NOAA Air Resources Laboratory

Quarterly Activity Report

FY2018 Quarter 3 (April-May-June 2018)

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DISPERSION AND BOUNDARY LAYER

1. HYSPLIT Website Interface Updates

In May, the READY HYSPLIT website interface and the National Weather Service Forecast Office (NWSWFO) HYSPLIT website were updated to allow the HYSPLIT results to be displayed on a JavaScript Leaflet open-source mapping application. The updates replaced the current mapping software, which is being phased out. Most of the functionality of the previous application has been adopted in the new application and work continues to add more capabilities. Users and customers can visualize HYSPLIT results on high-resolution, detailed map backgrounds with zooming and feature overlay capabilities that are not available with static HYSPLIT images. ARL supports the NWSWFOs in their Decision Support Services program to the local emergency managers / responders by providing a highly specialized website to run HYSPLIT and provide quick results. (glenn.rolph@noaa.gov)

2. Project Sagebrush

The manuscript “Plume dispersion in low-wind-speed conditions during Project Sagebrush Phase 2, with emphasis on measurement uncertainties” was accepted by *Boundary Layer Meteorology*. Volume and page number for the print version are pending but it is currently available online (doi: 10.1007/s10546-018-0360-8).

Peer reviews for the draft manuscript “Mechanisms for wind direction changes in the very stable boundary layer” were received from the *Journal of Applied Meteorology and Climatology* in early June. The revised draft and responses to reviewer comments were being circulated to the coauthors for review at the end of the quarter. Although there were some issues to address, the peer reviews were mostly favorable.

The manuscript “Distinct turbulence structures in stably stratified boundary layers with weak and strong surface shear” was revised and re-submitted to the *Journal of Geophysical Research – Atmospheres*. Researchers at Washington State University are leading this effort, with coauthors from FRD. This work also draws upon measurements made during Project Sagebrush, particularly from the turbulence instruments deployed by Washington State.

Some limited work was performed to identify potential differences on the turbulence regime near the surface based on whether winds aloft were influenced by upwind terrain that was mountainous

or a plain. This was part of the effort to address reviewer concerns in a paper rejected by the *Journal of the Atmospheric Sciences*. (dennis.finn@noaa.gov)

Rick Eckman agreed to be a member of the Ph.D. committee for a student at the University of Texas, San Antonio. The student is part of a group in the Department of Mechanical Engineering investigating the numerical simulation of turbulent flows. The group is interested in using the extensive turbulence observations from Project Sagebrush in their research. The Ph.D. student will combine high-resolution turbulence simulations with the Sagebrush field observations to gain new insights into plume dispersion. (Richard.Eckman@noaa.gov)

3. 2017 Annual Site Environmental Report (ASER)

All HYSPLIT model runs required for the 2017 ASER were completed in May. These runs simulated surface releases during 2017 for six different INL facilities and elevated releases for two facilities. The concentration grid used in the 2017 simulations is about 50 percent larger than that used in the 2016 runs. This was done at the request of the INL Environmental Surveillance, Education, and Research Program to assist with their estimates of population doses. (Richard.Eckman@noaa.gov)

FRD began updating the Meteorological Supplement provided with each year's ASER. The supplement includes weather records and other significant events taking place each year. It will be completed in the fourth quarter. (Richard.Eckman@noaa.gov, Jason.Rich@noaa.gov)

4. HYRad Dispersion System

The loss of support for the Flash plugin in web browsers, and changes in the licensing terms for common mapping services such as Google Maps and MapQuest, prompted FRD to update the HYSPLIT Radiological (HYRad) dispersion system that supports activities at INL. The updated version uses the (presently) free Leaflet mapping package and does not rely on the Flash plugin. This required a number of changes in the HYRad code. One change that enhances compatibility with the Leaflet package is that the code now uses the GeoJSON format to transfer map information rather than the XML format used previously. A working prototype of the new HYRad system was successfully tested and can be implemented on short notice if necessary. Presently, the older Flash-based version is still the default for supporting INL activities. The new prototype still lacks some of the features and capabilities of the Flash-based version; the majority of these missing features will be added in the fourth quarter. (brad.reese@noaa.gov, dennis.finn@noaa.gov)

5. Field Research Division (FRD) Tracer Program

Newer FRD staff are being cross-trained by the more experienced tracer program staff in anticipation of retirements within the next one to two years. This will help maintain the tracer program and measurement capabilities at FRD. A realistic mock experimental study was completed during the quarter that provided trainees with a comprehensive exposure to, and experience with, all facets of how a tracer experiment is conducted, including preparations and set up, sample handling procedures, gas chromatograph operation and sample analysis, chain of custody procedures, and follow-up quality control procedures to ensure reliable datasets. Ongoing

training will emphasize additional aspects of operations and equipment maintenance. (roger.carter@noaa.gov, dennis.finn@noaa.gov)

