NOAA ARL Monthly Activity Report

September 2002

Bruce B. Hicks, Director
Air Resources Laboratory

Contents

Highlights

1. NOAA's Air Quality Forecasting Program. Jonathan Pleim, Ken Schere, Tanya Otte, and Jeff Young met with several scientists of NOAA's Environmental Modeling Center within the National Center for Environmental Prediction (NCEP) in Camp Springs, Maryland, to discuss the development and implementation of an Air Quality Forecast System at NCEP. The AMSD scientists presented an overview of the Community Multiscale Air Quality (CMAQ) model system followed by an overview of the operational forecast models by the NCEP scientists. Much of the subsequent discussion focused on linkage between operational meteorological forecast models, such as Eta and the Nonhydrostatic Mesoscale Model (NMM), with the CMAQ model. A key issue will be how to adapt the CMAQ system to the map projection and gridding system used by the NCEP models. Jon Pleim followed up with Zavisa Janjic to learn some of the particulars of scalar advection on the staggered E-grid used by Eta and NMM. The NCEP scientists have provided samples of model output and the code for the Eta, NMM, and the product generator, which can interpolate model output to any grid on any map projection. (Jon Pleim, 919 541 1336; Ken Schere, 919 541 3795; Tanya Otte, 919 541 7533; Jeff Young, 919 541 3929)

2. United Nations Environment Program Global Mercury Assessment . At the invitation of EPA's Office of International Affairs (OIA), Russ Bullock helped to coordinate the EPA review and comment on a Global Mercury Assessment being developed by the United Nations Environment Program (UNEP). His efforts were focused on technical issues related to long-range atmospheric transport of mercury and included the development of official papers describing the United States Government position on mercury as a global-scale air pollutant. Russ was nominated by EPA to serve as a U.S. delegate to the UNEP Global Mercury Assessment Working Group Meeting in Geneva, Switzerland. His nomination was forwarded by the State Department and was granted final approval by The White House. He attended the Working Group Meeting during the week of September 9-13, 2002, serving on a technical review panel responsible for finalizing the Assessment Report for delivery to the UNEP Governing Council. In addition to the Assessment Report, the Working Group also recommended a list of options for addressing the dangers of mercury. These recommendations, together with the Assessment Report, will be considered by the UNEP Governing Council that meets on February 3-7, 2003, at the UNEP headquarters in Nairobi. Based on the Working Group's scientific and technical advice, the Governing Council will adopt political decisions that will set the course for global action on mercury for years to come. Specific information on UNEP's Global Mercury Assessment and the outcomes from the Working Group Meeting are available at http://www.chem.unep.ch/mercury/WG-meeting1.htm. (Russ Bullock, 919 541 1349)

Silver Spring

3. Modeling the Atmospheric Fate and Transport of Air Toxics. Work is almost completed on the current phase of a mercury modeling intercomparison project being organized by the Meteorological Synthesizing Center East of EMEP. The results obtained with the HYSPLIT– Mercury model appear to be reasonably consistent with ambient measurements, although differences are found for the case of chemically reactive gaseous mercury components. In the course of this work, the chemical equilibrium algorithm in the HYSPLIT– Mercury model was developed further, so that the calculation successfully converges after a reasonable number of iterations. This feature of the model is now included dynamically in the HYSPLIT–Mercury simulation. Until these improvements were made, it had been necessary to provide a pre-calculated solution to ensure that the simulation consistently finished. In addition, the ability to incorporate ambient measurements of key reactants (e.g., ozone, sulfur dioxide) was added into the model and implemented for this analysis. This makes the simulation much more realistic than the constant values used in the preliminary versions. Finally, additional post-processing programs were developed to provide detailed time series

concentration and deposition results for each receptor (as opposed to only totals for the entire modeling period), and source-receptor results for each time in the time series. mark.cohen@noaa.gov

4. HYSPLIT 4.6 Version Finalized. The various modifications and improvements reported in the last few months have been packaged together for a new HYSPLIT distribution release. These include a new viewer to adjust the model particle positions and view satellite data, help pages converted to html format and updated to reflect new model features, an integrated PM10 dust storm algorithm, generalization of the simple first-order chemical conversion module to permit tracking of multiple species, and the inclusion of GIS conversion software to permit viewing of concentration and meteorological data with Arc Explorer. The new version will be made available next month. roland.draxler@noaa.gov and albion.taylor@noaa.gov

