NOAA ARL Monthly Activity Report

October 2003

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Contents

Highlights

1. The National Atmospheric Deposition Program Ammonia Workshop. ARL led in a workshop on atmospheric ammonia, conducted in October in conjunction with the Annual Technical Meeting of the National Atmospheric Deposition Program. Invited speakers included several from Europe. The large uncertainty in the regional and local ammonia budget was raised as a key issue. Perspectives on local versus long-range transport from regional and modeled budget analyses were presented, using process analysis in the regional models, and discrepancies with conventional wisdom were noted. Overall conclusions were that the regional air quality models are capable of functioning in a reasonable manner in the large-scale sense, but they have a difficult time predicting time and space details correctly. Even with present deficiencies, the models are useful tools when carefully applied. A number of research recommendation were discussed, to help reduce uncertainties. The recommendations focused on measurements, including hourly time-resolved gas and particle observations, the need for 1 Hz or better ammonia measurements for better dry deposition algorithm testing, and the necessity of obtaining data in the third dimension, such as from remote sensing. Implicit is the need and opportunity for different ARL divisions to work together to improve ammonia dry deposition algorithms. (Robin Dennis, 919 541 2870)

2. Airborne Environmental Research Scientists meeting --NAERS. The second international workshop for the Network of Airborne Environmental Research Scientists (NAERS) was held in Trento, Italy, on October 20-22**.** The inaugural meeting was held in Idaho Falls in January, 2002 with FRD as host. The NAERS group contains over 35 members from ten countries and four continents operating more than twelve SERAs for atmospheric research. The second workshop had in attendance 25 members, nine of whom did not attend the first workshop. NAERS scientists formed this working group to discuss issues unique to SERA operations, to cooperate in the use of SERAs and airborne instrumentation, and to promote the use of SERAs as viable options to investigating difficult environmental issues.

ARL once again played a key role in the organization of the workshop. A total of seven presentations were given by ARL staff at the meeting. Six sessions during the two-day workshop covered topics ranging from individual members' programs to sensors and instrumentation to software development. Reports of data collected from SERAs were presented by various groups, illustrating the wide scope of problems the platforms are used to investigate. Ongoing collaborations within the group continue to pay dividends to all members. Discussions have lead to refinements in both data system software and processing algorithms, a better understanding of the physics of our instrumentation, including the first significant results from wind tunnel tests of the BAT probe, and continued evolution of our instrument development capability. The third workshop is tentatively scheduled for Spring 2005. jeff.french@noaa.gov

3. Office of the Federal Coordinator for Meteorology (OFCM) Committee Participation. Dr. Ellen Cooter participated in the Committees for Climate Analysis, Monitoring, and Services (CCAMS) meeting hosted by the OFCM in Silver Springs, Maryland. . Several ARL scientists are taking part in the Joint Action Group on Atmospheric Transport and Dispersion. Representatives of many federal agencies participated. The goal is to review research needs and plans of these agencies and develop a coordinated approach. (Ellen Cooter, 919 541 1334; Ray Hosker, 865 576 1248)

4. AGU Special Session on Tampa Bay Estuarine Studies – BRACE. An oral and a poster special session covering results of the Bay Region Atmospheric Chemistry Experiment (BRACE) Intensive Field Program will be held at the Fall American Geophysical Union Meeting December 8-12 in San Francisco. The goal of BRACE was to improve our understanding of atmospheric nitrogen deposition to Tampa Bay. Tampa Bay is one of the most important Gulf Coast estuaries. There has been a reduction of 72 per cent in the sea grass coverage in the bay over the last 70 years caused by anthropogenic nitrogen inputs. Twenty-nine per cent of this nitrogen input is estimated to come from direct atmospheric deposition. BRACE was executed during the month of May, 2002,

and involved more than 50 researchers from 12 Federal and State agencies and universities. ARL scientists flew over 80 hours on the NOAA Twin Otter making chemical and meteorological measurements in conjunction with ground-based flux and deposition measurements, and will test models against the measurements. The BRACE AGU special sessions will present the results of the experiment and promote cooperation, collaboration, and interdisciplinary connections between interested researchers and institutions involved in the program. The sessions will consist of 8 talks and 11 posters with the following ARL authors: Winston Luke, Richard Artz, Robin Dennis, Tilden Meyers, and Tom Watson. tom.watson@noaa.gov

Silver Spring

5. Turbulence Data Fields for HYSPLIT. The first steps have been completed to restructure the HYSPLIT code to be able to handle the turbulence kinetic energy (TKE) fields from ETA (and other models) to compute dispersion. The code conversion is required for the model to use measured turbulence data, regardless of whether TKE fields are available from the meteorological model. roland.draxler@noaa.gov

