



NOAA ARL Monthly Activity Report



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Highlights

1. Modeling of the World Trade Center (WTC) Disaster Site. The collapse of the World Trade Center (WTC) towers brought considerable focus to the need for adequate simulation tools for determining exposure and risk from such catastrophic events. An important first step in a methods development program is to examine the exposure pathways through a reconstruction of the transport and dispersion of pollutants released from the WTC site using available modeling and monitoring approaches. Central to development and evaluation of exposure modeling methods is a laboratory scale model simulation of pollutant transport and dispersion in Lower Manhattan. A 1:600 scale model of Lower Manhattan has been constructed and inserted into the test section of the Fluid Modeling Facility’s Meteorological Wind Tunnel (Figure 1). The model is constructed on a large turntable so that different wind directions can be selected for study. In addition to the many buildings and structures of Lower Manhattan, the model includes an emulation of the WTC rubble pile as it appeared approximately one week after the collapse. Smoke and tracer gas are released from nine positions throughout the simulated sixteen acre site.



Figure 1: Model constructed for wind tunnel tests.

The study design includes smoke visualization for a



Figure 2. The overall daytime dispersion pattern from the WTC site.



Figure 3: The daytime vertical distribution of pollutants from the WTC site.

qualitative examination of dispersion in this very complex urban landscape and detailed measurements of flow characteristics (velocities and turbulence) and concentration distributions within all of Lower Manhattan. Within the past month, smoke visualizations have been conducted for the due westerly wind direction suggesting a number of interesting flow phenomenon. Among them are vertical venting behind large/tall buildings, channeling down street canyons, and both horizontal and vertical recirculations associated with individual structures and groups of tall and tightly compacted buildings (such as the Wall Street area in the southeast edge of Manhattan). Examples of neutrally buoyant smoke released from the WTC site with flow from left to right are displayed in Figures 2 and 3; natural light is illuminating the smoke in Figure 2 and a vertical laser sheet is additionally illuminating the plume near the centerline of source in Figure 3. This shows an example where a significant amount of plume material is vented quickly upward by the tallest buildings in the immediate vicinity of the site. The vertical extent of the resultant plume is, therefore, well above the buildings at the time the material passes beyond the downwind city boundary.

The velocity and turbulence measurements for the westerly wind directions are just underway. A new Laser Doppler Velocimeter, providing remote measurements of flow and turbulence through optical windows in the tunnel floor, has been successfully inaugurated. A preliminary study was conducted within narrow, two-dimensional model street canyons to determine the critical Reynolds number needed to insure turbulent flow. Using the street canyon width as the appropriate length scale, the critical Reynolds number (above which similarity of turbulence in the model and atmosphere can be assumed) was found to be between 4000 and 5000. In the proposed study of Lower Manhattan, the lowest Re will exceed 10,000 (well above the critical value). The flow measurements will be followed by detailed tracer-concentration measurements throughout the model domain. The entire process will be repeated for other interesting wind directions. Upon completion of the data collection phase in early spring of 2003, the database will be analyzed, documented, and made available to developers for comparison with the simulation results from Computational Fluid Dynamics and other kinds of models. (Steve Perry, 919 541 1896; Roger Thompson, 919 541 1895)

2. *The 2nd WMO Conference on Women in Meteorology and Hydrology.* Planning continues for the 2nd WMO Conference on Women in Meteorology and Hydrology, to be held March 24-27 in Geneva. The purpose is to increase the participation of female meteorologists and hydrologists in WMO programs and activities and in the profession overall. The U.S. delegation will be lead by Brigadier General John (Jack) J. Kelly, Jr., the U.S. Permanent Representative to WMO and will include Vickie Nadolski (NOAA National Weather Service), Maria Pirone (WSI Corporation), Dian Seidel (NOAA Air Resources Laboratory) and Fiona Horsfall (NOAA National Weather Service). Mary Glackin (NOAA Satellite and Information Service) will co-chair the conference.

To solicit the views of the wider U.S. meteorological community, NOAA will host a luncheon meeting with delegation members on Wednesday, February 12 at 12 noon in Seaside Room 301 at the AMS Annual Meeting at the Long Beach, CA, Convention Center. If you are interested in providing your perspectives to the delegation on issues and recommendations for the Conference, please send an email to wmo.women@noaa.gov, by January 15, 2003, to ensure a space at the luncheon. If you are unable to attend the luncheon meeting, but would like to review and comment on the delegation position paper, please send a message to wmo.women@noaa.gov. dian.seidel@noaa.gov

Silver Spring

3. Sino-US Workshop on Dust Storms and Their Effects on Human Health. The PM₁₀ dust emission module developed for application in Kuwait was summarized for the visiting Chinese scientific team. To apply the model over other domains, such as China, where detailed digital soil characteristics are not available, the emission module was modified to use HYSPLIT's one-degree land-use file by assuming that a "desert" land-use grid cell corresponds to the Kuwait "active sand sheet" soil type category. To compensate for the greater number of potential dust emission cells, the original PM₁₀ flux equation was replaced by a relationship not dependent upon soil type and which had a substantially lower emission flux. The modified model was tested for two recent Chinese dust storms and one Australian event, the results of which were discussed in more detail in the presentation. The meteorological data for the examples and model executables were provided on CD-ROMs.

