NOAA ARL Monthly Activity Report

September 2003

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Contents

Highlights

1. P-3 Eddy Flux Systems Tested. There were two major tropical systems during September. Both systems formed in the mid-Atlantic and tracked westward passing just north of the U.S. Virgin Islands. On September 1, both NOAA P-3's were deployed to St. Croix for staging research flights through Hurricane Fabian. At that time Fabian was a category 3 hurricane and forecast to at least maintain intensity as it continued a general west-northwest track. Both P-3's flew three missions on consecutive days, during which time Fabian increased in intensity to a category 4 hurricane. N43RF completed stepped descent patterns

between rain-bands on all three days in an attempt to retrieve measurements necessary to estimate surface fluxes. Data from the BAT probe instrument suite was the focus of the measurements for these flights.

During the three flights in Fabian, the BAT probe performance was only good to marginal with the quality of the data collected deteriorating through the deployment. It was later discovered that water was seeping into the probe hemisphere and getting on the electronics, causing unpredictable behavior of the probe's sensors. For the initial flight in Fabian (September 2), N43RF completed one entire stepped descent pattern in roughly 40-45 kt surface winds. During this pattern, the BAT probe operated perfectly and should provide good flux data. During the second and third flights into Fabian (September 3 and 4) the intrusion of water into the BAT hemisphere began creating problems.

Following the deployment for Fabian, the BAT sphere was removed from the P-3 and returned with Jeff French to FRD. There was a window of only two days in which to make changes to the design/manufacture of the sphere before the next deployment for Hurricane Isabel. Two days after the completion of modifications, the P-3s were again deployed, this time for flights through Hurricane Isabel. It is anticipated that the dataset from Isabel and the first flight in Fabian should provide several unique series from which to begin the examination of the fluxes in a high wind boundary layer. (jeff.french@noaa.gov, Shane Beard, Randy Johnson)

Silver Spring

2. ***HYSPLIT Water Surface Transport Module***. The HYSPLIT main code was modified to permit contaminants deposited on water surfaces to continue to be transported on the water surface by the wind generated drift current. The wind induced surface water drift current is assumed to equal the vector atmospheric friction velocity. The friction velocity represents the momentum transport to the surface and hence is an initial approximation of the surface water movement. The code was modified to retain both the U and V components of the friction velocity. Previously only the scalar value was required for stability and deposition computations. The example calculations shown below are 6-h averages from a one hour duration hypothetical source in the southeast U.S. for the first 10 days of June 2003. By the third day (left panel), the plume has been deposited across the Atlantic in response to the atmospheric transport. After seven days (right panel), the deposited plume has been transported very slowly to the north. roland.draxler@noaa.gov
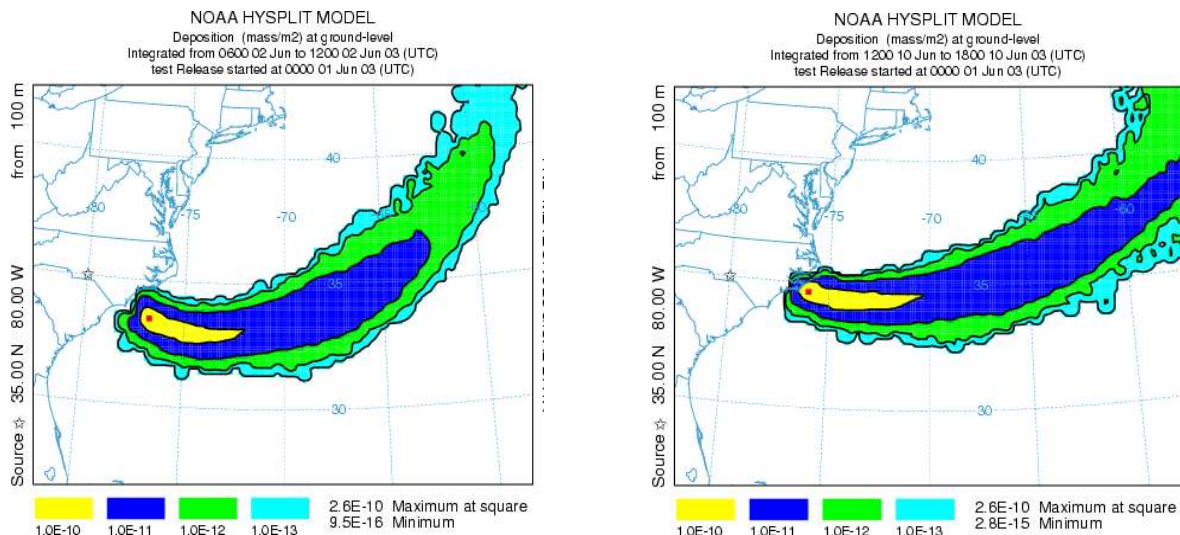
3. ***Volcanic Ash Workshop.*** At the 3rd International Workshop on Volcanic Ash in Toulouse, France, it was discovered that Meteo France plans to output a satellite analysis volcanic ash product after Meteosat Second Generation becomes operational, the UK Met Office is testing an automatic satellite imagery analysis technique to identify volcanic ash plumes, the CTBTO (Comprehensive Nuclear Test Ban Treaty) infrasonic

