continuing efforts to make additional improvements to the atmospheric model being used (a specially configured version of HYSPLIT). In the past month, efforts have focused on the dry deposition algorithms, and in the addition of several receptors of interest. Limited testing and sensitivity analysis of model changes made over the past months suggest that the model's simulations are more in fact more realistic. A full-scale analysis of mercury in the entire domain, emitted by all sources, is now being carried out. The goal is to produce a new set of simulation results by early May, for inclusion in the IJC Priorities Report and a manuscript for a joint publication based on a recent IJC mercury workshop. [mark.cohen@noaa.gov](mailto:mark.cohen@noaa.gov)

**8. Global Temperature Updated Through DJF of 2002-03.** Based on a 54-station radiosonde network, global tropospheric DJF temperatures for last season were the second warmest of the 45-year record, exceeded only by the DJF warmth in the middle of the powerful 1997-98 El Nino. Tropospheric temperatures last season were the second warmest of record in both polar zones (a portent, perhaps, of the accelerated greenhouse warming to be expected in polar latitudes!), and the third warmest of record in the tropics. The summertime tropospheric warmth in the south polar zone follows by one season the extraordinary warmth of the low stratosphere during the austral spring of 2002 (temperatures about 10K above the 1961-90 average), and accompanied by the near disappearance of the Antarctic ozone hole. As residents of the eastern U.S. might surmise, tropospheric temperatures in the north temperate zone were only slightly above the 1961-90 average last winter, and in the south temperate zone the summer temperature was indicated to be even slightly below this average. Thus, the global tropospheric warmth of last season is not related to mid-latitude conditions. (Jim Angell, 301 713 0295)

## **Boulder**

**9. SURFRAD/ISIS.** The Florida State University in cooperation with the NWS WSFO that is collocated with the Department of Meteorology has given ARL permission to move the ISIS station from the Tallahassee Airport to the roof of the Love Building on campus. They have a space reserved for the ISIS station and are willing to move small structures that may interfere with our measurements. (John Augustine, 303 497 6415)

**10. CUCF.** The CUCF completed the annual site visits and calibration audits of the EPA/NPS UV monitoring network in December 2002. The CUCF completed the data analysis and audit reports in March. The results show disagreements typically of the order of a few percent, but with one notable outlier (difference 10 - 15%). The differences between the CUCF's audit calibration and that of the Network Operator's (the University of Georgia-Athens) calibration have steadily decreased over the last few years. The UGA has increased their calibration frequency and they are typically updating the individual Brewer calibrations on a yearly basis. The EPA requires that the Network Operator's calibration fall within 3% of the CUCF's audit. While several of the sites meet this requirement, some still fall outside the acceptable range. The Brewer's absolute spectral responsivity degrades as a function of time and it is also dependent on ambient temperature. The more time that there is between the Network Operator's most recent calibration and the CUCF's audit results in larger discrepancies between the calibrations. This is explained in detail in the audit reports. The CUCF works closely with the Network Operator to help improve the Network Operator's field calibrations of the EPA/NPS monitoring network. (Patrick Disterhoft, 303 497 6355)

The CUCF entered into a joint project with the Italian government's counterpart to NOAA, ENEA to design, construct, characterize and deliver a portable field calibration system for spectral solar UV monitoring instruments. The design, construction, and characterization phases of the project were completed in March. The equipment was shipped to Italy on March 28 for deployment to ENEA's Lampedusa monitoring site. (Patrick Disterhoft, 303 497 6355)

The CUCF has been making preparations to host the fifth UV Spectroradiometer Intercomparison. Previously, the intercomparison participants were from the North American continent. For this intercomparison, there will be a participant from Germany and one from New Zealand's NIWA institute. The NIWA instrument will be operated on top of the David Skaggs Research Center in Boulder, Colorado, which is approximately 10 km south of the intercomparison site. Atmospheric conditions will need to be favorable to include the data from the NIWA instrument in the intercomparison because of the distance between the instruments. (Patrick Disterhoft, 303 497 6355; Kathleen Lantz, 303 497 7280)

