NOAA Air Resources Laboratory
Monthly Activity Report

May 2007

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1. Highlight – Report to Congress on Great Lakes Mercury Contamination. A report on Mercury Contamination in the Great Lakes was submitted to Congress on May 14, 2007, co-authored by Mark Cohen, Roland Draxler, and Richard Artz. The report was requested by the Conference Report accompanying the Consolidated Appropriations Act, 2005 (H. Rpt. 108-792). The report focuses on two areas: (1) the fate and transport of atmospheric mercury, including an analysis of the atmospheric transport and deposition of U.S. and Canadian anthropogenic mercury emissions to the Great Lakes using the NOAA HYSPLIT-Hg atmospheric mercury model; and (2) data regarding trends in Great Lakes mercury contamination, including trends in mercury air emissions and deposition, and in mercury concentrations in sediments, fish, and other biota. The report is available at: http://www.arl.noaa.gov/data/web/reports/cohen/NOAA_GL_Hg.pdf mark.cohen@noaa.gov

Air Resources Laboratory Headquarters, Silver Spring

2. HYSPLIT Training Workshop. A training workshop was conducted May 16-18 for 16 participants. An update to HYSPLIT based upon issues that came up during the training was released at the end of May: corrected sign on derivative for backward computed vertical motion; fixed graphical user interface (GUI) problem with Postscript to GIF conversion; more than six starting locations can now be specified through the GUI; automatic creation of namelist files that can

be read by the model; and fixed the cross-section plots when there are no particles. roland.draxler@noaa.gov

3. DOC Bronze Medal to RATPAC Team. At a May 2007 ceremony, the team of NOAA scientists responsible for development of Radiosonde Atmospheric Temperature Products for Assessing Climate (RATPAC) was awarded a DOC Bronze Medal. Members of the team include: Melissa Free, Dian Seidel and Jim Angell (NOAA Air Resources Lab), John Lanzante (NOAA Geophysical Fluid Dynamics Lab), Imke Durre, Jay Lawrimore and Tom Peterson (NOAA National Climatic Data Center). The work was supported by the NOAA Climate Program Office's Climate Change Data and Detection program, managed by Bill Murray and Chris Miller. RATPAC datasets are publicly available and have been used in international and national climate assessments. More information about RATPAC is available at http://www.ncdc.noaa.gov/oa/climate/ratpac/index.php dian.seidel@noaa.gov

4. Tropical Widening Study. A manuscript on "Recent Widening of the Tropical Belt: Evidence from Tropopause Observations" by Dian Seidel and Bill Randel (NCAR) has been submitted to the *Journal of Geophysical Research*. dian.seidel@noaa.gov

5. Climate Data Inhomogeneities. Members of the CLIVAR Expert Team on Climate Change Detection and Indices (http://www.clivar.org/organization/etccdi/etccdi.php) and other scientists are preparing a document on "Classic examples of inhomogeneities in climate datasets" to be available on their Climate Changes Indices website (http://cccma.seos.uvic.ca/ETCCDMI/). At the team's request, Dian Seidel prepared two examples, showing inhomogeneities in radiosonde and reanalysis data. dian.seidel@noaa.gov

Atmospheric Turbulence & Diffusion Division (ATDD), Oak Ridge

6. Evaluation of Soil Measurements. A study to evaluate the performance and sampling protocols for adding soil-moisture and soil-temperature measurements to the U.S. Climate Reference Network (USCRN) continued at the University of Tennessee Arboretum, where a new climate monitoring system was installed. New sensors, including air temperature and relative humidity, solar radiation, surface temperature, precipitation, and wind speed and direction will be measured along with the soil moisture and temperature. Tilden.Meyers@noaa.gov