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4. Kilauea Ensemble VOG Forecast Now Available in READY. An ensemble forecast system developed by Roland Draxler is now available through READY. It involves two separate components – meteorological prediction and plume dispersion forecast. In the current configuration, only one meteorological forecast is used to create an ensemble of dispersion forecasts. The meteorological component is comprised of the 8 km resolution output fields from NCEP's NMM, non-hydrostatic Mesoscale Model (Janic et al., 2001). The dispersion calculations are from the HYbrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model. Currently HYSPLIT is run locally on a workstation, while the NMM is run by NCEP. The dispersion ensemble output products are transferred to ARL's web server for analysis and visualization. glenn.rolph@noaa.gov and Roland Draxler

5. NWS Text Products Available Again in READY. Over the last few months reception of NWS text products (forecasts, surface & upper-air observations, and watches/warnings) has been intermittent. After much trial and error, the problem was found to be a faulty high-speed data modem, which was replaced at the end of November. All NWS text products are now available again with no problems noted. Alternative methods for accessing the data from the NWS will be investigated in the future.

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6. READY/HYSPLIT Registrations reach 1250. Since 24 September 2001, ARL has been requiring all users except those with **.noaa.gov** computer domains to register before being permitted to run the HYSPLIT transport and dispersion model on the ARL READY (<http://www.arl.noaa.gov/ready.html>) website. At the end of November over 1250 users have been registered. glenn.rolph@noaa.gov

7. Large Volcanic Eruption in Ecuador. NCEP issued 18 VAFTAD forecasts in November for several large eruptions of the volcano Reventador, in Ecuador. The largest eruption was to about 16 km. The VAFTAD forecasts are used by the aviation community. For future analysis at ARL, associated data were archived during the eruption period. This included mandatory-level, 100 km horizontal resolution, NCEP FNL analysis model output and satellite imagery and analyses in graphic formats such as jpg or gif. barbara.stunder@noaa.gov

8. Trajectory Cluster Program. As an extension to work done a few years ago, Tom Butler, Cornell University/ Institute of Ecosystem Studies, created a set of trajectories and ran the ARL trajectory cluster program on one of the ARL Headquarter's computers. The timing was very good in that he was able to use the new 'post-processing' portion of the trajectory cluster package which uses the current

standard HYSPLIT plotting program, as compared to the older NCAR graphics HYSPLIT application. More work needs to be done to complete the integration of the cluster package into the HYSPLIT system. barbara.stunder@noaa.gov

Boulder

9. SURFRAD/ISIS. Establishment of a no-cost lease for a SURFRAD station at the EROS Data Center near Sioux Falls, South Dakota is nearly complete. The Albuquerque, NM, and Sterling, VA ISIS stations were refurbished in November. Besides exchanging the instruments, the solar trackers were adjusted to accommodate the new Eppley ventilators. The tracker was also greased and realigned. At Albuquerque, all items in the logger box (data logger, storage module and modem) were replaced after being destroyed by a nearby lightning strike. A NWS lightning protection team from Lubbock was also there better protect the WSFO from future lightning strikes. They helped us tie in the ISIS station to the new grounding system. At both stations, robust Campbell modems replaced old third-party units. All old nonfunctioning equipment was removed, and the sites were generally cleaned up.

An improved version of the BSRN data quality control package has been provided; this should be applied to SURFRAD data in the coming year. john.augustine@noaa.gov

Oak Ridge

10. Air Quality – the BRACE program. During November, Simone Klemenz and LaToya Luse (a graduate student at Florida A&M University) have been working together on the Bay Region Atmospheric Chemistry Experiment(BRACE) project. BRACE is an extension of the Tampa Bay Estuary Program. Luse has been sending samples from Tampa Bay, Florida to Klemenz for analysis in the NOAA Chemistry Lab. at ATDD for certain nitrogen species. Klemenz also worked on the analysis, preparation, and extraction of filter packs for the AIRMON Dry Network. (Klemenz, Luse)

11. U.S. Climate Reference Network. A US CRN meeting was held at ATDD on Nov. 6. (Hosker, Meyers, Hall) Installation work and upgrades were performed during November in NH, MI, RI, IL, NE, MT, and VA. (Hall, Black, French, Brewer, Bryant, Randolph, Heuer, Lew)

Software development and testing was finished this month for the data acquisition system to be used at the CRN test sites in Sterling, VA and Johnstown, PA. Deployment instrumentation is scheduled for early December. (Hall, Dumas)