network may be able to detect volcanic eruptions, the USGS is concerned about the timing of ash arrival at airports near volcanoes, the Anchorage VAAC is testing a collaborative communications/forecasting computer system, and NCAR has begun work on volcanic ash satellite detection and ash plume nowcasting. Information was also presented on a US-sponsored international symposium on volcanic ash and aviation safety to be held in the summer of 2004 in Washington DC. A Call for Papers has not yet been issued for the symposium, but the participation of the group in Toulouse was encouraged. barbara.stunder@noaa.gov

4. NCEP HYSPLIT Dispersion Modeling. The NCEP scripts that convert Eta (CONUS) and GFS (Global Forecast System) model output to "ARL format" were originally written by two different people and hence were quite different. To simplify code upkeep and allow minor modification for possible additional NCEP datasets, the scripts were modified to be as identical as possible. The new scripts are now running in a parallel test environment. barbara.stunder@noaa.gov

5. Addition of Tropical Stratospheric Temperature Data to ARL Web. Seasonal and annual temperature deviations from 1958 to 2003 at 50, 30, 20 and 10 mb have been placed on the ARL website to form a tropical stratosphere dataset. The data are derived from 10 radiosonde stations between 10S and 30N and extending west from Ascension Island to Singapore. The data are also presented separately for equatorial (10S-10N) and north subtropic (10-30N) zones. The temperature anomalies are shown both for the three climate zones at a given pressure surface and the four pressure surfaces in a given climate zone, and in text and Excel format. (Jim Angell, 301 713 0295, x127)

6. NOAA Climate Monitoring Working Group Meeting. The CMWG, which reports to the NOAA Science Advisory Board (SAB) on matters relating to climate monitoring, met September 13-15 in Chicago. The group, consisting mainly of non-NOAA experts, heard presentations on various aspects of the NOAA climate observation, data management, and analysis programs, including the ongoing program assessment of these and other program areas. The working group will be presenting its recommendations to the SAB in October. dian.seidel@noaa.gov

7. Special Sessions at AMS Annual Meeting. Among the many activities planned for the 84th AMS Meeting (Seattle, Jan. 11-15, 2004) are two special sessions. One will focus on Women in Meteorology, Past, Present and Future, with prominent speakers from government, academia, professional societies, and international organizations. The other is a joint session between the 15th Symposium on Global Change and Climate Variations and the Symposium on Planning, Nowcasting, and Forecasting in the Urban Zone, which will focus on the intersection of climate change and urban issues. Both are currently scheduled for Thursday morning, Jan 15. dian.seidel@noaa.gov

Boulder

8. SURFRAD/ISIS. On September 4, the instruments at the Fort Peck SURFRAD station were exchanged, and the annual maintenance was conducted. This trip was accelerated because of a lightning strike on August 19 that partially disabled the station. Likewise, on September 18, 2003, annual maintenance and instrument exchange took place at the Table Mountain SURFRAD station. This completed the SURFRAD instrument exchanges for 2003, a year in which the seventh SURFRAD station was installed at Sioux Falls, South Dakota.

Also, during 2003, all lightning rods were removed from SURFRAD stations because they were considered more of an attractor of lightning than a protector, and all data logger systems were refurbished.

The SURFRAD automated aerosol optical depth algorithm continues to be improved. The latest is the addition of an automated procedure to retrieve 3-minute station pressure data from SURFRAD daily data files. The pressure time series is accessed to interpolate station pressure to the times of aerosol optical depth computation for more accurate molecular scattering calculations. (John Augustine, 303 497 6415)

9. International Brewer Workshop. Dr. Irina Petropavlovskikh attended the 8th Biennial Brewer Workshop at El Arenosillo, Spain, hosted by INTA (Spain Space Agency). The 8th Brewer Workshop included presentations of a more "tutorial" nature to the workshop and discussed accuracy of the radiometric measurements in the Ultra-Violet region of the solar spectrum as well as products that are derived from the

measurements. Among such products are total ozone column, UV-dose, UV spectrum, aerosol optical depth and ozone profile. The Brewer workshop answers to the needs of the community to have a meeting where the "nuts and bolts" of making good measurements is at the forefront of the agenda. There are lots of excellent science meetings to go to, but there is only one Brewer Workshop to fulfill the need for technical information exchange within the Brewer community. It still remains important to connect the operations of the instrumentation to the science, which one hopes to accomplish using measurements gathered by the instrument. Dr. Petropavlovskikh presented a tutorial on updates of the Umkehr ozone profile retrieval algorithm. She also discussed retrieved ozone profile errors as well as errors of the measurements. There were a number of new faces at the meeting that allowed the workshop to bring the standards of operation of more Brewers up to the high level. (Irina Petropavlovskikh, 303 497 6279)

