NOAA Air Resources Laboratory
Quarterly Activity Report
FY2015 Quarter 3
(April - June, 2015)

Contents

DISPERSION AND BOUNDARY LAYER

1. Roland Draxler Retired

After 40 years of Federal Government service, Roland Draxler retired on May 1, 2015. Roland's distinguished career at NOAA's Air Resources Laboratory set the bar high for dispersion modeling with the development of the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) atmospheric dispersion model and the many applications that this model now supports. Roland was the recipient of numerous awards and honors, including the Department of Commerce's Gold Medal award in 2009 for Scientific/Engineering Achievement and the OAR Employee of the Year Award in 2011. Roland was also instrumental in the development, execution and archival use of numerous atmospheric tracer experiments and the invaluable data they produced that are still used today to verify dispersion models around the world. Most recently Roland led a task team, appointed by the World Meteorological Organization, in an effort to assist the United Nation's Scientific Committee on the Effects of Atomic Radiation in its assessment of the Fukushima Daiichi accident. He also received the Department of Commerce's Bronze Medal Award in 2013 for his efforts during the disaster. His extensive knowledge of atmospheric dispersion, his numerous publications, and exquisite sense of humor will continue to be an inspiration for colleagues as well as future scientists in the field. ARL wishes him all the best in his future endeavors. richard.artz@noaa.gov

2. HYSPLIT Workshops

The annual 3-day HYSPLIT workshop was given June 2 - 4, 2015, at the NOAA Center for Weather and Climate Prediction in College Park, Maryland. The workshop focused on the use of the February 2015 release of the PC model and its Graphical User Interface with a focus on the HYSPLIT model verification of the CAPTEX 2 atmospheric tracer release study conducted in 1983. More than 30 participants from government agencies, such as NOAA, Nuclear Regulatory Commission, Department of Energy's Oak Ridge National Laboratory and Pacific Northwest National Laboratory, and Environmental Protection Agency, as well as academia and foreign governments as far away as the United Kingdom, Ireland, Chile, Brazil and Argentina, attended the workshop either in person or through a web connection. glenn.rolph@noaa.gov

Mark Cohen developed a hands-on workshop curriculum illustrating the use of automatic scripts with ARL's HYSPLIT model. The materials were presented in two, invited, day-long workshops. The first was on May 28 for students and faculty of the University of Maryland's Department of Atmospheric and Ocean Science, and the second was on June 14 for participants at the 12th International Conference on Mercury as a Global Pollutant in South Korea. Materials were developed and presented for Mac, Linux, and Windows platforms. The focus of the workshops was the use of HYSPLIT to investigate the relative importance of different source regions in contributing to observations at a given measurement site. mark.cohen@noaa.gov

3. Convective Initiation Project

The Atmospheric Turbulence and Diffusion Division (ATDD) field teams returned to northern Alabama to intensely monitor surface and boundary layer conditions as part of the Convective Initiation Project. The field experiments focused in a region near the University of Alabama in Huntsville, which is also the planned location for the NOAA 2016 VORTEX-SE study. ATDD's microwave profiling system was deployed to generate boundary-layer profiles of temperature and humidity on a continuous basis. A 3-dimensional lidar system was also deployed in the same location over a grassland area. The lidar system is used to observe the wind fields in the lowest 1-4 kilometers. Together the systems will measure the land-surface heat fluxes, soil moisture, soil and surface temperatures, wind speed and direction, turbulence statistics, and other relevant surface quantities and thermodynamic and stability indicators (i.e. Richardson number). These measured fluxes will validate regionally-mapped surface heat fluxes determined from both satellite and models, and evaluate the surface contributions to the local heat and water budgets. Since land surface temperature (LST) is also a necessary input to mapping the surface fluxes, a small Unmanned Aircraft System (sUAS) equipped with a forward- looking infrared camera (FLIR), will be flown for special selected periods to map the LST and evaluate the scale of flux footprints, surface flux variability, and the time rate of change of surface temperature. tilden.meyers@noaa.gov