12. Italian National Research Council Sky Arrow Aircraft. The new 20 Hz Javad AT4 GPS attitude system (for roll, pitch, and heading) was tested and evaluated as a replacement for the discontinued 10 Hz Trimble system. Javad's four antennas were spaced in a diamond array at 1-m separation on the roof of a vehicle. The vehicle was driven over terrain slopes up to 100 in an open field having good satellite visibility. Overall performance was satisfactory. The occasional dropouts were of inconsequential duration. A static test at the operational 4-m separation was also successful. The Javad system will be used in the two new Italian Sky Arrow flux airplanes, on ARL's planned replacement for the Long-EZ, and perhaps in retrofit to the NOAA Twin Otter. (Brooks and Dumas)

13. Mercury in the Arctic. Arrangements and scheduling were completed for mercury measurements to be conducted at a temporary US Navy ice camp in April 2003. The camp will be located approximately 200 miles north of Alaska, and will provide upwind and up-lead mercury measurements to complement the Barrow Dataset. (Brooks, Meyers, and Lindberg; ORNL)

The bromine that initiates Arctic mercury depletion events can not come solely from polynyas, according to HYSPLIT's air mass trajectory computations and polynyas' sizes and locations (Stirling, I. and H. Cleator, *Polynyas in the Canadian Arctic*). Re-freezing leads are better candidates. Polynyas and leads are the two categories of open Arctic water in the springtime, when mercury depletion events occur. Polynyas are areas where upwelling warm water prevents ice formation. Leads are breaks in the ice surface due to stress from currents, wind and temperature. Springtime leads typically re-freeze quickly expelling sea salt, some of which gets into the atmosphere. Air trajectories from them match well the distribution of atmospheric BrO and resultant mercury depletion. Re-freezing leads are thus believed to be an important source of the bromine which initiates mercury depletion downwind.

14. Aircraft Replacement. Representatives from ARL/ATDD, ARL/FRD, and OMAO/AOC attended a meeting at the Velocity aircraft factory on November 12, 2002. Discussed were aircraft certification, airframe modifications, avionics packages, availability timetable, and cost. The Velocity appears at this point to be a good replacement for the Long-EZ. It will accommodate all of ARL's instrumentation requirements for the foreseeable future. (Dumas, J. French ARL/FRD, Capt. R. Maxson and LtCdr. G. Yates, OMAO/AOC)

15. Canaan Valley. Modeling studies to determine source regions for atmospheric deposition to the watersheds of the Canaan Valley area are continuing using the HYSPLIT model. The 54-year climate record from the Canaan Valley is being examined in collaboration with NWS researchers, to assess correlations with large-scale phenomena such as the El Nino-Southern Oscillation. Wet and dry deposition studies for the region are also continuing. (Vogel, Meyers)

16. Coupled Dynamical/Photochemical Modeling. In preparation for a paper being written on the role of averaging in the interpretation of daytime trace gas observations, several new large-eddy simulations (LES) were completed. These idealized simulations with constant surface heating included a passive tracer that was emitted uniformly from the bottom surface at the same rate as the isoprene emissions specified in previous full chemistry coupled simulations. Several 12-hour LES runs were produced and the resulting dynamics statistically analyzed with the goal of generating an early steady-state convective boundary layer (CBL) for at least a 10-hour period. By specifying a -1.5 K potential temperature gradient over a 50 m height, the desired requirements were met and the resulting LES showed only around a 200-300 m rise in CBL depth (from 1800 m AGL to 2000-2100 m AGL) over the final ten hours. This corresponded with a final surface kinematic heat flux of 0.054 K m s⁻¹ or about 66 W m⁻² of sensible heat flux. The final convective velocity scale was 1.45 m s⁻¹, which yields a convective time scale of about 23 minutes. Complete statistics of the passive tracer and dynamics quantities were computed in preparation for further analysis and plotting. (Herwehe)

Research Triangle Park

17. CMAQ Optimization. Work on speeding up the Community Multiscale Air Quality (CMAQ) model by optimizing various aspects of modeling gas-phase chemistry. First, the CB-IV MEBI solver code has been restructured to improve computational efficiency. Tests conducted with the small

tutorial domain indicate a solver speed-up of about 25%, which translates to about a 10-12% increase in model run times *for this domain*. Tests are now being conducted with the more realistic 1999 CONUS domain to see if this speed-up holds for a larger domain. Second, a test has been conducted with the tutorial domain in which radical species were not diffused or transported. The model predictions were not significantly affected in this test, so this treatment is also being tested using the larger domain. The final part of this effort will be to examine using analytical expressions in place of numerical solutions in part of the MEBI solver code, but that work has not yet begun. (Jerry Gipson, 919 541 4181)

18. CMAQ Sensitivity Runs. EPA is currently considering the use of the Community Multiscale Air Quality (CMAQ) model to estimate the effects of a proposed reduction in emissions from non-road equipment. As part of this analysis, a series of sensitivity runs have been completed to better understand the base-case simulation (entire calendar of 1996). Several tests have been completed looking at the effects of a) increased diffusive mixing in the horizontal and the vertical, b) changes in surface roughness parameters, c) reductions in base-year emissions, and d) reductions in available moisture. These analyses have led to an increased understanding of the model and will likely lead to modifications in the way CMAQ will be applied for the non-road regulatory support modeling. (Pat Dolwick, 919-541 5346)