In recent years, new halocarbons with lower global warming potentials have been developed as refrigerants and foam blowing agents. Some of these chemicals may have potential as atmospheric tracers. Roger Carter performed some initial investigations of these new chemicals to see if they meet the basic requirements for a good tracer. One fundamental issue is cost, and some of the chemicals, such as HFC-1234ze and HFC-1233zd, are in the same cost range as the SF6 currently used by FRD as a tracer. However, these halocarbons appear to achieve a lower global warming potential by being more chemically reactive. Some are mildly flammable and can react with certain plastics. Since many components of FRD's tracer equipment are made from plastics, testing will be necessary to determine whether these candidate tracers can damage the components. There is also some question whether these halocarbons can be detected at parts per trillion concentrations using the electron capture detection method employed for SF6. A comprehensive investigation into the use of these halocarbons as tracers would require a considerable effort by FRD's staff to address all the potential issues. (Roger.Carter@noaa.gov, Richard.Eckman@noaa.gov)

6. Boundary Layer Research

Bai Yang has been working with Will Pendergrass at ATDD on comparing observations from FRD's flux station at the Idaho National Laboratory with output from NOAA's operational forecast models. Will is already performing similar comparisons using observations from the Chestnut Ridge station near Oak Ridge, Tennessee, and posting the results on the web. A similar web display will be set up for the Idaho data. (Bai.Yang@noaa.gov, Will Pendergrass)

7. Wind Forecast Improvement Project (WFIP)

During the quarter, FRD made significant progress in developing an overview manuscript describing the observations collected during the 2015-2017 WFIP field deployment in Oregon and Washington. This wind-energy study extended over 18 months and is known as WFIP2 to distinguish it from the earlier WFIP1 study that took place in the Midwest. The manuscript is intended to be part of a special issue on WFIP2 to be published in the Bulletin of the American Meteorological Society. James Wilczak at the Earth Systems Research Laboratory in Boulder, Colorado is lead author, and Rick Eckman has a section describing some of the surface energy balance observations collected by FRD. The manuscript may be submitted to the journal in the fourth quarter. (Richard.Eckman@noaa.gov)

8. Idaho National Laboratory (INL) Mesonet

For years, FRD has sent the INL Mesonet data to MesoWest, a meteorological data collection and distribution system operated by the University of Utah. Whenever changes were made to the upload system, MesoWest data were manually compared to the INL mesonet values to ensure that they were correct, but no continuous monitoring of the MesoWest values has ever been done. This was corrected via implementation of a new system that checks randomly selected MesoWest values against the INL mesonet database. Every day, it randomly selects one the stations in the INL mesonet, downloads a block of that station's data from MesoWest, and compares it to the

INL mesonet database. It has only been running for a few weeks and, so far, the only differences found in the two databases appear to be rounding differences. (Roger.Carter@noaa.gov)

An inventory of the off-site data repository used to store backups of the Mesonet data was conducted during May. The data collection appeared to be complete, up to date, and in good physical condition. (Roger.Carter@noaa.gov)

9. Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO)

The CTBTO-World Meteorological Organization (WMO) Backtracking Response System to identify potential nuclear test source locations was recently improved at NCEP following an issue during an operational run. A discrepancy between the number of stations stated (7) and the number of stations (8) in the listing of their details caused the operational failure. Manual correction of the stated station number from "7" to "8" by the National Centers for Environmental Prediction (NCEP) Central Operations (NCO) resulted in a successful run. The original delivered package included a checking function that can identify such errors in the request; however, NCEP had not included that in the initial implementation. Barbara Stunder and Tianfeng Chai at ARL Headquarters worked with NCO to implement this functionality. (barbara.stunder@noaa.gov, tianfeng.chai@noaa.gov)