ATDD is still awaiting documentation from both the Federal Aviation Administration (FAA) and NOAA's Aircraft Operations Center before the DJI S-1000 sUAS can be flown at the Knox County Radio Control (KCRC) society's model flying field near Oak Ridge, TN. On May 15, 2015, ATDD received a certificate of authorization (COA) from the FAA to fly at the KCRC. However, approval from FAA for the petition for exemption, mentioned in the ARL quarter 2 report, has not been received. The petition for exemption was originally submitted to the FAA by NOAA/AOC on March 21, 2015. In June, an FAA specialist was assigned to expedite the petition for exemption that has been filed. ed.dumas@noaa.gov, B. Baker

Michael Buban started his postdoctoral work at ATDD. Both ATDD and the Field Research Division are collaborating in supervising his activities. Michael has experience running Large Eddy Simulations (LES) of the planetary boundary layer and has made that an area of focus for the project. He is using LES to look at the effect of variations in surface properties on convective initiation. The simulations are being done on the NOAA Zeus computer. The project currently has about 7,000 core hours per month on this computer for the simulations. The LES work has mainly focused on horizontal variations in the surface sensible and latent heat fluxes. richard.eckman@noaa.gov

4. Project Sagebrush

The comprehensive data report (future NOAA Technical Memorandum) for Phase 1 of Project Sagebrush (PSB1) has passed review by ARL and all coauthors. Final revisions and editing that take into account reviewer comments are in progress and it should be published early in the 4th quarter. The report will provide a detailed description covering all aspects of experimental design, instrumentation, measurements, quality control procedures, and the final database for the project.

Based on internal FRD review, the manuscript 'Revisiting the values of the horizontal plume spread parameters σ_θ and σ_y' has been revised again and is undergoing internal review. The manuscript covers some of the key findings of PSB1. A second paper 'An investigation into the magnitude and variation in the standard deviation of horizontal wind direction σ_θ' is in internal FRD review and revision. Some of the discrepancies observed between PSB1 and some historical data are examined by comparing σ_θ at numerous field sites by time of day and season. 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. A third manuscript 'Empirical method for the estimation of the horizontal plume spread parameter σ_y based on results from Project Sagebrush Phase One' proposes a possible alternative for the determination of σ_y. It also addresses possible reasons for some of the discrepancies observed between PSB1 and historical studies. The third manuscript is also in internal FRD review.

Bruce Hicks has continued his analysis of the measurements gathered by FRD and Washington State University on the Grid 3 tall tower over the period of September, 2013 to November, 2014. The analyses also utilize complementary measurements from the INL mesonet, including measurements from the radar wind profiler and sodar. The focus of his effort has been on the parameterization of nighttime turbulence in the stable boundary layer. Bruce reports achieving some insights into the nature of nighttime turbulence. FRD continues to provide him with ongoing updated data sets from the Grid 3 tall tower and mesonet as they become available. dennis.finn@noaa.gov, Rick Eckman

5. Birch Creek Valley Wind Flow Study

The U.S. Forest Service Fire Sciences Laboratory (FSL) has provided FRD with their preliminary database of field measurements from the Birch Creek Valley in 2013. However, a final quality control (QC) reviewed database is still pending. Preliminary investigations, depending mainly on FRD measurements, have been pursued but a full research effort and merging of the FSL and FRD datasets into an integrated analysis awaits the final QC review. dennis.finn@noaa.gov

6. Wind Forecast Improvement Project (WFIP)

Matthew Brewer from the University of Washington accepted an offer for the postdoctoral associate position for the Wind Forecast Improvement Project 2 (WFIP2). Matthew is currently finishing up his Ph.D. His graduate research involved extensive use of the Weather Research and Forecasting (WRF) model. Some of this work involved simulating diurnal circulations over the same region in Oregon and Washington that are the focus of WFIP2. His start date is the last week in August.

FRD continues its preparations for the WFIP2 deployments in Oregon. Of the three planned sites, FRD is responsible for obtaining a lease and power feed only at the Boardman Airport. The lease for this location has been signed, although there are still

some Federal Aviation Administration requirements that must be resolved. FRD will also be installing equipment in Wasco and Prineville, Oregon, but the NOAA Earth System Research Laboratory is responsible for obtaining leases and power at those sites. The deployments at all three sites will be completed in one trip once all the legal hurdles are cleared. Preparation of the hardware that will be deployed is largely complete. kirk.clawson@noaa.gov, Richard Eckman