19. Dioxin Modeling with CMAQ. Two different simulations are being conducted to assess how gas to particulate partitioning affects air concentrations and dry deposition. One simulation uses a version of CMAQ that partitions dioxins and furans between the gas and particulate forms. The second simulation uses a version that represents these compounds only in the gas form. Results from these simulations are also being compared with observed air concentrations during July 1999. In brief, the two simulations produce almost the same air concentrations but very different values of the dry deposition. The lower deposition rates of particulate form can explain these results if both versions of CMAQ inefficiently remove dioxins and furans through wet and dry deposition. Comparisons to observations show good correlations only for furans with five to six chlorine atoms. The cause remains to be identified. This work was presented at an Air Toxics poster session at the 2002 Fall Meeting of the American Geophysical Union. William Hutzell and Russell Bullock presided over the session. (William Hutzell, 919 541 3425)

20. Atrazine Modeling. Atrazine is a widely-applied "restricted-use" herbicide, and it can volatilize, undergo long-range transport, and deposit to surface drinking water. An atrazine version of the Community Multiscale Air Quality (CMAQ) modeling system is being considered for use by the European Union. A committee, coordinated by Ian Cousins of the Institute of Applied Environmental Research in Stockholm, has compiled a list of 80+ models for use in exposure assessment of pesticides. The CMAQ/Atrazine model has received preliminary acceptance, but it is undergoing further evaluation by the Committee pending final inclusion in the database. (Ellen Cooter, 919 541 1334)

21. Air Quality Forecasting Initiative. Work has begun on the translation of meteorological model output from National Centers or Environmental Prediction (NCEP) to a CMAQ simulation grid. Several NCEP software programs, libraries, and utilities were obtained and loaded on the EPA IBM. NCEP's post-processor "product generator" was successfully modified and run to create output fields on a new grid configuration. Further modifications to the grid configuration and output from the product generator will continue into December. The goal is to have NCEP meteorological fields prepared for CMAQ for initial testing in January. (Tanya Otte, 919 541 7533)

22. *Fugitive Dust Emissions.* Preparations are underway for a two-year study examining dust emissions and deposition in the Northern Chihuahuan Desert near Las Cruces, New Mexico. Working with personnel from the Jornada Experimental Range (JER), a meteorological tower has been erected in the southern part of the JER and particle collectors have been rearranged to optimally sample dust emissions for south-to-west winds, which correspond to the strongest dust emitting winds. Related to this study, discussions were undertaken with Dr. G. Bergametti from the University of Paris LISA (Laboratoire Interuniversitaire des Systemes Atmospherique), scientists at the Jornada Long Term Ecological Research (LTER) group, Prof. Richard Langford of the University of Texas at El Paso, and scientists from New Mexico State University. (Dale Gillette, 919 541 1883)

Work continues on the development of algorithms for modeling windblown and fugitive dust from on-road and off-road activities, from industrial and construction activities, and from agricultural tillage practices. The initial focus of this work is the development, testing, and integration of a wind-blown dust algorithm. The basis for the wind blown dust formulation is derived from threshold friction velocities for various soil types, surface soil moisture content, weather and vegetation type and coverages. Recognizing the variability of vegetation coverages, the non-homogeneities in the distribution of wind erodible land-use types at sub-grid scales, and the interception of the uplifted dust particles by tree and vegetation canopies, CMAQ simulations were made to examine sensitivity of the model to the introduction of information such as percentage distribution of wind erodible land-use types and vegetative coverage at fine grid resolutions in modifying the estimated dust flux at the 36-km cell size. The development of determining the flux of dust from on-off road, construction and agriculture tillage will follow the current studies on windblown dust. The goal of this effort is to develop an emissions model for CMAQ, a prototype of which should be available for testing within SMOKE by September 2003. (Jason Ching, 919 541 4801)

23. *UltraViolet Radiation Research.* An UltraViolet Rotating Shadowband Spectroradiometer (UVRSS) was installed for evaluation at the Jenkins Road site in Research Triangle Park, North Carolina. This instrument partitions direct and diffuse hemispherical skylight at nearly 1000 wavebands from 290 to 370 nm. Using a charge-coupled detector, the spectrum can be measured at intervals of one minute, permitting Langley analysis for aerosol optical depth. Current instrument access is via analog phone line and modem. The acute sunlight exposure and dose model (version 0.3) has been completed for evaluation and testing. This model calculates incident broadband sunlight flux and cumulative energy density at 40 anatomical locations for user-specified latitude, longitude, date, start and stop time, and atmospheric transmissivity. (John Streicher, 919 541 3521)