7. Ammonia Flux Field Experiment. The second field intensive of the USDA Ammonia Flux Experiment was conducted from May 24 through June 5 near Lillington, NC. The main objective of this phase was to quantify pre- and post-fertilization ammonia fluxes over a 500 acre young maize crop (Zea mays). L. Myles and L. Gunter operated a gradient system utilizing annular denuders to collect ammonia, nitric acid, and sulfur dioxide along with filter packs to collect particulate nitrate and sulfate (Dp < 2.5 μm). Two-hour samples were collected four times each day to capture concentrations representative of morning, mid-morning, afternoon and late afternoon conditions. Overnight samples were also collected twice during the field intensive. All samples were shipped to S. Klemenz for ion chromatography analysis in the NOAA/ARL/ATDD chemistry lab. Ammonia flux data from NOAA/ARL/ATDD's gradient system will be compared to data from several state-of-the-art techniques deployed by other research collaborators, including two Pranalytica Nitrolux analyzers (one operated by W. Luke of ARL/HQ) and a system called Ammonia Measurement by

ANnular Denuder sampling with on-line Analyser (AMANDA). M. Heuer deployed supplementary micrometeorological and fast-response ozone measurements. Leaf and soil chemistry characterizations were performed by scientists from the U.S. EPA. Tilden.Meyers@noaa.gov

8. Television Interview. L. Myles was interviewed by the local NBC affiliate, WBIR TV-10, for a segment on NOAA's air quality research in East Tennessee. The interview is available online: http://www.wbir.com/

Atmospheric Sciences Modeling Division (ASMD), Research Triangle Park

9. Analysis of Air Quality Forecasts. An updated model configuration was deployed at the National Weather Service in early May 2007 for experimental O_3 forecast guidance over the continental United States. Underestimation of the regional O_3 during early May was diagnosed to arise from the use of incorrect mobile emissions in the modeling system. Slight underestimation of moderate level O_3 concentrations were also noted after the corrections to the mobile emissions. It was hypothesized that these underestimations could be related to O_3 production in plumes associated with wildfires in Georgia throughout May. Additional model simulations that include estimates of emissions associated with these wildfires (derived using remotely sensed information from the Hazard Mapping System) are currently underway. rohit.mathur@noaa.gov, george.pouliot@noaa.gov, brian.eder@noaa.gov.

10. Implementation of Pleim-Xiu Land Surface Model in the Weather, Research, and Forecasting Model (WRF). An extended abstract and presentation of the Pleim-Xiu land surface model (PX LSM), the Asymmetric Convective Model version 2 (ACM2) boundary layer model, and surface layer scheme implementation in Weather, Research, and Forecasting (WRF) model Version 2.2 was the main focus in May.

The PX LSM, surface layer exchange model, and ACM2 for the PBL, which are options in the Fifth-Generation Penn State/NCAR Mesoscale Model (MM5 PX) that have been used extensively in air quality studies, were implemented in WRF Version 2.2. In WRF, the implementation of these models allows them to be used independently (e.g., ACM2 with another LSM), although they have yet to be tested in this manner. A key difference between the MM5 and WRF implementation is an update to the parameterization of snow covered surfaces that significantly improves the simulated near-surface temperature. An evaluation of the WRF PX was completed for a summer and winter month. The WRF PX is compared to the MM5 PX and another WRF configuration with a different LSM and PBL option for accuracy of near-surface temperature, moisture, and wind. The key findings of this evaluation include evidence that the WRF PX simulations has more skill at representing near surface moisture and wind variations over a large part of the United States. The simulation of diurnal fluctuations of these variables is also better represented by the WRF PX simulation. Also, the WRF PX had a lower overall error in 10-m wind speed and direction than the other WRF simulations. We did find that the 2-m temperature had more error in the WRF PX than the MM5 and the other WRF configuration. We are actively working to correct this issue and expect to have a final version implemented by the end of the summer. robert.gilliam@noaa.gov, jonathan.pleim@noaa.gov

Field Research Division (FRD), Idaho Falls

11. Urban Dispersion Program. The revised manuscript "Atmospheric flow decoupling and its effects on urban plume dispersion" has been completed, re-reviewed, and will be submitted to the journal Boundary Layer Meteorology in early June. The revised manuscript develops the case for nocturnal flow decoupling during Joint Urban 2003 and how that affected the character of plume dispersion.