10. National Pyrheliometer Comparison. Joe Michalsky took part in the National Renewable Energy Laboratory's National Pyrheliometer Comparison (NPC-2003). The goal is to determine whether an ordinary pyrheliometer modified with a 5 degree field-of-view and a CaF2 window more closely follows an absolute cavity radiometer (the standard for direct beam measurements of the sun's irradiance) than does a standard pyrheliometer. The goal is a lower overall uncertainty in solar irradiance measurements at SURFRAD and DOE/ARM sites. (Joe Michalsky, 303 497 6360)

Oak Ridge

11. Air Quality. During the month of September, bias tests were performed to insure the accuracy of data in preparation for air quality studies soon to take place in eastern Tennessee. In addition, calibration and chemical analysis comparisons were performed between the new Methrom 790 ICs and the new Dionex 90 ICs. The analysis of the filter packs for the AIRMoN Dry Network program continued. The analysis includes preparation, extraction, and reloading of the filter packs. (Klemenz and Satterfield)

12. Bay Regional Atmospheric Chemistry Experiment. A second intensive BRACE study began near Tampa, Florida on September 28, with a main research objective of resolving differences that were found earlier in the measurement of nitric acid vapor. ATDD with the assistance of Latoya Myles will be operating the relaxed eddy accumulation system for the measurement of nitrogen and sulfur aerosol and gas phase deposition rates. Measurements also include standard meteorological data as well as the eddy covariances of heat, water vapor, CO_2 and O_3. Filterpack and denuder samples will be sent back to ATDD for analysis. (Meyers, Heuer, and Klemenz)

13. Canaan Valley. The 3200-acre land tract recently acquired by the Canaan Valley Institute (CVI) was explored for measurement sites suitable to various instrument suites. Planned in particular are wet and dry deposition measurements and the standard suites for SURFRAD and CRN. Two planned water-quality stations will help define the relationship between deposition of atmospheric pollutants and quality of water. A CVI hydrologist participated in the exploration. Also, discussion with the new manager of the Canaan Valley National Wildlife Refuge explored longer-term collaboration to obtain measurements on the Refuge of atmospheric deposition and climate. Finally, a proposal was submitted jointly by CVI and NOAA/ARL to the Pennsylvania Department of Environmental Protection to conduct nitrogen flux measurements in a dairy region of south-central PA. (Vogel and Meyers)

14. Italian National Research Council Sky Arrow. Three new Sky Arrow airplanes are being fitted with Mobile Flux Platforms for the Italian National Research Council. Installation began in September in Rome, Italy. The equipment, shipped from the USA, suffered some delay in Italian Customs, arriving on September 15. Given this start date, completion is expected around October 10. (Dumas)

15. Mercury in the Arctic. During times of mercury depletion at Barrow last March and April, BrO concentrations within 1 km of the surface were strongly correlated with incident UVB and the production of reactive gaseous mercury (HgII). The University of East Anglia (UEA) found this preliminary result, having analyzed the first few days of BrO profiles measured with a Differential Optical Absorption Spectrometer (DOAS) as part of the Arctic Mercury Study. Bromine oxide was found predominantly within the lowest 1km (the smallest scale of delineation), reaching daily values around 45ppt during peak solar UVB. The accepted background for the marine boundary layer is 1 - 2 ppt. As the sun sets, BrO concentrations drop sharply, passing below detection limits (~1ppt) within 30 minutes of sundown every night. (Brooks, with Alfonso Saiz-Lopez UEA)

Research Triangle Park

16. Community Multiscale Air Quality Modeling System - September 2003 Release. A new version of the Community Multiscale Air Quality Model (CMAQ) was released to the public in early September 2003. Changes for this version include: updated science, corrected implementations, efficiency enhancements, and bug fixes. There is a preliminary evaluation of the new release of the CMAQ model on the EPA Models-3 website comparing model results with observations of gas and aerosol species. There are also model-to-model comparisons between the 2003 release and the 2002 release. The biggest changes involve aerosol modeling, particularly nitrate aerosols and secondary organic aerosols (SOA). Nitrate modeling was updated so it is consistent with the most recent literature and the SOA implementation was corrected to allow for reversible semi-volatility. These changes resulted in substantially lower concentrations of both aerosol nitrates and SOA. Minor changes have also been made to aqueous processes and dry deposition.

There have been major modifications to improve model efficiency. A new fast gas-phase chemistry solver, known as the Euler Backward Iterative (EBI) scheme, has been developed for the CB-IV mechanism. Also, some of the fastest reacting species have been dropped from the transport processors. The time step for operator splitting has been revised to allow different advective time steps by vertical layer.

