NOAA Air Resources Laboratory
Quarterly Activity Report
FY2015 Quarter 2
(January - March, 2015)

Contents

DISPERSION AND BOUNDARY LAYER

1. MOU with EPA

Glenn Rolph, Richard Artz, Roland Draxler, and Ariel Stein have been interacting with colleagues at the U.S. EPA's Office of Air and Radiation to establish a Memorandum of Agreement between the two agencies to improve atmospheric dispersion modeling capabilities for foreign nuclear incidents. The source term used for HYSPLIT dispersion modeling can be refined using the near real-time observations from EPA's RadNet system, which would lead to a better prediction of the plume concentrations downwind. glenn.rolph@noaa.gov

2. READY

In READY, a separate volcanic ash dispersion capability was added to the main dispersion capability (http://www.ready.noaa.gov/HYSPLIT_disp.php). The user chooses the "Release Type" from a dropdown menu (e.g., Unknown Material, Volcanic Ash, Prescribed Burn, etc.), which then sets some of the subsequent input values accordingly. Having all the dispersion applications together will simplify website maintenance. glenn.rolph@noaa.gov

3. Convective Initiation Project

The DJI S-1000 small unmanned aerial system (sUAS) is moving closer to its first flight. The first test flights will be conducted at Knox County Radio Control (KCRC) society's model flying field near Oak Ridge, Tennessee to inspect instruments and prepare the sUAS for field deployments. KCRC offers a safe flying site with infrastructure, such as a paved runway, spectator control, and an airspace-friendly location within a 15-minute drive of the ARL/Atmospheric Turbulence and Diffusion Division (ATDD). Operations at KCRC would be under 400 feet above ground level (AGL) and the sUAS would remain within line-of-sight of the operator at all times.

The first mission for the sUAS will be from June until September to measure the spatial variability of both the thermal infrared and visible wavelengths reflected from the Earth's surface surrounding the surface flux towers near Belle Mina, Alabama. Additionally, profiles of temperature and humidity will be conducted up to 400 feet AGL over these tower sites.

With the help of NOAA's Aircraft Operations Center, an application was made to the Federal Aviation Administration (FAA) for a Certificate of Authorization (COA) to operate the S-1000 at KCRC on March 21, 2015. In addition, a petition for an exemption to 14 CFR § 91.151 of the Federal Air Regulations was also submitted on March 21, 2015, that addresses the fuel reserve requirements for rotorcraft. The CFR (14 CFR § 91.151) states that all rotorcraft must be able to complete their planned flight and land with a fuel reserve of at least 20 minutes. In the case of the S-1000, the largest capacity battery that it is capable of lifting allows a total flight time of 15 minutes. Because the S-1000 is considered an aircraft by definition, exemption from this regulation is required prior to flight. The permanent registration certificate is expected within 90 days of application submission. Robbie Hood and John Walker of NOAA's

UAS Program Office visited ATDD and discussed their vision for UAS operation within NOAA for the next several years, as well as ATDD's plans for operating the DJI S-1000 octocopter. The visit also included a tour of KCRC's flying field.

Ed Dumas and Charlie Brown attended the FlySafe UAV training held in Atlanta, Georgia, on March 20-22. This training class was very useful and provided an independent assessment of both Ed and Charlie's ability to fly multi-rotor sUAS vehicles. The course also included sessions covering basic knowledge of sUAS systems including aerodynamics, piloting techniques, airspace considerations, batteries, and FAA regulations, among others. Ed and Charlie successfully completed both the flight test and the written test, and are FlySafe certified to operate multi-rotor sUAS. ed.dumas@noaa.gov, C. Brown, B. Baker

Dr. Michael Buban has been hired as the new postdoctoral associate. Dr. Buban recently completed his Ph. D. at the University of Oklahoma while working with Dr. Conrad Ziegler at the National Severe Storms Laboratory. His thesis work is related to the development of vortices along boundaries such as drylines and fronts, and their role in convective initiation. This work is closely related to the goals of the ARL Convective Initiation project. Dr. Buban starts work at ATDD in Oak Ridge, Tennessee on 1 April. Due to the project's time constraints and focus on convection in the Southeast, the staff at FRD and ATDD decided that Oak Ridge would be a more suitable office location for Dr. Buban. However, both divisions will be involved in the supervision of his activities. Richard.Eckman@noaa.gov

4. Project Sagebrush

Considerable progress has been made in preparing the comprehensive data report for Phase 1 of Project Sagebrush (PSB1). When complete, it will provide a detailed description covering all aspects of experimental design, instrumentation, measurements, quality control procedures, and the final database for the project.