5. Comprehensive Test Ban Treaty. At the CTBTO-WMO cooperation workshop next month, technical details regarding standardization of formats for graphics and data exchange as well as illustrating some of the products will be discussed. These could be produced by RSMC Washington to identify pollutant source locations using only measurement data and meteorological modeling information. NOAA plans to support the Comprehensive Test Ban Treaty Organization's future meteorological requirements will also be discussed. Related arrangements are currently being coordinated by WMO and their RSMCs for Transport Model Products. Washington is one of those centers. roland.draxler@noaa.gov

6. Forecast "Windgrams" Added to the READY Website. A new program based on the popular meteogram program has been developed to display forecast wind flags at all model levels and all model forecast hours. This program should help those in need of wind forecasts at a point over a period of time (such as deciding when to launch manned balloons). glenn.rolph@noaa.gov

7. Total-ozone Data Reorganized. As part of a reorganization of the total-ozone data base, Indian total-ozone stations are now included in the tropics rather than the north temperate zone so as to allow for a better match between north temperate total ozone and ozonesonde values (there are no Indian ozonesondes). Stations which only sporadically reported total-ozone values during the period 1958-2000 have been expunged from the analysis. In addition, total-ozone variations are now presented for Northern and Southern Hemispheres, as well as 5 climate zones and the globe. As previously, the variations and trends are shown in terms of annual anomalies with confidence intervals based on 2 standard errors of estimate of the individual station anomalies within the region, and as traces based on a binomial smoothing of the average of station seasonal anomalies. The latter show that, in the north temperate zone where the data are best, total-ozone amount decreased by about 5, 7 and 9% following the volcanic eruptions of Agung, El Chichon and Pinatubo, respectively, illustrating the effects of an increase in chlorine loading. (Jim Angell, 301 713 0295, x127)

8. ARL Contributions to IPCC Reports. A review of citations of papers by ARL authors in IPCC reports dating back to the first assessment report in 1990 reveals a consistent reliance on ARL research. Here are the results

Year	Report	Citations with ARL Lead Authors	Citations with ARL Co-Authors
1990	First Assessment Report	15	8
1992	Supplementary Report	3	0
1994	Radiative Forcing Report	3	2
1995	Second Assessment Report (Vol. 1)	10	3
2001	Third Assessment Report	19	6

Boulder

9. SURFRAD/ISIS. A method for retrieving aerosol optical depth information from rotating shadow band radiometry has been refined and will be reported in the *Journal of Applied Meteorology*. The new set of code examines several weeks of daily MFRSR files and concurrent clear-sky identification results derived from SURFRAD data, for periods suitable for calibration Langley plots. The Langley plots are examined for data quality with an NCAR Graphics-based Graphical User Interface, and linearly interpolated to zero-airmass values using a regression analysis. The resulting set of zero-airmass intercepts is used to produce a representative calibration value. This value is subsequently applied to any MFRSR data within the calibration period to retrieve accurate time series of aerosol optical depth.

The annual instrument exchange at Fort Peck, the final one for 2002, was conducted on 12 September. That station now hosts a new CRN station and a new gas sampling experiment. It has become a major multi-agency site with representatives from three NOAA groups, the USDA, NADP, and others monitoring there.

10. CUCF. The most important aspect of the Central UV Calibration Facility (CUCF) is maintaining calibrations for U.S. UV monitoring and research efforts. Tungsten Halogen lamps are the primary reference standard for calibrating the various types of UV instruments. The Optics Technology Division of the National Institutes of Standards has generated lamps for the UV community in the past. Recently, NIST has moved to a detector-based irradiance scale, which reduces the uncertainties in the lamp irradiance scale. In September, Patrick Disterhoft visited NIST in Gaithersburg to ensure a smooth transition using the new detector-based irradiance scale. The trip involved comparing the CUCF primary standards with NIST's lamps generated with the new detector-based system. Final results are forthcoming. (Patrick.Disterhoft, 303 497 6355)