Note that other components of the CMAQ system such as Sparse Matrix Operator Kernel Emission (SMOKE) and Meteorology-Chemistry Interface Processor (MCIP) have also been revised recently. Revisions to MCIP are especially important because serious errors in the processing of the horizontal and vertical wind fields have been corrected. Thus, one needs to use version 2.2 of MCIP (see MCIP release notes for details) for CMAQ modeling. (Jonathan Pleim, 919 541 1336; Shawn Roselle, 919 541 7699; Jeffrey Young, 919 541 3929; Gerald Gipson, 919 541 4181; Tanya Otte, 919 541 7533; Brian Eder, Shaocai Yu, Alice Gilliland, 919 541 0347)

In addition, model change notes describing recent updates to the CMAQ model have been completed. These included the following: 1) updates to the heterogeneous nitrate chemistry, 2) revised treatment of secondary organic aerosols, 3) inclusion of the new Euler Backward Iterative (EBI) gas-phase chemistry solver for the CB-IV chemical mechanism, and 4) elimination of radical transport for CB-IV fast reacting species. The change notes have been included in the model change notice posted on the EPA Models-3 web site. In addition, the draft CMAQ technical description journal article has also been revised to reflect these updates. (Gerald L. Gipson, 919 541 4181)

Work also continued on updating the version of Community Multiscale Air Quality (CMAQ) for use in a National Air Toxics Assessment. One portion of the update upgraded the transport and deposition algorithms based on the September 2003 release of CMAQ. The remaining work attempts to decrease model runtimes by revising the numerical solver for gas phase chemistry based on the new Eulerian Backward Iterative solver in the recent September release. (William T. Hutzell, 919 541 3425)

Working with researchers at the Sandia National Laboratory -- who are looking at ways to optimize the Community Multiscale Air Quality (CMAQ) model code for faster execution -- has resulted in identifying two major code efficiency bottlenecks. For parallel operation, the message-passing inter-processor data communication takes a considerable amount of time. However, the writing of model output to disk consumes a surprisingly high amount of CPU, and is very sensitive to the domain decomposition used. For example, the model took more than twice as long if the computational domain were split up among ten processors, each containing all the rows rather than each processor containing all the columns of the grid. We are continuing to explore solutions to these and other impediments to improving code operational efficiency. (Jeff Young, 919 541 3929)

To track primary versus secondary formation of formaldehyde and acetaldehyde and to bring in emissions of other toxics compounds into the Community Multiscale Air Quality (CMAQ) modeling system, the standard Sparse Matrix Operator Kernel Emission (SMOKE) GSPRO speciation file had to be revised. That work has been completed and the revised file is ready for testing. Since this is the first attempt at using SMOKE to generate toxics emissions for CMAQ, some revisions to this file may be needed before proceeding with the SMOKE production runs. (Gerald L. Gipson, 919 541 4181)

17. Effect of CMAQ Physics Options on Ozone Control Strategy Predictions. A sensitivity study has been conducted to examine the effect of physics choices in CMAQ. The study first assessed the effect on the base year hourly ozone (O_3) and then assessed the effect on the control strategy response of O_3 to reductions in

precursor emissions of NO_X and VOC. Two physics choices were targeted: the first representing new science (the Asymmetric Convective Model, ACM) offered within CMAQ choices and the second representing an important change made by the CMAQ developers to the default configuration of the vertical eddy diffusivity option (K_Z) in CMAQ. The study was conducted for three grid resolutions of the southeast with the grid nesting, down to 2 km, targeting Nashville, Tennessee, and Atlanta, Georgia, where special data were available. A total of 48 simulations for a 2-week period in July 1999 were required to populate the study matrix. The physics sensitivities had a noticeable effect on the simulation of daytime base year O_3, with more increases than decreases and increases up to 30% or larger. However, the physics sensitivities had only a very small effect on the relative response of O_3 to reductions in NO_X and VOC emissions. This latter result is noteworthy and is in contrast to the previous results that uncertainties (changes) in the evolution and height of the boundary layer do affect the relative control strategy response of the model. The next step is to study the effect on control predictions of the choice of chemical mechanism for CMAQ. (Robin Dennis, 919 541 2870)

18. CMAQ Plume-in-Grid (PinG) Modeling Effort. The recent 2003 release version of the aerosol code was installed in the plume-in-grid (PinG) model to provide the capability to simulate aerosol processes concurrently with gas-phase chemistry in major point-source plumes. Revisions to various PinG algorithms were also necessary where linkages to the updated release of the CMAQ chemical transport model (CTM) code exist. Test simulations were underway with a reference regional 36-km domain data set already applied with previous CMAQ/PinG model versions, which will allow for comparisons of model results. Initial comparison of simulation results from CTM without PinG and CTM exercising PinG for the same case reveals somewhat lower sulfate concentrations in the grid in the region of the major point-sources from the CTM/PinG model run. (James Godowitch, 919 541 4802)