## **Oak Ridge**

**11. Urban Dispersion.** Energy exchange between gravity waves and turbulence is being examined for the VTMX, Salt Lake City study, using an adaptation of the technique described below under CASES. Airborne measurements replace the tall tower in this considerably more complex region. Predawn flights on five separate days have provided several cases of likely gravity-wave activity. Attempts to relate these to pressure measurements in an array on the surface, however, have proved frustrating. The waves may be Kelvin-Helmholz oscillations having little amplitude at ground level. On this hypothesis we are currently examining profiles of wind and temperature from radar and acoustic profilers, looking for layers having positive Richardson numbers less than 0.25 (see de Baas and Driedonks 1985, *BLM* **31**, 303-323). Such regions can still support gravity waves, but are also permissive of turbulence. [dobosy@atdd.noaa.gov](mailto:dobosy@atdd.noaa.gov), Nappo

Planning and hardware preparation for the multi-agency Joint Urban 2003 tracer dispersion study in Oklahoma City this July continued, with a series of conference calls and a visit to OKC to select instrument sites and talk to landowners. ATDD expects to provide three local surface energy budget stations, two crank-up towers with four levels of sonic anemometers each, and about 25 hours of flight



time with the turbulence and flux-measuring NOAA Twin Otter. [hosker@atdd.noaa.gov](mailto:hosker@atdd.noaa.gov), Pendergrass, White, and Gunter

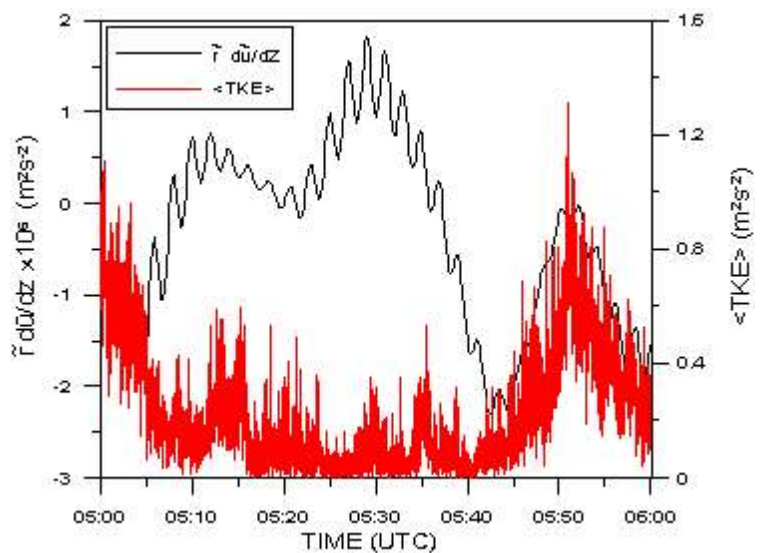
**12. Air Quality.** The Chemical analysis for AIRMoN-dry is now done at Oak Ridge. During the month of March, sequential tests to insure the quality of equipment and data for future programs were performed. Analysis of filter packs for the AIRMoN dry deposition program, which includes the preparation, extraction and reloading of the filter packs, has continued. After the analyses of filters packs are completed the data are transferred to the AIRMoN data base for quality assurance, reduction and analysis. [klemenz@atdd.noaa.gov](mailto:klemenz@atdd.noaa.gov)

**13. Canaan Valley.** Long-term integrated watershed research is planned for a land tract recently purchased by the Canaan Valley Institute. Opportunities for collaboration in implementing such plans were explored this month in meetings between NOAA/ARL and the Canaan Valley Institute. [vogel@atdd.noaa.gov](mailto:vogel@atdd.noaa.gov), Meyers

**14. Italian National Research Council Sky Arrow.** Work is progressing on the three MFP systems that are being built for Enzo Magliulo of ISAFoM-CNR (Italian National Research Council, Institute for Agricultural and Forest Meteorology). Despite problems with procurement of some needed parts, the MFP systems and appropriate spare parts are still scheduled to be delivered to Italy for installation in the Sky Arrow aircraft in early June 2003. [auble@atdd.noaa.gov](mailto:auble@atdd.noaa.gov), Brooks, Dumas, Ludwig, Mayhew

**15. U. S. Air Force Model Validation Program (MVP).** Concise instructions with subdirectory tree charts were written to accompany the four-disc set of CD-ROMs containing the complete MVP Data Archive. Upon request, disc sets with documentation were prepared and provided to Leslie Belsma (The Aerospace Corporation) and ATDD's Dr. Shankar Rao to enable them to continue their MVP research without having to access the MVP Data Archive FTP server. Nevertheless, the MVP server will remain online for the foreseeable future. [herwehe@atdd.noaa.gov](mailto:herwehe@atdd.noaa.gov)