11. Umkehr. The latest results of comparisons of ozone profiles retrieved using Brewer and Dobson instruments with satellite observations were presented at a recent Conference in Toronto. There are several reasons for current interest in Umkehr measurements. The middle latitude total ozone depletion is still not well understood, because climate change may be the dominant cause. However, the total ozone record is difficult to use for detection of O3 recovery, mostly because greenhouse warming is likely to produce confusing signals in the lower stratosphere. Whereas the upper stratosphere (~40 km) has minimal climate change interference. Therefore, Umkehr technique is important for early detection of ozone recovery. Moreover, variation of ozone recovery rates with altitude and latitude (Shindell, 2000) can be reliably monitored using the Umkehr technique. There are some other advantages in Umkehr technique. It provides a long historical record (Dobson from 1957, Brewer from 1984). The technique is a "self-calibrating", like solar/stellar occultation instruments (e.g., SAGE, GOMOS), which is achieved by low solar zenith angle normalization. The technique is found to be largely insensitive to tropospheric aerosols and surface albedo. Although stratospheric aerosols can produce large errors in both the Umkehr and satellite measurements they are usually short-lived (~6 months). The study concluded that standard C-pair Umkehr provides reliable information in layers 4-8 (19-43 km), while automated Dobson/Brewer can extend the information to layer 9 (43-48) km. Analysis of the SAGE II and Umkehr data show good agreement in layers 5 and above. Most of the differences between the SAGE II and Umkehr data are thought to be attributed to sampling differences. Both temporal and spatial differences between local station sampling and satellite coverage can noticeably affect the derived trends. Therefore, Umkehr measurements in upper stratosphere are important for monitoring ozone recovery, where it can be detected earlier than at the ground. Moreover, one can measure tropospheric column ozone in low and middle latitude in summer using the Umkehr technique. (Irina Petropavlovskikh 303 497 6279)

Oak Ridge

12. Terrestrial Carbon Program. Data collection at the Walker Branch Site has continued relatively constantly throughout the month. There were no significant equipment outages or power losses at the site during the period. The NASA Photometer was repaired, calibrated, and brought back online. New batteries and a charging unit will be ordered from NASA in order to help ensure reliable data transmission. The map of the new tower site (Chestnut Ridge Eco-System Site, CHESS) was submitted to DOE/ORR and the permit should be signed shortly, releasing the land for use and allowing physical work on the site to begin. Progress continues on the logistics for the new site, with the RFP of the tower being submitted. The design specifications and RFP for the support building is nearing completion, and the selection of rigging and other necessary components is nearly complete. meyer@atdd.noaa.gov

13. VTMX Program. Preliminary calculation of production of turbulent kinetic energy (TKE) at the flight level of 300 m to 400 m above ground over the west side of the Salt Lake Valley showed some promise of providing the dominant terms of the budget of TKE. Success in this effort promises to advance understanding of the processes that generate mixing over a mountainous urban valley at night. These results were presented in the 2002 VTMX data workshop in Salt Lake City. dobosy@atdd.noaa.gov

14. Canaan Valley. The Canaan Valley Institute's Board of Directors was briefed on air-quality activities. These include ongoing continuous air-quality monitoring by NOAA/ARL in the Canaan-Valley region, modeling of atmospheric behavior using RAMS and HYSPLIT, and future integration of atmospheric-deposition investigations with water-quality studies to assess watershed health. Also, a second CRN site for the Canaan Valley was surveyed within the Canaan Valley State Park. The site is being submitted to CRN managers for approval. vogel@atdd.noaa.gov

15. Coupled Dynamical/Photochemical Modeling. Dr. David Erickson (Director of the Center for Computational Sciences' Climate and Carbon Research group of ORNL's Computer Science and Mathematics Division) visited ATDD on September 5 to learn more about our coupled LESchem model and its research applications. Animations were shown of results from recent LESchem model simulations to study industrial source plumes, air toxics emissions, and forest fires, and additional background information was provided. A new facility is being built at ORNL which will house the Joint Institute for Computational Sciences and the Oak Ridge Center for Advanced Studies, along with the world's fastest supercomputers. Dr. Erickson thinks the computational requirements of the LESchem model would fit in nicely with their hierarchy of computationally intensive climate dynamics and ocean models, so future research collaboration was encouraged. herwehe@atdd.noaa.gov

16. Mercury in the Southeast. Sampling of Gulf Coast mercury continues in collaboration with the University of Alabama. Strong correlation has been found between concentrations of gaseous elemental mercury and reactive gaseous mercury. Sampling also continues in the Great Smoky Mountains National Park. brooks@atdd.noaa.gov

17. DCNet. Linux-based software was developed to link an APD 2000 chemical warfare detector and a Health Physics Instruments model 2070 gamma radiation detector to a computer for data collection. Final tweaking is in progress before installation in the Washington DC area. dumas@atdd.noaa.gov, White, Pendergrass, Smith (ORNL)

18. Urban Dispersion Study. A briefing on the planned July 2003 urban dispersion study in Oklahoma City was presented at OAR on September 10. Planning continued with a lengthy conference call on September 20, and a meeting in Salt Lake City on September 24. The latter was followed by a meeting of the Urban Dispersion Modeling Working Group in Salt Lake City on September 25 - 26. hosker@atdd.noaa.gov