19. Community Multiscale Air Quality (CMAQ) - Mercury Model. Russell Bullock attended a meeting in Moscow, Russia, to evaluate current efforts by the Russian Federation to develop a national inventory of atmospheric mercury emission sources. The EPA's Office of International Affairs recognized that the Russian data collection effort needed to include certain types of information about the individual mercury emission sources for that the inventory to be applicable to simulation modeling efforts planned for the next few years to address the issue of mercury deposition in arctic ecosystems. Russ provided specific information needs for simulation modeling and it appears that the inventory will indeed provide all of the necessary information for subsequent modeling. However, certain assumptions will have to be made about emission stack and exhaust characteristics based on the source type in question. Also, speciation of mercury emissions will be approximated based on source type, as is also the case for most source types in the U.S. inventory. (Russell Bullock, 919 541 1349)

20. Development of Regional-Scale Multimedia Mercury Model. The National Environmental Research Laboratory's Ecological Research Division, Athens, Georgia, visited Research Triangle Park, September 24-25, 2003, to discuss regional-scale multimedia modeling of mercury, identify areas for future collaboration with the Division, and discuss a potential opportunity for a pilot Hg study with the EPA Office of Water. The staff discussed the ERD calibrated watershed Total Maximum Daily Load (TMDL) model toolkit consisting of landscaping, tributary, river, and bioaccumulation factor models and results of recent validation studies, and presented a recent validation study for the mechanistic regional Hg-cycling model, R-MCM. It was concluded that a R-MCM modeling approach should be our long term goal. Ellen Cooter summarized the present ASMD plans for coupling CMAQ/Hg with a coarse compartmental model of underlying surface processes. The goal is to begin movement from a traditional, de-coupled emissions/deposition modeling treatment to a coupled "flux" approach. Key technical and research issues to be addressed by ASMD during FY-2004 were discussed. Two studies were identified that would explore relationships between the modeling approaches. The first study would look at the impact of differences in watershed versus regional grid scale landuse/landcover characterization on media concentration and flux estimates. The second study would focus on similar responses to differences in hydrological characterization. The meeting concluded with a discussion of a possible pilot Mercury TMDL study in Minnesota. Monitoring would be a joint EPA Office of Water, EPA Region 5, and State of Minnesota effort. The desire is to have a TMDL tool that includes consideration of large-scale and regional transport factors by the end of FY 2008. (Ellen Cooter, 919 541 1334).

21. Community Multiscale Air Quality Modeling System - Aerosol Module. Prakash Bhave traveled to Davis and San Ramon, California, to discuss ongoing and future work at the University of California, Davis (UCD) and Atmospheric and Environmental Research, Inc. (AER) on incorporating a sectional representation of the aerosol size distribution into a future public release of the Community Multiscale Air Quality (CMAQ)

model. A research group at UCD is incorporating a dynamic inorganic thermodynamics routine and a sectional aerosol representation into the 2003 public release version of the CMAQ model. A research group at AER has incorporated a sectional aerosol module, an advanced aqueous chemistry module, and several alternative secondary organic aerosol modules into the 2000 public release version of the CMAQ model. In collaboration with the UCD and AER groups, we anticipate that a selection of the modules listed above may be tested further and incorporated into a future public release of the CMAQ model. During his visit to the University of California, Davis, on September 8th, Prakash gave a presentation entitled "EPA's Vision for CMAQ." (Prakash V. Bhave, 919 541 2194)

22. *Community Modeling and Analysis System Cente*r. During September 2003, Dr. William Benjey continued working as Project Officer with the progress of the Community Modeling and Analysis System (CMAS) center at the University of North Carolina at Chapel Hill, Carolina Environmental Program, for advancement of the Models-3/Community Multi-scale Air Quality (CMAQ) user community and collaboration in model improvements, training, and support. During September, CMAS received approximately 50 extended abstracts for presentations during the second annual CMAS User's Workshop for October 27-29, 2003 at the Holiday Inn - Airport, Research Triangle Park, North Carolina. (www.cmascenter.org). Training in the use of CMAQ and the new version 2.0 of the Sparse Matrix Operator Kernel Emission (SMOKE) model system will be offered before and after the workshop. In addition, plans were drafted by CMAS to conduct an independent peer review of the science within the Models-3/CMAQ model. The review will assess the credibility of CMAQ as a state-of-the-art air quality modeling tool in the regulatory and research communities. External peer reviewers have been selected and the review is scheduled to be held in Research Triangle Park during December 17-18, 2003. (Bill Benjey, 919 541 0821)