7. HYRad

The new user interface for creating multiple simultaneous source releases for HYRad was tested and very few problems were experienced. That includes the use of proxy isotopes to provide reduced model runtimes. Problems encountered were easily resolved and it is now operational. Work is in progress for implementing the use of bundled xml output files. This will provide for the visualization of plume animations and give the user improved access to model run information. brad.reese@noaa.gov, D. Finn

8. NOAA/Idaho National Laboratory Mesonet

A manuscript describing the NOAA/INL Mesonet was sent to the Journal of the Idaho Academy of Science for review and final publication. The paper was created to inform the research community of the current availability and capabilities of the INL Mesonet. The location, instrumentation, quality insurance, and quality control of the mesonet are all briefly discussed. jason.rich@noaa.gov, Roger Carter

FRD continued the evaluation of radios and data loggers that may be used in a future upgrade of the INL mesonet. FRD sent detailed questionnaires to five companies that sell VHF communication equipment. Three responded in a timely manner. After evaluating their responses, asking for clarification on a few technical points, and talking to some of their customers, FRD purchased a few radios from one company for testing in the mesonet. These radios have a data transfer speed 3.3 times the speed of existing Campbell Scientific equipment and they provide full TCP/IP communications. FRD has requested a new RF frequency authorization that is required for the testing and hope to start testing later this summer. roger.carter@noaa.gov, Shane Beard

Problems with data uploads to MADIS are continuing. A significant fraction (30-50 percent) of the NOAA/INL mesonet data uploaded to MADIS is not ingested into their system. The problems began in March 2015 and there has been no apparent improvement. The latest communication from MADIS indicates they will test a solution to one of the problems in July. Other problems have also not been solved. This situation is not acceptable, but the only options are to wait for MADIS to resolve the problems or stop sending the mesonet data for inclusion in MADIS. roger.carter@noaa.gov

9. Consequence Assessment for the Nevada National Security Site

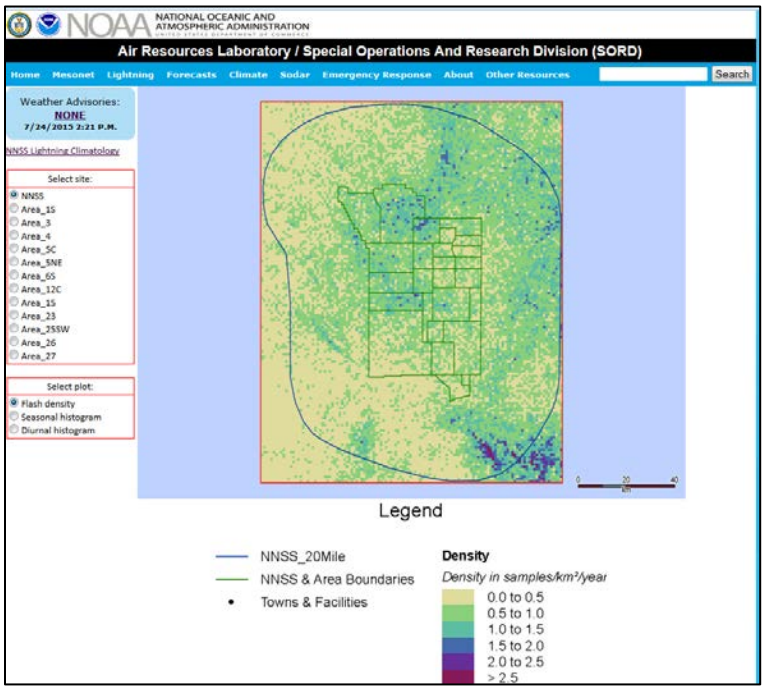
James Wood, Rick Lantrip, Kip Smith, and Walt Schalk participated in two emergency response Functional Drills as the Consequence Assessment Team for the Department of Energy National Nuclear Security Administration Nevada Field Office (DOE/NNSA/NFO). The drills were conducted on the Nevada National Security Site

(NNSS). In these drills, James and Rick provided drill specific weather data and weather forecasts, and generated dispersion products based on the worst case event scenario information provided for the facilities involved. The drills consisted of hypothetical radiological facility incidents. Consequence assessment models were run for the worst case scenarios and group leaders were briefed on the results. These drills involved the DOE/NNSA/NFO Emergency Response Organization. Kip Smith and Walt Schalk participated in the drills as Drill Facilitators for the Consequence Assessment Team. kip.smith@noaa.gov, Rick Lantrip, James Wood, Walt Schalk

10. SORD Mesonet Upgrade

The SORD Mesonet Upgrade installation was started. Approximately 70 percent of the towers have been installed. Procurement for the final sensor, a 3D sonic anemometer, is in process and will be completed in early Q4. The communications portion is also currently being tested. Final tower/sensor configurations and data logger programming are in process. Sensor installation will begin in August. SORD's goal is to have the new sensors operating by the end of FY15 for a 3 month testing period.