19. U. S. Air Force Model Validation Program (MVP). Several new items were added to the MVP Data Archive during September: Processed Long-EZ airborne flux data for MVP Session 4; Titan IV launch cloud HCl sampling data for launches #K15, #K16, #K22, and #K23; two PDF-formatted reports ("Ground Cloud Dispersion Measurements During the Titan IV Mission #K23 (14 May 1995) at Cape Canaveral Air Station: Volume 1 -- Test Overview and Data Summary" and "Aircraft HCl Sampling of the Titan IV K-23 Launch Effluent Cloud"); and a PDF-formatted version of the MVP final report titled "Model Validation Project Summary Report: MVP Field Sessions 1-4 (1995-97) for Surface and Elevated Blimp Releases of SF_6 Tracer, IR Imagery Tracking, Van and Aircraft Sampling, and Simultaneous 3-D Meteorological Data Collection." The final version of the entire MVP Data Archive was then archived onto four master CD-R discs for future reference, off-line access, and copying. herwehe@atdd.noaa.gov

20. U.S. Climate Reference Network. ATDD staff continue to participate in planning and presentations to the new NESDIS/OSD management and oversight team. A USCRN meeting was held in Asheville on September 5, a conference call was held on September 1, and a USCRN meeting was hosted by ATDD in Oak Ridge on September 20. In addition, a briefing on the current status of USCRN configuration and deployment was provided to OAR staff in Silver Spring on September 10. hosker@atdd.noaa.gov, Meyers, Hall, Shifflett

Additional USCRN stations were installed in Arizona(2) and Maine(2). An installation in Mississippi was delayed by the arrival of a hurricane. hall@atdd.noaa.gov, Brewer, Randolph, French, Bryant, Lew, Black

Research Triangle Park

21. Community Multiscale Air Quality model (CMAQ). As part of the checkout of the 2002 CMAQ model, a control strategy sensitivity analysis was conducted that compared the response of the old science and the new science in CMAQ to a change in emissions. First, it was found that the new chemistry (SAPRC99) yields larger relative reductions in ozone than the old chemistry (RADM2 and CB-IV). Further sensitivity analysis showed this to due entirely to the NO_x processing part of the chemistry. Second, grid size makes a difference for large urban areas. The relative reduction in ozone is significantly smaller when the grid over Atlanta is reduced from 32-km to 8-km cell size. Third, the new chemistry is hotter and makes more ozone than the old chemistry, especially for the eastern United States. Finally, physical processes such as changes in vertical mixing during the day can have as large an effect on the relative reduction of ozone as differences in the chemistry. The sensitivity investigation is continuing with several extra runs to better explain the differences. (Robin Dennis, 919 541 2870)

A series of test runs has been completed with the CMAQ system that was modified to model 18 gaseous toxic compounds explicitly. Three different sets of test runs were performed for the continental United States for the period June 30-July 14, 1999. Each set used a different method for simulating the air chemistry of the toxic compounds, varying from a detailed mechanistic approach to a less refined but more computationally efficient chemical approximation approach. The tests revealed that the modeling results for compounds that react relatively slowly are not particularly sensitive to the modeling approach. The largest differences occur for formaldehyde and acetaldehyde, primarily due to mechanistic differences in the representation of their atmospheric chemistry in the most computationally efficient method as compared to the other two approaches. It is not clear that the more efficient approach can be modified to agree more closely with the more rigorous approaches. These findings will need to be considered when configuring the CMAQ model for specific toxics modeling applications. (Gerald L. Gipson, 919 541 4181)

A focus on dioxin resulted in comparisons between observations and model predictions for a sampling period during July 1999. In one comparison, predictions show a weak correlation with observations. Additional evaluations of simulated air concentrations of dioxin and furan congeners indicate that furans with five and six chlorine atoms best agree with the observations. (Bill Hutzell, 919 541 3425)

