



NOAA ARL Monthly Activity Report



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Contents

1. **Highlight: U.S. Government Review Panel for IPCC Fourth Assessment Report**
2. **Highlight: HYSPLIT Update Installed at CTBTO**
3. **HYSPLIT Availability via AWIPS**
4. **Wildfire Smoke Forecasts**
5. **HYSPLIT and Google Earth**
6. **Coupling ARL's Eulerian and Lagrangian Modeling Systems**
7. **East Tennessee Ozone Study (ETOS)**
8. **WP-3D BAT Probe Integration**
9. **UrbaNet Graphical System Developments**
10. **Air Quality Forecast Model Development**
11. **CMAQ/HYSPLIT Coupling to Investigate Maximum 8-hr Ozone**
12. **North American Mercury Model Intercomparison Study**
13. **Joint Urban 2003 (Oklahoma City Urban Dispersion Experiment)**
14. **Extreme Turbulence Probe**
15. **TexAQS Smart Balloon Deployment**
16. **UrbaNet – Use of Real Time Observations**
17. **Urban Dispersion Program -- New York City**
18. **Atmospheric Tracer Chemical Analysis Upgrade**
19. **DIVINE STRAKE**
20. **UrbaNet – Las Vegas**

1. Highlight: U.S. Government Review Panel for IPCC Fourth Assessment Report. The Intergovernmental Panel on Climate Change is working on its Fourth Assessment Report, to be issued in three parts in 2007. The assessment report from Working Group I, entitled *Climate Change 2007: The Physical Science Basis*, was recently sent to governments in draft form for their official review, and the U.S. government has invited reviews from a broad group of interested parties. Dian Seidel is serving as a member of the U.S. Government Review Panel. The role of the panel is to review the merit of submitted comments, accept/reject/modify as necessary, and generate a final collation of comments that represents the U.S. Government position that will be forwarded to the IPCC via the Department of State. The panel will be meeting in Washington May 17-19. dian.seidel@noaa.gov

2. Highlight: HYSPLIT Update Installed at CTBTO. The Comprehensive Test Ban Treaty Organization headquarters in Vienna relies on two atmospheric dispersion models to help determine the locations of nuclear tests – FLEXPART and HYSPLIT. The former is a European development, designed to be driven by ECMWF products. The latter is the ARL mainstream development. HYSPLIT and FLEXPART are supported by the CTBTO and made available to member countries. During April, the CTBTO office was visited to help them install the most recent version of HYSPLIT on their new LINUX cluster. roland.draxler@noaa.gov

Silver Spring

3. HYSPLIT Availability via AWIPS. ARL is collaborating with ESRL/GSD (formerly FSL) to add a HYSPLIT interface to FX-Connect. The idea is that FX-clients would reside at various emergency management sites, while the server would reside at the local NWS forecast office. HYSPLIT would run on the server but could be initiated at any client. The meteorological data to drive the HYSPLIT calculation would come from AWIPS, and HYSPLIT output graphics must be converted to the AWIPS display format. ARL has created two different meteorological data pre-processors: one for LAPS and the other for Advanced Research WRF (ARW-WRF) files. GSD staff have created several programs to display HYSPLIT trajectories and concentration files on AWIPS. The current version of HYSPLIT is now installed on one of the GSD LINUX workstations. roland.draxler@noaa.gov

4. Wildfire Smoke Forecasts. Side-by-side comparison tests were conducted for a two week period comparing the current NWS wild fire smoke forecast with the newest ARL version that incorporates a dynamic plume rise option based upon the estimated wildfire heat release and the local forecast meteorological conditions. Another new feature, now available from NESDIS, permits the specification of different start and stop times for each fire location. The third feature tested supports the simultaneous calculation of fire points on the regional NAM grid and the global GFS. The calculation will use the finest resolution meteorological data available at the location of the smoke particle, permitting fires in Alaska and Central America to be included in the forecast. roland.draxler@noaa.gov