24. *Remote Sensing Image Processing.* A dark-surface water vapor algorithm has been developed and tested in the latest iteration of the Reflectance Processor model. Dark surface aerosol algorithms from recently published literature will be incorporated. These enhancements will enable accurate determination of the atmospheric water vapor fields and aerosol optical depth over class II waters. The Airborne Visible and InfraRed Imaging Spectrometer (AVIRIS) data collected over the Lower Neuse River Basin and Pamlico Sound on May 15 is expected to be released by NASA during November. Atmospheric corrections using the Reflectance Processor model will be undertaken, yielding precipitable water vapor, aerosol optical depth, and surface reflectance. The corrected image will then be analyzed for spacial patterns and quantification of chlorophyll A, suspended sediment, and colored dissolved organic matter. (John Streicher, 919 541 3521)

25. Dry Deposition Modeling. Efforts have begun to improve the algorithms within the Community Multiscale Air Quality (CMAQ) Meteorology-Chemistry Interface Processor (MCIP) that simulate dry deposition during the winter season. The literature discusses the need to treat wet and dry snow differently for soluble species, but there is considerable disagreement on how to specify the temperature range for wet snow. Recognizing the importance of all types of wet surfaces for soluble species, the existing ground resistance in M3DRY will be extended to include a treatment for wet ground resistance that will be scaled on Henry's Law. The literature proposes a dry cuticle resistance as a function of relative humidity for NH₃ and SO₂. The cuticle resistance in M3DRY will be modified to use this new approach. Another aspect of M3DRY analyzed is the effect of pH on the effective Henry's Law constant. The current code assumes a value of 4.3 for the pH of rainwater. Since this value is not representative of the entire United States for all seasons, ways are being explored to provide more appropriate pH values to M3DRY such as seasonally-varying average gridded values. The MCIP code has been modified to read the snow cover variable from the MM5 output and to pass it through to the output files for display using Package for Analysis and Visualization (PAVE). This is helpful for diagnostic purposes since MM5 data cannot be displayed using PAVE. A test case for January 1996 raised some questions about the interpretation and handling of lakes. Some of the Great Lakes showed up as snow covered, while others did not. It is unclear whether this is a reflection of frozen lakes or not. This also raises questions on the ability of the MM5-PX model to recognize and to handle the lakes. The RADMDRY subroutine was modified to recognize the presence of snow cover in a grid cell to trigger the use of the resistances for snow covered surfaces. Previous versions of the model only used seasons 1, 2, 3, and 5. Further testing of this code is needed to determine the sensitivity of the deposition velocity estimates to this change. The goal of this effort is to yield an improved dry deposition treatment in CMAQ by April 2003. (Donna Schwede, 919 541 3255)

26. Modeling Smoke Emissions from Fires. Work continues on a project to develop a prototype, a 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 (USFS). The goal of this project is to build a tool to generate emissions from forest burning for use in regional air quality modeling with the following characteristics: (a) horizontal scale from regional to national with grid resolution ranging from 1 km to 36 km; (b) temporal resolution from hourly to multi-year; (c) chemical species including all National Ambient Air Quality Standards and visibility components and their precursors; and with (d) accuracy equivalent to other emissions estimates. The prototype system, Community Smoke Emission Model (CSEM), consists of a set of processors developed primarily by the USFS that (a) identifies fire boundaries, (b) identifies vegetation and fuels involved, (c) calculates fuel moisture content, (d) calculates fuel consumption, (e) calculates fire emissions, and (f) speciates fire emissions and calculates plume rise. The fire data come from linking databases including the National Fire Occurrence database with the fuels model, the NFS' GIS based National Fire Danger Rating (NFDR) system at 1-km grid resolution. The modeled fuel's data are subsequently modified to be consistent with the National Fuel Condition Class Coverage database. CSEM derives the fuel moisture content of the NFDR system fuels utilizing input meteorology fields from the Mesoscale Meteorological model, Version 5 (MM5) system. The fuel consumption is based on the USFS' CONSUME model and the emissions computed using the Emissions Processing Modeling system. Finally, chemical speciation from the fires is based on derived ratios of pollutant species to CO emissions. This study is being performed by CIRA (Cooperative Institute for Research in the Atmosphere) and administered by the US National Park Service (NPS) with funding from both the EPA and USFS. An initial result from the CSEM system has been produced to demonstrate a proof of concept. Additionally, a paper entitled *Integration of Wildfire Emissions into Models-3/CMAQ with*

the Prototypes: Community Smoke Emissions Modeling System (CSEM) and BLUESKY by Mike Sestak, Susan O'Neill, Sue Ferguson, Jason Ching, and Douglas G. Fox was presented at the CMAS Workshop on October 22, 2002. The paper describes the modeling prototypes representing both the current effort along with the smoke modeling of the BLUESKY project for the USFS Fire Consortia for Advanced Modeling of Meteorology and Smoke in the Northwest. Currently, a no-cost time extension is in place for the current EPA-NPS Interagency Agreement to continue the collaborations and coordination of a separate USFS contract to CIRA for the main purpose of implementing the current modeling system into the Models-3 CMAQ Sparse Matrix Operation Kernel Emissions (SMOKE) processor. (Jason Ching, 919 541 4801; William Benjey, 541 0821)