**16. USDA Forest Service National Fire Plan.** Building upon the initial test simulations of the growing ring of wildfire described in last month's report, several new idealized forest fire large-eddy simulations (LES) were completed during March. The large sensible heat flux representing the fire ring was adjusted back down to around  $5 \text{ kW m}^{-2}$  after initial specifications were too large causing significant impact of the fire thermal plume into the model domain top at 4 km AGL. All of the March fire ring simulations were conducted on a  $16 \text{ km} \times 10 \text{ km} \times 4 \text{ km}$  domain, from a summer midday sounding for 2 h duration, with a mean westerly wind of  $2 \text{ m s}^{-1}$ , and uniform surface heating (outside the fire area) of about  $230 \text{ W m}^{-2}$ . Early fire ring test simulations started with 100 m vertical and 200 m to 100 m horizontal grid spacing, and culminated in a high-resolution LES with 50 m grid spacing in each dimension ( $323 \times 203 \times 82$  grid points) and a 1 s time step. The results from these simulations were quite interesting and



plausible, and several animation sequences, or “movies”, were created from the output for inclusion in presentations. Figure 1 is a frame from one of the animations taken near the end of the high-resolution simulation, showing the transport and dispersion of smoke (represented by a passive tracer) from the growing ring of fire. [herwehe@atdd.noaa.gov](mailto:herwehe@atdd.noaa.gov)

An invited talk entitled “Potential Application of a Coupled LES-Photochemical Model to Wildland Fire Research” was prepared and presented at the Second Annual Eastern Area Modeling Consortium (EAMC) Meeting which was hosted by the USDA Forest Service’s North Central Research Station (NCRS) on March 25-27 in Okemos and East Lansing, Michigan. The talk discussed the capabilities of ATDD’s coupled large-eddy simulation (LES) with photochemistry (LESchem) model and its potential application to wildland fire research and planning by showing example results and animations from air toxics, industrial point source, and fire ring simulations. Discussions were held with NCRS scientists regarding future modification of LESchem to incorporate a resolved canopy submodel. [herwehe@atdd.noaa.gov](mailto:herwehe@atdd.noaa.gov)

## Research Triangle Park

**17. Community Multiscale Air Quality Modeling System.** Testing of the CMAQ model for the winter simulation period of January 4–February 19, 2002, continued. Simulations are being conducted to address the issue of nitrate overprediction. A preliminary evaluation of CMAQ has been conducted using data from the CASTNet, NADP, and SEARCH sites, and Pittsburgh supersite. The evaluation showed good agreement for  $\text{SO}_4$ ; however, aerosol  $\text{NO}_3$ ,  $\text{HNO}_3$ , total nitrate, and  $\text{NH}_4$  are all overpredicted. Several model sensitivity tests have been conducted. (1) Two 6-week runs were made using different levels of ammonia emissions to set up the ammonia inverse calculations. The ammonia inverse results, based on wet concentration data, suggested that less of a reduction in the annual  $\text{NH}_3$  emissions was needed than was initially estimated based on CMAQ simulations for January 1990. (2) Recent publications suggest that for solutions containing nitrate, the heterogeneous  $\text{N}_2\text{O}_5$  reaction probability is significantly lower than earlier estimates. Their parameterization was tested in CMAQ and resulted in a 10% reduction in aerosol  $\text{NO}_3$  and about a 25% reduction in  $\text{HNO}_3$ . (3) To further isolate the importance of the heterogeneous  $\text{N}_2\text{O}_5$  pathway to nitrate concentrations, another test was conducted with this pathway completely “turned off.” The results show that this pathway contributes to about 35% of  $\text{HNO}_3$  and 25% of the aerosol  $\text{NO}_3$  concentrations. (4) Another test is underway that will include dry deposition of both  $\text{N}_2\text{O}_5$  and  $\text{NO}_3$ . Initial results suggest that including dry deposition of these species will further reduce  $\text{HNO}_3$  and aerosol nitrate. Results were presented in a briefing to the EPA Office of Air Quality Planning and Standards. (Shawn J. Roselle, 919 541 7699; Robin Dennis 919 541 2870; Jonathan Pleim, 919 541 1336; Gerald Gipson, 919 541 4181; Alice Gilliland, 919 541 0347; and Donna Schwede, 919 541 3255)

