



# NOAA Air Resources Laboratory Quarterly Activity Report

(July – September 2009)

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### Highlights

1. *DOC and NOAA Awards*

Congratulations to Roland Draxler for receiving a 2009 Department of Commerce (DOC) Gold Medal Award for research and development of the NOAA HYSPLIT atmospheric transport and

dispersion modeling system, and its application to real-world phenomena. Mr. Draxler is recognized as the driving force behind the development and continuous improvement of the HYSPLIT atmospheric transport and dispersion modeling system to reflect the state of the science. He led the successful transfer of HYSPLIT from research to operations within NOAA, and made it widely accessible via the Internet. HYSPLIT is used by DOC NOAA in support of its goals to protect life and foster environmental stewardship. Further, HYSPLIT is used worldwide for numerous purposes, including real-time emergency response and to improve understanding of air quality problems.

Congratulations to Tilden Meyers for receiving a 2009 NOAA Administrator's Award. The Award recognizes significant contributions to NOAA programs in many areas, including scientific research and environmental conservation. Dr. Meyers received this honor "for exemplary leadership and implementation of scientific strategies as Acting Director of the Atmospheric Turbulence and Diffusion Division."

### ***Air Resources Laboratory – Headquarters***

**2. Contribution to 2010 Ozone Assessment.** Dian Seidel is serving as a Lead Author for the chapter on "Stratospheric Changes and Climate" of the 2010 *WMO/UNEP Scientific Assessment of Ozone Depletion*. The assessment is required under the Montreal Protocol, and its completion is planned for spring 2010. [dian.seidel@noaa.gov](mailto:dian.seidel@noaa.gov)

**3. JGR-Atmospheres Article.** "The observed ENSO temperature signal in the stratosphere" by Melissa Free and Dian Seidel was accepted by the *Journal of Geophysical Research-Atmospheres*. The paper shows a cooling response in the tropical stratosphere, with up to 1 K difference between El Nino and La Nina winters. In the Arctic stratosphere the signal is a warming of up to 4 K and extends into the upper troposphere, accounting for 14 to 25% of the winter temperature variability at 100 mb. [melissa.free@noaa.gov](mailto:melissa.free@noaa.gov)

**4. GTAS Prototype Installed in Dallas/Fort Worth WFO.** Several NOAA ESRL/GSD employees and Glenn Rolph of NOAA ARL traveled to the Dallas/Fort Worth Weather Service Forecast Office (WFO) in July to train the forecasters and personnel from the local Emergency Operations Center (EOC) on the use of the Geo-Targeted Alert System (GTAS), recently installed in both locations. GTAS is a system that allows the WFO to display meteorological data and run the ARL HYSPLIT atmospheric dispersion model while at the same time collaborating with the local EOC who can view the briefing given by the WFO and who can also run the HYSPLIT model independently. Some display problems were noted and will be fixed before the next implementation in Seattle in the fall, but in general the forecasters and the EOC view the ability to run HYSPLIT and collaborate with each other using GTAS as a positive step forward. [glenn.rolph@noaa.gov](mailto:glenn.rolph@noaa.gov)

**5. Mercury Monitoring Network.** The National Atmospheric Deposition Program's (NADP) emerging mercury monitoring network was officially accepted as an operational subnetwork of NADP at the 2009 fall technical meeting. The subnetwork is known as AMNet - the Atmospheric Mercury Network. ARL's three surface mercury monitoring stations (Beltsville, MD; Canaan Valley, WV; Grand Bay NERR, MS) will become AMNet stations. [winston.luke@noaa.gov](mailto:winston.luke@noaa.gov)

## Atmospheric Turbulence and Diffusion Division

**6. U.S. Climate Reference Network.** The Climate Reference Network (CRN) continues its upgrades, and the Historical Climatology Network Modernization (HCN-M) is coming to life. Two CRN sites were installed in Alaska, the fifth and sixth there. Wind power was added to supplement solar at four sites in the continental US. Ten sites received probes for soil moisture and soil temperature. Now 35 sites in the east-central US from South Carolina to South Dakota can monitor conditions in the top meter of soil. The U.S. Department of Agriculture National Soil Survey Center in Lincoln, Nebraska, will analyze soil samples from each probe's location to provide metadata important to interpretation of the measurements. These new soil measurements expand the utility of CRN sites as monitors of temperature and moisture, primary indicators of the effect of climate on all living things. The HCN-M was doubled in July with installation of five new sites. Clearance to begin data transmission was received in September bringing the network on line. [mark.e.hall@noaa.gov](mailto:mark.e.hall@noaa.gov)