6. Upcoming Changes to HYSPLIT via READY. Within the next month or two we will be moving our newest web server online to host the ARL and READY websites. At the same time we will be changing the login methodology of HYSPLIT via READY. First, we plan to open HYSPLIT access to everyone, without a password, when running HYSPLIT with **archived data** only. Secondly, we will have only one username and password for access to HYSPLIT when using **forecast data** and will continue to require new users to fill out a registration form for access. After registration approval, we will email the single account name and password to the user. We plan to change the single username and/or password every 1-3 months, which will be emailed to all registered users. If the return email address is no longer valid, and we have not been notified of a new email address, we will remove their application, eliminating "dead" accounts. Finally, we will continue to have a third area of the READY/HYSPLIT website that provides a limited set of users access to the "special" or "emergency response" section of READY, which includes the use of the 12km Eta forecast data with HYSPLIT and a version of HYSPLIT with more options. glenn.rolph@noaa.gov

7. Global Temperatures Updated Through JJA of 2003. Global tropospheric and low-stratospheric temperatures estimated from 54- and 63-station radiosonde networks have been updated through the past summer. In this interval of neither El Nino or La Nina, the temperatures are generally unexceptional, the global tropospheric JJA temperature is 6th warmest of the 46-year record, the global low-stratospheric JJA temperature the warmest since the 1992 warming resulting from he Pinatubo eruption. A fairly unusual condition for recent years is the larger positive global temperature anomaly for the troposphere (0.5k) than for the surface (0.3k), thus opposing the tendency over the last 25 years for a greater global surface than tropospheric warming. (Jim Angell, 301 713 0295, x127)

Boulder

8. SURFRAD/ISIS. On October 20-23, Gary Hodges and John Augustine installed a lightning protection system at the Goodwin Creek SURFRAD station in northern Mississippi. The USDA National Sedimentation Laboratory, our host at Goodwin Creek, purchased nearly all of the materials for this project. The new system is the same as that installed at the SURFRAD station near Sioux Falls, SD, and involves the encirclement of the entire station with a buried thick copper cable with several ground rods attached. All structures and equipment are tied into that common grounding system. The decision to install lightning protection at Goodwin Creek was prompted by a direct lightning strike in July that resulted in the loss of thousands of dollars worth of equipment.

The monthly averaging program for SURFRAD was improved to allow for current year averages to be available on the SURFRAD web site. john.a.augustine@noaa.gov

9. Diffuse Radiation Intensive Observation Period. The second diffuse irradiance intensive observation period (IOP) was held October 6-17, 2003. Fifteen shaded pyranometers produced diffuse solar irradiance simultaneously for clear, partly cloudy, and totally overcast conditions. The goal of this exercise was to develop a working standard for this measurement for DOE/ARM and the WMO/BSRN community from among the best available commercial and experimental instruments. Although the diffuse contribution is generally smaller than the direct component of sunlight, the largest uncertainty is with the diffuse since there is no absolute measurement of diffuse as exists for direct using absolute cavity radiometers. joseph.michalsky@noaa.gov

Oak Ridge

10. Terrestrial Carbon Program. Equipment loss to lightning at the Walker Branch tower over the past several months was traced to a poor ground. A length of approximately 250 linear feet of horizontal electrodes was placed in five trenches emanating from the tower base. The electrodes were encased in bentonite to conduct surges efficiently to ground and to minimize electrodes' oxidation. New down leads and air terminals, to be installed as soon as possible, will complete the grounding upgrade. Data collection at the site was consistent through the period with only minor power outages. (Meyers)

11. Air Quality Measuring near I-40. During the month of October, bias tests were performed to insure the accuracy of data in preparation for air quality studies near adjacent to Interstate 40 near Oak Ridge. In addition, analysis of samples for the BRACE program in Tampa, Florida began. The analysis of the filter packs for the AIRMoN Dry Network program continued. The analysis includes preparation, extraction, and reloading of the filter packs. Upon completion of the analysis of the filter packs, the data are converted and recorded. (Klemenz and Satterfield)

12. Coupled Dynamical/Photochemical Modeling. Additional time series data at various heights and locations were extracted from an idealized 12-hour large-eddy simulation (LES) with continuous passive tracer emissions from the surface. Plots of tracer mixing ratio deviation were produced showing instantaneous 2-minute values, 1-hour and 5-hour running means from the extracted time series. As expected, the characteristics of the 5-h running mean are dependent on location for this LES with no mean wind and dominated by convective updrafts. (Herwehe)

13. Air Toxics Program. During October progress was made on refining a methodology to determine trace gas probability density functions from fine scale air quality simulations. Working with sample Models-3/CMAQ surface grid cell output provided by ARL colleagues at Research Triangle Park, Exploratory Data Analysis (EDA) techniques were used to used to examine subgrid formaldehyde mixing ratio variations. A program was written to test the fine scale trace gas samples for location (*e.g.* mean) drift, variation (*e.g.* standard deviation) drift, randomness, outliers, and normalcy. If the sample is determined to have a nearly normal distribution, the program prints out the equation for the normal probability density function (PDF). The data from the CMAQ 12-km by 12-km area provides an example where a normal distribution best fits the fine scale trace gas mixing ratio variation. (Herwehe)

14. EGRETT Data Analysis. The EGRETT is a high-altitude research airplane owned and operated by Airborne Research Australia (ARA) in Adelaide. It measures atmospheric turbulence *in situ* using up to three BAT probes, developed in collaboration between ARA and ATDD. A variety of additional sensors can also be fitted. EGRETT's unusually slow airspeed (under 100 ms^{-1}) allows fine-resolution measurements at altitudes through and above the tropopause, up to 15 km.