Rick Lantrip completed an update of the Nevada National Security Site Lightning Climatology. This update contains data from March 2001 through February 2015. The climatology data are available on the SORD website where the user can select different areas of interest to view three different products (flash density, a seasonal histogram, and a diurnal histogram). These climatological data were assembled into a single pdf document with a brief description of lightning. In addition, a brief description of lightning (Lightning 101) was developed by Walt Schalk and posted on the SORD website. walter.w.schalk@noaa.gov, Kip Smith, James Wood, Phil Abbott, Rick Lantrip, Bobby Gates



11. Support to DOE/NNSA NNSS Shock Physics Experiment
SORD wrapped up their month long support of the latest NNSA Shock Physics Experiment at the Nevada National Security Site (NNSS) to support non-proliferation research. SORD's participation was truly a team effort that included important contributions from everyone over the month long campaign. Walter Schalk expressed thanks to the entire SORD team for their hard work and important contributions to the success of this important NNSA national security experiment. walter.w.schalk@noaa.gov, Kip Smith, James Wood, Phil Abbott, Rick Lantrip, Bobby Gates

AIR QUALITY

12. NOAA U.S. Weather Research Program
Three ARL projects were awarded funding through the NOAA U.S. Weather and Research Program. The following projects are scheduled to be implemented over the course of one year (June 1, 2015 to May 31, 2016):

The first is titled "Rapid refreshing of anthropogenic nitrogen oxide (NOx) emissions through assimilated fused satellite and ground observations." The proposed work is comprised of three activities: 1) Updates of the National Air Quality Forecasting Capability (NAQFC) emission inventories and the Community Multiscale Air Quality (CMAQ) model, the NAQFC's chemical transport model to build a realistic base case; 2) Adjustment of base emission inventories with fused ground and satellite observations; and 3) Evaluation of the effect on the NAQFC forecast performance. daniel.tong@noaa.gov

The second is titled "In-Line Coupling of Non-Hydrostatic Mesoscale Model in B-grid staggering (NMMB) and CMAQ Models through National Centers for Environmental Prediction (NCEP) Earth System Modeling Framework (ESMF): Proof of Concept for Dust Forecasting." The project is to in-line the NMMB with the CMAQ model to generate detailed emissions, transport, and sediment removal simulations for the wind-blown dust. pius.lee@noaa.gov

The third is titled "Toward a Unified National Dust Modeling Capability." The National Weather Service (NWS) uses the ARL HYSPLIT model to disperse dust plumes using the NMMB regional model to provide advection and diffusion dynamics for dust transport and mixing. A Eulerian model with comprehensive emissions, transport and removal processes is being contemplated to succeed the HYSPLIT-based dust forecasting capability. The HRRR model is chosen to provide the meteorology. The proposed emission modules from HRRR-dust and CMAQ are tested with a period of severe dust storm outbreaks in the spring, 2014. daniel.tong@noaa.gov, Pius Lee.

13. Mercury Measurement Comparisons at Mauna Loa
Winston Luke and Paul Kelley upgraded existing equipment and installed additional mercury detectors at NOAA's Mauna Loa Observatory (MLO) on the island of Hawaii.

The expansion of the measurement suite was undertaken to conduct a months-long intercomparison of various detection techniques and operational protocols for the measurement of atmospheric mercury species. Increasingly, field- and laboratory-based research suggests that the current denuder-based technique to monitor gaseous oxidized mercury (GOM) compounds in the atmosphere suffers from severe bias and reduced collection efficiency under some conditions. GOM is the most important mercury species in the atmosphere owing to its high solubility in rainwater; rapid removal from the atmosphere; and bioavailability when deposited to receiving watersheds and ecosystems. As a result, its accurate measurement is critical to our understanding of atmospheric mercury dynamics.