Results of two sets of CMAQ chemical transport model (CTM) simulations for an eastern regional United States domain with a 36-km grid size are being analyzed. A test series was performed without the plume-in-grid (PinG) treatment and another series was exercised with PinG for the same July 1995 period. For the CTM/PinG runs, the pollutant plumes from 77 high emission, point sources of NO_x or SO_x were simulated in the PinG approach instead of being mixed into the rather large grid cell volumes in the NoPinG runs. Comparisons of the modeled concentrations are being made to investigate the impact of the subgrid plume treatment on model concentrations and model performance since all other components of the model were the same. Model ozone concentration fields reveal the most notable differences occurred in the grid cells where the major point sources were located and in a broad area downwind. Because numerous high NO_x point sources exist in the Ohio and Tennessee River Valleys, the largest ozone differences were found in these regions with lower ozone levels in the CTM/PinG simulation than from the CTM/NoPinG run. This result can be explained by the rapid over-dilution of NO_x emissions into the large grid cells in the NoPinG run, which immediately triggers accelerated photochemical production of ozone. In contrast, in the PinG simulations, the high NO_x emissions are contained in small, subgrid scale plumes where ozone levels are reduced to considerably lower values than background concentrations until recovering further downwind. An encouraging result is that comparisons of modeled concentrations to ozone monitoring sites in the region reveal better agreement and lower bias with the CTM/PinG results. Additional analyses are continuing with these simulation results and for model simulations with a 12-km domain. (Jim Godowitch, 919 541 4802)

22. Fugitive Dust Modeling. Work continues on the development of algorithms for modeling of windblown and fugitive dust (from on, off roads) from industrial and from agricultural tillage practices. In September, the first results were evaluated of a multi-day simulation of gridded wind-blown coarse mode particle concentration fields from CMAQ at 36-km resolution based upon the prototype dust emissions algorithms. This prototype incorporates the BELD (Biogenic Emission Land Use) database and methods for introduction of agriculture tillage practice into the emissions processing. The preliminary results were in qualitative agreement with the values obtained from the National Park Service IMPROVE network. The benefits and requirements of introducing a new database containing information on vegetation fraction derived from satellite observations are being investigated. This information will provide an improved methodology for estimating the gridded percent exposed land area for dust production. Development of the modeling capability for $PM_{2.5}$ was begun. This will provide a means to depict both fine and coarse mode particles. (Jason Ching, 919 541 4801)

23. Fire Emissions Modeling. Work continues on a project to develop a prototype stand-alone emissions processor that will introduce smoke from fires (prescribed and wildfires) into the Models-3/CMAQ modeling system based on state-of science algorithms developed by the U.S. Forest Service. The prototype will be tested by directly inserting data into CMAQ. However, operational use will depend on converting the dust module to a form that runs in conjunction with SMOKE. Efforts in September were focused on preparing a case study to demonstrate the linkages between the various smoke preprocessors. Presentation of preliminary results of this limited modeling study is scheduled for early October in Research Triangle Park, North Carolina. This study is being performed by CIRA (Cooperative Institute for Research in the Atmosphere) and administered by the U.S. Park Service. The implementation and testing of the processor will be incorporated into the generalized SMOKE (Sparse Matrix Operator Kernel Emissions) processor model, which ultimately will produce hourly dust emission estimates. Planning continues for establishing the requirements and sources for the activity databases and optimization of the emissions model for both regional and national assessments. (Jason Ching, 919 541 4801; Bill Benjey, 919 541 0821)

24. Community Modeling and Analysis System. During September, the organization and progress of the Community Modeling and Analysis System (CMAS) center continued. CMAS is crucial to forming and sustaining a CMAQ user community for collaboration in model improvements, training, and support. The

CMAS concept continues to gather community support. Support of the MIMS framework for air quality applications and the new Spatial Allocator for gridding of data will be added by the end of 2002. The user support system (http://www.cmascenter.org) includes documentation, frequently asked questions (FAQs), and bulletin boards, and supports e-mail capabilities linked with bug tracking. The e-mail support documentation section has expanded its database of records significantly to include many Sparse Matrix Operator Kernel Emission (SMOKE) queries as well as information pertinent to CMAQ. Support requests to ASMD staff are now directed through the new system. During September, work focused on making a smooth transition of CMAS from its current location at MCNC to the Carolina Environmental Programs (CEP) of the University of North Carolina at Chapel Hill. The transition also will require a transfer of the cooperative grant establishing CMAS. In addition, plans continued for a Models-3/CMAQ User's Workshop, scheduled for October 21-23, 2002, in Research Triangle Park, North Carolina. The agenda is available on the CMAS web site. Training sessions for CMAQ, SMOKE, and MIMS will be offered. At the end of September, the CMAQ training was oversubscribed, and 20 people had registered for the MIMS training. Approximately 120 people have registered for the Workshop, and 39 abstracts were submitted. There will also be a poster session including approximately 20 presentations. The User's Workshop will be an annual event as a part of CMAS' outreach function. (Bill Benjey, 919 541 0821)