The EGRETT and a companion King Air flew a study of jet-stream cirrus clouds over South Australia in September 2001. The combined remote and *in situ* measurements help examine cloud-physics and dynamical processes on multiple scales. In support of this work, the EGRETT's turbulent wind and temperature observations were computed at ATDD from their raw source data. (Dobosy)

15. HYSPLIT Atmospheric Dispersion Model System. Three more HYSPLIT dispersion model systems were prepared for deployment to the field. One system was shipped to NOAA HAZMAT in Seattle for installation early in 2004. (Dumas, Pendergrass)

16. Italian National Research Council Sky Arrow. Installation and checkout was completed for of one of the three MFP systems built for Enzo Magliulo of ISAFoM-CNR (Italian National Research Council, Institute for Agricultural and Forest Meteorology). Personnel from IATA-CNR in Florence will install the remaining two systems following replacement of their computer motherboards, found defective. (Dumas)

ATDD participated in a meeting on US-Italy cooperation on carbon budget research on October 15 - 16, following the AmeriFlux meeting in Boulder, CO. ATDD continues to work with US and Italian scientists on airborne measurements of energy and carbon fluxes. (Hosker)

17. NOAA Dry Deposition Inferential Method. Five dry deposition sites in State College, PA and Grasonville, MD were visited this month. The sites received new data-loggers along with new, or recently calibrated, sensors and pumps. The towers were re-guyed to enhance safety and stability. Sites in Underhill Center, VT, Whiteface Mountain and Newcomb, NY have been discontinued. (Meyers)

18. Urban Dispersion Study. Data QA/QC continues for the Joint Urban 2003 study in Oklahoma City this past summer. Data from the ATDD surface energy budget stations will be provided to Ms. Christy Carlson, a graduate student at the University of Oklahoma, as a possible thesis topic. (Hosker, Gunter, Heuer)

19. U.S. Climate Reference Network. Annual site maintenance was performed at each of the following sites: Fairbanks, AK; Barrow, AK; Sterling, VA; Johnstown, PA; State College, PA; Limestone, ME; Old Town, ME; two Durham, NH; Pechkham Farm, RI; Plains Road, RI; and two Asheville, NC. (Hall, Black, Brewer, Bryant, Boice, Dunn, and Randolph)

USCRN sites were installed at Boulder, CO; St. Mary, MT; and Jackson (French, Randolph, Boice, and Rutherford)

Research Triangle Park

20. Community Multiscale Air Quality Model. Work is continuing with researchers at the Sandia National Laboratory to optimize the Community Multiscale Air Quality (CMAQ) model for faster execution. Some initial work in optimizing the I/O for Linux clusters has resulted in a significant speed-up with an estimated 7-10 day wall time to run an annual simulation using the test data on 32 of their CPU's. The test data represents a typical scenario that States might use for a State Implementation Plan (SIP) analysis. Some of these results, along with optimization work to develop an optimized air quality forecast version of CMAQ, were presented at the Models3-CMAS Workshop held October 27-29 in Research Triangle Park. (Jeff Young, 919 541 3929)

A test simulation was performed with the CMAQ-Hg model to investigate model sensitivity to an aqueous chemical reaction of mercury that new research in Sweden indicates may not actually occur in cloud water. The CMAQ-Hg cloud chemistry mechanism currently includes the reduction of all aqueous Hg(II) species to Hg(0) by reaction with the hydroperoxyl radical (HO_2). New research indicates that the seminal investigation of this reaction may have produced an artificial reduction of Hg(II) by reaction with the oxalate compounds and simulated actinic radiation used to produce HO_2 for the experiment. The CMAQ-Hg model test period of April 4 to May 2, 1995, was simulated once again, this time with the rate constant for the HO_2 reaction set to zero. All other parameters and reactions were left unchanged from the latest version of the model. Changes in simulated wet deposition of total mercury due to the elimination of the HO_2 reaction in the model were analyzed and the test simulation results were compared against Mercury Deposition Network (MDN) observations. Total mercury wet deposition at all MDN sites during the test period increased by 23.9% with individual weekly wet

deposition values increasing by 3.3% to 110.1%. The general model bias for Hg wet deposition went from -16% to +4%. However, the low bias in the base CMAQ-Hg model has previously been attributed to an even more severe low bias in weekly precipitation amounts from the Mesoscale Model - Version 5 (MM5) meteorological driver. While this study has identified a significant model sensitivity to the HO_2 reaction, it has not demonstrated a more realistic cloud physicochemical process simulation with the HO_2 reaction removed. (O. Russell Bullock, 919 541 1349)