A Tekran® mercury analyzer previously measuring only gaseous elemental mercury (GEM) at MLO was upgraded to also measure total mercury, and thus to calculate reactive mercury concentrations by difference. In addition, a second complete Tekran® speciation system was installed at MLO to allow side-by-side comparisons with both the total mercury system, and with an existing Tekran® speciation system operating at the site since 2000. The two speciation systems were configured with differing GOM collection media and were operated at varying temperatures and flow rates, to better quantify variations in GOM collection efficiency using accepted protocols employed in the National Atmospheric Deposition Program's (NADP's) Atmospheric Mercury Network. In addition, one speciation system was equipped with a humidifying system to allow the investigation of the effects of varying water vapor concentrations on GOM collection efficiency. The goals of the research are a better characterization and understanding of the limitations of current mercury monitoring techniques, and the development of improved methodologies for mercury measurement.
winston.luke@noaa.gov and Paul Kelley

14. Atmospheric Mercury Modeling with HYSPLIT-Hg

Analyses continued with the HYPLIT-Hg fate and transport model for atmospheric mercury. Mercury air emissions from anthropogenic and natural sources were simulated globally for the year 2005. The results were compared against ambient concentrations and wet deposition measurements in the Great Lakes region and elsewhere. Several different model configurations – e.g., with different parameterizations of chemical transformation and deposition phenomena – were found to produce results reasonably consistent with observations. A special emphasis was placed on developing source-attribution estimates for atmospheric deposition to the Great Lakes. As expected, the different model configurations resulted in different source-attribution estimates, but the overall patterns were relatively consistent. The results suggest that U.S. anthropogenic sources directly contributed on the order of 20-25 percent of 2005 deposition to the Great Lakes basin as a whole. Anthropogenic sources from China contributed 6-8 percent, and all other global anthropogenic sources contributed 8-10percent. The remainder of the deposition came from oceanic natural emissions and re-emissions of previously deposited mercury (25-35 percent), terrestrial natural emissions and re-emissions (19-26 percent), biomass burning (~4 percent) and geogenic emissions (~4 percent). There were differences in the source-attribution patterns among Great Lakes. For example, Lake Erie and Lake Superior were estimated to have the highest and

lowest contributions, respectively, from U.S. anthropogenic sources. These results were presented at the 12th International Conference on Mercury as a Global Pollutant held in June 2015 in South Korea and will be submitted as a manuscript for a Special Issue of the journal Elementa featuring atmospheric mercury modeling analyses presented at the conference. mark.cohen@noaa.gov

15. Fourth of July Fireworks and Air Pollution

A paper on the "Effects of Independence Day Fireworks on Atmospheric Concentrations of Fine Particulate Matter in the United States" by Dian Seidel and Abigail Birnbaum appeared in June online in Atmospheric Environment. (The publication will appear in print form in the August issue.) The paper reports results from a national, multi-year analysis of air quality monitoring data and shows statistically significant increases in concentrations of atmospheric particulate matter. Concentrations of fine particulate (PM2.5) are elevated on July 4 evening and July 5 morning. On national average, holiday 24-hr PM2.5 levels are elevated by 5 µg/m3 (42%). The timing of the publication just in advance of the Independence Day holiday led to substantial media interest in the study, which was featured in Time magazine, USA Today, and many other newspapers, online publications, and radio news programs. dian.seidel@noaa.gov

CLIMATE

16. GRUAN

The Global Climate Observing System (GCOS) Reference Upper Air Network (GRUAN), conceived almost a decade ago, has made significant progress toward establishment of long-term, reference-quality observations of the atmospheric column for climate purposes. Because GRUAN is envisioned as a multi-decadal effort, and because it is unique in its requirements that measurements adhere to the GCOS Climate Monitoring Principles, documenting the history of the activity is important. To capture the recollections of scientists and program managers involved in the conception and first decade of GRUAN, an oral history project was initiated in 2015. Dian Seidel is working with the newly-appointed GRUAN Lead Center Director Ruud Dirksen to interview members of the global GRUAN community. In February and April, a total of ten interviews were conducted and recorded. They will be archived at the Lead Center in Lindenberg, Germany. NOAA's contributions to the GRUAN effort have been the subject of ongoing discussion among OAR, NWS and NESDIS scientists and program managers. During this quarter, and in light of discussions at the GRUAN Implementation and Coordination meeting held in February 2015, the cross-line-organization team continued to develop a realistic and coordinated plan for current and future NOAA participation in GRUAN.