CMAQ can now be run on a 12-processor Beowulf Linux cluster. The model configuration included cloud processing, the AE3 aerosol module, and new mass conservation techniques. New build scripts, run scripts, and make files were constructed to conduct 1-hour and 24-hour simulations. A 24-hour test simulation on the Linux cluster completed in just under 2.5 hours. (Michelle Mebust, 919 541 0833)

A new version of CMAQ’s Meteorology-Chemistry Interface Processor (MCIP) was prepared and released to the CMAQ community. This version of MCIP corrected several errors in the code. The most severe of the bug fixes addresses vertical layer interpolation of the horizontal wind components, which are used in the chemical transport model. Other bug fixes include correction of the vertical wind component calculations, the density calculation, and various grid interpolation issues. The new code,

MCIP Version 2.1, was released on March 31. (Tanya Otte, 919 541 7533, and Jon Pleim, 919 541 1336)

Analyses of the Community Multiscale Air Quality (CMAQ) PinG gas/aerosol model results were underway in preparation for the upcoming Air Quality Modeling Workshop to be held at the American Association for Aerosol Research (AAAR) Particulate Matter (PM) Conference. The updated PinG concentration output file contains both gaseous and aerosol species, and an additional plume visibility output file is also generated. Results of analyses of plume aerosol species concentrations are encouraging from comparisons of measured gas species (ozone, NO, SO<sub>2</sub>, and hydrogen peroxide) against modeled concentrations. Modeled aerosol sulfate formation was greater in the SO<sub>2</sub>-rich plumes from point sources with the lower NO<sub>x</sub> emissions rates than those exhibiting the highest NO<sub>x</sub> emissions, which is in agreement with emerging aircraft plume data. (James Godowitch, 919 541 4802)

**18. Secondary Organic Aerosol.** In the previous release of CMAQ, Secondary Organic Aerosol (SOA) formed from the biogenic species other than VOC was being mislabeled as being of anthropogenic origin. Note that this occurred only when using the SAPRC99 or RADM2 chemical mechanisms, and the total amount of anthropogenic and biogenic SOA was not affected. SOA production from olefin compounds in CMAQ was likely over-stated because SOA production is based on the total amount of olefins reacting, whereas SOA production from this class of compounds is likely due only to olefins with a large number of carbon atoms (*e.g.*, seven or more). An analysis was conducted of the national emission inventory that indicated, for SAPRC99 speciation, only about 15% of the emissions of SAPRC99 species representing internal olefins (OLE2) were likely to generate SOA. However, 5% of the SAPRC99 species representing primary olefins (OLE1) emissions were from potential SOA precursors, and the production from this source was not accounted for in our current version of CMAQ. In addition, the use of the new Biogenic Emission Inventory System 3.11 results in large emissions of a new biogenic compound, methylbutenol. Since this compound is lumped into OLE2 in SAPRC99, but is not a likely SOA precursor, CMAQ is now predicting too high SOA from this compound in some areas. Hence, a special version of CMAQ was formulated to correct all of these problems. This version eliminates the production of SOA from methylbutenol, correctly categorizes the SOA according to anthropogenic or biogenic origin, and modifies the production of SOA from olefins by including both OLE1 and OLE2 as SOA precursors, but scales the SOA production rates from these precursors by the percentages listed above. The overall results of these changes was to lower overall SOA production as well as the anthropogenic fraction. (Gerry Gipson, 919 541 4181)

**19. Emissions Processing.** An emissions processing system for air quality forecasting is being developed. The separation of meteorologically-independent components of the emissions processing from the meteorologically-dependent components is underway. Planning for the incorporation of the meteorology-dependent components into the preprocessing air quality module (CMAQ-I) has begun. A beta-release of the Sparse Matrix Operational Kernel Emissions (SMOKE)(version 1.5) has become available. We are testing an internally linked version of MOBILE6 to SMOKE for both the 1999 criteria and the toxics inventory. Comparisons of MOBILE6 and MOBILE5B emissions for January 2002 have begun, and it is hoped that a CMAQ sensitivity test can be started later this spring. In addition, we are testing the Plume-in-Grid (PIN-G) treatment of emissions with this latest version of SMOKE. (George Pouliot 919 541 5475)

