NOAA Air Resources Laboratory

Quarterly Activity Report

FY2018 Quarter 1 (October-November-December 2017)

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DISPERSION AND BOUNDARY LAYER

1. Review of MELCOR Accident Consequence Code System (MACCS) / HYSPLIT Development

Two scientists from Sandia National Laboratories (SNL) and one from the Nuclear Regulatory Commission (NRC) visited ARL Headquarters in October to provide a progress update and discuss any remaining issues regarding integrating the MACCS (http://maccs.sandia.gov/maccs.aspx) with the HYSPLIT model. Developed at SNL for the NRC, MACCS is a fully integrated, engineering-level computer code developed to analyze the off-site consequences of an accidental atmospheric release of radioactive material. SNL is tasked with incorporating the HYSPLIT dispersion model into the MACCS software to improve the dispersion calculations, which are currently using a simplistic Gaussian plume model. This collaboration is part of the HYSPLIT support that ARL provides to the NRC under a recently approved memorandum of understanding between the two offices. (glenn.rolph@noaa.gov, ariel.stein@noaa.gov)

2. Weather Research and Forecasting Model (WRF) Capability in READY

The WRF/Advanced Research WRF (ARW) meteorological model was configured to run through a web interface on READY for any location selected by the user and create a HYSPLIT-compatible meteorological file. Currently, the system is designed to create two domains, both with six hours of spinup and nine hours of forecast: a continental United States domain at 27 kilometers and a user-defined domain at 9 km. For boundary conditions, WRF utilizes the AWRF archive (27 km) for the years 1980 through 2016 and North American Regional Reanalysis (NARR) data for the current year. The NARR data, which is only updated once per month, comes from the research data archive at the National Center for Atmospheric Research/University Corporation for Atmospheric Research. The next steps are to initialize WRF with current Global Forecast System (GFS) data to allow WRF forecasts in real-time and to create scripts that will allow registered users to run HYSPLIT utilizing the WRF high resolution meteorological data through the READY website. (glenn.rolph@noaa.gov)

3. Upgraded HYSPLIT Code Delivered to the National Centers for Environmental Prediction (NCEP)

Barbara Stunder delivered revised code to NCEP Central Operations for planned implementation in May 2018. The HYSPLIT transport and dispersion model itself had no significant changes. The main modifications with this release included changes in the programs that convert NCEP meteorological model output to HYSPLIT-format: High-Resolution Rapid Refresh (HRRR) three km, hybrid-level was added; RAPid Refresh 20 km, pressure-level was removed; and the half-degree hybrid-level GFS was changed to

quarter-degree. The higher resolution meteorology drivers provide the opportunity for improved dispersion modeling in some meteorological situations. Also added was an option to use the Ganser fall velocity algorithm for NCEP HYSPLIT volcanic ash dispersion runs, which may improve model results when it is suspected that an eruption consists of mostly relatively large ash particles. (barbara.stunder@noaa.gov)

4. HYSPLIT Development Team Presented with 2017 NOAA Technology Transfer Award

On November 14, 2017, Glenn Rolph, Ariel Stein, Barbara Stunder, Mark Cohen, and Roland Draxler (retired) were presented with a 2017 NOAA Technology Transfer Award. The team received this accolade for their exceptional work in transferring the HYSPLIT dispersion model to first responders, emergency planners, academia, and other government agencies. (glenn.rolph@noaa.gov, A. Stein, B. Stunder, M. Cohen)

5. Project Sagebrush

The draft manuscript “Plume Dispersion in Low Wind Speed Conditions during Project Sagebrush Phase 2 with Emphasis on Measurement Uncertainties” was submitted to Boundary Layer Meteorology early in the quarter. Initial reviews are still pending. The emphasis of the paper is on the large uncertainties in tracer measurements in the very stable boundary layer and the significance of that with respect to plume modeling.

Bruce Hicks is lead author on a pair of manuscripts that were submitted as companion papers to the Journal of the Atmospheric Sciences early in the quarter. These utilized data from measurements on the Idaho National Laboratory (INL) to examine (1) contributions to turbulence events at the surface from mechanisms aloft and (2) the limitations of Monin-Obukhov similarity theory, particularly in the stable boundary layer. Initial reviews are still pending.