17. Climate Reference Network (CRN)

The National Climatic Data Center (NCDC) retrieved 53 data files from USCRN sites through ATDD's ftp server. Data are passed to NCDC by this path when retrieved episodically by ATDD from individual site visits to fill data gaps. Instrumentation characteristics for each site are maintained in the Integrated Station Information System (ISIS) database on NCDC's server, along with a record of events which affect data

quality. New ISIS events are identified from ATDD's field crews and archived data. lynne.satterfield@noaa.gov

The CRN staff spent 165 days on travel visiting 43 sites. They made 42 annual maintenance visits and one unscheduled maintenance visit. mark.e.hall@noaa.gov

18. INL Climate Trends

DOE-Idaho requested an analysis of the 65-year temperature and precipitation record at the Central Facilities Area of the Idaho National Laboratory (INL) to see if a climate change signal could be determined. Mean, maximum, and minimum statistics of daily air temperatures were examined. A linear regression and analysis of variance were conducted on the resulting annual average data set. The regression analysis showed a slight upward trend in air temperature. The temperature rise was most visible in the maximum air temperature trend line and least visible in the minimum air temperature trend line. The air temperature rise for the average annual maximum daily air temperature was 0.18 degrees F for each decade. However, this rise was not statistically significant at the 95% confidence level.

The analysis of air temperature was further examined in light of the summer (June-August) and winter (December-February) seasons. For the winter season, the air temperature trend was slightly negative for the maximum, average, and minimum daily air temperatures. However, the slopes were not significantly different from zero at the 95% level as determined by the analysis of variance. For the summer season, a steep increase in air temperature was readily apparent. The steepest increase was observed in maximum daily air temperature, followed by average and then minimum daily air temperature. The slopes for the summertime maximum and average daily air temperatures were significantly different from zero at the 95% confidence level, according to the analysis of variance. This indicates that the summer season maximum air temperature rise is statistically significant and increasing at the rate of 0.4 degrees F every decade.

A similar analysis was undertaken for precipitation. Daily precipitation totals were averaged for each year of record. A linear regression and an analysis of variance were performed on the averaged data. The linear regression indicated that precipitation has been declining at the rate of 0.13 inches per decade, which is a rather small decline. However, the analysis of variance indicated that the slope was not significantly different from zero at the 95% confidence level. A separate analysis of seasonal precipitation did not show any difference between the winter and summer seasons.
kirk.clawson@noaa.gov, Jason Rich

ARL 3rd Quarter Publications

Butler, B. W., N. S. Wagenbrenner, J. M. Forthofer, B. K. Lamb, K. S. Shannon, **D. Finn**, **R. M. Eckman**, **K. Clawson**, L. Bradshaw, P. Sopko, **S. Beard**, D. Jimenez, C. Wold, and M. Vosburgh (2015). High resolution observations of the

near-surface wind field over an isolated mountain and in a steep river canyon. Atmospheric Chemistry and Physics 15, 3785-3801. doi:10.5194/acp-15-3785-2015

Chai, T, **Roland Draxler**, and **Ariel Stein** (2015). Source term estimation using air concentration measurements and a Lagrangian dispersion model – Experiments with pseudo and real cesium-137 observations from the Fukushima nuclear accident. Atmospheric Environment 106: 241-251. doi:10.1016/j.atmosenv.2015.01.070

Chen, L., Xin-Zhong Liang, David DeWitt, Arthur N. Samel, and **Julian X. L. Wang** (2015). Simulation of seasonal US precipitation and temperature by the nested CWRF-ECHAM system. Climate Dynamics 1-18. ON-LINE April 28, 2015 doi:10.1007/s00382-015-2619-9

Dong, J. W., X.M. Xiao, P. Wagle, G.L. Zhang, Y.T. Zhou, C. Jin, M.S. Torn, **T. P. Meyers**. . . B. Moore (2015). Comparison of four EVI-based models for estimating gross primary production of maize and soybean croplands and tallgrass prairie under severe drought. Remote Sensing of Environment, 162, 154-168. doi:10.1016/j.rse.2015.02.022