**7. Surface Energy Balance Network (SEBN).** Respiration in leaf litter and soil is a complex problem important to the atmospheric budget of CO<sub>2</sub> and in need of further understanding. Extensive sampling on the forest floor at the Chestnut Ridge Environmental Study Site (CHESS) is providing important data to the study of the dynamics of soil respiration in the Southern Appalachian Region. [mark.heuer@noaa.gov](mailto:mark.heuer@noaa.gov)

**8. Atmospheric Mercury Initiative Site at Allegheny Portage, PA.** Surfaces reclaimed from coal mining using ash from waste bituminous coal burned for on-site electricity generation are likely to be a significant source of atmospheric mercury. This unexpected discovery came from monitoring of atmospheric mercury species at a new site at Allegheny Portage in Pennsylvania. Intended to assess the impact of three large point sources, 25 km to 45 km distant, the monitoring started in late March, 2009. Through May and June, prominent peaks appeared in gaseous elemental mercury (GEM) unaccompanied by the other species. This is uncharacteristic of direct products of coal combustion. Preliminary analysis points to smaller waste-coal facilities about 10-km upstream. Waste coal, a commercially unacceptable mix of coal and "rock," was formerly dumped near the mines. Environmental issues encouraged burning the coal for on-site electricity and using the resultant ash to reclaim mined land. Although real environmental benefits have resulted, no one monitored potential atmospheric emissions. Relative to the coal's energy content, ash from waste bituminous coal is rich in mercury, having an average of 27.5 kg (PetaJ)<sup>-1</sup>. Limited preliminary chamber measurements in September at the Revloc reclamation site showed a flux of (41 to 90) ng m<sup>-2</sup> hr<sup>-1</sup> from dry reclaimed surface and (145 to 182) ng m<sup>-2</sup> hr<sup>-1</sup> from reclaimed surface wetted with distilled water. These results, though still uncertain implicate such reclaimed surfaces as significant sources of atmospheric mercury. [steve.brooks@noaa.gov](mailto:steve.brooks@noaa.gov)

**9. Atmospheric Integrated Research and Monitoring Network (AIRMoN).** The AIRMoN-dry dataset, which includes atmospheric concentrations of trace gases and particulates along with deposition velocities estimated by the inferential method is being finalized and will be made available on ARL's website. [latoya.myles@noaa.gov](mailto:latoya.myles@noaa.gov)

**10. Washington, DC Mixing-Height Study.** An ATDD team released radiosondes in a study of urban mixing depth over Washington DC. The mixing depth vital to atmospheric dispersion, air quality, and climate, is complex and understudied in urban environments. The larger collaboration included the National Centers for Environmental Prediction, National Aeronautics and Space Administration (NASA), National Center for Atmospheric Research, and Howard University. Student involvement was a large component of ATDD's activities with students from Howard University's Physics Department and from the student body at large aiding in the experiments. Balloons were released from Howard University's campus and from RFK Stadium's parking area every two hours from 0900 to 1800 local time on four separate days. The data were made publicly available on line in real time as the balloons ascended and were carried over the city. The radiosondes reported wind, temperature, and humidity, along with the probe's three-dimensional location along its track. Interpretation by modeling and data analysis is in progress. [chris.vogel@noaa.gov](mailto:chris.vogel@noaa.gov)

### **Field Research Division**

**11. ET Probe.** Hardware and software upgrades for the Extreme Turbulence (ET) probes were completed in August. These probes are designed to measure winds, turbulence, and air-sea fluxes in hurricane conditions. Such observations are important for understanding rapid changes in hurricane intensity. FRD also conducted a series of road tests in which the probes were mounted on a vehicle and driven at highway speeds. Some hardware issues were identified during these tests and corrected. Most of these issues were related to bad electrical connections or faulty sensors.

As the development phase was wrapping up, the focus shifted to deploying the ET probes at suitable marine locations and testing their ability to function over longer periods. One of the first locations to be investigated was the 560 m research pier at Duck, NC operated by the U.S. Army Corps of Engineers. After discussions with the Corps, a probe was deployed in late August on a tower at the end of the pier. Since the pier has both power and internet connectivity, the probe's data acquisition computer can be accessed remotely using standard internet protocols. The system has continued to function reliably except for some gaps mostly related to power losses. The longest data gap so far was caused by one of the data wires coming loose between the probe itself and the computer. This was easily fixed by a Corps employee.