A manuscript for journal publication has been drafted and is currently being reviewed internally by FRD. The paper covers some of the key findings of PSB1. A second paper, which was originally slated to be a companion paper to the original draft, is now being worked on as a standalone paper. The paper will include several additional data sets and expand on some issues regarding the magnitude of σ_θ raised in the first paper. Tentatively, it has been found that the magnitudes of σ_y measured during PSB1 tend to be larger than those determined from earlier field studies and that the magnitudes of nighttime σ_θ are much larger than those presently utilized in many existing modeling schemes.

FRD continued to assist Bruce Hicks with his analysis of the Grid 3 tall tower data, collected from September, 2013 to November, 2014, for his research on the stable boundary layer. The analysis is also utilizing complementary measurements from the INL mesonet, including measurements from the radar wind profiler and sodar. Washington State University has provided FRD with 30-minute averages for their data, but receipt of other data sets is still pending. dennis.finn@noaa.gov, and Rick Eckman

Preparations for phase 2 of Project Sagebrush began. Some dryers for the Fast Response Tracer Analyzers were rebuilt for use this fall. Inventories of calibration standards and other supplies will be conducted in April so supplies may be ordered. A differential GPS survey of the entire grid is scheduled for April. Since phase 2 will focus on light winds, climatological data both from the NOAA/INL Mesonet and a sonic anemometer deployed near the tracer release site are being reviewed to provide a better understanding of the most likely wind directions and turbulence levels that can be expected under such conditions. This is important for determining the central direction and width of the sampling arcs that make best use of the available equipment. The review also revealed some interesting issues related to computing the standard deviation of the wind direction in light winds. These issues are being investigated further. roger.carter@noaa.gov and Rick Eckman

5. Wind Forecast Improvement Project 2 (WFIP2)

FRD is moving ahead with its deployment plans for the second phase of the Wind Forecast Improvement Project (WFIP2), which focuses on wind farms near the Columbia River on the Oregon-Washington border. Participants in the study are expected to get their equipment into the field around September. FRD's profiling equipment, which includes three sodars and one 915 MHz radar profiler, is scheduled to be deployed at three locations in Oregon: Boardman, Wasco, and Prineville. FRD also plans to use two surface-flux systems. These systems measure soil temperature and moisture, surface energy balance (including all four components of net radiation), and turbulence. The region with wind farms is covered with a patchwork of fallow and wheat fields. One option being considered is to place one system in a fallow field and the other in a wheat field. kirk.clawson@noaa.gov and Rick Eckman

6. HYRad (HYSPLIT Radiological)

A prototype user interface for creating multiple simultaneous source releases for HYRad has been developed and is currently in beta testing. The key development steps involved appropriate configuration of the CONTROL and EMITIMEs files that are necessary to implement the multiple source scenarios. Considerable work was also required to optimize the user interface. The realization of multiple source modeling made the potential for a much larger number of isotopes a concern with respect to long model run times. A scheme was devised to classify the isotopes by location, deposition characteristics, and half-life and then to represent each class by proxy isotopes. The proxy isotopes are processed in HYSPLIT instead of each individual isotope and the HYSPLIT output is then reprocessed to restore the actual contribution by each real isotope. This pares the number of particles that HYSPLIT must process and often offers significant time savings. brad.reese@noaa.gov and D. Finn

7. NOAA/INL Mesonet

January brought cold temperatures and the usual radio frequency interference to the VHF radio telemetry network used to collect data from the NOAA/Idaho National Laboratory (INL) mesonet. FRD was able to avoid most of the problems by switching to the remote Radio Frequency (RF) base station located on the INL site. Unfortunately,

the telephone line connecting the FRD office to the remote RF base station went down over one weekend leaving a couple of days of data holes that had to be filled. The Campbell Scientific CR23X data loggers have a problem with collecting large data holes. They go into a mode where they cannot complete any hole collections and must be manually rebooted to correct the problem. FRD spent a couple weeks working with the RF network and rebooting data loggers before all the data could be recovered. An automatic CR23X reboot mechanism is being tested in an effort to reduce this problem in the future.