Huang, M., K. W. Bowman, G. R. Carmichael, M. Lee, T. Chai, S. N. Spak, D. K. Henze, A. S. Darmenov, and A. M. da Silva (2015). Improved western U.S. background ozone estimates via constraining nonlocal and local source contributions using Aura TES and OMI observations. Journal of Geophysical Research- Atmospheres. 120, 3572–3592, doi:10.1002/2014JD022993

Leeper, R. D. and **J. Kochendorfer** (2015). Evaporation from weighing precipitation gauges: impacts on automated gauge measurements and quality assurance methods. Atmospheric Measurement Techniques 8(6): 2291-2300. doi:10.5194/amt-8-2291-2015

Liu, S., **Julian X. L. Wang**, Xin-Zhong Liang, and Vernon Morris (2015). A hybrid approach to improving the skills of seasonal climate outlook at the regional scale. Climate Dynamics 1-12. doi:10.1007/s00382-015-2594-1 ON-LINE April 18, 2015

Ngan, F., **A. Stein**, and **R. Draxler** (2015). Inline Coupling of WRF-HYSPLIT: Model Development and Evaluation Using Tracer Experiments. Journal of Applied Meteorology and Climatology, 54(6), 1162-1176. doi: 10.1175/jamc-d-14-0247.1

Song, S., …**R. Artz**…**W.Luke**… (2015) Top-down constraints on atmospheric mercury emissions and implications for global biogeochemical cycling. Atmospheric Chemistry and Physics. 15 (12): 7103-7125. doi:10.5194/acp-15-7103-2015

Stein, A., R. Draxler, G. Rolph, B. Stunder, M. Cohen, and F. Ngan (2015). NOAA's HYSPLIT atmospheric transport and dispersion modeling system. Bulletin of the

American Meteorological Society. doi:10.1175/BAMS-D-14-00110.1, Early On-Line Release.

Stein, A. F., F. Ngan, **R.R. Draxler**, and T. Chai (2015). Potential Use of Transport and Dispersion Model Ensembles for Forecasting Applications. Weather and Forecasting 30(3): 639-655. doi 10.1175/WAF-D-14-00153.1

Sun, Bomin, **Melissa Free**, Hye Lim Yoo, Michael J. Foster, Andrew Heidinger, and Karl-Goran Karlsson (2015). Variability and Trends in U.S. Cloud Cover: ISCCP, PATMOS-x, and CLARA-A1 Compared to Homogeneity-Adjusted Weather Observations. Journal of Climate 28(11): 4373-4389. doi: http://dx.doi.org/10.1175/JCLI-D-14-00805.1

Tong, D. Q., Lok Lamsal, Li Pan, Charles Ding, Hyuncheol Kim, **Pius Lee**, Tianfeng Chai, Kenneth E. Pickering, and Ivanka Stajner (2015). Long-term NOx trends over large cities in the United States during the great recession: Comparison of satellite retrievals, ground observations, and emission inventories. Atmospheric Environment 107: 70-84. doi:10.1016/j.atmosenv.2015.01.035

Turner, Matthew D., Daven K. Henze, Amir Hakami, Shunliu Zhao, Jaroslav Resler, Gregory R. Carmichael, Charles O. Stanier, Jaemeen Baek, Adrian Sandu, Armistead G. Russell, Athanasios Nenes, Gill-Ran Jeong, Shannon L. Capps, Peter B. Percell, Rob W. Pinder, Sergey L. Napelenok, Jesse O. Bash, and Tianfeng Chai (2015). Differences between magnitudes and health impacts of BC emissions across the United States using 12 km scale seasonal source apportionment. Environmental Science & Technology 49 (7), 4362-4371 doi:10.1021/es505968b

Wang, J. L. (2015). Mapping the Global Dust Storm Records: Review of Dust Data Sources in Supporting Modeling/Climate Study. Current Pollution Reports: 1-13. doi:10.1007/s40726-015-0008-y ON-LINE June 23, 2015

Conference Presentations & Invited Talks

Ariel Stein presented an invited talk entitled "NOAA's Air Resources Laboratory's aerosol modeling capabilities" at the 19th Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling on June 9, 2015.