**20. Fugitive Dust Emissions.** A preliminary version of a fugitive dust emission model has been implemented into the CMAQ modeling system. The Emission Inventory Improvement Program, which



is being administrated by the Environmental Protection Agency's Office of Air Quality Planning and Standards, has agreed to provide funding to assemble geographical data on roads, construction activity, vegetation, and agricultural practices. The dust model will be applied to estimate particulate emissions from roads, construction, and agricultural fields using the new geographical data. After testing, the dust model will be installed as a module of the Sparse Matrix Operation Kernel Emission (SMOKE) system. (Bill Benjey, 919 541 0821; Stan He, 919 541 0098)

Preparations were made for an intensive experiment on dust storms to be conducted at the Jornada Experimental Range in New Mexico in conjunction with a seminar on dust emission research to be held at New Mexico State University during April. Through NOAA's Office of Public Affairs several inquiries were made by national media outlets regarding the characteristics of dust storms. These inquiries were apparently prompted by the war in Iraq and the prevalence of dust storms in southwest Asia during March. Media outlets included *USA Today*, CNN, and the *New York Times*. (Dale Gillette, 919 541 1883)

**21. Community Modeling and Analysis System Center** During March 2003, Dr. William Benjey continued working with the progress of the Community Modeling and Analysis System (CMAS) center. The CMAS is crucial to forming and sustaining a CMAQ user community for collaboration in model improvements, training, and support. An application was filed with the Grants Administration Division to transfer the cooperative research grant establishing CMAS from MCNC, the North Carolina Supercomputing Center to the Carolina Environmental Program (CEP) of the University of North Carolina at Chapel Hill. This transfer should be effective on May 1, 2003. Because the personnel operating CMAS have already moved to CEP, MCNC is subcontracting to CEP until the transfer is completed. Meanwhile, CMAS was involved in a number of activities during March:

- The CMAS External Advisory Committee conferred during March concerning the agenda for the next CMAS Users Workshop scheduled for October 27-29, 2003, at the Holiday Inn in Research Triangle Park, North Carolina.
- CMAS has scheduled training for users of CMAQ and the SMOKE emission model during April 2003 and during the week of the Workshop.
- CMAS has updated their web site for user support and model releases. During March, agreements were made between ASMD and CMAS on Models-3/CMAQ code release procedures through CMAS, procedures for support back up by the ASMD code developers, and tentatively a minimum level of coding standards for code contributed to CMAS for the Models-3 system.
- CMAS has assumed the responsibility for operating the M-3-list listserver for support of the Models-3 system.
- CMAS has begun releasing Models-3/CMAQ code on their web site, replacing releases through the ASMD web site. The initial release is a patch (bug fix update) for the Meteorology Chemistry Interface Processor (MCIP) Version 2.1. This will be followed shortly with a patch of CMAQ, and then a new release of CMAQ with improved nitrate chemistry. (Bill Benjey 919 541 0821)

**22. Air Quality Forecasting Initiative.** Accounts have been set up for the air quality forecast team members on the National Center for Environmental Prediction/NOAA high-performance forecasting computers. We are now working to develop means by which we can transfer data between these

computers and EPA. The CMAQ model has been successfully converted to be applied to the air quality forecasting project. Further testing and development awaits file transfer capability to the NCEP target platforms. A work plan is being developed to collaborate with Sandia National Laboratory to optimize CMAQ and reduce model run time. (Jeff Young, 919 541 3929)

**23. *New York City World Trade Center (WTC) Modeling.*** A derivative of the CALMET-CALPUFF dispersion modeling system has been used to simulate the plume dilution for a 50- x 50-km square area surrounding Lower Manhattan, New York City, for a 3-month period after September 11, 2001. The plume was estimated by a unit emission volume from the World Trade Center (WTC) along its pathway transported by winds over the Metropolitan New York City Area. Estimates of actual environmental concentrations could not be made since the strength of the emissions is unknown.