25. Mobile-Modal Model. Collaboration continued on an implementation plan for the Mobile-Modal Model (MMM) based on a combination of features from the EPA Mobile 6 model and the data-intensive but spatially accurate MEASURE mobile source model. The general plan is to implement and test the Mobile-Modal model during 2003. The implementation plan, which will be part of a project Quality Assurance Project Plan, was completed in September. Plans call for a PC version of Mobile-Modal to be completed by September 2003. (Bill Benjey, 919 541 0821)

26. Neighborhood Scale Modeling. In September, a draft journal article was prepared on the preliminary results of the modeling of air quality at neighborhood scales. The overall objective of this project is to develop a capability for modeling air toxics and particle concentrations at neighborhood scale grid resolutions to provide the air pathway links to human exposure assessment models. An important component of this effort is to address the concentration variability from both chemical variability due to turbulent motions and from sub-grid concentration variability arising from individual sources. The article reports on evaluation of simulations of the prototype air quality simulation model for the Philadelphia metropolitan and surrounding vicinity focusing primarily on the preliminary set of results for 36-, 12-, 4-, and 1.33-km grid resolutions. The effort included testing of an important new mixing length parameterization to the basic urban canopy parameterizations (UCP) already in the neighborhood scale version of MM5 (MM5 is the CMAQ meteorological driver model). Comparisons between the 36-, 12-, 4-, and 1.33-km grid resolution fields reveal substantial differences in air quality features. Also in September, the effort to produce gridded, high resolution urban canopy parameters, UCPs, based on building and tree canopy data for Harris County and the Houston Ship Channel area (derived from airborne lidar measurements) has begun under a contract with the University of Arkansas. These UCPs will subsequently be implemented into the MM5/CMAQ as part of the overall modeling study of the southeast Houston, Texas, area using the Models-3/CMAQ modeling system. The formulation of a methodology to produce the subgrid concentration distributions (as Probability Density Functions, PDFs) is under investigation. Finally, discussions began with investigators from the Ecole Centrale Nationale of the University of Nantes, France, for collaborative studies relevant to this neighborhood scale modeling project. The collaborative effort proposes a model evaluation of models using the special field study database called ESCOMPTE. This database is of specialized urban canopy scale measurements made in Marseilles, France, in 2001. (Jason Ching, 919 541 4801; Tanya Otte, 919 541 7533)

27. Sub-Canopy Deposition. The initial database from this summer's field study looking at sub-canopy deposition has been constructed. Ozone monitoring data from the four monitors has been checked, and entered in the data sets, where they were combined with the meteorological observations. Ten Hz data from the sonic

anemometers were checked, coordinate rotations performed, and half-hour averages of all 1st, 2nd, and 3rd moment turbulence statistics computed and filed. The meteorological and ozone data have been combined with the observations on the plants taken by the collaborators. These observations include LAI, PAR, conductance, leaf damage, leaf size, photosynthetic rate, and several other plant-physiological measurements. All data were then processed into half-hour averages so that they could be combined with the turbulence data. Initial statistical screening and data-mining has been completed, looking for relationships between ozone depletion in the canopy and predictor variables. These results have been shared with co-workers who are preparing for a fall conference in Goteborg, Sweden, which will consider the ECE standards for protection of vegetation from air pollution. The Meyers sub-canopy 2.5 order closure model has been modified, and run successfully in an initial test. Further modification of the model to set it up for production runs on all the observed data, and further analysis is planned for the next months. (Peter Finkelstein, 919 541 4553; Donna Schwede, 919 541 3255)

28. Analysis of Wind Data for the Jornada Experimental Range. This analysis of wind data for the Jornada Experimental Range was largely concerned with providing evidence for the consistency of wind speed at a height of 60 meters, obtained by extrapolating the wind profile for near neutral conditions for three sets of wind profiles taken simultaneously at the Jornada Experimental Range. Additionally, parameters of aerodynamic roughness length and displacement height were estimated as a function of wind direction for the three sites at the Jornada Experimental Range. (Dale Gillette, 919 541 1883)

29. Analysis of Results Testing the Gillette Box Model. Predictions of the transportable fraction of dust emitted from roads have been compared to profiles of dust emitted from normal and military vehicles at Fort Bliss, Texas. The experimental work was largely produced by scientists at the Desert Research Institute (DRI). The conclusions of the meeting held at DRI in Las Vegas, Nevada, were that the model seems to predict the right order of "transportable fraction," but that the desert conditions of Fort Bliss, the "transportable fraction" was near 1. Activities are underway on work associated with communications regarding fugitive dust. An abstract on fugitive dust is being prepared for the June 2003 AWMA meeting; a presentation on transportable fraction of ground emitted road dust is being prepared for the Fall 2002 AGU meeting in December 2002; and preparation is being made for meetings of the Fugitive Dust Group. (Dale Gillette, 919 541 1883)