When running a continental-scale Community Multiscale Air Quality (CMAQ) model simulation on a single processor, the aerosol module accounts for as much as 44% of the total model run time. Within the aerosol module, coagulation calculations account for approximately 50% of the computational burden. A more efficient coagulation algorithm is being developed. Initial tests of the new algorithm in continental-scale model simulations reveal that it runs nearly sixty times faster than the existing coagulation algorithm. The accuracy of the new algorithm is being examined. (Prakash Bhave, 919 541 2194)

21. An Evaluation of the Models-3 Community Multiscale Air Quality Model. The 2003 release of the EPA's Community Multiscale Air Quality (CMAQ) model was made available during August of this year. As part of this release, an evaluation was performed involving two simulation periods (4 January - 19 February 2002, and 15 June - 16 July 1999). Performance for individual species were as follows:

Ozone*:* CMAQ produces fairly unbiased (normalized mean bias (NMBs) < 10%) and accurate (normalized mean error (NMEs) ~ 20.0%) simulations of both the max-1 hour and max-8 hour ozone concentrations when compared against the AIRS data. Correlations are also fairly good (between 0.72 and 0.75) indicating that CMAQ is capturing roughly 50% of the variability exhibited by the observations.

Sulfate*:* CMAQ performed quite well in simulating SO_4 concentrations. Correlations are high, ranging from 0.90 during the summer (against both CASTNet and IMPROVE sites) to 0.66 in the winter against STN sites. The NMBs are (with one exception) positive and between 9.2 and 38.4%. The lone underprediction occurs against STN data (NMB: -12.0%) and like the lower correlation, may be attributable to the more urban influences in the STN. The NMEs range from 25.7% (winter, CASTNet) to 61.9% (summer, IMPROVE).

Nitrate*:* Of all of the species simulated by CMAQ, NO_3 simulations are the worst. Correlations are lower for the winter simulations (0.27: CASTNet, 0.36: IMPROVE) when compared to the summer simulations (0.39: STN, 0.54: IMPROVE, 0.76 (CASTNet). The summer simulation produces negative biases (NMB: -30.8% for CASTNet, -39.1 for IMPROVE), while NMBs for the winter simulation are mixed, ranging from 8.0% for STN to 46.8 for CASTNet. The errors associated with NO_3 simulations are generally the largest produced by CMAQ and range from 66.9% (winter, STN) to 96.5% (winter, IMPROVE).

Ammonium: Results of NH_4 simulations mirror those of SO_4 in that CMAQ performed quite well and consistently especially when compared against CASTNet observations (correlations: 0.86 summer simulation, 0.85 winter). As seen with SO_4 and probably for the same reason, the CMAQ correlation against the STN is considerably lower (0.41). The NMB against STN data is however small (5.2% for the winter simulation) when compared against CASTNet (40.0% for the winter and 22.7% summer). The NMEs range from 36.5% (summer CASTNet) to 57.7% (winter, STN) to 96.5% (winter, IMPROVE).

$PM_{2.5}$: The results of the $PM_{2.5}$ simulations are like $PM_{2.5}$ itself, a composite of the other species. Correlations associated with the more rural IMPROVE network are considerably higher (0.71 summer, 0.68 winter) than those associated with the more urban STN network (0.37 winter). The NMB for the summer simulation is small and negative (-9.8%) against the IMPROVE network, small but positive for the winter simulation against STN and large and positive for the winter simulation against the IMPROVE network. The NME range from 40.3% (summer simulation against IMPROVE) to 57.7% (winter simulation against STN).

***Nitric Acid**:* The results associated with the HNO_3 evaluation are consistent between the summer and winter simulations. The correlation for the summer simulation is 0.79, while that for the winter is 0.64. The NMBs are positive (49.0, 44.2 for summer, winter respectively) and the NMEs average near 60%.

Organic Carbon: Results for OC are mixed depending on season and network. The NMB against IMPROVE is small and negative (-1.5%) in the summer yet it is positive and larger in the winter (17.2%). Against the STN data, the winter CMAQ simulation significantly underpredicts (NMB: -50.0%). The NMEs are more consistent - though large, ranging from 60.4 to 70.0%, and the correlations range between 0.32 and 0.56.