10. International Civil Aviation Organization (ICAO) Meteorology Panel Working Group

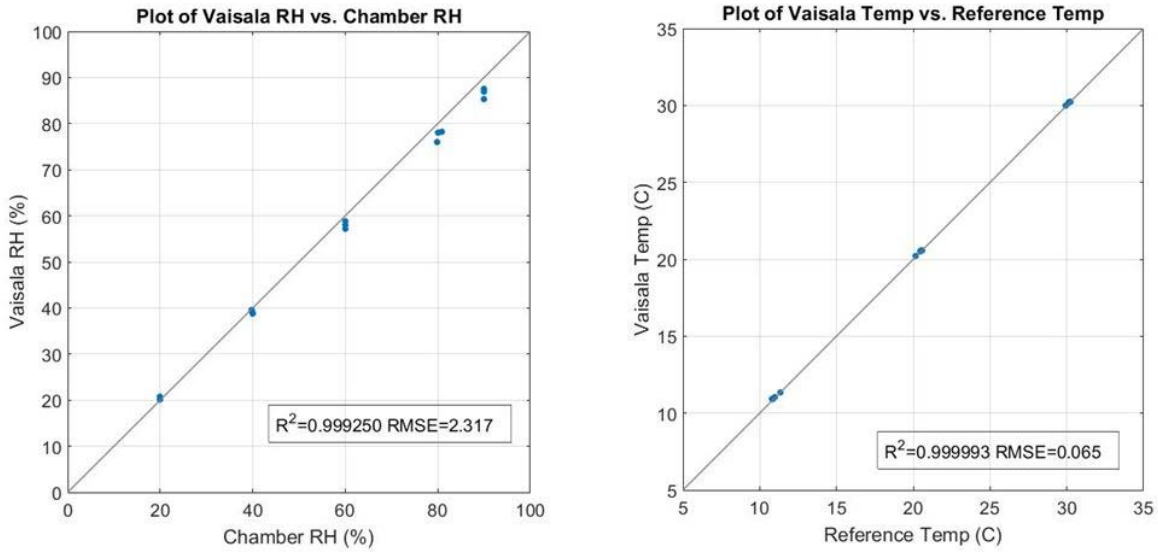
Barbara Stunder participated in the ICAO's Meteorology Panel Working Group on Meteorological Information and Services Development in Washington, DC. Ms. Stunder attended the session on release of radioactive material, along with colleagues from the NWS, Federal Aviation Administration, and international counterparts. Attendees discussed the issue of guidance regarding flight diversion around a radiological cloud in the event of a nuclear incident. During the meeting, Ms. Stunder and several colleagues formed an ad hoc group whose primary focus is to enhance and finalize what is currently a draft Concept of Operations (CONOPS) document utilized by aviation decision-makers. The draft CONOPS document describes information services provided for a release of radioactive material. (barbara.stunder@noaa.gov)

11. Assisting Volcanic Ash Advisory Center (VAAC) Response

Alice Crawford and Barbara Stunder supported the Washington VAAC's response to the ongoing Kilauea eruption. They participated in a series of conference calls with U.S. Geological Survey, VAAC, and Honolulu Weather Forecast Office staff until it became clear that a single explosive eruption in May was an outlier. For several weeks following the large May eruption, Alice posted, on a password protected webpage, daily ash dispersion graphics for an assumed continuous release based on the occasional, very brief ash eruptions that were occurring. These periodic small ash emissions were usually caused by rock falls or collapse events in the volcano summit from inward slumping of the rim and vent walls. Barbara added Kilauea to the hypothetical eruptions and trajectory web pages at https://ready.arl.noaa.gov/READYVolcAsh.php. She also facilitated the addition of Kilauea to the NCEP volcano trajectories computer job. (alice.crawford@noaa.gov, barbara.stunder@noaa.gov)

12. Atmospheric Turbulence & Diffusion Division (ATDD) – Coyote Small Unmanned Aircraft System (sUAS)

ATDD acquired three Vaisala RSS421 dropsonde temperature and relative humidity (T/RH) sensors for testing and potential use on the next-generation Coyote sUAS aircraft. A preliminary test of these sensors, conducted in ATDD's Thunder Scientific T/RH chamber in April 2018, showed about a 40 percent difference between the humidity values reported by the device and the chamber values. A modification to the procedure was then made after consultation with Vaisala and the National Center for Atmospheric Research (NCAR) which resulted in about a 10 percent difference. Software was modified to make the reconditioning process a part of the normal calibration procedure and final testing was performed in early May. (ed.dumas@noaa.gov, B. Baker)



Results shown above: A plot of the reference temperature versus Vaisala temperature (left), and a plot of the reference humidity versus Vaisala humidity (right). The R2 values are 0.999993 and 0.999250 for the temperature and relative humidity, respectively. The reference instrument for the temperature was a Hart Scientific platinum resistance thermometer (PRT), while the reference for the humidity was the Thunder Scientific chamber itself.

13. ATDD – sUAS Instrument Testing

On April 5, 2018, Ed Dumas, Temple Lee, and Michael Buban tested four ManoNano Technologies eMote sensors by dropping them from the DJI S-1000 sUAS at various altitudes over House Mountain RC model flying field. A tethersonde was constructed from two weather balloons and a model sailplane winch and instrumented with various T/RH instruments that were suspended at 150 meters (m), 100 m, 75 m, and 50 m, respectively to provide comparison data for the eMotes, which auto-rotate as they descend and transmit data in real-time to a ground-based computer where it is recorded. Each eMote has two temperature sensors, an RH sensor, pressure sensor, GPS, and several accelerometers to measure the thermodynamic quantities of the atmosphere, as well as the position, altitude and inertial state of the device as it falls through the atmosphere. The eMotes showed erratic flight behavior and fell at velocities typically around six meters per second (m/s) under quiescent/weak wind conditions. Flight behavior improved under more windy conditions. Significant differences in temperature, on the order of 2-4°C, were found when comparing the two temperature sensors onboard each eMote. Large errors in GPS