A manuscript analyzing wind direction changes in the very stable boundary layer is presently being drafted. It is based upon results from Project Sagebrush Phase 2. (dennis.finn@noaa.gov)

6. Birch Creek Valley Wind Flow Study

The manuscript “HRRR Predictions of Surface Winds during a Thunderstorm Outflow Event in Complex Terrain” was rejected by the International Journal of Wildland Fire. Researchers from the Forest Service’s Missoula Fire Sciences Laboratory had lead authorship on the manuscript. Decisions on potential resubmission are under consideration. (dennis.finn@noaa.gov)

7. Proposed Tracer Study with the University of California, Riverside

FRD collaborated with the University of California, Riverside to write and submit a research proposal to the Transportation Research Board in response to the Board’s request for proposals for research to evaluate and improve dispersion models used in transportation applications. This joint proposal included a tracer study involving the deployment of FRD’s tracer samplers along roadways and the release of tracer from moving vehicles. If funding permits, some experiments may take place at more complicated roadway locations such as grade-separated intersections. (richard.eckman@noaa.gov, Dennis Finn, Roger Carter)

8. Evaluation of NOAA Forecast Models Using Data from ARL Networks

ARL is discussing a plan to use existing meteorological stations measuring surface energy fluxes to evaluate the land-surface parameterizations used in NOAA forecast models. Since the ARL divisions are widely dispersed around the country, the laboratory has flux stations deployed in many different environments. Such flux stations are uncommon relative to stations measuring more conventional meteorological variables, so ARL has unique assets available for evaluating how well the models represent energy exchanges between the surface and atmosphere. FRD can contribute to this effort with its own flux station at the INL site and its capability of installing additional temporary flux stations. (richard.eckman@noaa.gov)

9. NOAA/INL Mesonet

The fall semi-annual maintenance of all Mesonet stations was completed on time and with no issues. Testing of replacement radios for the Mesonet has continued throughout the quarter and the new radios continue to perform well. All radios in the Mesonet must be upgraded by 2019 to comply with Department of Commerce regulations. (Roger.Carter@noaa.gov, Devin.Clinger@noaa.gov, Adam.Haggerty@noaa.gov)

The automatic quality control system for the Mesonet was upgraded this quarter. This system is a set of software programs that run on the data ingest computer every time data are collected from the meteorological stations. Since the current implementation of the NOAA/INL Mesonet began operation in 1993, a meteorologist has manually

reviewed all data, setting quality flags to indicate any measurement problems. An automatic program to set certain flags in near real-time was introduced in 2010 to assist the meteorologist. The intent of the current upgrade is to improve the quality of data forwarded to outside entities (specifically, NOAA's Meteorology Assimilation Data Ingest System and the University of Utah's MesoWest) by making the near real-time quality flag setting more complete and as close as possible to the final data set. The system now completes 152 quality tests on incoming data. Manual review of the data by a meteorologist is still necessary; however, because computer algorithms cannot detect all of the issues that arise, such as from instrument malfunctions. (Roger.Carter@noaa.gov, Jason.Rich@noaa.gov)

10. National Centers for Environmental Prediction (NCEP) Model Evaluation Studies

Several ARL division leaders (Ariel Stein, Rick Eckman, and Walk Schalk) held a meeting to discuss NCEP model evaluation studies being conducted by Will Pendergrass, who also participated in the discussion. (walter.w.schalk@noaa.gov)

11. 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 National Nuclear Security Administration's (NNSA) Nevada Field Office (NFO). The training was conducted on the NNSS and events consisted of two field exercises. In these events, the activities to be conducted were discussed, local weather data and weather forecasts were provided, and dispersion products were generated 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. These events were conducted with the Department of Energy (DOE)/NNSA/NFO Emergency Response Organization. Dispersion and Consequence Assessment products were developed for use during exercise play as "ground truth."

Lantrip, Wood, and Schalk also participated in a meeting with NFO contractor's Emergency Management representatives to discuss activities from the last exercise. The primary topics of discussion were the support provided by the CAT to the Field Monitoring Group, and how to improve the interaction between the two groups during exercises and the real world. Additional discussions were held to work on improving response modelling.

Routine training and practice were conducted to maintain consequence assessment qualifications and expertise. (rick.lantrip@noaa.gov, james.s.wood@noaa.gov, walter.w.schalk@noaa.gov)

12. Special Operations & Research Division (SORD) Mesonet

SORD continues to look at ways to improve the SORD/NNSS mesonet. As we complete our second year with the current system, we've identified several areas of improvement. 3D sonic anemometers and precipitation gauges that record snow are at the top of the list of improvements. Static dissipaters were purchased and continue to be installed, especially at problem-prone anemometer sites, to help prevent scrambling of the wind sonic programming. Also, the wiring at several sites was repaired due to chewing critters.

James Wood, Rick Lantrip, and Walt Schalk completed the most recent instrumentation calibration/verification cycle.