Because NOAA funding did not materialize until June, a second probe deployment was considered to be optional. However, by September FRD had secured permission to deploy a probe on the 15 m Tennessee Reef navigation light in the Florida Keys. This site is only accessible by boat, but it has a wireless internet connection set up by the Great Lakes Environmental Research Laboratory. The greatest difficulty at this location was not installing the ET probe but in helping to erect a 6 m meteorological tower on the navigation light at the request of SEAKEYS (the Sustained Ecological Research Related to the Management of the Florida Keys Seascape). The SEAKEYS organization which services the structure and owns the tower underestimated the effort required to erect such a tower given the limited space available. After three days of effort and increasing concerns about safety, the attempt to erect the upper section of the tower was abandoned and the probe was installed at the top of the lower section. This is not ideal from a flow-distortion perspective but was the best that could be done under the circumstances. Since installation, the Tennessee Reef system has also

had some power problems that are likely due to cables damaged or disconnected during the tower installation efforts. The SEAKEYS organization will revisit the site to investigate these issues. [richard.eckman@noaa.gov](mailto:richard.eckman@noaa.gov), Tom Strong, Roger Carter, Shane Beard, Randy Johnson

**12. *Weather In-Situ Deployment Optimization Method (WISDOM).*** The ARL Field Research Division WISDOM balloon launch team deployed to the Azores, Bermuda, and Dakar, Senegal for a 4-week launch window of 13 September through 9 October, 2009. Unfortunately there was not much tropical cyclone development in the tropical Atlantic during deployment. Tropical Depression 8 (25-26 September), Tropical Storm Grace (4-6 October), and Tropical Storm Henri (6-8 October) were the only systems of note. However, the team successfully launched a total of 30 balloons: 7 from the Azores, 6 from Bermuda, and 17 from Dakar, Senegal. One of the balloons launched from the Azores on 05 October traveled over Paris, France, then Moscow, Russia, and was last observed near Tashkent, Kyrgyzstan. A balloon launched from Bermuda on 04 October traveled over Morocco, then Rome, Italy, and was last observed over Pakistan. Several balloons launched from Senegal traveled west across the Atlantic Ocean and were last observed over northern South America. [kirk.clawson@noaa.gov](mailto:kirk.clawson@noaa.gov), Randy Johnson, and Shane Beard

**13. *Low Altitude Measurement Platform (LAMP) Proposal.*** FRD has developed a proposal for a LAMP proposal that could provide critical meteorological data at the air-sea interface under hurricane conditions. LAMP is expected to be a low cost, long term, simple to use balloon system that could be used in large numbers to provide information from “data poor” regions in the North Atlantic Ocean. Data from LAMP could be used to help understand and characterize the low-level marine boundary layer, the evolution of the energy content of inflow to hurricanes and its relationship with hurricane intensity changes, Estimates of surface fluxes could also be obtained from a LAMP platform. Some of the measurements that LAMP could make just above the ocean surface include: 1) balloon position (latitude, longitude and altitude), 2) wind speed and direction, 3) barometric pressure, 4) air temperature profile, 5) relative humidity, 6) sea surface temperature, and 7) solar radiation. [randy.johnson@noaa.gov](mailto:randy.johnson@noaa.gov)

**14. *EPA Roadside Sound Barrier Tracer Study.*** The manuscript “Tracer studies to characterize the effects of roadside noise barriers on near-road pollutant dispersion under varying atmospheric stability conditions” was revised in response to reviewer comments and re-submitted to the journal Atmospheric Environment. The revised draft is presently under review. [dennis.finn@noaa.gov](mailto:dennis.finn@noaa.gov)

## **Special Operations and Research Division**

**15. *Interagency Monitoring of Protected Visual Environments (IMPROVE).*** The SAGA (San Gabriel, CA Wilderness at the top of Vetter Mountain, 5908 ft) IMPROVE monitoring site in Southern California was “lost,” burnt down due to local recent wildland fires. Work is being done to install a replacement sampler to maintain 2009 data completeness criteria. A temporary site was set-up at the Big Pine Forest Service Fire Station (about 20 km away from original site) and is operating. It is designated as SAGA2. Once power is restored to the area, the original site will be restored.





SAGA IMPROVE site as a result of the wildland fire. 9/11/09



SAGA2 temporary IMPROVE site. 9/17/09

Marc Pitchford chaired the IMPROVE Steering Committee meeting at Wind Caves National Park, South Dakota. The meeting included updates on network performance over the previous year, and discussion of issues with respect to monitoring, laboratory analysis, and data processing/dissemination. The steering committee approved a plan for more systematic documentation and availability of extensive meta-data such as quality assurance information, raw to intermediate forms of the data, blank and calibration factors, etc. A newly revised Visibility Information Exchange Web System (VIEWS) web site was announced at the meeting <http://views.cira.colostate.edu/web/>, which is the principal data archive for IMPROVE monitoring data though it also includes the Environmental Protection Agency Air Quality System, CASTNet (Clean Air Status and Trends Network) DryChem, NADP/NTN (National Trends Network) and AIRMoN data and will ultimately begin to host the NASA satellite derived air quality observations (within the next six months). The steering committee also discussed and approved plans for the next

IMPROVE report which should be completed within about a year. Presentations were made on a number of topics, including the following.

