



NOAA Air Resources Laboratory Monthly Activity Report



June 2007

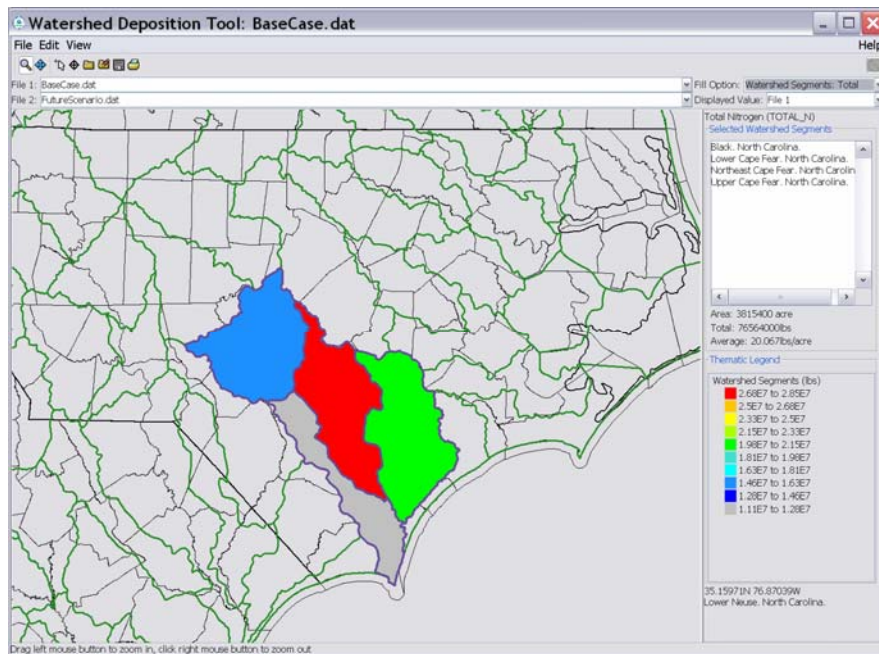
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1. ***Highlight -- Great Lakes Mercury.*** Mark Cohen, Steve Fine, and Patricia Hathaway (OAR) presented a briefing on June 12 to Congressman Mark Kirk (R-IL) regarding the Report to Congress on Great Lakes Mercury Contamination. Briefing materials were prepared that synthesized and summarized the key concepts and findings of the report. An extended discussion was held with the Congressman and his staff. mark.cohen@noaa.gov

2. ***Highlight -- Multimedia Tools Development: Watershed Deposition Tool.*** Atmospheric Sciences Modeling Division (ASMD) has developed a Watershed Deposition Tool (WDT) for mapping the deposition estimates from a regional air quality model to watersheds. The WDT provides the linkage between airsheds and watersheds to estimate Total Maximum Daily Load (TMDL) and related nonpoint-source watershed analyses. This tool takes the gridded atmospheric deposition estimates from Community Multi-scale Air Quality (CMAQ) model and allocates them to 8-digit HUC's (hydrologic cataloging units of rivers and streams) within a watershed, State or Region (see figure below). The WDT calculates the weighted average CMAQ atmospheric deposition (wet, dry, wet + dry) across a selected HUC or a set of selected HUC's for a given scenario. The WDT can also calculate the average change in air deposition across a HUC between two different air deposition simulations. Calculations can be exported as CSV (comma delimited) files. Experienced GIS users can also export GIS Shape files of the CMAQ gridded outputs. The tool is designed to work under the Microsoft Windows operating system. Beta testing of the software has been completed and version 1.4.4 was released. The Watershed Deposition Tool can be downloaded from <http://www.epa.gov/asmdnerl/Multimedia/depositionMapping.html>. Questions or

comments on the WDT should be directed to Donna Schwede at donna.schwede@noaa.gov; or 919-541-3255.



Air Resources Laboratory Headquarters, Silver Spring

3. Mercury Simulation with HYSPLIT. Work continues on creating a new version of the HYSPLIT model, configured to simulate atmospheric mercury. Substantial progress has been made, and most major elements of the new code are in place (e.g., chemical equilibrium in the aqueous phase, vapor/particle partitioning, vapor/droplet partitioning, chemical reactions in the vapor and aqueous phase, dry and wet deposition, apportionment of deposition to specific receptors, etc.). Extensive testing of these elements is underway. mark.cohen@noaa.gov

4. Summer Interns, ARL Headquarters. Shaheer Tariq will be a senior next year at Montgomery Blair High School in Silver Spring and is working this summer with Mark Cohen, Winston Luke, and Paul Kelley investigating atmospheric mercury. His work involves an initial examination of the atmospheric mercury measurement dataset, looking for trends, correlations, and peaks. HYSPLIT back-trajectories are being run for peak mercury concentration episodes to see if the high concentrations are related to emissions sources in the region. Both the EDAS-40km and NAM-12km meteorological datasets are being used for the back-trajectories, and the analysis will also provide a qualitative comparison of the two datasets. mark.cohen@noaa.gov