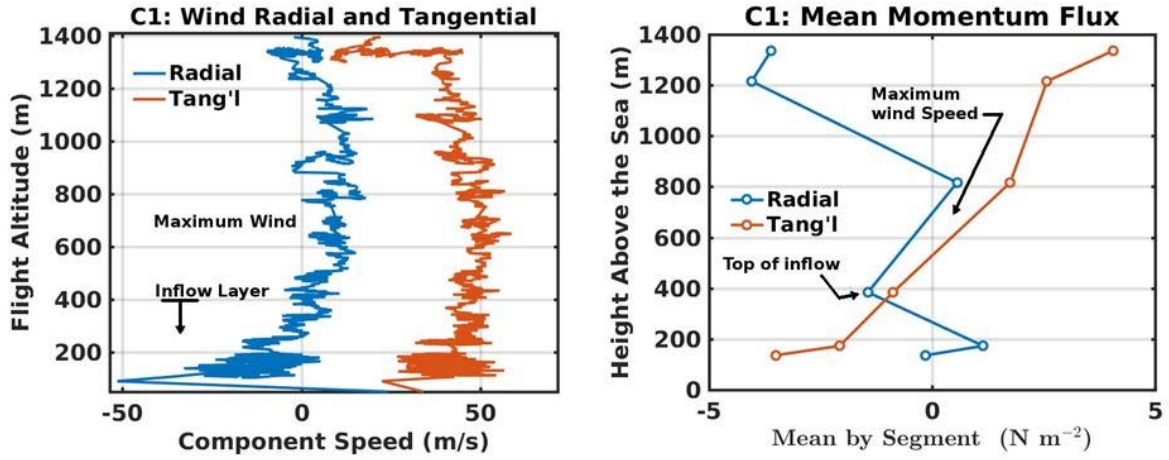
height measurements from each eMote were noted, and a warm, dry bias was found when eMote T/RH data were compared with the iMet-XQ sensors installed on the sUAS and also with the iMet-XQ2 sensors installed on the tethersonde.

We received a set of 10 F-TUTNA.44L2 fast-response T/RH sensors from UPSI in France, which we will use on the new BlackSwift S2 sUAS. Custom-designed for ATDD, these sensors feature a smaller footprint and an integrated fast-response temperature sensor to complement the existing fast-response RH sensor.

We built interface cables and developed 3-D printed housings to enable sensor testing against an eddy covariance flux station in the same environment wherein the aircraft will fly, performing tests in the back of a pickup truck driven at 15 m/s (the flight speed of the BlackSwift S2 aircraft). (ed.dumas@noaa.gov, T. Lee, M. Buban, B. Baker)

14. First Coarse Estimate of Momentum Flux by Eddy Covariance Down to Below 200 m in a Major Hurricane

ATDD staff are among the members of a team, led by Joe Cione of NOAA's Hurricane Research Division, which achieved the first high-rate measurements from a drone in controlled flight below 200 m above the sea in the eyewall of a major hurricane. We launched six Raytheon Coyote drones into Hurricane Maria from one of NOAA's P3 "hurricane hunter" aircraft, achieving sample rates of 2 s^{-1}. Gijs DeBoor of NOAA's Cooperative Institute for Research in Environmental Sciences estimated the vertical wind from the Coyotes' true airspeed and navigation parameters, and Ron Dobosy presented momentum fluxes derived from these data at the 33rd AMS Conference on Hurricanes and Tropical Meteorology. Lack of a gust probe made the estimate coarse. Although we have not yet estimated the uncertainty, the derived momentum-flux profile matches encouragingly well with the horizontal-wind profile. (ron.dobosy@noaa.gov, E. Dumas)



The figures above show the wind and flux components radial (outward) and tangential to the hurricane. Computed momentum flux below 200 m is a drag on both the inflow (negative radial) and the tangential flow. The radial flux has opposite sign at 400 m (the top of the inflow), a drag on the outflow above. At maximum wind (~ 700 m), the momentum flux is near zero, as expected. Thus, at least the qualitative relation expected between the wind and the momentum flux in a hurricane is found in these data.