Work is ongoing in developing a database of meteorological and pollution measurements to support refined analyses of the effects of meteorology and potential emission factors near the WTC recovery site. This information is being used to support the set up of a computational fluid dynamics numerical simulation of the building collapse and subsequent plume dispersion for the weeks following the events. Preliminary simulations of the building collapse and the initial dust cloud surrounding the WTC site has been completed. The set up of a numerical simulation of the entire building environment of Lower Manhattan is ongoing and will be compared with the measurements being collected in the EPA's Fluid Modeling Facility's Wind Tunnel. (Alan Huber, 919 541 1338)

**24. *Multilayer Biochemical Model.*** Donna Schwede continued working on creating a stand alone version of the Multilayer Biochemical Model (MLBC) so that it can be put into the Multimedia Integrated Modeling System (MIMS). Work has progressed slowly because of the need to investigate several of the algorithms to determine the best way to implement them for network operations. One issue of note is the handling of the moisture stress function. MLBC uses a photosynthesis model for stomatal resistance rather than the Jarvis-type scheme used in the Multilayer Model, so the moisture stress functions are not directly interchangeable. Additionally, MLBC calculates the plant transpiration for use in the calculation of the evapotranspiration in the soil moisture budget. If each plant is modeled separately and area-weighting is used to average the disposition velocities, the computed plant-specific soil moisture budget may be unrealistic. Research on handling this aspect of the model will continue next month. (Donna Schwede, 919 541 3255)

**25. *Vegetation Change Scenarios.*** Plans have been finalized to generate vegetation change scenarios to support Phase I of an assessment of the impacts of global change on air quality. These scenarios will be provided to Biogenic Emissions Inventory System (BEIS) 3.10 to estimate potential changes in magnitude and distribution of biogenic emissions from natural vegetation. Vegetation scenario development makes use of Department of Energy/National Center for Atmospheric Research (DOE/NCAR) Parallel Climate Model (PCM) results. These results will be downscaled to a 36-km application grid using MM5 run in regional climate mode (RCM). After additional post-processing, the results will be used to drive the MC1 model, which is a dynamic vegetation model, for the estimation of the distribution of vegetation and associated ecosystem fluxes of carbon, nutrients, and water. MC1 also includes a fire module that simulates the occurrence and impacts of fire events. (Ellen Cooter, 919 541 1334)

**26. *Ammonia Emissions Modeling.*** Division scientists are collaborating with the EPA Office of Air Quality Planning and Standards Emission Inventory and Factor Group on the development and improvement of ammonia emission modeling tools. Using funding from the Emissions Inventory

Improvement Program and in conjunction with our fugitive dust work, geographical data will be assembled on crop coverages, fertilizer application, and tilling practices. In addition, a revised model of ammonia emissions from fertilized fields and a literature review of ammonia fluxes from native soils is planned for the Fall of 2003. (Bill Benjey, 919 541 0821; Thomas Pierce 919 541 1375)

**27. Sun Glint Removal for Pamlico Sound AVIRIS Images.** Work continued on an algorithm to correct sun glint in the 2002 Pamlico Sound images. On May 15, 2002, NASA flew the ER-2 aircraft over Pamlico Sound in North Carolina to obtain hyperspectral imagery at 20 meter spatial resolution for an ecological assessment by the Environmental Protection Agency. Five out of the six flight lines were blighted with sun glint due to an unfortunate coincidence of sun angle, flight heading, and wave height. Surface reflectance can be obtained for Lambertian surfaces, so removal of the specular of direct sunlight is necessary prior to processing of upwelling radiance into surface reflectance. After processing the surface reflectance, image analysis to derive spatial patterns of chlorophyll will begin. (John Streicher, 919 541 3521)

## **Idaho Falls**

**28. JOINT URBAN 2003 (JUT).** Much of the FRD staff emphasis this past month was directed at preparing for JUT. Field deployment is a scant two months away. Of the \$4 million project, FRD garnered more than 25% of the total budget. This month we received the first draft of the field experiment plan and made appropriate comments. The plan calls for the use of all 100 of our programmable integrated gas samplers (PIGS), which are portable bag samplers. The plan also calls for us to build 50 more PIGS with adjustable programming capabilities. These samplers have been dubbed Super PIGS. They will provide us much greater flexibility in developing deployment strategies. [kirk.clawson@noaa.gov](mailto:kirk.clawson@noaa.gov) and staff

Two additional prototype versions of the new sampler and cartridge have been manufactured by Valley Sheet Metal. The current version appears to have overcome the small problems of the previous versions and will be the one that we manufacture. Valley Sheet Metal will be manufacturing the samplers and cartridge parts over the next few weeks. Electronic and mechanical parts and assemblies used in the samplers and cartridges are being fabricated in our shop at this time. [randy.johnson@noaa.gov](mailto:randy.johnson@noaa.gov), Shane Beard