***Elemental Carbon**:* The summer CMAQ simulation of EC is unbiased (NMB: 1.0%) and produces a correlation of 0.69 when compared against IMPROVE data. Conversely, the winter simulation significantly overpredicts EC, resulting in large positive biases (31.0% and 59.1% against IMPROVE and STN respectively) and large errors as well (NME 81.0, 95.0%. (Brian Eder, 919 541 3994)

22. Plume-in-Grid (PinG) Modeling Effort. Test simulations and analyses of results have continued with the updated aerosol algorithm in the Plume-in-Grid (PinG) model. A recently revised version of the plume dynamics model (PDM) processor has also been exercised, which allows more frequent intervals for plume emission releases than the originally designed hourly interval. The Community Multiscale Air Quality (CMAQ) PinG was successfully run with the revised PDM output file containing twice hourly plume release information. Visualization of the plume chemical and aerosol concentrations is also underway using a plume graphics tool in Data Explorer. In addition, CMAQ PinG simulations are being planned with a continental domain for summer and winter periods. (James Godowitch, 919 541 4802)

23. Air Toxics Modeling. A new numerical solver has been added to the air toxics version of the Community Multiscale Air Quality (CMAQ) model. The work revised the Euler Backward Iterative solver for the Carbon Bond-IV mechanism that was released to the public in September 2003. The new solver decreases the model run time by 10 - 20 percent. We are testing the emission inventory that will be used to support the National Air

Toxics Assessment with CMAQ. This work is intended to identify potential errors in the emission inventory before it is used for the annual assessment. (William T. Hutzell, 919 541 3425)

24. Meteorological Model Evaluation Tool. Further development and testing have been performed on the meteorological model evaluation system. The primary accomplishment was matching surface observations with corresponding July-August 2003 National Centers of Environmental Prediction (NCEP) Eta model meteorology. This effort represents the most extensive use of the system to date. Approximately 1.5 million observations per variable were matched with model output. Progress was also made on the main evaluation utility that uses the "R" statistical package to connect and then extract observation-model pairs from the database. An evaluation matrix of statistical measures is generated from these extracted data. Plots and tables are then generated from the matrix. Over the next few months, the system will be refined by adding new graphical output and more formal reports. Additionally, Mesoscale Model Version 5 (MM5) 2001 year-long simulation data are currently being loaded into the database. This data set will be used to extend the functionality and streamline the automated aspects of the tool. (Robert Gilliam, 919 553 4593)

25. Biogenic Emissions Modeling. After analyzing an annual run of BEIS3.11 for a 36-km continental domain, a decision was made to modify the estimation of soil NO emissions for the latter half of the growing season. This minor update has resulted in the creation of BEIS3.12, which will be available at www.epa.gov/asmdnerl/biogen.html. Results from this update were presented at the recent CMAS workshop. (George Pouliot, 919 541 5475).

26. An Evaluation of the ETA-CMAQ Air Quality Forecast Model. The initial phase of this program, which couples NOAA's Eta meteorological model with EPA's Community Multiscale Air Quality (CMAQ) model,

began operation in July of this year and has been providing forecasts of hourly ozone concentrations over the northeastern United States. As part of this initial phase, an evaluation of the coupled modeling system has been performed in which both *discrete type forecasts* (observed versus modeled concentrations) and *categorical type forecasts* (observed versus modeled exceedances/non-exceedances) for both the maximum 1-hr (125 ppb) and 8-hr (85 ppb) concentration fields were evaluated. The evaluation encompassed approximately two months (7 July-31 August 2003) and used hourly O_3 concentration data obtained from the EPA's AIRNow network.

The Eta-CMAQ modeling system performed reasonably well in its first attempt at forecasting ozone concentrations, surpassing the target for acceptable performance at categorical accuracy of 90% or better. Discrete statistics revealed that correlations exceeded 0.60. (Brian Eder, 919 541 3994)

27. Emissions Processing for the National Air Toxics Assessment. Test files for the December 2000 "ramp-up" period have been used for the initial test of the toxics version of the CMAQ modeling system. Emissions processing for the entire year of 2001 is expected to continue during November. (George Pouliot, 919 541 5475)

As an extension of the National Air Toxic Assessment (NATA) effort and to support human exposure modeling assessment in urban areas, the CMAQ modeling system is being set up to perform annual simulations of selected toxic compounds over a 12-km and a 4-km grid mesh centered over Philadelphia. We plan to complete these annual simulations by April 2004. MM5 simulations for the first 10 days of 2001 for the 12-km and 4-km grid mesh have been reviewed and appear reasonable. Emissions processing and CMAQ simulations will begin as soon as the NATA 36-km simulations are available. (Jason Ching, 919 541 4801; and Tom Pierce, 919 541 1375)

28. Emissions Processing for Air Quality Forecasting. In consultation with the National Weather Service, priorities for updating the emissions processing portion of the air quality forecast system for the 2004 season have been determined. The highest priority is to use the MOBILE6 model for estimating mobile source emissions. To this end, we are comparing MOBILE6 to estimates made by MOBILE5b during the summer 2003 ozone season. Processing of the mobile inventory using MOBILE6 with SMOKE version 2.0 has begun. Another high priority is to project Electric Generating Unit (EGU) point-source emissions to 2004. Attempts will be made to account for newly installed emissions control technology that may significantly perturb nitrogen oxide (NO_x) emissions. Another priority is to process emissions for an expanded domain. Since the proposed expanded domain would be a subset of an existing regulatory modeling domain for which spatial surrogates already exist, implementing the emissions processing for this new domain should be relatively easy. (George Pouliot, 919 541 5475)