15. Consequence Assessment for the Nevada National Security Site (NNSS)

James Wood, Rick Lantrip, and Walt Schalk participated in two emergency response training exercises as the Consequence Assessment Team (CAT) for the NNSA Nevada Field Office (NFO). The event consisted of two field exercises that occurred on the NNSS. Participants discussed activities to be conducted, provided local weather data and weather forecasts, and generated dispersion products based on the worst-case event information provided for the scenario. In addition, the CAT worked with field measurement teams to help identify/locate the plume. Events were conducted with the DOE/NNSA/NFO Emergency Response Organization, including development of dispersion and consequence assessment products for use during exercise play as "ground truth." Routine training and practice are required to maintain consequence assessment qualifications and expertise. (rick.lantrip@noaa.gov, james.s.wood@noaa.gov, walter.w.schalk@noaa.gov)

16. Special Operations & Research Division (SORD) Mesonet

SORD continues to look at ways to improve the SORD/NNSS mesonet. As we begin our third year with the current system, we have identified several areas of improvement. 3D sonic anemometers, precipitation gauges that record snow and snow depth, and a LIDAR are at the top of the list of improvements. Ongoing activities include continued installation of static dissipaters to help prevent scrambling of the wind sonic programming and wiring repair at several sites due to chewing critters.

Walt Schalk completed the annual mesonet data processing and distributed the information for use in annual compliance reporting activities and the annual Site Environmental Report.

Lightning Detection System: We received the equipment and software necessary for the system upgrade and expansion. Next steps include a site visit to determine the best location for the new sensor and waiting for our new hires to arrive before training and upgrades occur.

3D Sonic Anemometers: A couple of sensors had issues this quarter, but Rick Lantrip and Wayne Bailey were able to reset them without having to lower the tower. SORD is installing static dissipaters at trouble prone sites in an attempt to reduce the program scrambling issues. The plan is to install dissipaters at all of the sites. (walter.w.schalk@noaa.gov, james.s.wood@noaa.gov, rick.lantrip@noaa.gov)

17. Support to Department of Energy (DOE)/National Nuclear Security Administration (NNSA) NNSS Projects and Experiments

Walt Schalk participated in several planning meetings in preparation for Phase II of non-proliferation experiments [Source Physics Experiments (SPE) – Phase I, Dry Alluvium Geology (DAG) – Phase II]. Discussions continue with Los Alamos scientists to determine collaborative and support areas, especially in the area of using balloons to elevate instrument platforms. There will be at least one balloon launch for the first experiment in the DAG series. Practice runs were conducted with the new mobile upper air system. These activities will continue to evolve over the fiscal year.

James Wood and Rick Lantrip provided specific point forecasts for the DAG experiment set-up and participated in the daily Plan of the Day meetings providing the forecast and answering questions. Lightning and winds were particular items of interest. The experiment is scheduled to take place on the NNSS in July.

Walt Schalk continues to develop a portable micro-net of weather stations and a portable wind set package to support experiments, such as the SPE, on the NNSS. A micro-net station was set-up to support the DAG experiments and has been collecting data for several months.

Walt Schalk continues to meet with NFO contractor personnel on a monthly basis to discuss NNSS efforts to complete the vulnerability screening activity for the mandated Site Sustainability Project – Climate Resiliency. (walter.w.schalk@noaa.gov, james.s.wood@noaa.gov, rick.lantrip@noaa.gov)

18. Forecasting A Continuum of Environmental Threats (FACETs)

Alice Crawford attended the FACETs working group meeting at the Severe Storms National Laboratory in Norman, Oklahoma, April 10-12. Participants observed forecasters testing new tools to create probabilistic hazard information, or PHI, for end users in the hazardous weather testbed. They also took part in creating a FACETs Maturity Assessment Matrix to assess the maturity of probabilistic hazard information in their program. (alice.crawford@noaa.gov)

ATMOSPHERIC CHEMISTRY AND DEPOSITION

19. Ozone Water-Land Environmental Transition Study 2 (OWLETS-2)

In June 2018, Paul Kelley, Xinrong Ren, Winston Luke and Mark Cohen were involved in OWLETS-2, a NASA-led study examining the roles played by chemistry and meteorology in controlling levels of photochemical ozone and fine particulate pollution across the water land transition zone around the Northern Chesapeake Bay. Xinrong Ren was involved in research flights over Baltimore, the upper portion of the Chesapeake Bay, and the Eastern Shore to capture horizontal and vertical gradient ozone and its precursors. Paul Kelley, Xinrong Ren, and Winston Luke deployed in situ trace gas instrumentation (O3, CO, SO2, NO, NO2, NOY, CO2, CH4, and Hg0) at a monitoring site on the Hart-Miller Island, approximately 10 miles east of Baltimore's Inner Harbor. Weekly maintenance was performed to ensure the quality of the data collected. The project officially ran for a month from June 6 to July 7, but the measurements at the Hart-Miller Island were extended for about one month to catch possible pollution events for the rest of the summer.