The manuscript "Analysis of plume dispersion in a nocturnal urban boundary layer in complex terrain, Salt Lake City, URBAN 2000" has completed internal FRD review and the subsequent revisions are very nearly complete. It will be submitted for ARL review in early June. dennis.finn@noaa.gov

12. Perfluorocarbon Tracer Analysis Development. As part of our development of a perfluorocarbon (PFC) tracer capability, we are conducting tests on the aging characteristics of PFCs in our sample bags. Sampling cartridges, which consist of 12 sample bags, were filled with three concentrations of PFCs and the concentrations have been monitored by repeated analysis while they aged. Tests for low (250 pptv), middle (4,000 pptv), and high (100,000 pptv) concentrations are still in progress. Each set of cartridges have been analyzed over periods of 3-4 months. All indications suggested that the concentrations in the sample bags maintained their original concentrations until the latest round of analyses in late May. There was some evidence hinting that the concentrations had declined, especially for the most volatile of the PFC species (PDCB). Furthermore, low shoulders developed on the PDCB peaks that complicated peak integration. Subsequent monthly analyses will hopefully determine the significance and reliability of these anecdotal observations. Knowing sample aging characteristics is essential because samples collected as part of a field study must be analyzed before the concentration changes in order for the sample data to be valid. dennis.finn@noaa.gov and Roger Carter

13. NOAA INL Weather Center Web Page. Progress continues on the development and testing of the new NOAA INL Weather Center web page. This one stop weather web page has been designed to simultaneously provide "INL site specific" meteorological information to both emergency and daily operations managers. Processes and programs running on the new web page such as the severe weather hazards, current observations and summaries, and wind trends information have been updating accurately and regularly during the testing period. Several DOE officials along with top emergency and operations managers have seen the new web page and are excited for its release to the site. The new URL is http://niwc.noaa.inel.gov/ and is expected to be officially released to the INL by the middle of June. brad.reese@noaa.gov, Jason Rich, Neil Hukari, and Kirk Clawson

14. INL Wildfire Modeling. With the Idaho wildfire season fast approaching, a simple fire-hazard forecast tool has been developed using the output from the WRF model. It is based on thresholds in weather conditions that local fire managers consider to represent a significant fire danger. Forecast wind speed, temperature, and relative humidity from the WRF runs at FRD are used to compute a simple fire hazard index. Starting in June, this index will be displayed on the FRD web site along with the other WRF graphics. richard.eckman@noaa.gov

Special Operations and Research Division (SORD), Las Vegas

15. Hollings Scholarship Intern. SORD was fortunate to be selected by the NOAA Scholarship Office to participate in the Hollings Scholarship program. The selected candidate was Jackson Switzer. He reported for duty on May 29 and will participate in SORD research activities until July 27 when he travels to Silver Spring, MD, to present the results of his research activities to NOAA. Mr. Switzer will evaluate one-hour dispersion predictions made by the 00Z and 12Z WRF/HYSPLIT model and the NOAA ALOHA model for a release point on the Nevada Test Site (NTS). He will also evaluate the performance of the 00Z and 12Z six-hour trajectory patterns beginning at 1300 PDT from the Hazardous Materials Spills Facility on the NTS.

16. DOD Range Commanders Conference. Dr. K. Smith attended the DOD Range Commanders Conference held in Lompac, California. Dr. Smith presented a technical paper describing progress made on implementing the NOAA WRF model at SORD.

17. NOAA WRF Model Application. At the present time, the WRF model is initialized twice per day at 0000 and 1200 UTC and run for 36 and 24 hours, respectively. Important preliminary results are that the moisture content at low levels in the desert frequently is much higher than observed and that the strength and duration of early morning temperature inversions is not forecast as accurately as desired. Future plans include implementing variational data assimilation and observation nudging, obtaining additional resources so the forecasts can be extended farther into the future on larger domains, and working to resolve the low-level moisture and inversion problems. kip.smith@noaa.gov

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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.