Lantrip completed updating the weather station site surveys with new pictures and information. In addition, he finished removing the large battery from the main Logger Box on the towers and installing them into a separate box on the ground. This makes the towers weigh less, which is helpful when tilting them down.

Schalk provided several processed data sets from the NNSS weather towers for use by NNSS environmental and experimental groups. He analyzed lightning data prepared by Lantrip from the NNSS SORD Lightning Detection System for a location on the NNSS and the main DOE/NNSA Campus in North Las Vegas. Isokeraunic (audible detection of thunder) data and lightning flash density were calculated and distributed to NNSS Engineers.

Lightning Detection System: The equipment and software necessary for the system upgrade and expansion was received. Next steps include a site visit to determine 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. Lantrip was able to reset one of the anemometers without having to lower the tower. The other anemometer was replaced and then sent to the manufacturer (RM Young) for repair, refurbishment, and calibration. We are also installing static dissipaters at the trouble-prone sites to potentially help reduce the program scrambling issues. The plan is to eventually install dissipaters at all of the sites. (walter.w.schalk@noaa.gov, james.s.wood@noaa.gov, rick.lantrip@noaa.gov)

13. Support to DOE/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 were conducted with Los Alamos scientists to

determine collaborative and support areas, especially in the area of using balloons to elevate instrument platforms. One meeting was for the airborne diagnostics expected to be fielded for the DAG series of SPEs next year. The purpose was to lay out all of the assets that will be fielded and to de-conflict, or prepare to de-conflict, any airspace issues. Numerous balloons, UAVs, and aircraft will be used during the experiment. These activities will continue to evolve over the fiscal year.

James Wood provided specific point forecasts for an experiment that was conducted on the NNSS in November. Wood and Schalk participated in the daily Plan of the Day meetings where the forecast was provided and any questions were answered. Lightning and winds were items of particular interest. The experiment timeline was accelerated as a result of the forecast for a significant weather system moving into the area that was expected to, and did, bring strong winds to the NNSS. The NNSS mesonet measured 15-minute averaged winds from 25-35 mph, with gusts to 50 mph, for several hours.

Schalk continues to develop a portable micro-net of weather stations and a portable wind set package to support experiments on the NNSS such as the SPE. The proof of concept station during the SPE-6 experiment was a success and greatly appreciated by the National Laboratory scientists. The main challenge is communications. Schalk met with NFO contractor personnel to discuss the NNSS's 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)

14. HYSPLIT Runs Simulating Volcanic Ash

At the request of the Washington Volcanic Ash Advisory Center (VAAC), Alice Crawford provided HYSPLIT runs simulating the eruption of Bali's Mount Agung. The model output was used to support the Darwin VAAC, which is responsible for the area where the volcano resides. (alice.crawford@noaa.gov)

15. DOE Ashfall Project Meeting

Alice Crawford attended the DOE ashfall project meeting in Richland, Washington on November 7-8, 2017. This project is a collaboration between DOE, NOAA, the United States Geological Survey (USGS), and the Desert Research Institute (DRI) to estimate concentrations of airborne ash that might be expected at DOE's Hanford site if an eruption of Mount St. Helens were to occur. (alice.crawford@noaa.gov)

16. New Conversion Programs, Datasets for HYSPLIT

Alice Crawford created an era52arl program to convert the new ERA5 reanalysis from the European Centre for Medium-Range Weather Forecasts (ECMWF)

to ARL HYSPLIT readable format. The program is now available with the HYSPLIT distribution. The ERA5 dataset will eventually span the time period from 1979 onward and provides hourly meteorological data at approximately 31 km resolution globally. Currently, only data from 2010 onward is available. This dataset will replace the ERA-Interim reanalysis. https://www.ecmwf.int/en/newsletter/147/news/era5-reanalysis-production. The era52arl program is based on the galwem2arl program and utilizes the ecCodes library (https://software.ecmwf.int/wiki/display/ECC). A python program, get_era5.py, was also created and automates the retrieval of the ERA5 grib files for conversion to ARL format. The program utilizes the ecmwfapi https://software.ecmwf.int/wiki/display/WEBAPI/Access+ECMWF+Public+Datasets and simplifies the task of choosing which data fields need to be downloaded for use by HYSPLIT. (alice.crawford@noaa.gov)

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

Data processing and quality control were performed for six Coyote flights into Hurricane Maria. In addition, ATDD assisted Joe Cione, NOAA/AOML/HRD (Atlantic Oceanographic and Meteorological Laboratory/Hurricane Research Division), with initial quality control of the Hurricane Maria data. Three of the flights were eyewall penetrations, two were gliding flights, and one was designed to measure inflow around the eyewall of the hurricane. (Ed.Dumas@noaa.gov, R. Dobosy, B. Baker)

18. NOAA/ATDD – Penguin BE sUAS

The Penguin BE fixed-wing sUAS has been at BlackSwift Technologies in Boulder, Colorado, for the duration of this quarter. A BlackSwift SwiftPilot autopilot system was installed, as well as payload instruments that included a TeAx Thermal Fusion camera that combines visible and infrared images, and a Resonon Hyperspectral camera. The aircraft was successfully test flown by BlackSwift personnel and their contractors on October 10, 2017, at Brush Airport in Brush, CO.