Winston Luke presented a poster and an oral presentation entitled "Assessment of Mercury Measurement Fidelity by an Automated Tekran Speciation Unit" at the 2015 International Conference on Mercury as a Global Pollutant (ICMGP), held June 14-19 in Jeju, Republic of Korea. The paper presented preliminary results of the measurement intercomparison conducted at MLO beginning in April 2015.

Winston was also a co-convener of a special session at the conference, entitled "Measurement Uncertainty and New Method Development for Atmospheric Mercury",

held on June 19, 2015. His co-convener of the session was Dr. Seth Lyman, executive director of the Utah State University's Bingham Entrepreneurship & Energy Research Center in Vernal, UT.

Ed Dumas attended a workshop sponsored by the Center for Transformative Environmental Monitoring Programs (CTEMPS) at Oregon State University in Corvallis, OR, June 22-25, 2015. This workshop included a specific training session on distributed temperature measurement systems utilizing fiber optic cables to make high resolution temperature measurements. Potential applications include the measurement of atmospheric temperature, relative humidity, wind speed, and wind direction, as well as soil moisture and stream flow rates. The spatial and temporal resolutions offered by this technique are revolutionary. Additional topics covered in the workshop included the use of IR (infrared) cameras on UAV's to make measurements of vegetation indices, and the use of RGB (red, green, and blue) cameras on UAV's to generate digital elevation maps of small areas using a point-cloud technique. For more information see www.ctemps.org.

John Kochendorfer was invited to help lead the World Meteorological Organization (WMO) meeting on the Solid Precipitation Intercomparison Experiment (SPICE) in Zaragoza, Spain. The preparation and analysis of the final dataset were planned, and scientific topics to be addressed using the SPICE dataset were assigned to lead authors. These results will help improve snow measurements, and provide international standards for the measurement of solid precipitation.

LaToya Myles co-authored a white paper entitled "Advancing ecosystem modeling of hypoxia and diversion effects on fisheries in the Northern Gulf of Mexico" from the 5th Annual NOAA/NGI Gulf Hypoxia Research Coordination Workshop. The 5th Annual NOAA/NGI Gulf Hypoxia Research Coordination Workshop brought Louisiana state officials together with federal and other state agencies, NGOs, and academic scientists with interests in discussing a path forward to achieve a balance of: (1) restoring Louisiana's coastal wetlands, (2) reducing the size of the annual Gulf of Mexico hypoxic zone, and (3) sustaining ecological and socioeconomic benefits of fisheries.

Outreach

SORD hosted two tours for about 15 scientists each from the DOE National Laboratories. The tours were part of the Federal Expertise Training program hosted by NNSA. The tours took place at the Desert Rock Weather Observatory at the Nevada National Security Site. A verbal history of the SORD program and support of the testing program was given. SORD's current activities were also presented. The numerous instrumented sites that SORD maintains for NNSS Programs (mesonet and lightning detection network) and hosts for a variety of NOAA Programs (Climate Reference Network, SURFRAD, GPS Water Vapor soundings – ESRL) located in the immediate Desert Rock area were discussed. As a finale, a Pilot Balloon (PIBAL) release was demonstrated.

Thomas Ludwig of the University of Alabama carried out research with Mark Cohen at the Air Resources Laboratory in College Park, as part of the Hollings Scholarship summer internship program. Tom's work involved the use of a new box-model version of the HYSPLIT-Hg atmospheric mercury fate and transport model. In the box model, a single, stationary "puff" of pollutant can be studied at a user-specified height and location. The box model allows a more detailed evaluation of processes than can typically be obtained using the "full" model (i.e., with multitudes of puffs and/or particles undergoing transport and dispersion). Tom investigated the effect of atmospheric droplet pH on the chemistry and phase-partitioning of mercury, and associated effects on wet and dry deposition. The box model was also configured to allow different mechanisms to be turned off and on to focus on one or more fate pathways in isolation (e.g., dry deposition, wet deposition, and/or chemical transformation). The modeling results were found to be consistent with expected overall behavior and served as a comprehensive check on the relevant algorithms in HYSPLIT-Hg. Results showed that there was a strong pH influence on mercury's behavior -- and atmospheric lifetime -- in the pH range from ~3-5 (in the range of observed atmospheric droplet pH values), demonstrating the importance of accurate pH estimates for realistic atmospheric mercury simulations. Tom was a pleasure to work with and we wish him the best in his upcoming senior year at the University of Alabama.