29. Global Change Regional Climate Analysis. To better understand and interpret seasonal and spatial variability of regional-scale meteorological patterns as they relate to air quality, six years of data from the ETA Data Assimilation System (EDAS) archive are undergoing cluster analysis. The data files have been downloaded and are being processed. SAS code has been written and tested for data analysis, and a GRADS script is being developed to visualize the results. Computer memory constraints are hindering the final processing of these data until a fully-functional Linux version of SAS is in place. After the cluster analysis has been completed, 700 mb *u* and *v* component wind results will be compared to those based on Nation Centers for Environmental Prediction (NCEP) reanalysis fields reported in Cohn *et al*. (2001). If and when this comparison is successful, the same approach will be applied to the MM5 downscaled scenarios driven by NCEP reanalysis and GIS boundary conditions. The results will then be evaluated for evidence of large-scale bias that could impact the Division's global change and air quality assessments. (Ellen Cooter, 919 541 1334)

30. Development of a Multimedia Modeling Approach for Mercury. Work is continuing on adaptation of the Community Multiscale Air Quality (CMAQ) modeling system to serve as a multimedia platform for mercury. Additional documentation for a 4-compartment modeling approach has been received from Argonne National Laboratory. The documentation and source code files have been shared for further evaluation. Inclusion of Russ

Bullock's CMAQ/Hg modules in the September CMAQ release on the T3E super-computer are nearing completion. Results for two sample periods will be reviewed in early November to determine if proper implementation of these modules has been completed. (Ellen Cooter, 919 541 1334)

31. NARSTO Emission Inventory Workshop, October 14-17, 2003, Austin, Texas. The Workshop was sponsored by NARSTO and the Commission for Environmental Cooperation (CEC) with David Mobley, National Exposure Research Laboratory, as Co-Chair. Approximately 220 people attended the Workshop representing a good cross-section of the emission inventory community with approximately 20% from academia (20 universities), 20% from States (26 States), 15% from U.S. Federal Government (EPA, NOAA, NASA, USDA, and DOE National Laboratories), 15% from contractors and research institutions, 10% from industry, 10% from Mexico, 5% from Canada, and 5% from local governments. The Workshop focused on new and improved methods for the improvement of emission inventories used for regulatory air quality modeling, with an opening plenary session featuring challenges to emission inventories in the future in the United States, Canada, and Mexico. The Workshop then featured breakout sessions on Measurement Methods (Source and Flux, Mobile and Tunnel Studies, and Ground/Aircraft/Satellite Observations) and Analytical Methods (Receptor and Air Quality Modeling, Emission Modeling, Evaluation and Data Management). The final day featured the recommendations from the breakout sessions on tools and techniques, which could make an impact on emission inventories in the future. A synthesis paper with results from the Workshop, including findings and recommendations, is slated for publication by the end of the year. It was also announced at the Workshop that NARSTO is planning the next assessment on emission inventories, which should be conducted over the next year or so. The Workshop and the assessment have the potential to help emission inventories deliver products with the desired quality, timeliness, and cost. (David Mobley, 919 541 4676)

Dr. William Benjey and Thomas Pierce also participated in the NARSTO Workshop. Dr. Benjey served as a member of the program committee and recorder for the Air Quality and Receptor Modeling Session, while Mr. Pierce gave an invited presentation on the use of satellite imagery to improve biogenic emissions modeling. Presentations from the workshop may be viewed at: http://www.cgenv.com/narsto/. (Bill Benjey, 919 541 0821; Tom Pierce, 919 541 1375)

32. Models-3 Users' Workshop, October 27-29, 2003. The 2003 Models-3 User's Workshop was hosted by the Community Modeling and Analysis System (CMAS) and the UNC-Chapel Hill, Carolina Environmental Program. More than150 participants registered representing 7 countries. There were 44 oral presentations, 8 posters, and 3 panel discussions on computational efficiency, regional planning organization use of CMAQ, and CMAS priorities. Training in the use of CMAQ and the new version 2.0 of the Sparse Matrix Operator Kernel Emission (SMOKE) model system was offered before and after the workshop. The first session featured presentations on the status of Models-3 components: the emission processor Sparse Matrix Operator Kernel Emission (SMOKE) and the chemical transport model Community Multiscale Air Quality (CMAQ), as well as the status of the CMAS Center. The rest of the workshop included presentations and posters on a variety of model application studies, evaluation studies, sensitivity studies, and further model development. Extended abstracts and power point presentations can be accessed at www.cmascenter.org.