30. Global Climate Change Research. Work has began on the emissions aspects of regional air quality effects of climate change. During September, Bill Benjey joined a climate change emission sub-group that meets monthly. He is participating in writing the scope of a STAR grant intended for climate change-related emission research. The emission sub-group is now working on a plan of action in support of the whole of the EPA climate change effects research effort. (Bill Benjey, 919 541 0821)

31. Development of an Image Reflectance Processor. The development of the image reflectance processor using an enhanced water vapor calculation algorithm has progressed to the testing phase. Testing is performed by submitting synthesized images to the reflectance processor. The synthetic images are constructed using MODTRAN radiative transfer code to model upwelling radiance from known surface reflectances, atmospheric water vapor, and aerosol optical depth. The improved precipitable water vapor algorithm is expected to yield improved accuracy over surfaces of low (i.e. < 20 %) reflectance, which would include all water-covered surfaces. As interest in remote sensing for ecological assessments has expanded to include coastal waterways, atmospheric correction over low reflectance surfaces will be essential for even qualitative "spacial pattern" identification of chlorophyll, colored dissolved organic matter (CDOM), and suspended sediment. (John Streicher, 919 541 3521)

32. UV Radiometer Evaluation and Comparison with Brewer Spectrometer. YANKEE Environmental Systems has loaned the EPA their latest UV radiometer for evaluation and intercomparison with a collocated Brewer Spectrometer (SciTech). The YANKEE UV Rotating Shadowband Spectroradiometer (UVRSS) uses

a charge-coupled detector instead of a photomultiplier to detect flux. The spectral resolution and range of both instruments are comparable (0.6 nm for the UVRSS, 0.5 nm for the Brewer; both have a range from approximately 290 nm to 360 nm). The optics of the UVRSS enable near continuous spectral measurements, with the shadowband feature allowing the partitioning of the irradiance spectrum between beam and diffuse light. (John Streicher, 919 541 3521)

Idaho Falls

33. CLAST-High. In early September, the BAT probe mounted on N43RF (one of two NOAA P3s) made several penetrations through Tropical Storm Eduoard. While the probe and associated instrument package appeared to operate as expected, the front portion of the hemisphere suffered damage due to pitting caused by the impaction of rain drops. It was decided that the probe should be repaired prior to another flight. The probe was returned to FRD and re-surfaced with a gel-coat over the original carbon-fiber hemisphere. Further testing revealed that while the gel-coat reduced the amount of pitting, it did not completely eliminate it. Within one week, a new solution was in hand, a hemisphere precision-milled out of 1024 aircraft aluminum (Fig. 1). This new hemisphere was fitted with signal conditioning and sensor boards and plumbed as the original carbon-fiber models. Unfortunately, testing was not completed in time for mounting the new 'aluminum BAT' on N43RF for flights through Hurricane Lily. The probe is currently at AOC, awaiting completion of static load and vibrational tests before a functional flight will be made, likely in early October. There is still some hope that a flight through a tropical system will be possible before the end of October. jeff.french@noaa.gov , Randy Johnson, Shane Beard

34. Refractive Turbulence Study. Nearly 40 hours were flown during the 3 ½ week field campaign from late August through mid-September based in Adelaide, Australia. A total of 10 flights were flown by the Egrett aircraft, owned and operated by Airborne Research Australia (ARA). The Egrett was outfitted five years ago with two BATs (one under the left wing and a second on the tail) as well as a modified Rosemount 858 gust-probe. In support of this year's campaign (the fifth in as many years) the BATs were upgraded to use the FRD-designed FUST probe. The original micro-beads used to measure precision temperature suffered from noise contamination due to stress induced by vibration. This was more noticeable at higher altitudes where temperature structures are typically less pronounced. The FUST uses a fine thermocouple and a vented reference-junction in which the temperature is monitored using a slow-response, accurate thermistor bead. The thermocouple does not suffer any adverse effects due to vibration and hence has a considerably lower noise floor. jeff.french@noaa.gov