A training session was conducted by BlackSwift for ATDD, Aircraft Operations Center (AOC), and University of Tennessee Space Institute (UTSI) personnel to learn how to operate the Penguin BE and its payload systems. This training took place November 6-9, 2017 in Boulder, CO, and was attended by Ed Dumas, Mark Rogers (NOAA/AOML/AOC), and Steve Brooks (UTSI).

Dan Hesselius of the University of Colorado initially flew the aircraft, giving Ed Dumas instruction in performing the manual takeoff, handoff to autonomous flight, and handoff back from autonomous flight to perform the manual landing. Mark Rogers operated the ground station during all flights with help from BlackSwift personnel. The aircraft was then flown three times by Ed Dumas for pilot and instrument familiarization. Flight one

was only for pilot familiarization and was flown with a dummy payload installed. Flight two was flown with both the FLIR camera and the Resonon hyperspectral camera installed. The payload was removed for flight three, and the aircraft was flown again for pilot familiarization.

The aircraft was very underpowered and required a 600-foot takeoff roll followed by very careful control inputs to prevent stalling during climb-out. Handoff to autonomous operation was performed without problems, as was the transition back to manual control for landing. Due to the aircraft's high flying weight (20 kg), the stall speed was approximately 17 m/s and maneuvering to land required very gentle and careful control inputs. The aircraft was not stalled during any flight.

During landing approach, continuous airspeed reports were provided to the pilot by the autopilot operator. These reports are required during every flight of the aircraft. On flight three, the aircraft was slightly damaged due to having bounced after touching down at a slightly excessive speed (approximately 20 m/s as opposed to 18 m/s). At that point all flight operations ceased. Video documentation of each flight was taken by Bill Thomas of Sky High Videography and Production Studio in Boulder, CO.

Following the flights on November 8, 2017, the aircraft remained at BlackSwift and was fitted with a more powerful motor and propeller combination that now provides 12 lbs. of static thrust (versus the original eight lbs. of static thrust). The addition of the larger motor and new propeller should improve the takeoff performance significantly. However, because the gross weight of the aircraft has not changed, the stall speed will remain the same and the aircraft will still require the utmost care when it is being flown under manual control for takeoff and landing. The aircraft has not been flown since the November training session. (Ed.Dumas@noaa.gov, T. Lee, M. Buban, B. Baker)

ATMOSPHERIC CHEMISTRY AND DEPOSITION

19. MOtor Vehicle Emission Simulator, Year 2014 Version a (Moves2014a) Testing

Youhua Tang processed the Moves2014a mobile emissions for National Air Quality Forecast Capability (NAQFC) in the contiguous U.S. domain and tested its impact. The new mobile emission tended to increase the ozone high bias, so NAQFC management decided to defer its implementation until the performance issue is resolved. (youhua.tang@noaa.gov)

20. Community Air Quality Multi-scale Model (CMAQ) Testing

Youhua Tang tested the latest version of CMAQ (version 5.2) with its carbon bond 6 chemical mechanisms and found that its ozone high bias is even worse. Further study and tuning is required for this issue. (youhua.tang@noaa.gov)

21. Mauna Loa Observatory (MLO) Visit

Paul Kelly, Xinrong Ren, and Winston Luke visited the NOAA MLO in November 2017. The mercury detection equipment at the site was repaired, calibrated, and improved. A special calibration study was conducted, with the goal of improving the accuracy and robustness of measurements of gaseous oxidized mercury. The current measurement methodology for gaseous oxidized mercury suffers from artifacts and biases, which can be especially severe in humid environments. The current research activity at MLO may improve the overall quality of atmospheric mercury measurements. (xinrong.ren@noaa.gov)