During OWLETS-2, Mark Cohen developed forecast products for the Baltimore-Washington region for OWLETS-2, to inform flight planning of research aircraft, deployment of mobile sampling platforms (boats, automobiles), and preparation of special sampling programs at ground sites (e.g., ozonesonde launches, etc.). The product was nominally produced four times per day, and was based on the NOAA North American Mesoscale Forecast System 4 km 48 hour forecast. Each PDF file contained an explanatory cover page and 47 hourly forecast pages. The graphics and other post-processing were being done with the NOAA HYSPLIT model. The product was

also being made available to study participants through a Google Group to which emails containing a link to each new product were automatically sent as soon as it was posted. (xinrong.ren@noaa.gov)

20. National Atmospheric Deposition Program (NADP)

Winston Luke attended the NADP's spring 2018 meeting from April 9-12 in Milwaukee, Wisconsin. The NADP was initiated in 1977 to monitor the atmospheric input of pollutants and other ecologically significant chemicals to terrestrial and aquatic ecosystems (e.g. atmospheric deposition) on a nationwide scale, and is now supported by over 100 federal and non-federal agencies and other organizations. Five NADP networks comprise over 400 environmental monitoring sites for atmospheric deposition across the United States.

The NADP Program Office and Central Analytical Lab were located at the University of Illinois for 40 years. Effective June 1, these facilities were transferred to the University of Wisconsin's State Laboratory of Hygiene in Madison, WI. This undertaking was a massive effort, and the spring meeting focused on operational and organizational details of this transfer, as well as scientific and technical issues and findings related to network operations and observations. (winston.luke@noaa.gov)

21. Clean Air Status and Trends Network (CASTNET)

On April 24-25, 2018, Winston Luke attended a CASTNET meeting in Washington, DC, focused on emerging scientific and technical issues related to network operations and observational results. During the meeting, Dr. Luke presented an overview of NOAA research and monitoring efforts that complement and support CASTNET objectives. (winston.luke@noaa.gov)

22. Pandora Spectrometer

On April 20, Drs. Robert Swap and Nader Abuhassan from NASA's Goddard Space Flight Center installed a Pandora spectrometer on the roof platform at the NOAA Center for Weather and Climate Prediction (NCWCP). Pandora tracks the Sun and Moon to collect light through the total atmospheric column, at wavelengths between 291nm and 523nm, to measure the column abundances of formaldehyde, ozone (O_3), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). The Pandora instrument will remain at NCWCP indefinitely for comparisons with ARL's in situ measurements (of NO_2, O_3, and SO_2), and to form a mesonet of similar column-abundance measurement systems installed by NASA scientists around the Washington metropolitan area. Operations of the spectrometer are overseen by Drs. Xinrong Ren and Winston Luke, who were assisted in April by Mr. Owen Parker of the City College of New York; a visiting intern under the NOAA Cooperative Remote Sensing Science & Technology Center Scholarship program. (winston.luke@noaa.gov)

23. Delaware National Estuarine Research Reserve (DNERR) Field Study

Drs. LaToya Myles, Rick Saylor and Nebila Lichiheb, along with Mark Heuer, Simone Klemenz and Dave Senn, joined scientists from the NOAA Beaufort Laboratory, University of Delaware and DNERR for a field study that began on June 18. This study took place at the DNERR St. Jones Reserve, a 700-acre sanctuary. The team collected air, water, vegetation, and sediment samples

to determine cycling of ammonia, carbon dioxide, methane, and other gases in the coastal marsh environment. The goal of the study is to improve understanding of the processes that influence atmospheric gas exchange in coastal wetlands. (latoya.myles@noaa.gov)

24. National Air Quality Forecasting Capability (NAQFC)

ARL's air chemistry team has been recommending and implementation testing NAQFC for its operational deployment by the National Centers for Environmental Prediction (NCEP) since the capacity's inception in 2003. The team's recommendation encompassed the entire system from model configuration, physics and chemical package selection, emission projection for forecasting application, and performance metrics definition. Operational deployment on May 1, 2018 marked the culmination of a long-invested effort to upgrade NAQFC's anthropogenic emission inventory (e.g. a scientific record of pollutant emissions from man-made activities) from the U.S. Environmental Protection Agency's (U.S. EPA) 2011 base-year data to one based on 2014. This significant upgrade included substantial increases in pollutant categorizations stemming from the advancement of science and resulting new areas of emphasis in several industries, such as new industrial pollutants from the fracking industry. In addition to the oil and gas industry, there were new areas of emphasis in marine transportation. Implementation testing concluded that the 2014 base year data (data gathered through summer 2017) is performing well and is more accurate due to the inclusion of recent actual measurements and quality-controlled data from U.S. EPA. NAQFC's major clients, air quality forecasters, have expressed satisfaction with the upgrade both verbally and in writing. (pius.lee@noaa.gov)