- Research to better understand a peak in the ion chromatography data that seems to be a good indicator of the influence of forest fire smoke, though its composition has thus far eluded identification;
- A newly discovered winter episode of very high aerosol sea salt at a number of sites in the Northern Great Plains;
- An extension to the Midwestern nitrate bulge analysis, focusing on an ammonia source region in southeastern Pennsylvania; and
- Efforts to better understand the relationship of particulate mass to light extinction in urban areas.

A meeting summary and copies of the presentations will be on the IMPROVE web site soon (<http://vista.cira.colostate.edu/improve/>). [marc.pitchford@noaa.gov](mailto:marc.pitchford@noaa.gov)

**16. Particulate Matter (PM) National Ambient Air Quality Standards (NAAQS).** Marc Pitchford participated in several conference calls regarding the EPA assessment document for the secondary PM NAAQS. Calls with EPA staff and contractors were to discuss their reviews of preliminary drafts as well as preparing new materials for the document, reviewing newly created summary tables and graphics, and distributing and receiving new information to others on the writing team. [marc.pitchford@noaa.gov](mailto:marc.pitchford@noaa.gov)

**17. Urban Visibility Assessment.** Marc Pitchford completed the first draft version of the urban visibility assessment document for EPA internal review. [marc.pitchford@noaa.gov](mailto:marc.pitchford@noaa.gov)

**18. Rocky Mountain Atmospheric Nitrogen and Sulfur Study (RoMANS).** Peer review of the NPS RoMANS report is progressing. The RoMANS study was designed to better understand the mechanisms and sources of nitrogen and sulfur deposition at Rocky Mountain National Park. Marc Pitchford is the National Park Service (NPS) peer review manager for the report, and responsible for recruiting peer reviewers; compiling, summarizing, and transmitting their reviews to NPS management and report authors; judging the responsiveness of the authors to the review comments and documenting the entire process. Reviews are compiled, summarized and transmitted. [marc.pitchford@noaa.gov](mailto:marc.pitchford@noaa.gov)

**19. Southern Methodist University (SMU) Memorandum of Understanding (MOU).** The MOU between SORD and SMU has received SMU and NOAA approval. The MOU establishes an agreement for SORD to provide SMU upper-air weather data in support of research being conducted by SMU. The support entails the simultaneous release of two weather balloons/radiosondes from remote field locations about 100 km apart for a several day period. [karen.balecha@noaa.gov](mailto:karen.balecha@noaa.gov) and [walter.w.schalk@noaa.gov](mailto:walter.w.schalk@noaa.gov)

**20. El Nino and the Nevada Test Site.** Data was gathered and preliminary research conducted into the relationship between El Nino and monthly and seasonal precipitation on the Nevada Test Site and

in southern Nevada. The most interesting result so far is that over the past 45 years, when SSTs in the eastern equatorial Pacific were abnormally warm in the spring the higher elevations of the NTS were more likely to be abnormally wet in the summer. [kip.smith@noaa.gov](mailto:kip.smith@noaa.gov)

**21. A&WMA Publication.** The following article was published in the A&WMA:

Pitchford, M. L., Poirot, R. L., Schichtel, B. A., & Malm, W. C. (2009). Characterization of the Winter Midwestern Particulate Nitrate Bulge. *Journal of the Air and Waste Management Association*, 59 (9), 1061-1069.

**22. DOE Meteorological Coordinating Council (DMCC).** Walt Schalk participated as part of a DMCC team that examined the Brookhaven National Laboratory's (BNL) Meteorological Program and Consequence Assessment Program relating to meteorology. The team looked at the BNL program and compared it to the American Nuclear Society (ANS)/American National Standards Institute (ANSI) 3.11-2005 voluntary consensus standard (Determining Meteorological Information at Nuclear Facilities), Department of Energy (DOE)/EH-173T Chapter 4, and DOE O 151.1. Observations are presented with recommended improvements at an exit briefing and followed up in about 2 months with a report. [walter.w.schalk@noaa.gov](mailto:walter.w.schalk@noaa.gov)

**23. Federal Radiological Monitoring and Assessment Center (FRMAC).** Walt Schalk participated in a 2-day FRMAC Operations Working Group meeting in Las Vegas. Primary topic discussed were lessons learned from the previous emergency response exercise, Empire. Minimal information was presented regarding the National Level Exercise 2010 (NLE2010), which will be held in Las Vegas in May 2010. Discussions also involved future activities of revising current operations and organizational documents. [walter.w.schalk@noaa.gov](mailto:walter.w.schalk@noaa.gov)