23. *Updating of the Economic Growth and Analysis System*. During September 2003, Dr. William Benjey continued participation in an evaluation of how the EPA's Economic Growth and Analysis System (EGAS) might be updated to allow projection of emission data through 2050 for use in global climate change air quality modeling. In addition, updates to EGAS will allow it to continue as the source of emission projection factors for near-term (2 to 15 year) future air quality modeling in support of regulatory activities. The evaluation group received detailed descriptions of the capability of the last two versions of EGAS (version 3 and version 4). Version 3 contained the capability to allow users to vary input data and assumptions, allowing alternative scenarios. Version 4 was simplified with more internal "hard-wired" options the for simplified use. The group is considering a range of improvements to EGAS. Alternative economic growth models are also under consideration, although they may not provide as detailed a spatial resolution as EGAS. Work is planned to begin on EGAS during fall 2003. (Bill Benjey, 919 541 0821)

24. *Meteorological Model Evaluation Tool.* Further development and testing has been done on the meteorological model evaluation system this month. In addition to the regular surface fields (temperature, wind and humidity), hourly precipitation and radiation have been incorporated into the evaluation. The precipitation data will allow us to further partition the statistics. For example, the model evaluation statistics matrix can be calculated for instances where the model correctly and incorrectly predicts precipitation.

A measure of the daytime cloud cover prediction is now implicitly incorporated by comparing downward solar radiation measurements from NOAA/ARL's Surface Radiation (SURFRAD) network to the model. The first real data set has been loaded into the model evaluation database. This consists of Eta model forecasts from the summer of 2003 Air Quality Forecast Project. The data is in the process of being analyzed and will be presented at the Community Modeling Analysis System (CMAS) workshop at the end of October. (Robert Gilliam, 919 553 4593)

25. *Emission Processing.* Development of a episodic dust model for unpaved roads has begun. Three new areas of improvement have been identified compared to methods used in the 1999 National Emissions Inventory. One area is an improvement to the county level unpaved road information by using a road-level geographical information system database of roadways from 2000. A second area of improvement is to use hourly meteorological variables of rainfall, relative humidity with the AP-42 emissions factor equation to calculate spatially and temporally resolved emissions from unpaved roads. A third area of improvement is to incorporate a transport factor for the unpaved road dust accounting for capture by the canopy. Each of these updates can be tested independently and compared with existing emissions estimates.

A plan for updating the Air Quality Forecasting system for 2004 is currently under development. The projection of the inventory to 2004 is one the key areas of work to be completed by 2004. Initial focus will

be the incorporation of MOBILE6 and the projection of Electric Generating Unit point source emissions for 2004.

The creation of input files for the 2001 National Air Toxics Assessment annual run has begun. All key input files have been provided to the contractor. Toxic Emission inventories are currently being converted to a format for use by the Sparse Matrix Operation Kernel Emission Module version 2.0 (SMOKEv2.0). (George Pouliot, 919 541 5475)

26. *University Collaborations – Chicago, Houston, and Arizona*. On September 12-13, 2003, Jason Ching visited the University of Chicago's Principal Investigator of the EPA's grant to the University's Center for Integrating Statistics and Environmental Sciences (CISES). Under CISES, a collaboration has begun to investigate the role of statistics in air quality fields, capitalizing on the fine grid scale modeling results of the EPA's Neighborhood scale modeling project. During the visit, review of this joint activity showed a range of differences between native coarse scale grid results from those that were composited using finer scale resolution fields. Interest was expressed in pursuing an investigation of space-time correlations based on different grid size modeling. This will require some additional model runs to be made to the original set of runs for July 1994 of the Philadelphia area. Also of interest was the use of gridded space variability concentration distributions derived using fine scale modeling (1.3 km grid size) to explore the contention that some of the differences between model results and observations is due the inherent differences between point measurements and grid volume values.

A collaborative program has begun between the University of Houston and Arizona State University's (ASU) Department of Environmental Fluid Mechanics on a study modeling air quality and flows at neighborhood scales. The purpose of this visit was to develop the study plan for this collaboration. Under this activity, the ASU has agreed to perform studies integral to EPA's Neighborhood Scale modeling studies at fine scales by incorporating their Computational Fluid Dynamics modeling capabilities for several sections of Houston, Texas, where fine (1 m resolution) detailed building and vegetation morphological information is available. The objective of this investigation is to understand and derive sub-grid spatial concentration variability relationships that result from increased dispersion due to a source's location relative to urban structures. A variety of urban structures will be studied including street canyons, and industrial zones such as in Houston's ship channel area. For its part, the EPA will provide the fine structure urban data as a subset from its large Houston (and vicinity) building database. In addition, the study will call on using EPA's results of MM5 meteorological modeling at 1 km grid, urbanized for Houston, to drive the CFD simulations. The fine scale urban features will have been incorporated into the MM5 by way of its linkage with the SM2-U soil-urban canopy model, and urban canopy parameters (UCPs) also derived from the Houston building and vegetation cover database. This collaborative effort will greatly complement the ongoing neighborhood scale modeling studies. (Jason Ching, 919 541 4801).