CLIMATE OBSERVATIONS AND ANALYSES

25. U.S. Climate Reference Network (USCRN)

CRN crews visited 42 sites; performing 41 annual maintenance visits and one unscheduled maintenance visit. (mark.e.hall@noaa.gov)

In April, May, and June, the National Centers for Environmental Information (NCEI) retrieved 42 data files from USCRN sites through the server ftp.atdd.noaa.gov. Data are passed to NCEI by this path when retrieved episodically by ATDD from individual site visits to fill data gaps. This data is maintained in the Integrated Station Information System (ISIS) database on NCEI'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)

26. Local Meteorological Support

Data reduction for April, May, and June was completed without problems. The monthly data for these three months were entered into WxCoder and submitted. (lynne.satterfield@noaa.gov)

ARL 3rd Quarter Publications

Wang, J., P. Bhattacharjee, **V. Tallapragada**, C.-H. Lu, **S. Kondragunta**, A. Da Silva, X. Zhang, S.-P. Chen, S.-W. Wei, A. S. Darmenov, **J. McQueen**, **P. Lee**, P. Koner, and A. Harris (2018). The implementation of NEMS GFS Aerosol Component (NGAC) version 2.0 for global multispecies forecasting at NOAA/NCEP – Part I: Model description. Geosci. Model Dev., 11, 2315–2332, https://doi.org/10.5194/gmd-11-2315-2018

Zhao, Q., Ren, Y. & **Wang, J.X.L.** (2018). Temporal and spatial characteristics of potential energy anomaly in Lake Taihu. Environ Sci Pollut Res, 1-10, https://doi.org/10.1007/s11356-018-2204-y

Hicks, B.B., **Pendergrass, W.R.**, Baker, B.D., **Saylor, R.D.** et al. (2018). On the Relevance of ln(z0/z0T)=kB−1. Boundary-Layer Meteorol, 167: 285, https://doi.org/10.1007/s10546-017-0322-6

Qiaohua Zhao, Jing Wang, Jianjian Wang, **Julian X.L. Wang** (2018). Seasonal dependency of controlling factors on the phytoplankton production in Taihu Lake, China. Journal of Environmental Sciences. https://doi.org/10.1016/j.jes.2018.05.010

Wang, F., Li, Z., Ren, X., Jiang, Q., He, H., Dickerson, R. R., Dong, X., and Lv, F.: Vertical distributions of aerosol optical properties during the spring 2016 ARIAs airborne campaign in the North China Plain, Atmos. Chem. Phys., 18, 8995-9010, https://doi.org/10.5194/acp-18-8995-2018, 2018.

McLagan, D. S., Mitchell, C. P. J., Steffen, A., Hung, H., Shin, C., Stupple, G. W., Olson, M. L., **Luke, W. T.**, Kelley, P., Howard, D., Edwards, G. C., Nelson, P. F., Xiao, H., Sheu, G.-R., Dreyer, A., Huang, H., Abdul Hussain, B., Lei, Y. D., Tavshunsky, I., and Wania, F.: Global evaluation and calibration of a passive air sampler for gaseous mercury, Atmos. Chem. Phys., 18, 5905-5919, https://doi.org/10.5194/acp-18-5905-2018, 2018.

Fong Ngan, **Ariel Stein**, **Dennis Finn**, **Richard Eckman** (2018). Dispersion simulations using HYSPLIT for the Sagebrush Tracer Experiment, Atmospheric Environment, 186, 18-31. https://doi.org/10.1016/j.atmosenv.2018.05.012

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Finn, D, **Carter, R.G.**, **Eckman, R.M.**, **Rich, J.D.**, & Gao, Zhongming & Liu, H. (2018). Plume Dispersion in Low-Wind-Speed Conditions During Project Sagebrush Phase 2, with Emphasis on Concentration Variability. Boundary-Layer Meteorology. https://doi.org/10.1007/s10546-018-0360-8.

Salmon, O. E., Shepson, P. B., Ren, X., He, H., Hall, D. L., Dickerson, R. R., et al (2018). Top-down estimates of NOx and CO emissions from Washington, D.C.- Baltimore during the

WINTER campaign. Journal of Geophysical Research: Atmospheres, 123. https://doi.org/10.1029/2018JD028539

Kim, H.C.; Lee, S.-M.; Chai, T.; Ngan, F.; Pan, L.; **Lee, P.** A Conservative Downscaling of Satellite-Detected Chemical Compositions: NO2 Column Densities of OMI, GOME-2, and CMAQ. Remote Sens. 2018, 10, 1001. https://doi.org/10.3390/rs10071001

Conference Presentations & Invited Talks

Two ARL Staff Served as Speakers in the Second Earth Day Symposium at UMBC: Dr. Pius Lee started a series of 14 invited talks for the Second Annual Earth Day Symposium at the University of Maryland, Baltimore County, with a talk titled, "Challenge of air quality forecasting for Baltimore and coastal places downwind of large emissions." There exist distinct trends in emission composition and flux-rates in the Washington and Baltimore region in the past four decades. Pius shared that one of the obvious trends was the reduction in mass-flux in sulfur and nitrogen oxides that contributed to chemical regime changes shifting away from an urban polluted environment to a nitrogen-dioxide-limited suburban-type regime for the Washington-Baltimore region. Source-receptor relationships in the region showed the regional characteristics of the pollution episodes in the region. Pius highlighted the necessity for a regional approach to remedy/resolve the occasional air quality poor conditions there.