Software development for the new programmable integrating gas sampler (PIGS) is nearing completion. Requests from the JUT 2003 planning group have required that the samplers have considerably more capability than originally planned for this experiment. This has required development of a new downloader and software instead of using the existing ones as originally planned. [roger.carter@noaa.gov](mailto:roger.carter@noaa.gov)

Testing was conducted on the automated tracer gas analysis system (ATGAS) to determine what effect Tygon® tubing has on carry-over from high concentration samples. The latex rubber tubing that attaches to each bag in the cartridge was replaced with Tygon® tubing. The 208,500 ppt standard was analyzed followed by the 1.97 ppt standard. The Tygon® tubing produced slightly less carry-over than the latex tubing. Therefore, the latex tubing will be replaced with Tygon® tubing. As further studies are conducted, the effect of using Tygon over time will be assessed. Testing was also done on the ATGAS to determine the appropriate sample loop size to provide the largest analytical range in the concentration areas of interest. The 2 ml sample loops provided a calibration range from 2 ppt to 20,000

ppt where the detector became saturated. Sample loops of 1 ml, 500  $\mu$ l and 250  $\mu$ l have been ordered and will be tested next month. [debbie.lacroix@noaa.gov](mailto:debbie.lacroix@noaa.gov)

Three sulfur hexafluoride calibration gases have been re-certified. The 3.47 ppt standard last analyzed in 1996 was certified to be  $3.84 \pm 10\%$ , the 292.9 ppt standard last analyzed in 1992 was certified to be  $302 \pm 5\%$  and the 18,600 ppt standard last analyzed in 1988 was certified to be  $19,750 \pm 5\%$ . The previous certified values were within the re-certification tolerances, except for the 18.6 ppt standard which was slightly high. For the most part, this indicates a rather stable series of SF<sub>6</sub> standards we maintain in our possession. We will consider sending back other calibration gases as appropriate based on this information. [debbie.lacroix@noaa.gov](mailto:debbie.lacroix@noaa.gov), Roger Carter

**29. CBLAST-High.** Upgrades have been made to the data system hardware package. The repackaging of the hardware allows for easier access to the computer when mounted in racks on the NOAA P-3. Work has begun on the fabrication of a second aluminum hemisphere for the P-3 BAT probe. Some flaws were identified in the original design and these have been corrected. With the new sphere, we will enter the 2003 hurricane season with a backup to ensure that we will continue flying if one of the spheres becomes damaged. [jeff.french@noaa.gov](mailto:jeff.french@noaa.gov), Shane Beard, Randy Johnson

**30. Extreme Turbulence Probe.** A considerable amount of time was spent in March going through the software being used for data acquisition on the ET probes. The AD boards used with the probes are only supported under Windows, so the ET probe software is by necessity a Windows program. This makes the source code significantly more difficult to follow, because the program must contain a somewhat convoluted looping structure to handle messages generated by the operating system and hardware drivers. A major effort is under way to simplify the source code and improve its reliability. Hopefully, this effort will be completed in April, so further field testing can be started in May. The project is still suffering from delays in getting the FY 2003 funding from ONR. With over half the fiscal year now passed, we may be forced to push some of the FY 2003 development goals ahead into 2004. One goal that may be pushed ahead is an effort to develop a backflushing mechanism to clear water from the pressure ports. [richard.eckman@noaa.gov](mailto:richard.eckman@noaa.gov)

**31. SERA Instrument Development.** Four fiberglass BAT spheres were manufactured to support the ATDD program for supplying instrumentation for the Italian Sky Arrows. The BAT probes on the new Sky Arrows will be equipped with the Fast, Ultra-Sensitive Temperature (FUST) probe. Additionally, FRD will continue working with Airborne Research Australia (ARA) in collaborative research on instrument development. We will be supplying ARA with two of the new aluminum BAT spheres to be tested on ARA aircraft. [jeff.french@noaa.gov](mailto:jeff.french@noaa.gov), Shane Beard