27. *Neighborhood Scale Modeling.* 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 information needed for performing human exposure assessment modeling. The neighborhood scale modeling features attention to modeling pollution variability at fine scales and consequently, it was found necessary to provide an estimate of the stochastic variability at sub-grid scales. These requirements were addressed by identifying sources of concentration variability from chemical variability due to turbulent motions and from sub-grid concentration variability arising from individual, within-grid sources. Evaluation was reported of the simulations of the prototype air quality simulation model for the Philadelphia Metropolitan Area and surrounding vicinity focusing primarily on the preliminary set of results for 36-, 12-, 4-1.33- km grid resolutions. The effort included testing of an important new mixing length parameterization to the basic urban canopy parameterization (UCP) already in the neighborhood scale version of MM5 (MM5 is the CMAQ meteorological processor).

Work has begun on the second phase of this project, neighborhood scale modeling for Houston, Texas. The effort to produce gridded, high resolution urban canopy parameters, UCPs, based on building and tree canopies data for Harris County and the Houston Ship Channel area (derived from airborne lidar measurements) is underway 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 Texas (Houston) area (Texas 2000 study) using the Models-3/CMAQ modeling system. Concurrently, the formulation of a methodology to produce the sub grid concentration distributions (as Probability Density Functions) is underway. Also, discussions with investigators from the Ecole Centrale Nationale of the University of Nantes, France, for collaborative studies relevant to this neighborhood scale modeling project have begun. The collaborative effort proposes a model evaluation of EPA neighborhood scale modeling using a special database called ESCOMPTE, a major European sponsored intensive field study program. The ESCOMPTE database contains specialized urban canopy scale boundary layer and chemical measurements made in Marseilles, France, during 2001. (Jason Ching, 919 541 4801)

28. *Testing of the Sparse Matrix Operational Kernel Emissions (SMOKE) Model.* The creation of emissions for an air quality forecasting model requires the efficient and accurate estimation of temporal and spatial variations of emission sources. To achieve this goal, the existing emission inventory preparation and processing systems need to be streamlined and modified. A nonlinear least squares method was developed for mobile source emissions using the SMOKE/MOBILE5B model. By separating the spatial and temporal variations that are not dependent on meteorological fields from the spatial and temporal variations dependent on temperature, a very fast and efficient method for modeling mobile source emissions was developed and tested. The SMOKE system was modified to improve its flexibility in representing the Earth. An environmental variable was added that allows the user to select

any one of up to 20 definitions of the Earth's radius including both spherical and oblate spheroid representations. These updates are most important when gridding point-source emissions for a high resolution grid on the order of a few kilometers or less. (George Pouliot, 919 541 5475)

29. *Biogenic Emissions Inventory System (BEIS)*. The latest version of the Biogenic Emissions Inventory System (BEIS3.10) has been tested on three platforms: AIX, Solaris, and Linux with the Portland Group Compiler. Consistent results were obtained on all three platforms for a test case. Efforts are underway to release the BEIS3.10 code on the Division's FTP site. (George Pouliot, 919 541 5475)

30. *Ozone Deposition to Forest Soils in the Winter*. A short-term experiment conducted by Tilden Meyers of ATDD and ASMD to look at ozone deposition to natural ecosystems in winter after the vegetation is no longer active has taken place. Two ozone flux systems were established at Purchase Knob, in the Great Smoky Mountains National Park, site of this summer's sub-canopy deposition study. Data were collected for two weeks, and analysis will begin this winter. A first draft of a paper analyzing the data collected in this summer's sub-canopy deposition study has been completed. Preliminary findings indicate that the Meyers-Paw U sub-canopy model works quite well in predicting ozone levels in mid-canopy, but under-predicts the deposition at the lowest levels by a small amount. This model, when refined, will be a tremendous boon to pollution damage to ecosystem research by allowing for the first time estimates of pollutant exposure at the leaf level. This will be a significant improvement over using remote measures of air concentration. CASTNet data have been obtained for the January-February 2002 period, and a preliminary analysis of spatial patterns completed. This is a contribution to the model evaluation dataset being compiled for one of the Division's first priorities: the evaluation of CMAQ NO_x levels during the winter. Further spatial analysis will be conducted to test the models ability to predict the patterns and amounts of deposition over a large geographic region. (Peter Finkelstein, 919-541 4553)

31. *Summer 1999 Ammonia Model Evaluation*. In October, an issue was uncovered with the 1999 ammonia emissions inventory, which had been set according to the seasonality adjustment defined for 1990. The question was whether 1999 conditions were different from those of 1990, resulting in an incorrect ammonia adjustment for seasonality. A new ammonia inverse modeling series was completed for the actual 1999 meteorological conditions for June, July, and August 1999 at 32 km to establish appropriate levels of ammonia emissions for the evaluation of PM fine predictions for summer 1999. Rather different results were obtained for August 1999 compared to August 1990, while the results for June/July 1999 were fairly similar to the June 1990 results. Whereas in August 1990 the inverse resulted in a reduction of ammonia emissions, for August 1999 the inverse resulted in an increase of ammonia emissions, keeping the adjusted August emissions very close to the June/July emissions. New 32-km CMAQ runs were started and expected to be complete in early December. Thus, there appears to be significant interannual variability in the ammonia emissions that "fit" the model as determined by inverse modeling. This will be explored further to determine the cause or causes. Two journal manuscripts have been completed. The first, addressing measurement needs for diagnostic evaluation of photochemical models, was submitted to Atmospheric Environment. The second, describing the Extended RADM model with ammonia budget adjustments and subsequent analyses, was submitted to Journal of Geophysical Research-Atmospheres. (Robin Dennis, 919-541 2870)