The CR23X data loggers used on the NOAA/INL mesonet stations are aging and they will need to be replaced in the next few years. FRD began evaluating available data loggers and communication options. Four data loggers have been purchased: two from Campbell Scientific, one from Thermo Fisher Scientific, and one from Coastal Environmental. Attempts will be made to run the data loggers for several months to a year to see how they perform. Several companies that can provide VHF communications at much higher speeds than the Campbell Scientific system currently used will be evaluated. The goal is to develop a plan for a complete network upgrade over the next year. roger.carter@noaa.gov , Shane Beard, Tom Strong

Meteorological data from the NOAA/INL mesonet are uploaded to NOAA MADIS every five minutes. Unfortunately, a number of problems with the data upload have been identified, and FRD staff are working to resolve them. The problem with data being inserted in the MADIS database at incorrect times is still being investigated. There is also a problem with uploading data that was missed in the initial every five minute upload. MADIS is implementing a fix for this problem. In late March, a problem ingesting the uploaded data into the MADIS database developed. Currently, 30-50% of the INL data that are successfully uploaded to the MADIS computers are not showing up in the MADIS database. This problem is still being investigated. roger.carter@noaa.gov

8. Consequence Assessment for the Nevada National Security Site

James Wood and Walt Schalk participated in two emergency response drills and one exercise as the Consequence Assessment Team for the Department of Energy (DOE) National Nuclear Security Administration (NNSA), Nevada Field Office. The exercise was conducted on the Nevada National Security Site (NNSS). In this exercise, James, and Walt provided exercise specific weather data and weather forecasts and generated dispersion products based on the worst case event scenario information provided for the facility involved. The drills/exercises consisted of a temperature sensitive chemical spill. A Consequence Assessment model was run for the worst case scenario and group leaders were briefed on the results. This exercise involved the DOE/NNSA/NFO Emergency Response Organization. Kip Smith participated in the exercise as the Drill Facilitator and the Exercise Controller/Evaluator for the Consequence Assessment Team. kip.smith@noaa.gov, Rick Lantrip, James Wood, and Walt Schalk

9. Mesonet Upgrade, Sodar, and Lightning System

The NNSS Mesonet upgrade needs one more sensor purchased before a complete

installation phase can begin. 3D sonic anemometers have been selected and will likely be purchased in the next several months. Several tower mounting plates have been ordered that will demonstrate proper application to our environment. A main improvement to the NNSS Mesonet will be moving the polling PC to the downtown North Las Vegas Office and off of one of the peaks on the NNSS.

A complete update of the MEDA (NNSS mesonet) wind roses has been finished. The wind roses were computed for each station: annual, monthly, hourly by month, and hourly by annual. These will be used to update site climatology reports, compliance reports, and requests for climatology for field project planning. The monthly and annual wind roses have been updated on the SORD Website.

The sodar installation has been completed at the Desert Rock Weather Observatory. SORD resolved numerous obstacles with location, power, and network connectivity, resulting in the sodar becoming operational. The communications connection from the building to the sodar was put into a protective conduit and buried. In addition, multiple cables were fished through the conduit for future use and troubleshooting. A data table and horizontal and vertical wind plots are updated every 15 minutes and displayed on the SORD website. See examples of the sodar data table, horizontal wind plots, and vertical wind profiles.

The NNSS Lightning Detection System continues to perform well. Improvements to sensor grounding have been completed. Sensor grounding was improved by adding connections to new ground wire grids. Ground wire grids were installed at two sensors on the NNSS, which involved driving 21 grounding rods into the ground at 4 foot and 8 foot depths, and burying 325 feet of #2 gauge braided copper wire 12 to 18 inches deep. The sensor vendor was consulted and the readings of both of the grounding grids were greatly improved and well within the vendor recommendations. These improvements are expected to improve sensor sensitivity and improve location accuracy. walter.w.schalk@noaa.gov, Kip Smith, James Wood, Phil Abbott, Rick Lantrip, and Bobby Gates.