**32. INEEL Support.** Staff from the DOE National Atmospheric Release Advisory Center (NARAC) visited INEEL in March to install the iClient dispersion modeling software. FRD staff attended one of the iClient orientation meetings to obtain a better understanding of the ARAC system's capabilities. Currently the system has no linkage to the INEEL Mesonet data, so any model runs at INEEL are driven by meteorological data from distant airports, such as the Idaho Falls and Challis airports. Challis, incidentally, is approximately 100 miles from the INEEL and is located in rugged mountainous terrain, whereas the INEEL is in the relatively flat Snake River Plain. These measurements are too distant from INEEL to provide representative conditions, so FRD has cautioned against putting much credence in the ARAC output until the model can ingest Mesonet data. The time to obtain model output from ARAC also seems to be excessive, and is on the order of 15 minutes. INEEL management

has recently stated that they intend to keep ARAC only as a backup modeling capability to the FRD effort. [richard.eckman@noaa.gov](mailto:richard.eckman@noaa.gov), Kirk Clawson

The MM5 modeling for INEEL has been running smoothly over the last few months. Disruptions due to Internet connectivity, hardware failures, and NCEP server problems have been infrequent. The “official” model runs that are accessed from FRD’s web home page are still being run on the older Alpha-processor workstation. These MM5 runs are initialized from Eta model output at 40 km horizontal grid spacing. A newer configuration based on 12 km Eta model output is still being tested on a Linux workstation. Output from this configuration is available internally within FRD, but is not being posted for public display. The new configuration appears to provide improved forecasts for INEEL, but it has not yet become the “official” configuration because it does not run as reliably. Problems are usually caused by a lack of availability of the higher resolution Eta model output. [richard.eckman@noaa.gov](mailto:richard.eckman@noaa.gov)

**34. *Air Quality Forecasting Research Plan.*** The NOAA Long-Term Research Plan for Air Quality Forecasting was completed and submitted to David Rogers and the Research Council on March 3. The plan was a cooperative effort of the Aeronomy Laboratory, Air Resources Laboratory, Environmental Technologies Laboratory, Forecast Systems Laboratory, and National Severe Storms Laboratory with input from the National Weather Service. The plan will be used to support ongoing efforts to secure base funds to support the development of an operational air quality forecasting capability in NOAA. [tom.watson@noaa.gov](mailto:tom.watson@noaa.gov)

**35. *Network of Airborne Environmental Research Scientists (NAERS).*** Plans are currently under way for the second workshop of the Network of Airborne Environmental Research Scientists (NAERS) to be held in Trento, Italy, October 2003. The planning committee for this meeting consists of Jorg Hacker (ARA, Australia), Jeff French (NOAA/ARL), Bruno Neininger (MetAir, Switzerland), and Franco Miglietta (CNR, Italy). The workshop will build on many of the discussions that were begun at the inaugural workshop, hosted by ARLFRD in Idaho Falls in 2002. This Network of scientists, consisting of researchers from more than 20 institutions world-wide, is critical to the success of the SERA program within ARL. [jeff.french@noaa.gov](mailto:jeff.french@noaa.gov)

## Las Vegas

**36. *NOAA Cooperative Institute for Atmospheric and Terrestrial Applications (CIASTA) – Mesoscale Modeling.*** NV-RAMS ran to completion on the University of Nevada-Las Vegas (UNLV) computer system 31 of 31 days (a 100% completion factor). Data are continuing to be renamed and saved daily, and backed up to CD monthly (4 CDs).

Continuing to work with UNLV Computer staff to test “miser queue” function by running normal run at 2000 and miser run at 2245 both with over 18 CPUs. The miser queue model runs do not run with over 18 CPUs. A message was sent out to the RAMS modeling community asking for other user experiences. (Walt Schalk, 702 295 1262)

**37. *Computer Programming/Surface Data Plots.*** A new program was constructed to plot surface observations for all available reporting stations from AWIPS. This program is set up with background information from the ARL/READY system. With this background, plots can be made for any location on the earth. The background is fairly well detailed for the “lower 48”, but is mostly “rough” for other locations. The program is set up so that the user specifies the latitude/longitude of the center of the plot



and the N-S range in nautical miles. The graphic produced is in a mercator type plot. The center latitude determines the ratio to use for the plot, thus, the plot is “true” at the latitude of the center. The program utilizes the new database of surface observations that resides on “tornado”. These observations will be expanded to include Alaska, Canada, Mexico, Central America, and the Caribbean. (Doug Soule’, 702 295 1266)