32. *Background Concentrations of Air Toxics for the National Air Toxics Assessment*. Progress is being made to determine background concentrations for use in the National Air Toxics Assessment

(NATA) based on ambient monitoring data. Even though this approach may seem straight forward, it is complicated in that there are almost 188 toxic air pollutants listed in the Clean Air Act. Additionally, an estimate of background for each pollutant is needed for the full domain of the NATA study, which included the Continental United States as well as Alaska and Hawaii. This current study utilizes archival data collected by Federal and State agencies and attempts to estimate background by using statistical data analysis techniques. Estimates for some pollutants were obtained and the next stage involves extrapolating these estimates nationwide. (Joe Touma, 919-541 5381)

33. *PM Forecasting (2002-2003)*. A project is underway to help develop city-specific air quality forecasting techniques for 36 major metropolitan areas in the United States. The focus of these forecasting efforts will be on fine particulate matter (PM_{2.5}) concentrations. The goal is to develop statistical models relating the increasingly available, continuous, real-time PM_{2.5} ambient data to various meteorological scenarios, with an eye toward generation of next-day public health advisories using EPA's Air Quality Index. The preliminary forecasting for the 10 highest-priority cities is just getting started (Atlanta, Baltimore, Cincinnati, Cleveland, Columbus, Detroit, Minneapolis-St. Paul, Pittsburgh, Sacramento, & Washington DC.) A workshop will be held in February 2003 to communicate the results of the forecasting project. (Pat Dolwick, 919-541 5346)

Idaho Falls

34. *URBAN-2000*. The URBAN-2000 study, conducted during October 2000 in Salt Lake City UT, required that part of the integrated bag samplers have adsorbent CATS tubes attached to the inlets. The CATS tubes are used to collect perfluorocarbon tracer samples. The intent of attaching these to the inlet of the SF₆ samplers was to sample simultaneously for both types of tracers. Experts in perfluorocarbon tracers assured the experiment participants that SF₆ would not be adsorbed on the adsorbent in the CATS tubes. However, this past spring, it was discovered that the CATS tubes had indeed adsorbed part of the SF₆ during the field experiment. By comparing SF₆ concentrations measured from collocated samplers where one sampler was equipped with CATS tubes and one was not, we were able to calculate an approximate correction factor. We have used this correction factor to correct all of the bag sampler SF₆ concentration data and submitted the corrected data to the data archive. Work also continues on a final report for the experiment. roger.carter@noaa.gov, Debbie Lacroix, Kirk Clawson

35. *Rain In Cumulus over the Ocean (RICO)*. The second draft of the Scientific Overview Document (SOD) was made available to prospective participants of RICO. The document outlines the main objectives of RICO and suggests aiming for fall/winter 2004 for an eight week intensive field study off the northeast coast of Puerto Rico. RICO will focus not only on the development of rain in shallow trade wind cumuli, but will also attempt to gain a better understanding of the organization, formation, and dynamics associated with these clouds. To this degree, it is important to obtain not only in-cloud measurements, but also boundary layer measurements of energy fluxes. Researchers from FRD and the Department of Atmospheric Science from the University of Wyoming will participate in preparing a joint proposal to investigate the dynamics and formation of the clouds in RICO. jeff.french@noaa.gov

36. *INEEL Support*. In November a revised list of recommended upgrades to the INEEL dispersion modeling was presented to DOE management. The 12 recommendations were placed into three tiers, with Tier I being the highest priority upgrades, Tier II being important items that should be implemented but could be postponed, and Tier III being upgrades that are desirable but not critical.

An upgrade budget was also presented. The DOE management was receptive to the recommendations, but there is some question as to where the funding for such an upgrade will come from. richard.eckman@noaa.gov

Additional modifications were made to INEELVIZ adding to the changes from last month. Additional limiting contours were included for the TRA releases, increasing the number of contours from 3 to 5 for the default RSAC scenarios. The output was changed to display the 5 and 10 rem limiting Thyroid dose isopleths. Limiting release scenarios were also added for the INTEC site. A new web server was brought online and the FRD and the ARL Aircraft (<http://ArlAircraft.noaa.inel.gov>) Web sites were moved to the new server. A new web-based INEELVIZ display is now available on the new server. brad@noaa.inel.gov