22. Atmospheric Mercury Modeling

Mark Cohen completed the report Modeling Atmospheric Mercury Deposition to the Great Lakes: Analysis for 2011, a final technical report for work conducted with FY2014-2015 funding from the Great Lakes Restoration Initiative (GLRI). The analysis described in the report estimates the amount and source-attribution for mercury deposition to the Great Lakes for 2011 using HYSPLIT-Hg, a special version of the NOAA HYSPLIT model developed to simulate the fate and transport of atmospheric mercury. The percentage contribution from direct anthropogenic atmospheric mercury emissions sources to total atmospheric mercury deposition to the Great Lakes ranged from ~40% for Lake Erie to ~25% for Lake Superior. If indirect contributions are included, arising from re-emissions of previously deposited emissions, anthropogenic sources likely contributed 70% or more of the atmospheric deposition to each of the Great Lakes in 2011. Model estimates indicate that U.S. emissions continue to contribute more to the Great Lakes than any other country. However, the contribution from U.S. sources has declined significantly in recent years due to decreased mercury emissions. The modeling methodology was evaluated by comparison of results with ambient measurements of mercury concentrations and deposition, including data from ARL's long-term mercury measurement sites at Beltsville (MD), Grand Bay (MS), and the Mauna Loa Observatory (HI). Despite numerous uncertainties in emissions, model physics and chemistry, and measurement data, results were encouragingly consistent with observations. As part of the overall GLRI-funded project, detailed results were provided to the NOAA National Ocean Service (NOS) Office of Response and Restoration so that the information could be included in the Environmental Management

and Response Application (ERMA) system. Work to incorporate the results into Great Lakes ERMA is ongoing. (mark.cohen@noaa.gov)

23. Improving Gaseous Oxidized Mercury (GOM) Measurements

Winston Luke, in collaboration with Paul Kelly and Xinrong Ren, developed and tested in the NCWCP laboratory a novel calibration device to support measurements of GOM species. Gaseous oxidized mercury is the most bioavailable form of atmospheric mercury, and its accurate measurement is critically important to better understanding of the global mercury cycle and its impacts upon sensitive ecosystems. However, the current measurement methodology for GOM can suffer from artifacts and biases, and characterizing these errors requires a robust calibration system. After development and testing in the laboratory, the new calibration device was installed at NOAA's MLO for field testing in November 2017. Unfortunately, numerous malfunctions in the aging instrumentation used to measure atmospheric mercury species at MLO prevented a successful test of the unit. The study was terminated two weeks early and the calibrator was returned to College Park, where testing continued. (winston.luke@noaa.gov)

24. Global Observation System for Mercury (GOS4M)

Winston Luke and Mark Cohen participated in a planning meeting for the GOS4M on October 20, 2017, along with Erica Nuñez of NOAA's Office of International Affairs. GOS4M has recently been established as a Flagship Program of the Group on Earth Observations (GEO). The meeting was convened by Nicola Pirrone [Consiglio Nazionale delle Ricerche *or National Research Council* (CNR) - Institute of Atmospheric Pollution, Rome, Italy] and William Sonntag (GEO Secretariat, Geneva, Switzerland) to discuss scientific, organizational and governance issues for the new group with key participants from around the world. Approximately 20 people attended the meeting at the U.S. Environmental Protection Agency (USEPA) in Washington D.C. (in person or remotely) from the U.S., Canada, Europe, Asia, and Russia. GOS4M will include global measurements of mercury in the atmosphere, ocean, terrestrial ecosystems, and biota. It will draw on existing measurement networks and programs and will attempt to facilitate the use of worldwide data from diverse sources using a common framework. It is anticipated that GOS4M will be useful to parties in the Minamata Convention on Mercury global treaty, as well as policy and modeling stakeholders worldwide. The GEO coordinates international efforts to build a Global Earth Observation System of Systems (GEOSS); aiming to construct a global public infrastructure for Earth observations consisting of a flexible and distributed network of systems and content providers. There are numerous programs within GEO/GEOSS but only four of the programs have been given the Flagship designation. ARL is expected to play a significant role in GOS4M given its leadership in the science of mercury modeling and measurements at its three long-term mercury measurement sites within the National

Atmospheric Deposition Program's Atmospheric Mercury Network (AMNet) (at Mauna Loa, HI, Grand Bay, MS, and Beltsville, MD). (winston.luke@noaa.gov)

25. ARL/Center for Spatial Information Science and System (CSISS) Joint Retreat

ARL's Air Chemistry and Air Quality Forecasting Group visited George Mason University's CSISS for a day-long exchange of notes and ideas. This retreat allowed the group time to brainstorming and proactively position itself for the new era of Next Generation Global Prediction System (NGGPS) planned by the National Weather Service to drive air quality forecasting by 2020. The event began with a two-hour introductory seminar by the two organizations that established recognition of complementary strengths. CSSIS has expertise in mining large data sets, such as those from satellite retrievals, to generate timely geospatial information. ARL may leverage such large data handling capability for air pollutant emission and land use data rapid refresh. (Pius.Lee@noaa.gov)