35. ET Probe. By early September, three ET probes were ready for deployment in a landfalling tropical cyclone. The ET probe deployment kits have two main components: a 3 m tripod tower for the sphere, and an igloo enclosure for the notebook computer and batteries. These kits are lightweight but strong, and can be set up by one person in under half an hour. The first target of opportunity that came up in September was Hurricane Isidore, which made landfall in Louisiana on 26 September. A team from ATDD in Oak Ridge attempted to deploy the ET probes in Isidore, but developed vehicle problems en route to the Louisiana Coast and was forced to turn back. Although this first attempt to deploy ground-based instrumentation into a tropical cyclone was not a complete success, valuable information was still obtained regarding the ET probe's behavior and the procedures required for tropical cyclone deployment. richard.eckman@noaa.gov, Ron Dobosy and Dave Auble [ATDD]

36. IMS Development Project. The prototype Ion Mobility Spectrometer (IMS) being developed to measure atmospheric tracers was improved in three areas: an new ion gate, an improved aperture, and the addition of a data acquisition system. The new ion gate is made of ceramic to eliminate contamination sources. The circuit boards used to support the gate were first made incorrectly and had to be re-done. We then had great difficulty soldering the gate wires on to the gold traces without removing the traces from the board. Finally,

a working gate was assembled on the last day of September. The combination of the new gate and the improved aperture increased the signal by about a factor of five. Since the noise in the system did not increase, the signal to noise ratio improved by a similar factor. The new gate also significantly reduced the contamination peaks present in the signal. The addition of a single board computer has allowed us to collect digitized signals and start testing signal processing algorithms.

Progress on this project was presented September 24, 2002 at the Joint URBAN-2003 Planning Meeting in Salt Lake City. At that time, the decision was made to not use the IMS as a tracer measurement instrument for that study. We will continue development at a much lower priority, as other funded programs must be completed first. We hope to take a few prototypes for deployment to Oklahoma City in 2003 to gain field experience with them. roger.carter@noaa.gov, Debbie Lacroix, Shane Beard

37. Joint URBAN 2003. It is now clear that FRD will be fully involved in the DTRA/DOE Oklahoma City study by using all of its stationary and mobile real-time SF_6 detection equipment, and its SF_6 release equipment. The science team might also decide to use FRD's sodar. Kirk Clawson has been pegged by the science team to coordinate the tracer measurements conducted by the various participants. kirk.clawson@noaa.gov

38. INEEL Support. As reported last month, FRD is looking into possible options for upgrading the dispersion modeling it provides to INEEL operations. Another model candidate being considered for use is the HYSPLIT model developed at ARL headquarters, which is used in the READY system (http://www.arl.noaa.gov/readyinfo.html). HYSPLIT can be run either as a puff model or a Lagrangian particle model, and it has algorithms for deposition and radiological decay. Its main drawback for INEEL applications it that the horizontal and vertical diffusion algorithms are geared towards long-range dispersion. This is particularly true of the horizontal diffusion, which is based solely on deformation of the flow field (*i.e.*, Smagorinsky diffusivity). The diffusion algorithms would have to be modified to adapt the model for INEEL use. However, any of the other models under consideration (*e.g.*, CALPUFF) would also require modifications, so HYSPLIT is still a viable candidate. richard.eckman@noaa.gov

Las Vegas

39. Defense Threat Reduction Agency (DTRA) - DIVINE INVADER (DI). During September, SORD staff provided meteorological and dispersion forecasting guidance for several studies at the Nevada Test Site. The first DI test run took place on 20 September. Full meteorological support was provided including operation-specific weather forecasts and transport and dispersion projections using NOAA RAMS and NCEP models. (Jim Sanders, 702 295 2348, Phil Abbott, 702 295 1490, Shawn Byrne, 702 295 1260, and Mike Rondeau, 702 295 1247)

Subcritical experiments were also being planned. On 19 September, initial discussions about the forthcoming ROCCO Experiment took place. On 26 September, full meteorological support was given to the ROCCO experiment. The SORD Director served as the Meteorological Advisor on the Test Controller's Scientific Advisory Panel. SORD personnel presented a comprehensive assessment of current and projected meteorological and dispersion conditions in the vicinity of the ROCCO experiment in Yucca Flat, making use of a wide variety of remote meteorological sensors, NOAA weather forecast models, and the RAMS model centered on the NTS. Transport and dispersion forecasts were also provided, for the unlikely occurrence of release of toxic material into the atmosphere. (Doug Soule', 702 295 1266, and Walt Schalk, 702 295 1262)

The Los Alamos National Laboratory WATUSI Experiment was also conducted during this period. (Walt Schalk, 702 295 1262, and Darryl Randerson, 702 295 1231)