AIR QUALITY

10. Atmospheric Mercury Modeling

Several enhancements to the HYSPLIT-Hg (mercury) modeling suite were made. Using the improved version, numerous simulations were carried out in support of the ongoing Great Lakes Restoration Initiative work and other projects. These new simulations resulted in the most encouraging agreement to date between HYSPLIT-Hg-modeled and measured ambient mercury concentrations and wet deposition. In the first enhancement, atmospheric mercury concentration output from the model was converted (during run-time) to the standard temperature and pressure used by the mercury measurement instruments. In the past, this conversion was carried out via extensive post-processing, but now, the model output can be directly compared with measured concentrations. In a second enhancement, the wet and dry deposition to each of the 20 land-type classifications considered in the model (e.g., ocean, agricultural, mixed forest,

desert, etc…) is now tracked individually. A new output file is written from each model run with these data, and a new post-processing program was created to provide useful, abbreviated summaries of these data. One important reason for adding this feature was to be able to estimate the net surface exchange from specific surface types. Using the ocean surface as an example, the model is given (i.e., as input) the gross (or one-way) mercury emissions flux *upwards* from the ocean. The new output gives the gross *downwards* mercury deposition flux to the ocean. From these data, the *net* ocean mercury flux can be determined. Since some models only consider this net ocean flux, the ability to determine its value in the HYSPLIT-Hg simulations is needed in order to compare its results with these other models. The same type of net-flux calculation is also now possible for other types of surfaces, e.g., reemissions and other emissions from soil/vegetation. mark.cohen@noaa.gov

11. National Air Quality Forecasting Capability (NAQFC)

The National Center for Environmental Prediction's Central Operations started to generate fine particulate matter ($PM_{2.5}$) developmental forecasts to local and state air quality forecasters and public health agencies. It was the first officially released and reliable $PM_{2.5}$ forecast, as well as a first major chemical model upgrade by NOAA since 2007. ARL played a central role in both of these achievements. The new upgrade includes improved tropospheric gas phase chemistry with linkage to aerosols through heterogeneous reactions and improved treatment of dry deposition of the related species. Within the chemical model, modulation of the minimum mixing heights of air pollutants was imposed to avoid severe stagnation due to cool pools and strong thermal stratification in the lowest layers. Updated chemical boundary conditions, derived from a widely used global chemical model, were among the important upgrades that contributed to the overall superior performance in forecasting surface ozone than that produced by the current operational NAQFC forecast. Specifically, the perennial night time minimum over-prediction in the eastern U. S. and the day time maximum under-prediction in the western U. S. were significantly reduced simultaneously. pius.lee@noaa.gov

A rapid refresh methodology in nitrogen oxide (NOx) emissions projections for the NAQFC is gaining attention. An ARL-authored paper titled "Long-term NOx trends over large cities in the United States during the Great Recession: Comparison of satellite retrievals, ground observations, and emission inventories" was published in Atmospheric Environment (see publication section). The research uses both NASA's satellite (Ozone Mapping Instrument) and EPA's ground-based observations (Air Quality System) to investigate the trend in urban NOx emissions during the period of the economic recession. The NOx trends derived from these datasets are then applied to evaluate emission updates by the NAQFC. daniel.tong@noaa.gov

12. Ammonia Studies

A research article entitled "Recent trends in gas-phase ammonia and $PM_{2.5}$ ammonium in the Southeast United States" was published in the Journal of the Air & Waste Management Association by Rick Saylor, LaToya Myles, Daryl Sibble, Jason Caldwell, and Jia Xing. The article describes an analysis of collocated measurements of gaseous

ammonia and $PM_{2.5}$ ammonium from the Southeastern Aerosol Research and Characterization (SEARCH) network for the period 2004-2012. Total ammonia (gaseous ammonia + $PM_{2.5}$ ammonium) was found to have declined at a rate of 1-4 %/yr over the nine-year period, consistent with U.S. EPA emissions estimates for the Southeast U. S., whereas the fraction of ammonia in the gas phase has risen steadily over this time period (+1-3 %/yr). Declining emissions of SO_2 (sulfur dioxides) and NO_x (nitrogen oxides) resulting from imposed national air-quality regulations have resulted in decreased formation of atmospheric strong acids and, consequently, less ammonia being partitioned to the fine particle phase, which may be altering the amount and overall pattern of ammonia deposition in the Southeast. rick.saylor@noaa.gov