Dr. Chris Loughner also gave a talk on air quality in the region and beyond, titled "Impact of historical air pollution emission reductions on human health during extreme heat." It focused on the strong dependence of poor air quality on ambient temperatures and heat-wave association of poor air quality condition jeopardizing the health of sensitive populations. Chris' climatological analysis of these relationships on human health exposure provided insight on trends and thresholds of recent past events in areas such as the Washington-Baltimore region.

The Annual Earth Day Symposium is an initiative by UMBC to promote data sharing and research collaboration among UMBC and governmental of non-governmental institutions in earth science disciplines. It also encourages graduate students in UMBC to use the symposium to broaden their knowledge in the earth sciences to refine their research and dissertations. (pius.lee@noaa.gov, christopher.loughner@noaa.gov)

33rd American Meteorological Society (AMS) Conference on Agricultural and Forest Meteorology: Bai Yang attended this conference in Boise, Idaho, in May. He presented a poster entitled "Assessment of Surface Flux Parameterizations in Weather Research and Forecasting (WRF) Using Eddy Covariance Measurements" which describes recent efforts to investigate the air-surface exchange parameterizations in the WRF model using observations from flux stations. (bai.yang@noaa.gov)

33rd AMS Conference on Hurricanes and Tropical Meteorology: Ron Dobosy presented at this conference in Ponte Vedra, Florida, in April 2018. *(See item 14 above)* (ron.dobosy@noaa.gov)

ARL/Geophysical Fluid Dynamics Laboratory (GFDL) Collaboration: Dr. Rick Saylor (ATDD) and Barry Baker (HQ) visited with scientists at NOAA's GFDL in Princeton, New Jersey, on June 21-22. Dr. Saylor presented a seminar entitled, "Surface-Atmosphere Exchange: Beyond Emissions and Deposition" outlining recent research activities and suggesting potential areas of collaboration between ARL and GFDL. Follow-on discussions identified several topics in surface-atmosphere exchange and land surface modeling that will be explored over the coming months. (rick.saylor@noaa.gov, barry.baker@noaa.gov)

52nd Canadian Meteorological and Oceanographic Society Congress: John Kochendorfer co-authored three papers presented at this event, held in Halifax, Nova Scotia, in June 2018. "The testing and development of transfer functions for tipping-bucket precipitation gauges in WMO-SPICE," "WMO-SPICE: overview, methods, and Canadian perspective," and "Post-SPICE transfer function validation."

- Kochendorfer, J., M.. Earle, A. Reverdin, Y.A. Roulet, R. Nitu, R. Rasmussen, S. Landolt, S. Buisan, D. Hodyss, T. Laine (2018). The testing and development of transfer functions for tipping-bucket precipitation gauges in WMO-SPICE.
- Earle, M., J. Hoover, C. Smith, J. Kochendorfer, H. Mouradian, S. Pinzariu (2018). WMO-SPICE: overview, methods, and Canadian perspective.
- Smith C. D. , A. Ross , J. Kochendorfer , M.E. Earle, M. Wolff , T. Laine , S. Buisan, Y.A. Roulet (2018). Post-SPICE transfer function validation. (john.kochendorfer@noaa.gov)

Other

DOE Meteorological Coordinating Council (DMCC) Activities: Walt Schalk prepared/finalized the agenda for and ran the annual meeting held in Albuquerque, New Mexico in May during DOE's Emergency Management Issues – Special Interest Group Conference. The meeting consisted of a round robin update of program status of those present, a discussion on the path forward with the new DOE Order and the development of new Criteria Review and Approach Documents, recent DMCC activities and projects, and site met program discussions. Several site representatives attended the meeting for the first time. (walter.w.schalk@noaa.gov)

ARL/SORD Site Tour: Walt Schalk and James Wood provided tours to about 15 to 20 people, consisting of DOE National Laboratory scientists and Department of Defense representatives, in April and May. (walter.w.schalk@noaa.gov)

SORD Website: Work continues to add improvements, updates and new capabilities to the website. Caleb Steele added "Quick Look" graphics to our NNSS forecast page as well as a mesonet data table display for internal use. The web address is www.sord.nv.doe.gov. (walter.w.schalk@noaa.gov)