The External Advisory Committee (EAC) met after the workshop to discuss future priorities for CMAS. Future funding possibilities was a key part of the discussion. Discussions were also held on filling vacant seats on the EAC.

CMAS is coordinating an independent peer review of the Models-3/CMAQ modeling system. Reviewers have been selected and review materials will be provided during November. The review is scheduled for December 17-19, 2003 in Research Triangle Park. (Bill Benjey, 919 541 0821)

Idaho Falls

33. CBLAST-High. Work continues on the reduction, processing, and analysis of data from this year's field deployments. Recent work focused on merging high frequency NOAA P-3 data and data from the BAT system. Presently, no tools exist to read the high frequency P-3 data. The software currently being built will be disseminated to other CBLAST investigators. Of the six hurricane research flights, usable data were obtained from five. Problems related to the intrusion of water into the BAT probe were eliminated between the two field deployments. Analysis will focus on data collected in the first two flights of Hurricane Fabian and the three flights from Hurricane Isabel. jeff.french@noaa.gov

34. JOINT URBAN-2003. During the past three months, our efforts have focused on preparing the data from the continuous SF_6 analyzers for release and also on understanding the data collected with the new bag samplers. The work with the continuous analyzer data is progressing well. We have completed QC checks of all data and have identified and extracted the SF_6 measurements from the raw data files. We are currently reviewing all data and identifying problems in the data that will require quality flags to be set. Before final data files may be generated, we must also establish correct positions for the continuous analyzers during each test. Each continuous analyzer was equipped with a GPS unit to provide positions. However, positions provided by GPS units in close proximity to tall buildings are very suspect and most of the position information we have can not be trusted. We must identify a way to get correct position information.

The data from the bag samplers ("Super PIGS") present a more difficult challenge. The first indication of problems was very poor results from the QC samplers during field deployment to Oklahoma City. These QC samplers consisted of field controls and field blanks. Both types of QC samplers were deployed just like normal samplers, collected after each test, and analyzed with the rest of the samplers. They were used as indicators of method performance. The difference between these and the typical plastic sampler is that the QC samplers were equipped with a source box containing bags of gas with known concentrations of SF_6. In the case of field blanks, the source bags contained pure Nitrogen. For field controls, the source bags contained calibration standards of known concentrations. The comparison of the analysis of these samples to the true concentration values provides an indication of how well the sampling process performed in the field. roger@noaa.inel.gov, debbie@noaa.inel.gov

35. Rain In Cumulus over the Ocean (RICO). The NSF Observing Facilities Advisory Panel (OFAP) met on October 13 to consider a request to deploy the University of Wyoming King Air and 95 GHz cloud radar to Antigua in winter 2004/2005 in support of the RICO project. The request for the King Air, submitted jointly by NOAA/ARL, University of Wyoming, and organizers of RICO, was approved. We are presently awaiting a decision from the NSF physical meteorology division for support of a proposal submitted in July to participate in RICO. jeff.french@noaa.gov

36. ARL Dispersion Modeling System. ARL has been developing a laboratory-wide dispersion modeling system that is flexible enough for various applications at the various divisions. One issue that has come up is a desire to assimilate data from a variety of observation platforms and update the wind and turbulence fields based on these observations. Dugway Proving Ground (DPG) in Utah is using a data assimilation system developed by a group called 4DWX (http://www.4dwx.org). FRD staff visited DPG in late October to see how their system works. It is based on rapid updates of the MM5 mesoscale model. They assimilate data from several different sources, including their own tower network, MesoWest, satellite-derived winds, and commercial aircraft (ACARS). Every three hours MM5 is restarted and nudged using the real-world meteorological data that have come in since the last update. The model is cold started only once per week using output from the Eta model. Thereafter, it is warm started using its own output. DPG uses four nested grids, with the highest resolution grid having a 1.1 km spacing. One issue with adapting something like the 4DWX system to ARL use is that it may require significant computer resources. DPG is using a 32-node Linux cluster, and are upgrading to a 64-node cluster. richard.eckman@noaa.gov and Kirk Clawson

Las Vegas

37. Cloud-to-Ground (CG) Lightning Study. Research continues on characterizing CG flash density as a function of altitude in Southern Nevada. CG data were analyzed to yield flash density versus terrain elevation versus time of day (PDT), flash density versus elevation for the two primary mountain ranges, and a data listing of flash count by year, month, hour, and terrain elevation. Preliminary analysis of the data show that flash intensity tends to decrease with elevation. The most powerful flashes ($\geq$75 KV) appear to occur between terrain elevations of 2500 and 7500 ft MSL. Preliminary results of this complex data base show that the peak flash density (avg. 4.4 fl/km2) is between 7000 and 9000 ft MSL. Analysis also shows that CG lightning activity increases dramatically after 1200 PDT, peaking at 1400 to 1500 PDT over the highest terrain and at 1700 to 1900 PDT over the lowest terrain. In addition, a weak increase in CG activity appears at all elevations at 0300 PDT. (Darryl Randerson, 702 295 1231)