LaToya Myles is a collaborator on a proposal led by scientists at the NOAA Geophysical Fluid Dynamics Laboratory (GFDL) entitled "Towards a closed nitrogen cycle in the GFDL Earth System Models: Advancing understanding of atmosphere-land interactions under climate change and land use." The proposal was recommended for support by the NOAA Climate Program Office (CPO) Atmospheric Chemistry, Carbon Cycle, and Climate (AC4) Program. The goal of the project is to advance the representation of reactive nitrogen in the GFDL Earth System Models through improved characterization of interactions between the land and atmosphere on timescales from hours to centuries, which will enable characterization of the historical and future nitrogen cascade under changing climate as well as under land use and land cover changes. latoya.myles@noaa.gov

CLIMATE

13. Defining Sudden Stratospheric Warmings

Sudden Stratospheric Warmings (SSWs) are extreme events in the polar wintertime stratosphere in which temperature increases rapidly and winds reverse direction. These stratospheric events can descend into the troposphere and cause cold winter weather outbreaks at the surface. Over the past four decades, the definition of SSWs has evolved, leading to ambiguities and inconsistencies that result in confusion and discrepancies in different studies and applications. To help resolve these, a paper on "Defining sudden stratospheric warmings" by Amy Butler (ESRL, CIRES), Dian Seidel (ARL), Steven Hardiman, Neal Butchart, Thomas Birner, and Aaron Match was published in the Bulletin of the American Meteorological Society. This work was presented at the January 2015 AMS Annual Meeting as background for a session of open discussion aimed at updating and revising the SSWs definition. Similar sessions are planned for the April 2015 European Geophysical Union meeting and the August 2015 Asia Oceania Geosciences Society meeting, in an effort to develop a community consensus on a revised SSW definition. dian.seidel@noaa.gov

14. GCOS Reference Upper Air Network (GRUAN)

The GCOS (Global Climate Observing System) Reference Upper Air Network (GRUAN) is a unique atmospheric measurement network aimed at obtaining long-term, quality-controlled, reference-quality observations, with complete uncertainty analyses, for climate applications. Dian Seidel participated in the annual meeting of the GRUAN community in February 2015 hosted by the Potenza, Italy GRUAN site. The meeting

covered a wide range of topics related to implementation and coordination of GRUAN activities and plans. In preparation for the meeting, NOAA scientists from OAR, NESDIS and NWS have been meeting regularly over the past few months to better coordinate NOAA's contributions to GRUAN and maximize their benefits. dian.seidel@noaa.gov

15. Cloud Cover

Work has begun on a comparison between cloud cover data from US weather stations and cloud fraction in reanalysis datasets. The goal is to evaluate the reanalysis in terms of climatology and long-term changes in total cloud cover. ARL is examining four reanalysis datasets: NCEP's Climate Forecast System Reanalysis (CFSR), NASA's Modern-Era Retrospective Analysis For Research And Applications (MERRA), the European Centre for Medium-Range Weather Forecast's ERA-15, and the Japanese Meteorological Agency's JRA-55. melissa.free@noaa.gov

16. Maryland Greenhouse Gas Study

Xinrong Ren participated in an aircraft field study in February called Fluxes of Greenhouse Gases in Maryland (FLAGG-MD) to characterize the greenhouse emissions from the Baltimore/Washington area. Xinrong planned and flew most of the flights to collect the aircraft measurements, and Winston Luke and Paul Kelley provided some technical support. The University of Maryland's Cessna 402B and Purdue University's Beechcraft Duchess were used to determine greenhouse gases, meteorological variables, as well as trace gases and aerosols downwind and upwind of the area. The study was coordinated with the National Center Atmospheric Research's (NCAR) WINTER campaign that focuses on wintertime emissions and chemical processes in the Northeastern U.S. FLAGG-MD is expected produce policy-relevant science on greenhouse gas mitigation. The goal of this study is to provide improved quantification of anthropogenic GHG emissions to the scientific community and to regulatory agencies such as Maryland Department of Environment (MDE) and US EPA through direct analysis of ambient and remote measurements, as well as through model inversion. xinrong.ren@noaa.gov