Kun Li, a rising senior at Montgomery Blair High School in Silver Spring, will be working as a summer intern with the Climate Variability and Trends group. His project involves analysis of climate time-scale variability of the planetary boundary layer (PBL). He will be working with a new global planetary boundary layer dataset, based on radiosonde data, developed as part of a collaborative effort with scientists at NOAA/ARL/ASMD, NOAA/NESDIS/NCDC, and UMass, Amherst. dian.seidel@noaa.gov

5. WMO CBS Expert Team Meeting on Non-nuclear Emergency Response Issues.

1) The recent Executive Council - 59th session (EC-LIX) (28-30 May 2007) adopted resolutions effective 1 July 2007 to drop the nuclear designation for Regional Meteorological Specialized Centres (RMSC) providing transport model products to reflect the broader (non-nuclear and source-attribution) support that they may be providing. Currently non-nuclear arrangements still require prior arrangements at the highest management levels.

2) Under the new EC-LIX designation, other NMC'S may now make "backtracking" (source attribution) requests at any time. The upwind (backward integration) transport and dispersion option is supported by the current operational version (NCEP CCS) of HYSPLIT. However, ARL needs to add the "source-attribution" option to SDM scripts.

3) Other RSMCs will start to exchange model products with one other in GRIB2 format starting with the November 2007 International Atomic Energy Agency international exercise. We already produce GRIB2 air concentration fields for smoke products. ARL will need to add this option to NCEP's CCS scripts. CMC (Canada) will advise other RSMCs about the appropriate GRIB record identification values to use for RSMC model products.

4) RSMC's Toulouse and Exeter will coordinate a non-nuclear "source-attribution" demonstration experiment with the other RSMCs. The experiment is planned for sometime in October 2007, depending upon favorable weather conditions. The RSMCs will use a variation the product format developed for Comprehensive Nuclear-Test-Ban Treaty Organization. ARL will put together the individual RSMC results from participating countries into joint probability products that identify the source location and if time permits perhaps a multi-center ensemble product.

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6. Meeting with USFS Pacific Wildland Fire Sciences Lab. The U.S. Forest Service laboratory that developed the BlueSkies emission algorithms for wildfire smoke is working on an improved version that will be better suited to real-time forecasting. They are willing to provide NOAA with NCEP compatible code that we can use to replace the existing emissions system used in NOAA's Smoke Forecast Tool. roland.draxler@noaa.gov

7. Review Panel for IPCC Synthesis Report. The Intergovernmental Panel on Climate Change will be issuing the final Synthesis Report (covering all three Working Group reports of the IPCC Fourth Assessment) in November 2007. Dian Seidel is serving on the US Government Review panel, jointly coordinated by the White House Office of Science and Technology Policy and the Department of State. dian.seidel@noaa.gov

Atmospheric Sciences Modeling Division (ASMD), Research Triangle Park

8. Ammonia Monitoring and Modeling. Matthew Jones of the Centre for Ecology and Hydrology, Edinburgh, Scotland has recently completed a brief post-doc appointment at ASMD. The focus of his research was the monitoring and modeling of leaf surface exchanges of NH₃. He has worked with ASMD scientists to determine the best way to implement concentration-dependent cuticular resistances into CMAQ, the creation of a model to estimate these resistances and the validation of the model over a range of vegetation types. Dr. Jones worked with U.S. EPA scientists to install,

test, and operate the Ammonia Measurement by ANular Denuder with on line Analyzer system (AMANDA) monitoring unit at field site near Lillington, NC. The unit provides higher temporal resolution, has a lower detection limit, and provides higher precision NH₃ measurements than any other technique currently used in North America. Dr. Jones participated in a USDA funded intensive field campaign for NH₃ deposition with scientists from ASMD, NOAA/ARL/Headquarters, the NOAA/ARL Atmospheric Turbulence and Diffusion Division, U.S. EPA National Risk Management and Assessment Laboratory and North Carolina State University. A publication will be developed in collaboration with ASMD scientists concerning the cuticular exchange model. Dr. Jones will continue the analysis of field data collected at the Lillington site and the collaboration with CMAQ model developers. ellen.cooter@noaa.gov

Field Research Division (FRD), Idaho Falls

9. Urban Dispersion Program. The manuscript “Atmospheric Flow Decoupling and its Effects on Urban Plume Dispersion” was submitted to the journal Boundary Layer Meteorology. Some concentration fluctuation data analysis (e.g. peak-to-mean ratio) was removed from this paper to sharpen its focus and to meet length requirements. Research is in progress on probability density functions for the real-time tracer concentration data from JU03. This will be combined in a new manuscript with the concentration fluctuation data analysis that was removed from the original manuscript. dennis.finn@noaa.gov

10. Perfluorocarbon Tracer Analysis Development. Additional tests were conducted to evaluate the possibility for contamination of tubing and pumps in the programmable integrating bag samplers when exposed to high perfluorocarbon concentrations. The test data suggested that a low level of contamination was present in subsequent samples after exposure to high concentrations. The artifact appeared to be ephemeral but an additional test will need to be conducted to confirm this and develop a protocol for dealing with this situation.