38. Impact of California Forest Fires on SURFRAD Data. The impact on solar radiation at the Desert Rock Meteorological Observatory (DRA), SURFRAD station, by the smoke plume from the California forest fires, October 28, is presented in the following table. The smoke-day data are compared with a relative clean-air day, October 29, 2003. DRA was on the northern edge of the dense smoke plume on Oct. 29. Minimum surface visibilities in the L as Vegas area were 1.5 to 2.0 miles. During peak smoke impact (1800 through 2000 UTC) at DRA, the surface visibility decreased to 4.0 miles with southwest wind 13 to 26 kts and no clouds visible. There appears to be little impact on infrared radiation. (Darryl Randerson, 702 295 1231)

RADIATION (1800 UTC)	28 OCT 2003	29 OCT 2003	29-28= CHANGE	PERCENT CHANGE
Direct Solar [w/m^2]	1010	400	-610	-60
Downwelling Solar	620	400	-22-	-35
UVB	100	30	-70	-70
UVB Max	130	70	-60	-46
Diffuse Solar	50	200	150	75
Net Solar	500	340	-160	-32
Net Radiation	320	200	-120	-38

39. CIASTA. Mesoscale Modeling: NV-RAMS ran to completion on the University of Nevada-Las Vegas 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 (3 CDs). (Walt Schalk, 702 295 1262)

The 12z model run is continuing to working well with a 100% completion factor. (Walt Schalk, 702 295 1262)

ARL Management Issues

40. TCCR Meeting, Princeton. Chris Cornwall remotely attended the NOAA Research Technical Committee for Computing Resources (TCCR) meeting, held in Princeton, NJ, at GFDL (Geophysical Fluid Dynamics Laboratory). Some of the highlights are listed here:

NOAA's new calendar software will be rolled out this coming spring, and comes from Oracle, although it's really the old Netscape Calendar, which Oracle purchased. There is still some question about who in NOAA will receive the software. It may only be for federal employees, and may be most useful for those in the DC area. Once the new calendar has been rolled out, focus will shift to new directory servers and new consolidated email servers. There is also more discussion of (voluntary) consolidation of web servers. Netscape 7.1 will probably be the new NOAA standard for web browser and email client.

Adware and Spyware: You can use "AdAware" to detect and remove these undesirable programs. Note that Weatherbug software does contain spyware that sends email addresses to spammers.

NOAA is changing its document format standard from WP to MS Word.doc files. OAR has worked hard to keep the standard from proclaiming we must all use MS Word. So it's okay to use WP or OpenOffice or Star Office, but for exchanging documents with other NOAA folks, .doc. is the preferred file format.

Quarterly Vulnerability Scans: each ARL division is required to perform a network vulnerability scan on all of their network connected computers. This requirement comes from DOC, and is not negotiable. NOAA has purchased and decided to standardize on the Harris Stat scanning tool. This doesn't mean you can't use other tools to scan your network, but it does mean you have to use Harris to scan your net every quarter. The scans will look for open ports, unpatched systems, and other known vulnerabilities. Results of the scans will be sent (via a secure connection) to NOAA's security people. The first scan data are due to NOAA on December 15, 2003. Subsequent scans will be due March 15, June 15, and September 15.

On the NOAA implementation of Microsoft Active Directory, OAR proposed allowing as much flexibility as possible, and not requiring all NOAA AD trees to be part of the same AD forest. We were outvoted. Fortunately, there was no money for the NOAA-wide AD implementation, so we have defaulted back to what OAR suggested in the first place. So you're free to do whatever sort of Active Directory your division needs. And if you are interested in doing Active Directory, Jeremy Warren is interested in hearing from you. Email him at jeremy.warren@noaa.gov.

NOAA has training requirements for its IT people. Depending on what sort of IT you do, you may be required to keep up on your training. The policy is still in draft form, but currently IT Security Officers need to take 40 hours of training each year. Network administrators need 8 hours per year. And system administrators should take 8 hours of training every 3 years. The training should be geared toward computer and network security. Two online training opportunities already exist in OAR. SANS security training courses are available online for the deeply discounted price of $700 each. They also offer NOAA discounts on the live courses. NOAA's e-learning (http://e-learning.noaa.gov) program also offers IT security courses, in addition to many other varieties of training, from management classes to other computer skills. Currently OAR has 50 free seats available to share between the NOAA labs. Each seat can access as many courses as they want, and additional seats are available for a small fee. The e-learning program is only available to NOAA federal employees, but the SANS training can be taken by contractors and joint institute personnel, too.

If you know of any other good sources for IT training, please let me know about them, and I will pass the information on to OAR. christopher.r.cornwall@noaa.gov