17. FOCAL- Alaska Study

ATDD continued its analysis of the data collected during the Flux Observations of Carbon from an Airborne Laboratory (FOCAL) –Alaska study conducted in August, 2013. The methane flux data collected from the aircraft was compared with the methane data collected from the surface tower. In August, three of the aircraft flights passed repeatedly within 1 km of the surface tower. The first flight was in midmorning with strong insolation (incoming sunlight) and light wind. The methane flux measured from the aircraft did not vary significantly along the path. The path average methane flux (2.0 μg CH_4 m^{-2} s^{-1}) matched that from the tower (2.4 μg CH_4 m^{-2} s-1) reasonably well. On the second flight, two weeks later, insolation was weaker due both to the evening flight time (1800–1830 local time) and to approaching autumn. The path-averaged methane flux from the aircraft was half that at the tower, but there was strong variation along the track. Within 2 km of the tower, the methane flux reported from both aircraft and surface tower matched exactly (1.0 μg CH_4 m-2 s-1). However, on the third flight, two days later

also in the evening (1830–1930 local time), there was no match (0.55 µg CH_4 m-2 s-1 from tower and 0.10 µg CH_4 m-2 s-1 from aircraft). Further analysis showed turbulence on the third flight to be limited to fine scale, below the ability of the airborne measurements to resolve. Analysis results so far confirm the expected outcome that measurement of methane fluxes in the evening is risky (third flight) but not precluded (second flight). A decision on funding for the NSF proposal, which will support further field work, is expected in May 2015. ron.dobosy@noaa.gov

18. New Zealand Study

John Kochendorfer continued his analysis of eddy covariance flux data from a rye field and from a dairy farm to quantify the effects of land use on the carbon and water cycles within the important agricultural region of Canterbury, New Zealand. The area has experienced a widespread transition from traditional crops, such as rye and wheat to dairy farming. This transition has affected the water balance, impacting recreation, civic water availability, and agriculture. john.kochendorfer@noaa.gov

ARL 2nd Quarter Publications

Arnold, D., C. Maurer, G. Wotawa, **R. Draxler**, K. Saito, and P. Seibert (2015). Influence of the meteorological input on the atmospheric transport modelling with FLEXPART of radionuclides from the Fukushima Daiichi nuclear accident. Journal of Environmental Radioactivity 139: 212-225. doi:10.1016/j.jenvrad.2014.02.013

Draxler, R., Dèlia Arnold, Masamichi Chino, Stefano Galmarini, Matthew Hort, Andrew Jones, Susan Leadbetter, Alain Malo, Christian Maurer, Glenn Rolph, Kazuo Saito, René Servranckx, Toshiki Shimbori, Efisio Solazzo, and Gerhard Wotawa (2015). World Meteorological Organization's model simulations of the radionuclide dispersion and deposition from the Fukushima Daiichi nuclear power plant accident. *Journal of Environmental Radioactivity* 139: 172-184. doi:10.1016/j.jenvrad.2013.09.014

Hicks, B., **W. R. Pendergrass III**, C. A. Vogel, R. N. Keener Jr., S. M. Leyton (2015). On the Micrometeorology of the Southern Great Plains. 2: Turbulence Statistics. *Boundary-Layer Meteorology*, 154(3), 351-366. doi:10.1007/s10546-014-9981-8

Katata, G., M. Chino, T. Kobayashi, H. Terada, M. Ota, H. Nagai, M. Kajino, **R. Draxler**, M.C. Hort, A. Malo, T. Torii, and Y. Sanada (2015). Detailed source term estimation of the atmospheric release for the Fukushima Daiichi Nuclear Power Station accident by coupling simulations of an atmospheric dispersion model with an improved deposition scheme and oceanic dispersion model, *Atmospheric Chemistry and Physics* 15, 1029-1070. doi:10.5194/acp-15-1029-2015

Leadbetter, S. J., Matthew C. Hort, Andrew R. Jones, Helen N. Webster, and **Roland R. Draxler** (2015). Sensitivity of the modelled deposition of Caesium-137 from the

Fukushima Dai-ichi nuclear power plant to the wet deposition parameterisation in NAME. *Journal of Environmental Radioactivity* 139: 200-211. doi:10.1016/j.jenvrad.2014.03.018