5. HYSPLIT and Google Earth. HYSPLIT is now capable of exporting trajectories, air concentrations and deposition into the Google Earth software application. Google Earth, a free program to display layers of information on a three dimensional map of the earth, is available from: <http://earth.google.com/>. Programs were developed at ARL to convert the trajectory endpoints and contours of concentration and deposition generated by HYSPLIT into Google Earth files. Google Earth provides the user with a method of overlaying a seemingly endless amount of free geo-referenced information onto the HYSPLIT output and providing the user with a tool to move about and within the model results. This capability is now available to registered users of HYSPLIT. After a period of testing by registered users, the product will be made available to non-registered users. glenn.rolph@noaa.gov

6. Coupling ARL's Eulerian and Lagrangian Modeling Systems. The feasibility of using HYSPLIT outputs as boundary conditions for the CMAQ model is being tested using a number of case studies. The period from 14 – 23 July 2004 was chosen to assess the contribution to particulate matter (PM) levels in the Eastern US from wild fire emissions located in Alaska. To this end three main tasks were performed:

- 1) The HYSPLIT model was run to simulate the transport, dispersion and deposition of particulate matter originating from wild fire emissions in Alaska using the same model settings currently used at NCEP for the interim forecasting modeling exercise.
- 2) Boundary conditions were calculated using a postprocessor that reads HYSPLIT outputs and determines the concentration of the pollutant at the boundaries of the CMAQ domain.
- 3) Two sets of CMAQ model runs were performed to assess the consequences of long range transport of PM originating from wild fires in Alaska. One set was produced including the boundary conditions calculated from HYSPLIT, and the second set without these boundary conditions. The results are still being evaluated. ariel.stein@noaa.gov rohit.mathur@noaa.gov

Oak Ridge

7. East Tennessee Ozone Study (ETOS). Planning continued for the East Tennessee Ozone Study (ETOS) 2006 Science Workshop, to be conducted at the Pollard Technology Conference Center on May 17-18. Twenty-one papers were accepted for technical session presentations, and four for plenary session presentations. Opening remarks during the workshop are scheduled to be given by Dr. Richard Spinrad, Assistant Administrator of NOAA/Office of Oceanic and Atmospheric Research (OAR) and staffers from the offices of Sen. Bill Frist, Rep. John Duncan, and Rep. Zach Wamp. The full agenda is available at the workshop website http://www.atdd.noaa.gov/Research_Page_Additions/ETOS_additions/etosworkshop.htm will.pendergrass@noaa.gov; LaToya Myles, Gabrielle Ridenour

8. WP-3D BAT Probe Integration. Development of the BAT turbulence probe for the NOAA P3 aircraft continued, with extensive updates of the MFP software to accommodate the hardware improvements. A new data interface system and a new power supply and timing board are part of the package. Testing is under way. Installation on the P-3 is planned for June. philip.g.hall@noaa.gov, Ed Dumas, and David Senn

9. UrbaNet Graphical System Developments. An RRT (Real-time Response Tool) analysis and display system was brought back to ATDD from the National Weather Service HQ Office in Silver Spring, MD for upgrades. The system will be moved to Towson University's Center for GIS (CGIS) as part of the cooperative agreement mentioned last month. ed.dumas@noaa.gov and Will Pendergrass

A power supply board was designed and fabricated for the P-3 system. The power supply board also supplies timing signals for data acquisition, and power connections for the pneumatic purge system. The timing signals are generated by a microprocessor on the board. The microprocessor can be reprogrammed while on the board should any future timing changes be needed. See photo below. ed.dumas@noaa.gov, P. Hall, and D. Senn

Research Triangle Park

10. Air Quality Forecast Model Development. In preparation for the 2006 forecast season, rigorous testing of the linkage between the Weather Research and Forecasting-Non-Hydrostatic Mesoscale Model (WRF-NMM) and the Community Multiscale Air Quality (CMAQ) model is being performed. Updated CMAQ codes were delivered to NCEP for deployment in the 2006 AQF system. The modifications enable the CMAQ calculations to occur on the same vertical coordinate and grid structure as the WRF-NMM and provide consistent coupling between the two modeling systems. The CMAQ AQF code was also updated to reduce the CPU time requirement, enabling the same CMAQ executable to be used with different layer definitions. Several diagnostic tracers are now included in the CMAQ model to aid in understanding the impact of lateral boundary conditions on predicted ozone concentrations. An updated CMAQ code for developmental testing of particulate matter forecasting was also delivered to NCEP. The updated codes are expected to be deployed by NWS for experimental testing over the continental United States domain on June 1, 2006. rohit.mathur@noaa.gov; tanya.otte@noaa.gov; jonathon.pleim@noaa.gov