26. Results from the Air Quality Applied Science Team Program

A write-up of the scientific products of a chemical data assimilation project resulted in an article published in the Journal of Geophysical Model Development *(see ARL 4th Quarter Publications below)*. Pius Lee was the Principal Investigator of the project, called the Air Quality Applied Science Team Program, which was funded by NASA's Earth Science Program and ended in 2016. (Pius.Lee@noaa.gov)

27. Atmospheric Chemistry

In the context of NH_3 emissions in the atmosphere, the main cause of which is intensive agriculture, measurements of NH_3 fluxes above a corn canopy in central Illinois were conducted using flux-gradient (FG) and relaxed eddy accumulation (REA) measurement methods. A peer-reviewed research paper on the inter-comparison of FG and REA measurements was written to improve our understanding of temporal variability of NH_3 fluxes and enhance NH_3 emission model evaluations. (Nebila.Lichiheb@noaa.gov, R. Saylor, M. Heuer, L. Myles)

CLIMATE OBSERVATIONS AND ANALYSES

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

The USCRN staff visited 38 sites this quarter. There were 36 annual maintenance visits (AMV) and two unscheduled maintenance visits (UMV) to install new soil-moisture probes at sites in Alabama. (mark.e.hall@noaa.gov)

In October, November, and December, the National Centers for Environmental

Information (NCEI) retrieved 46 data files from USCRN sites through the server

ftp.atdd.noaa.gov. Data retrieved episodically by ATDD from individual site visits are passed to NCEI by this path to fill data gaps. Instrument characteristics for each site are maintained in the database Integrated Station Information System (ISIS) 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)

29. Local Meteorological Support

Data reduction for October, November, and December was completed without problems. The monthly data for these three months was entered into WxCoder and submitted. (lynne.satterfield@noaa.gov)

ARL 1st Quarter Publications

Tang, Y., M. Pagowski, **T. Chai**, **L. Pan**, **P. Lee**, **B. Baker**, R. Kumar, L. Delle Monache, **D. Tong**, and **H. Kim**, A Case Study of Aerosol Data Assimilation with the Community Multi-Scale Air Quality Model over the Contiguous United States using 3D-Var and Optimal Interpolation Methods, *Geosci. Model Dev*., 10, 4743–4758, 2017. (https://doi.org/10.5194/gmd-10-4743-2017)

Goldberg, D.L., L.N. Lamsal, **C.P. Loughner**, W.H. Swartz, Z.F. Lu, and D.G. Streets, A high-resolution and observationally constrained OMI NO2 satellite retrieval, Atmospheric Chemistry and Physics, 17, 11403-11421, 2017. (https://doi.org/10.5194/acp-17-11403-2017)

A NOAA Technical Memorandum (OAR ARL-277) was written to document the flights made by the DJI S-1000 and MD4-1000 in Land-Atmosphere Feedback Experiment (LAFE) 2017 and was published on November 29, 2017. The document is available here: ftp://ftp.library.noaa.gov/noaa_documents.lib/OAR/ARL/TM_OAR_ARL/TM_OAR_ARL_277.pdf

A NOAA Technical Memorandum was written to document the flights made by the DJI S-1000 during the Great American Eclipse of 2017. It is currently in the process of being published. (Ed.Dumas@noaa.gov, T. Lee, M. Buban, B. Baker)

Conference Presentations & Invited Talks

Youhua Tang attended the 16th Annual Community Modeling and Assessment System (CMAS) Conference in Chapel Hill, North Carolina (October 23-25, 2017, https://www.cmascenter.org/conference/2017/agenda.cfm) and presented our results of using the Goddard Earth Observing System Model, Version 5 (GEOS-5) chemical lateral boundary condition in CMAQ. It can improve the forecast capability for pollutant intrusion events in NAQFC. (youhua.tang@noaa.gov)

Alice Crawford presented the University of Maryland's Atmospheric and Oceanic Science Departmental Seminar on November 30, 2017. Her talk was titled, HYSPLIT: Modeling the Transport and Dispersion of Atmospheric Tracers. (alice.crawford@noaa.gov)

Mark Cohen presented a NOAA NOS Science Seminar on October 24, 2017 titled, "Mercury in the Great Lakes: Can We Explain Trends?" (Available as a PowerPoint presentation and PDF file). (mark.cohen@noaa.gov)