27. *Air Quality Forecast Focus Group Meeting.* During the 2003 initial summer test season for the Eta-CMAQ air quality forecast model, NOAA National Weather Service (NWS) convened a Focus Group of potential state/local air quality forecasters to help assess the emerging model system. On September 8-9, 2003, in Silver Spring, Maryland, the Focus Group was convened for a meeting with NOAA and EPA personnel to discuss the feedback being received on model forecasts. Although many members of the Focus Group noticed the model system to have a relatively high bias during the summer for ozone predictions, they were generally enthusiastic about the forecast guidance being provided. They were encouraging as far as improving the system for 2004 summer testing and doing a second assessment at that time. Several members of ASMD attended the meeting, and Jon Pleim and Brian Eder made presentations on the development and evaluation of the forecast system. (Ken Schere, 919 541 3795)

28. *International Workshop on Physical Modeling of Flow and Dispersion .* David Heist recently visited the Environmental Wind Tunnel Laboratory at the University of Hamburg, Hamburg Germany. This laboratory is involved in work similar to that performed at the Fluid Modeling Facility in Research Triangle Park, North Carolina. The Hamburg facility has recently performed measurements on a scale model of Oklahoma City to support a field measurement campaign (Joint Urban 2003) carried out in the summer of 2003. The model scale is 1:300, with a model area of 1.8 km x 1.8 km. Flow visualization and unsteady concentration measurements were performed using the model to aid in planning the field campaign. Follow-up experiments are being planned to examine and explain results from the field campaign. Prof. Schatzmann, Director of the Hamburg laboratory, introduced Dr. Heist to the research group and described the research projects currently being tackled in their four wind tunnels. A very good relationship has been established, for future collaboration and exchanges of support and ideas. (David Heist, 919 541 1199)

Idaho Falls

29. Extreme Turbulence Sphere. An accelerated effort was made early in September to get the ET spheres ready for deployment in a hurricane. The spheres were completed just in time for deployment into Hurricane Isabel, which was predicted to reach the U.S. East Coast in mid September. The spheres were shipped back to ATDD so that they could be packed with the towers that were required for deployment. On 16 September, two FRD staff members departed for North Carolina to deploy the spheres in Isabel. They were met by Ron Dobosy from ATDD, and then proceeded to New Bern, NC, just inland from the point where Isabel was expected to make landfall. One of the spheres was deployed on 17 September at an airport near the coast in Beaufort, NC. Texas Tech University also deployed instrumentation at this site, which will be valuable for intercomparison with the ET sphere. The second sphere was to be deployed in New Bern, but it had been significantly damaged during shipment; the damage was repairable, but not in time for Isabel's landfall.

Isabel made landfall during the afternoon of the 18th, just north of the Beaufort ET sphere. The sphere either went through the eye or through the eyewall on the south side of the storm. When the crew returned to Beaufort on the 19th, the ET sphere was still operating normally. It ran uninterrupted for over 36 hours, generating about 1.2 Gbytes of data. Analysis of the data has not yet begun. It was apparent, however, that rain water had entered some of the pressure ports and affected the wind computations. The original plans for this fiscal year included the development of a back-flushing system for the ports, but this was deferred because project funding from the Office of Naval Research was not received until June 2003.

Overall, the deployment went remarkably smoothly. It provided ARL with valuable experience on the logistics of hurricane deployments. Moreover, both the tower design and the spheres themselves held up well to the punishment dealt out by Isabel. richard.eckman@noaa.gov and Tom Strong, FRD; Ron Dobosy, ATDD)

30. CBLAST-Low. Work is ongoing with the analysis of fluxes and transfer coefficients and the comparison of aircraft results with COARE bulk algorithm results. Two versions of the COARE algorithm have been used. When the latest version (v3) became available, the Fortran code was converted to IDL and applied to the data from the 2001 field campaign. This latest version includes two models that account for the sea state through either a wave age parameterization or wave slope parameterization. Work has been directed at determining the wave state parameters from the aircraft laser data. It was necessary to write code based on the algorithm presented by Sun *et al.* (2003). In this paper (currently under review) Sun *et al.* demonstrate the capability to determine the true wave number and the wave propagation speed and direction based on data from the laser array. Sun *et al.* present the theoretical basis and data from the SHOWEX project, thereby demonstrating the capability.