Ngan F, **M. Cohen**, **W. Luke**, X. Ren, **R. Draxler**. (2015) Meteorological Modeling Using the WRF-ARWModel for Grand Bay Intensive Studies of Atmospheric Mercury. ***Atmosphere***. 6(3):209-233. doi:10.3390/atmos6030209

Saito, K.,T. Shimbori, and **R. Draxler** (2015). JMA's regional atmospheric transport model calculations for the WMO technical task team on meteorological analyses for Fukushima Daiichi Nuclear Power Plant accident. *Journal of Environmental Radioactivity* 139: 185-199. doi:10.1016/j.jenvrad.2014.02.007

Saylor, R., **LaToya Myles**, Daryl Sibble, Jason Caldwell, and Jia Xing (2015). Recent trends in gas-phase ammonia and PM2.5 ammonium in the Southeast United States. *Journal of the Air & Waste Management Association*, 65(3): 347-357 doi:10.1080/10962247.2014.992554

Hu, L.,…**Roland Draxler**…**Ariel Stein**…et al. (2015), U.S. emissions of HFC-134a derived for 2008–2012 from an extensive flask-air sampling network, *Journal of Geophysical Research - Atmospheres*, 120 (2), 801–825, doi:10.1002/2014JD022617

Yan, H.,…**T. Meyers**… et al. (2015). Improved global simulations of gross primary product based on a new definition of water stress factor and a separate treatment of C3 and C4 plants. *Ecological Modelling* 297: 42-59. doi:10.1016/j.ecolmodel.2014.11.002

Zhao, H. M., Tong, D. Q., Gao, C. Y., & Wang, G. P. (2015). Effect of dramatic land use change on gaseous pollutant emissions from biomass burning in Northeastern China. *Atmospheric Research*, 153, 429-436. doi: 10.1016/j.atmosres.2014.10.008

Conference Presentations & Invited Talks

Ariel Stein was an invited lecturer of the Master Interunivesitario en Ingenieria Ambiental teaching the graduate course entitled “Contaminacion Atmosferica: Origen, Tratamiento y Control”, at the Universidad Internacional de Andalucia in Huelva, Spain. This graduate course is considered one of the top courses in Spain regarding environmental pollution and air quality.

Roland Draxler and Ariel Stein visited the University of Puerto Rico where they presented a short course describing the use of the HYSPLIT model to undergraduate and graduate students.

Barbara Stunder and Alice Crawford gave a presentation for a NOAA/NESDIS "Technology in Science and Operations" seminar on volcanic ash. They reviewed current HYSPLIT features available in NWS operations and described the volcanic ash-relevant sections of the ARL READY web page and current research and development.

LaToya Myles participated in the Florida Sea Grant Elise B. Newell Seminar Series in March. She delivered two seminars: “Air Quality and Ecosystem Research” at the Apalachicola Bay National Estuarine Research Reserve (NERR) and “Impacts of Air Quality on Marine and Coastal Ecosystems” at the NOAA Environmental Cooperative Science Center at the Florida A&M University School of the Environment.

Outreach

Barbara Stunder participated in a Montgomery County (Maryland) Public Schools' (MCPS) Stakeholder Meeting for High School Science focusing on physics, earth-science, and chemistry. MCPS has successfully transitioned middle school science classes to a "project-based learning" model in which at the beginning of a unit a real-world problem or project is assigned, and then there is an iterative mix of teacher instruction and student work on solving the problem. This model is now being applied at the high school level, aligning with the new "Next Generation Science Standards." There was some interest in the volcanic ash source term / transport and dispersion issue Barbara suggested. She also gave the staff some relevant links to ESRL GSD web sites regarding the carbon cycle, which was specifically noted in the science standards.

The Special Operations and Research Division (SORD) hosted another tour of the Desert Rock Weather Observatory at the Nevada National Security Site for about 15 scientists from the DOE National Laboratories. The tours occur on a regular basis as part of the Federal Expertise Training program hosted by NNSA. SORD staff spoke about the history of the SORD program, support of the testing program, and current activities. They also discussed the numerous instrumented sites that SORD maintains for NNSS Programs (i.e., mesonet and lightning detection network) and hosts for NOAA Programs (i.e., Climate Reference Network, SURFRAD, GPS Water Vapor soundings – ESRL) located in the immediate Desert Rock area. A Pilot Balloon (PIBAL) release was also demonstrated.