Ariel Stein and Chris Loughner attended the CO2 Urban Synthesis and Analysis (CO2-USA) Workshop November 6-7, 2017 at the National Institute of Standards and Technology (NIST). Stein led a discussion session on the future of atmospheric modeling. The need for future model improvements to reduce model bias, new model evaluation datasets, and a better understanding of model uncertainty were discussed. Chris Loughner presented his current work of enhancing the HYSPLIT modeling system by adding new modeling schemes and providing new datasets and benchmark model simulations for model evaluation. (christopher.loughner@noaa.gov)

The Maryland Department of the Environment (MDE) and the Ozone Water Land Environmental Transition Study (OWLETS) science team held the OWLETS Science Team and Planning Meeting in Baltimore, MD, from October 17-19, 2017. NASA sponsored an OWLETS campaign over the Chesapeake Bay near Hampton, VA, in July 2017 and MDE is interested in sponsoring a sequel campaign (OWLETS-2) over the Baltimore region in summer 2018. Chris Loughner, Xinrong Ren, Barry Baker, and Pius Lee were invited to participate to explore possibility of ARL joining this campaign. The group gave three presentations: Air quality modeling, bay breeze, nitrogen deposition (Loughner), Operational forecasting from NOAA ARL (Baker and Lee), and Airborne air quality and greenhouse gas measurements (Ren). They also discussed possible collaboration on both modeling and measurements. (christopher.loughner@noaa.gov)

Rick Saylor and Nebila Lichiheb attended the 2017 National Atmospheric Deposition Program Fall Meeting in San Diego, CA, from October 30 - November 2, 2017. Dr. Saylor presented a poster titled, "The Atmospheric Chemistry and Canopy Exchange Simulation System for Ammonia (ACCESS-NH3): Formulation and Application to a Corn

Canopy" and Dr. Lichiheb presented a poster titled, "Evaluation of Ammonia Air-Surface Exchange at the Field Scale: Improvement of Soil and Stomatal Emission Potential Parameterizations." For more information contact either Rick Saylor (Rick.Saylor@noaa.gov) or Nebila Lichiheb (Nebila.Lichiheb@noaa.gov).

Ron Dobosy presented, "Six Controversial Climate Questions through a Science Filter: The Devil is in the Details" to the Oak Ridge, TN, Kiwanis Club in November. (Ron.Dobosy@noaa.gov)

On November 13, 2017, Dr. Ariel Stein participated in the Urban Dispersion Virtual Workshop: Designing the Next Generation Urban Dispersion Field Programs. The main objective of the workshop was to design and execute the next generation of Urban Dispersion field programs to address emergency response needs. (ariel.stein@noaa.gov)

Drs. Ariel Stein and Pius Lee presented work progress to a dozen program reviewers of the National Air Quality Forecasting Capability (NAQFC), who confer annually to evaluate progress and contribute direction for the NAQFC forecasting service. ARL has been the primary NAQFC developer since the NAQFC's inception in 2003; providing cutting-edge modeling science and software development for the forecast modeling system. ARL leverages advancements in air chemistry, meteorology, emission, and evaluation disciplines from other NOAA laboratories, federal institutions, and the academia to ensure adoption of the best science, computation efficiency and accuracy for the NAQFC. New emphasis of the next era regional air chemistry model that forms the center piece of NAQFC should play a dual role to serve both regional and global atmospheric composition models. Through the one and a half decade long NAQFC development responsibility, ARL has accumulated a wealth of knowledge on air composition characteristics over the U.S. The reviewers encouraged that this knowledge could be integrated into the NOAA global air chemistry and climate influence sciences, and also encouraged ARL strengthen its involvement in the development of the Next Generation Global Prediction System (NGGPS). (ariel.stein@noaa.gov, P. Lee)

Presentations at the 2017 American Geophysical Union (AGU) Fall Meeting

Bruce Baker had an oral presentation on "Evaluation of Unmanned Aircraft Systems for Weather and Climate using the Multi-testbed Approach" in a session on Use of Unmanned Aerial Systems in Atmospheric Science. (Bruce.Baker@noaa.gov)

Bruce Baker and Howard Diamond presented a poster entitled, "Climate Observing Systems: Where are we and Where do we Need to be in the Future" in a session titled Planning the Climate Observing System of the Future. (Bruce.Baker@noaa.gov)

Praveena Krishnan presented a poster on the Variability of soil CO2 efflux in a semi-arid grassland in Arizona in the session on Past, Present, and Future of Dryland Ecosystems: Local Trends to Global Impacts II. (Praveena.Krishnan@noaa.gov)