For sensible and latent heat fluxes, comparison is good between the aircraft calculated values and that computed using the COARE algorithm. The aircraft calculations are less than the COARE values for latent heat flux at low values (possibly a sensor issue with the IRGA) and are greater than the COARE for sensible heat flux at high values. The FUST sensor (utilizing a thermocouple and designed to respond much faster than the standard BAT fast response thermistor bead) was also flown in CBLAST. The FUST does not suffer from high frequency noise contamination due to vibration and stress of the element. Data from this sensor are being processed for use in further analyses. These data may shed light on the discrepancy between the sensible heat flux calculations. jeff.french@noaa.gov Tami Grimmett

31. JOINT URBAN-2003. Studies continued to be conducted on the new plastic samplers to try to pin down the reasons for the bad quality control (QC) data from the URBAN-2003 study done in July. Studies are also being done to compare the newer plastic samplers (Super PIGS) to the old cardboard samplers (PIGS). So far, some of the bad data from the plastic samplers can be directly traced to at least two samplers that did not function properly. Further studies on all samplers will eventually be done to verify that the remaining samplers worked properly. The two samplers known to have failed will be carefully disassembled to pinpoint the reasons for their failures. All other plastic samplers will be checked to verify that the problems discovered in the non-functioning samplers do not appear in any other samplers.

The data analysis for the continuous SF_6 analyzers has been continuing throughout the month. Each data set from the continuous analyzers must be examined carefully to ensure that calibrations meet the QC criteria, all SF_6 peaks have been identified, and no peaks caused by interfering chemicals or other sources are included. The identified peaks must then be extracted and instrument baseline subtracted out. We estimate that this effort is currently about 75% complete. roger.carter@noaa.gov, Debbie Lacroix

32. *Smart Balloon Research*. Research has begun into improving the battery performance lifetime of the balloon. Two approaches are being investigated: solar chargers and fuel cells.

Solar Charger - A lightweight solar battery charger has been built and tested. The charger uses a 4.8 volt thin-film solar cell to charge 3.6 volt lithium-ion rechargeable batteries. These batteries are charged up to their maximum capacity of about 4.2 to 4.4 volts. The charger and pack of three batteries were allowed to charge over several days in typical weather and sunlight conditions and then were taken into the lab to test the actual capacity of the batteries working with two different load resistors.

Fuel Cells - One of the proposed means of providing energy for the smart balloon transponder is the use of a fuel cell. However, there are not yet fuel cells available that are small enough for applications like the smart balloon transponder. In mid-September, NEC Corp. and Toshiba Corp. announced and demonstrated prototypes of fuel cells that they claim will be used in their notebook computers before the end of next calendar year (2004). The direct-methanol fuel cells weigh about 900 grams each and can power a notebook computer for five hours with one 50 cc container of methanol fuel. NEC also intends to market a notebook equipped with an internal fuel cell that offers 40 hours of continuous operation by the end of 2005. Toshiba claims to have an average output of 12 watts for the fuel cell. Delivering 40 hours of operation at 12 watts would give a total output of 480 watt-hours from a single fuel cell with the large capacity (400 gram) methanol pack. Of major concern are the actual cost of these fuel cells and if they will be made available for other applications by either of these companies or some other manufacturer at a reasonable price for use on the smart balloon. randy.johnson@noaa.gov, Shane Beard

33. *BRACE*.   An oral and a poster special session covering the results of the Bay Region Atmospheric Chemistry Experiment (BRACE) Intensive Field Program will be held at the Fall American Geophysical Union Meeting to be held 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% 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 as well as ground-based flux and deposition measurements. These data will be used to test various deposition models. The BRACE AGU special session will allow researchers to present the results of the experiment and promote cooperation, collaboration, and interdisciplinary connections. The sessions will consist of 8 talks and 11 posters. tom.watson@noaa.gov

Las Vegas

34. *NTS Lightning/Thunderstorms*. DOE has requested a climatology of the movement of thunderstorms and potential lightning on the NTS. The initial approach taken to satisfy this request was to look at thunderstorm cases included in a previous report that addressed the potential of strong winds associated with thunderstorms. These particular thunderstorms, which mostly occurred in the vicinity of Yucca Flat (UCC), were looked at in conjunction with the twice daily radiosonde observations taken at UCC. These observations were utilized to compute winds aloft at standard 1000 foot levels. A program was written to compute mean-layer winds utilizing these 1000-foot level winds. The initial application produced mean-layer winds for each of the cases utilizing winds aloft from 10K feet to 40K feet. A mean-layer wind was computed for each of the selected thunderstorm cases. The results showed that most summertime thunderstorm had mean transport speeds less than 20 kts (only 9 cases out of 37 were greater than or equal to 20 kts). After compiling these results it was agreed upon to compute mean-layer winds for all months and years. A program was written and mean-layer winds were computed with several layers utilized. These layers are, 5-10K, 10-20K, 10-30K, 10-40K, 20-30K, 20-40K, 30-40K, and 40-50K. These mean-layer winds will be used to compile more comprehensive statistics for computing mean transport speeds for thunderstorms. (Doug Soule', 702 295 1266, and Darryl Randerson, 702 295 1231)