11. CMAQ/HYSPLIT Coupling to Investigate Maximum 8-hr Ozone. Assessments of the effects of recent NO_x point source emission reductions on ozone concentrations in the eastern United States are continuing. In summary, model simulations were performed for two different summer periods (*i.e.*, June, July, and August of 2002 and 2004) in a regional domain covering the eastern half of the United States with a 12-km grid cell sizes. Results at selected locations downwind of the Ohio River Valley revealed notable differences in the contribution of chemistry to ozone concentrations between the base case and control simulations. For days during the summer 2002, chemical production was found to be reduced by 20-30% during daytime hours in the emission control simulations, which is attributed to lower NO₂ concentrations found in these NO_x control

results. Under southwesterly/westerly winds across the Ohio River Valley (ORV) region where the largest NO_x emission reductions occurred, the notable decreases in maximum 8-hr ozone were found northeast of the ORV and toward the mid-Atlantic region, while under northerly flows more modest ozone reductions were displaced toward the south into Kentucky/Tennessee, as expected. james.godowitch@noaa.gov

12. North American Mercury Model Intercomparison Study. The North American Mercury Model Intercomparison Study (NAMMIS) is providing some interesting results. The NAMMIS global-scale modelers at Atmospheric and Environmental Research, Inc., ICF Kaiser, and Harvard University completed their simulations last year and three initial condition and boundary condition (IC/BC) data sets were developed from them. The Community Multiscale Air Quality (CMAQ) and Regional Modeling System for Aerosols and Deposition (REMSAD) regional models have been run with all three IC/BC cases and their output data were sent to the New York State Department of Environmental Conservation (NYSDEC) for analysis. The Trace Element Analysis Model (TEAM) results for the IC/BC case based on their global-scale Chemical Transport Model (CTM) were sent to NYSDEC on April 30, 2006. The CMAQ wet deposition results were shown to be generally in better agreement with observations from the Mercury Deposition Network than the REMSAD results, but both models tended to overestimate mercury deposition to some degree. Incorporation of the TEAM modeling results into the analysis will continue. o.russell.bullock@noaa.gov

Idaho Falls

13. Joint Urban 2003 (Oklahoma City Urban Dispersion Experiment). Funding to analyze the JU03 tracer dispersion data is in the process of being transferred from the U.S. Dept. of Homeland Security. In accordance with that agreement, we will analyze and publish two joint papers with urban dispersion colleagues from the Pacific Northwest National Laboratory. Work has already begun on this project. kirk.clawson@noaa.gov

A preliminary analysis of Intensive Observation Period (IOP) 3 from JU03 highlights two issues that might be important in considering how to deal with the consequences of a toxic plume release. The first of these is the fact that peak 5-second concentrations, approximately equal in length to the human breathing cycle, can be much higher than longer term average concentrations that are often used in modeling assessments of risk. Peak-to-mean ratios for 30-minute periods ranged as high as 43.6 with mean and median values of 9.2 and 6.4, respectively. Secondly, the peak concentrations have a definite tendency to exhibit periodic behavior with distinctive pulses of higher concentration occurring at approximately regular time intervals separated by periods of low concentration. We will be examining other IOPs and analyzers for this behavior, which may have implications for future urban dispersion experiments. dennis.finn@noaa.gov

14. Extreme Turbulence Probe. An oral presentation on the ET probe hurricane data was given at the 27th Conference on Hurricanes and Tropical Meteorology in Monterey, CA. The conference also provided an opportunity to discuss the ET turbulence data with some of the other groups that have deployed instruments into landfalling hurricanes. One interesting result was that the ET power spectra for the horizontal velocity components tend to have peaks at length scales near 500 m. Other groups with mobile radars have observed coherent structures (e.g., rolls) in the hurricane boundary layer that appear to have similar length scales. There is some possibility that the ET spectra may therefore provide information about these coherent structures. richard.eckman@noaa.gov