37. INEEL Mesoscale Modeling. The National Centers for Environmental Prediction (NCEP) have recently started to post 12-km Eta model gridded output on their ftp server. These data are broken up into a series of tiles, so that the full 3D model output can be downloaded for a limited region. This provides some new opportunities for the high-resolution MM5 modeling at FRD. Currently, FRD is using coarser resolution Eta model output to drive 3 MM5 grids at 27, 9, and 3 km horizontal grid spacing. With the new tiled NCEP output, it should be possible to drop the coarsest grid and focus on the smaller scales. This was tested on the new dual-processor Intel Xeon computer at FRD by constructing a 2-grid MM5 configuration using 12 and 4 km grids; the coarsest grid was chosen to be 12 km rather than 9 km to match the NCEP output. MM5 was able to run an hour of simulated time in about 2 minutes with this configuration, compared to about 5 minutes with the current 3-grid configuration. The new configuration appears to do a better job of forecasting the temperatures in the Snake River Plain, primarily due to the better initialization. The improvements in the MM5 initialization with the 12 km Eta output appear to more than offset the reduction in resolution (4 km vs. 3 km grids). One test run was performed with a third 1.33 km grid placed right over INEEL. However, this increased the time required to complete an hour of simulated time to about 9 minutes. Although this fine-scale grid resolves some local terrain features at INEEL, it is not clear whether its high computational costs are justified by any forecast improvements. richard.eckman@noaa.gov

38. ARL Aircraft. Representatives from FRD, ATDD and NOAA/AOC visited the Velocity factory in Sebastian, Florida. Discussions were held with company president Duane Swing and vice-president Scott Baker regarding the possibility of acquiring a modified Velocity XL for use as a NOAA aircraft to replace the LongEZ. During the discussions, emphasis was placed on the modifications required to make the velocity a suitable research platform. Other items for discussion included safety, maintenance, and certification. In general, it was decided that the Velocity would best suit ARL's needs for a small, environmental research aircraft (SERA). A list of necessary modifications was given to Velocity, including general requirements for engineering. Velocity is expected to respond with an estimate/bid in early December. jeff.french@noaa.gov, Ed Dumas

Las Vegas

39. Cloud-to-Ground (CG) Lightning Study. During November, focus was on closing out issues related to the October 1 lightning incident at the U1a Complex. In addition, the potential use of field mills was reviewed and assessed. Meetings and telephone conference calls were arranged to involve, C. Odom, Los Alamos National Laboratory (LANL), DX Division, and E. Forness, NNSA/NV, STD, regarding the potential use of field mills on the NTS. A draft plan-of-action was prepared regarding

the potential use of field mills at the U1a Complex. (Darryl Randerson, 702 295 1231, and Walt Schalk, 702 295 1262)

40. NOAA Cooperative Institute for Atmospheric and Terrestrial Applications (CIASTA). NV-RAMS ran to completion on the University of Nevada-Las Vegas computer system “elko” 29 of 30 days (97%). Three of these runs only completed 32 hours. On the day of no run, the model was run manually using 12z initialization data. Data are continuing to be renamed and saved daily, and backed up to CD monthly (3 CDs). Work began on implementing the RAMS Meteogram graphic routine upgrade. The current version does not allow the plotting of wind data. Initial work has generated several errors that deal with the graphics library itself. Next step is to contact R. Holmes to work through errors. (Walt Schalk, 702 295 1262)

41. Special Climatological Request – NTS. A request has been received for SORD help with compliance issues for the NTS for radioactively contaminated areas/sites. BN is particularly concerned with comparing an individual year with past studies (early 1990's) that utilized data averaged for 5-year periods. They want to use data for 2002, as soon as it's available, to produce similar results to the earlier study. Additionally, they are considering utilizing SORD's capability to produce trajectories for specific locations on the NTS. (Doug Soule', 702 295 1266, and Walt Schalk, 702 295 1262)

ARL Administrative Items

42. NOAA's CIO and IT issues. Carl Staton (NOAA's CIO) visited the Boulder Labs November 5 and 6. There was a round table discussion, where we brought up some of the concerns and questions we in the field have.

His message was that we should expect NOAA to be run more and more like a business; OMB will be demanding more reporting on IT security and expenditures. Some specific items of relevance :-

IT Expenditures over \$25K -- approval still lies with Lab CIO's, with quarterly reports must be made to Nancy Huang at OAR.

Blanket Purchase Agreements (BPA's): if you want to know if NOAA or DOC has an agreement for a certain software package, check the NITES site at http://www.nites.noaa.gov/bpa/bpa_list.asp or ask Sandy Wine (sandra.j.wine@noaa.gov).

The Macromedia BPA company (Beyond.com) went belly-up, so they're looking for a new provider. Webtrends analyzer has been requested by ARL HQ. Other possibilities: S-Plus, Network Appliance, LZW.

There was a lengthy discussion of the LZW compression license issue, which affects us through the use of the GIF graphics format. Although CCR recommended NOAA move away from GIF, and instead use PNG where possible, the consensus now seems to be to hold on until the LZW patent expires in July, 2003. christopher.r.cornwall@noaa.gov