The 250, 4000, and 100,000 pptv sample stability tests continued. These tests have been in progress for 5 months now and the data indicate that sample deterioration is minimal. There was a brief comment last month about a small peak on the tail of the PDCB peak that was beginning to show up in some chromatograms and complicate correct peak integration. The origin and an understanding of this anomaly were recently determined. We are evaluating ways to deal with this but at least for the present the consequences are that this introduces a bias into the measurement of PDCB and increases the detection limit. A reliable and accurate PDCB peak integration is presently possible but it entails a much longer run time (about 10 versus 3 minutes). dennis.finn@noaa.gov, and Roger Carter

11. Emergency Operations Center (EOC). On June 12, 2007, the INL Emergency Operations Center (EOC) was activated to respond to a fire in a chemical fume hood. FRD personnel were called into the EOC to provide meteorological and dispersion modeling support to the EOC planning team for approximately four hours. Two FRD employees also attended a “Lessons Learned” session at the WCB main conference room on June 14 to participate in discussions regarding improved EOC response to emergencies. neil.hukari@noaa.gov and Roger Carter

12. Transport and Dispersion Modeling. Discussions between FRD and other groups within NOAA, including other ARL divisions, have identified several upgrades or add-ons to the HYSPLIT dispersion model that would be generally beneficial. One of the most important is to upgrade the output graphics to make them more useful for decision makers. ARL Headquarters has already made substantial progress in this area. Other upgrades include adding a chemical database (via NOAA CAMEO) and improving radioactive dose calculations. All of these changes will be of direct benefit at INL when HYSPLIT eventually replaces MDIFF as the primary dispersion model. Another upgrade that primarily benefits FRD and SORD in Las Vegas is an option to derive a wind field directly from mesonet observations. The current version of HYSPLIT gets its winds from forecast models such as those used by the National Weather Service. For EOC applications, this presents a serious problem, because the forecast model winds are sometimes not consistent with the current mesonet observations. Such discrepancies cannot be ignored in a real accident, so there must be some kind of “fallback” option based on direct wind observations. This wind-field option is of most benefit to organizations like FRD and SORD that maintain large mesonets. richard.eckman@noaa.gov

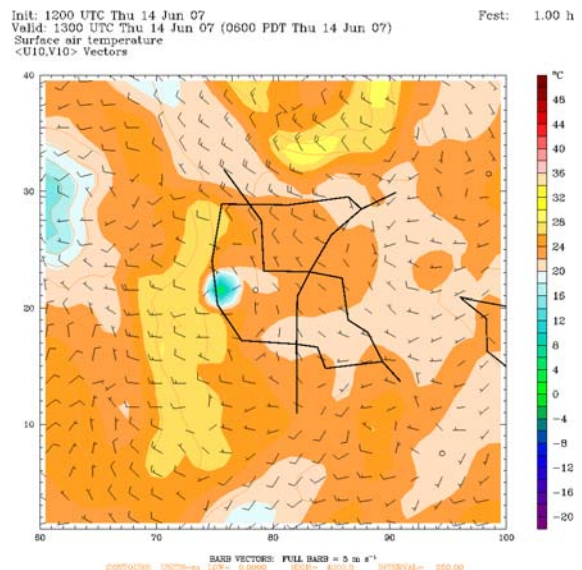
13. INL Wildfire Modeling. The WRF model output displayed on FRD’s website now includes a simple fire hazard index for helping forecast periods of maximum wildfire danger. The index is directly proportional to wind speed and air temperature and is negatively related to the relative humidity. Through June the index seemed to provide reasonable forecasts of periods of high fire danger when the NWS issued red-flag watches or warnings. On a few days the index also correctly forecasted high fire dangers at INL even though there were no official warnings. The main reason for this was that the 4 km WRF simulations more accurately predict the peak afternoon wind speeds that are partly driven by orographic effects. One interesting pattern that seems to be emerging is that the early morning WRF runs (e.g., 0900 or 1200 UTC initialization) seem to forecast the highest afternoon fire hazards, whereas later runs (1500 or 1800 UTC) tend to reduce the hazard. richard.eckman@noaa.gov

Special Operations and Research Division (SORD), Las Vegas

14. WRF Model. The 30s land use data file for the Las Vegas metropolitan area was updated which resulted in a large increase in the area designated “urban”.

A problem with the NOAA urban canopy model was identified. When the urban canopy model is turned on, ucmcall is set equal to 1 in the WRF namelist, unrealistically low temperatures occasionally appear in the Las Vegas metropolitan area (see figure).

The black lines in the center of the plot represent the Las Vegas area freeway system and the black lines on the right are the western border of Lake Mead. Note the subzero temperatures near the center of the plot are surrounded by temperatures greater than 20° C.



The soil moisture content (SLMO) in LANDUSE.TBL was reduced 80% for categories 1 (urban and built up land) and 8 (shrubland) to better reflect the dry conditions normally found in the desert Southwest. kip.smith@noaa.gov

ARL is considering how to best keep its stakeholders informed about its activities. You could help the Lab share information with you more effectively, by sending a brief note to betty.wells@noaa.gov indicating if you find information in the monthly activity reports useful and if you have any suggestions for how we could more effectively provide the information that you need.