15. TexAQS Smart Balloon Deployment. Six smart balloon transponders are in the process of being fabricated and tested for use during the TexAQS II study in Houston, Texas this summer. We are currently waiting for completion of modifications to the Iridium satellite phone modem system. FRD also participated in TexAQS II planning meetings held in Austin, Texas on April 18, 2006. Representatives from each of the participating organizations attended the meetings. During those meetings it was learned that the deployment

of NOAA P-3 aircraft for TexAQS II has been delayed until August 15, 2006. Considering this, we will plan to be ready for our first smart balloon launch on or shortly after the arrival of the P-3 research aircraft in mid-August. randy.johnson@noaa.gov

16. *UrbaNet – Use of Real Time Observations.* As part of the UrbaNet program, FRD and ATDD are discussing a possible collaboration related to the use of forecast winds and other variables in urban dispersion modeling. Models such as HYSPLIT are designed to use forecast output from systems like MM5 or NAM to drive the dispersion. On many occasions, however, model winds can be in obvious disagreement with current observations, so one has little confidence in the model winds at future times. It is not entirely clear what the user can do when these “busted” forecasts occur. FRD will encounter a similar problem if it starts using HYSPLIT with MM5 (or WRF) output to forecast dispersion from INL. If MM5 produces a bad wind forecast, FRD will need a recovery procedure that makes best use of the local Mesonet observations to correct the problem. This issue is therefore relevant both to UrbaNet and to the DOE partnership at Idaho Falls. richard.eckman@noaa.gov and Will Pendergrass, ATDD

17. *Urban Dispersion Program -- New York City.* Word was officially received this month that DHS has declined to fund a planned third urban dispersion field deployment in Lower Manhattan this coming summer. Indeed, the entire program is being prepared for mothballing. DHS will provide no funds for urban dispersion model improvement, verification, or validation. However, DHS will provide a small amount of funds for data analysis, data submission to the data archive, final report preparation, journal article preparation, and program termination. FRD will receive a portion of these funds. A principle investigator meeting is being planned for next month to discuss the use of these funds for program termination. kirk.clawson@noaa.gov

18. *Atmospheric Tracer Chemical Analysis Upgrade.* As part of our on going effort to improve our atmospheric tracer analysis capabilities, we have consulted with instrument manufacturers about a number of different technologies that may be used for measuring concentrations of the halogenated compounds we use as atmospheric tracers. A potential detection system has been identified, that may be sensitive enough for our use while being less affected by other compounds, which currently interfere with the analysis. We have arranged a short-term lease of the detector so we can test it in our laboratory. roger.carter@noaa.gov

In parallel with this activity, improved chemical analysis methods are being developed, partially to avoid some sample carryover issues associated with the automated sample analysis system. debbie.lacroix@noaa.gov

Las Vegas

19. *DIVINE STRAKE.* The recent reconfiguration of the dispersion mesonet is proving to be satisfactory. Meteorological data are now being transmitted from the two new meteorological towers; data are of high quality and are transmitted every 15 minutes. These refined systems are ready to support the DIVINE STRAKE experiment. The data from the entire mesonet will yield comprehensive information on atmospheric stability and wind direction and speed (vertical wind shear) every 15 min during test operations. ARL staff will employ the data to forecast dispersion regimes, using the latest versions of ARL models, on a site-specific basis. During test operations, all required meteorological data and dispersion calculations will be displayed to the test management team in real time on wide screens in the test operations center (CP-1). An additional safety focus will be on the prediction, detection, and warning of cloud-to-ground lightning within 10 miles of the GZ. darryl.randerson@noaa.gov, gerry.flemming@noaa.gov

20. *UrbaNet – Las Vegas.* A team has been assembled to work on the Las Vegas stage of the UrbaNet program. A Monthly Progress Report will be prepared on a routine basis. In preparation for the Las Vegas activity, the Weather Research and Forecasting Model (WRF) has been installed on the SGI computer at the

UNLV supercomputer center (NSCEE) using a varying number of processors. Initial results have identified several apparent problems. One is that the SGI is slower than anticipated and running the model in forecast mode with 1.67 km horizontal grid resolution will not be possible. darryl.randerson@noaa.gov