LaToya Myles gave a presentation at the NOAA booth on atmospheric deposition of reactive nitrogen. She was also co-author on two posters: Investigating the processes of ammonia exchange between the atmosphere and a corn canopy following urea ammonium nitrate (UAN) fertilization with urease inhibitor N-(n-butyl)thiophosphoric triamide (NBPT), presented by Nebila Lichiheb [ATDD National Research Council (NRC) postdoctoral researcher], and Inter-comparison of flux-gradient and relaxed eddy accumulation for measuring NH3 flux above a corn canopy in central Illinois, USA presented by Andy Nelson [University of Illinois at Urbana-Champaign (UIUC) doctoral candidate]. She was also an invited panelist for a live webcast session on "Creating inclusive and diverse field and lab environments within the geosciences" and an invited discussion leader for a workshop on "Strategies for attracting and advancing a diverse geoscience workforce." (latoya.myles@noaa.gov)

Outreach & Engagement

Winter Safety Forum

Jason Rich gave a presentation on the NOAA INL Weather Center web page and upcoming winter forecast at an INL Winter Safety Forum. Held at the Idaho Nuclear Technology and Engineering Center (INTEC) on November 15, 2017, the forum was designed to discuss safety preparations for keeping the site and employees safe during the upcoming winter. Officials from the Department of Energy and each of the INL contractors participated in the meeting. (Jason.Rich@noaa.gov)

Senior Project

Meteorologist Jason Rich and Research Meteorologist Dennis Finn participated in the Skyline High School Senior Project with student Daniel Brown. FRD employees introduced Daniel to forecasting, research projects, and the benefits of working for the government, which was part of his senior project. Jason Rich also took Daniel to the nearby Idaho Falls weather station. Brown, a senior with autism, was supervised by R.C. Phelps with Community Mental Health Services. (Dennis.Finn@noaa.gov and Jason Rich)

Training

Karen Balecha attended the Equal Employment Opportunity (EEO)/Diversity Committee training for ARL. This training helped to define the roles and responsibilities of committee members including, when necessary, to advise management on EEO-related issues. The face-to-face meeting also connected new members to the rest of the committee. Balecha also attended the Diversity & Inclusion Summit held in Silver Spring, Maryland. The summit included discussions of recruiting, retaining, and supporting the advancement of talent within the agency, as well as how to be a successful leader. (karen.balecha@noaa.gov)

Other

SORD Openings

SORD is currently filling three full-time equivalent openings; two Research Meteorologists and an Electronics Technician. The Electronics Technician position selectee continues to be processed by Human Resources (HR) with no firm start date. The Meteorologist III position selectee began to be processed by HR with no firm start date (expected Q1 CY18). The Met-III/IV position had a setback when the position selectee declined the position. Re-announcing options are under review. (walter.w.schalk@noaa.gov)

DOE Meteorological Coordinating Council (DMCC) Activities

Walt Schalk prepared and distributed pre-call notes, finalized the agenda, and conducted the DMCC conference call in November 2017. The call consisted of a round-robin update of program status by participants, a discussion on the path forward with the new DOE Order 151.1d (Comprehensive Emergency Management System), recent DMCC activities and projects, site meteorology program discussions, and some information about the upcoming 2018 DOE Emergency Management Issues – Special Interest Groups (EMI-SIG) Conference in Albuquerque, New Mexico. (walter.w.schalk@noaa.gov)

ARL/SORD Site Tour

In November, Walt Schalk and James Wood hosted two tours with about 15 attendees in each, comprised of DOE National Laboratory scientists and Department of Defense representatives. The tours, which are part of the Federal Expertise Training Program hosted by NNSA, took place at the Desert Rock Weather Observatory at the NNSS. Attendees were presented with a verbal history of the SORD program and support of the testing program, as well as an overview of SORD's current activities. Also

discussed were the numerous instrumented sites located in the immediate Desert Rock area that SORD maintains for NNSS programs [SOnic Detection And Ranging (SODAR), mesonet and lightning detection network] and hosts for a variety of NOAA Programs [Climate Reference Network, Earth System Research Laboratory (ESRL) SURFace RADiation Network (SURFRAD), ESRL global positioning system (GPS) Water Vapor soundings]. As a finale, a Pilot Balloon (PIBAL) release was demonstrated.

Walt Schalk and Rick Lantrip provided an overview of the ARL/SORD program to several new hires of the NNSA/NFO. The overview included discussions on the services provided to the NFO, as well as the observation systems operated and maintained in order to collect the required data. The meeting ended with a tour of the SORD facilities in the NFO Nevada Support Facility. (walter.w.schalk@noaa.gov)

SORD Website

Work continues to add improvements, updates, and new capabilities to the website, which can be found at www.sord.nv.doe.gov. (walter.w.schalk@noaa.gov)