NOAA Air Resources Laboratory

Quarterly Activity Report

FY2019 Quarter 3 (April-May-June 2019)

Contents:

DISPERSION AND BOUNDARY LAYER

1. Inline Weather Research and Forecasting Model (WRF)/HYSPLIT Capability in Real-time Environmental Applications and Display sYstem (READY)

The inline WRF-HYSPLIT model, developed at ARL, was configured to run through a web interface on READY for any location selected by the user to create a high-resolution dispersion simulation that takes advantage of the higher temporal frequency of the meteorological variables produced by the WRF-Advanced Research WRF (ARW) meteorological model, as well as using WRF-ARW's vertical coordinate scheme. The inline coupling approach is a more consistent depiction of the state of the atmosphere available to the dispersion model through the elimination of the need to interpolate the meteorological fields temporally and vertically. Currently, the system is designed to create four meteorological domains, with six hours of spin-up and six hours of forecast: 27 kilometers (km), 9 km, 3 km, and a 1 km domain, in which the 1 km domain is used to run the dispersion simulation. For boundary conditions, WRF uses the AWRF archive (27 km) for 1980 to the end of the last year and the North American Regional Reanalysis data from the Research Data Archive at National Center for Atmospheric Research /University Corporation for Atmospheric Research (http://rda.ucar.edu) for the current year up to the end of the last month. Current forecasts are produced for the last nine days from the current day using the Global Forecast System (GFS) forecast model for boundary conditions. (Glenn.Rolph@noaa.gov, Fantine.Ngan@noaa.gov)

2. 2019 HYSPLIT Workshop

The 2019 HYSPLIT Workshop was held during the month of June using a new format. In the past, ARL hosted a four-day workshop in College Park, Maryland, that was designed to provide the user with hands-on instruction on how to install, run, and interpret the results of the PC/Mac-based version of the HYSPLIT model. This year, the HYSPLIT workshop was not held in person or "live" via video conferencing. Instead, an agenda was created that guided the user through each section of the online training materials, with each of the four weeks focusing on several sections of the training materials (such as installation, meteorology, trajectories, dispersion, etc.). This allowed the users to learn the materials at their own pace and time. During the week, users submitted questions to the HYSPLIT Forum that were answered by HYSPLIT experts. ARL held live one-hour sessions on all Mondays in June at 4 p.m. Eastern Daylight Time (EDT) and Tuesdays at 9 a.m. EDT. During these sessions, Roland Draxler reviewed the questions that were

received during the week and gave some highlights of the material covered in that week's session, while other HYSPLIT experts responded to live questions via GoToMeeting. (glenn.rolph@noaa.gov)

3. HYSPLIT Upgrade (v7.6.0)

NOAA's National Centers for Environmental Prediction (NCEP) implemented hysplit.v7.6.0 in June 2019, coinciding with the GFS upgrade. The main features of this HYSPLIT upgrade were changes required to keep up with NCEP's GFS upgrade. They included: increasing the GFS-HYSPLIT-formatted hybrid-level file horizontal resolution to quarter-degree, adding conversion of High-Resolution Rapid Refresh native-level output to HYSPLIT-format, and adding trajectories for hypothetical volcanic eruptions in the Washington Volcanic Ash Advisory Center's area of responsibility. (barbara.stunder@noaa.gov)

4. Project Sagebrush

We continued our study on how low-level jets in the stable boundary layer affect wind direction changes of near-surface turbulent flow. The stability parameter, Richardson Number, was derived from different datasets (measurements of sonic anemometers and NOAA/Idaho National Laboratory (INL) Mesonet observations) and its control on wind direction changes was investigated under two contrasting turbulence regimes (presence of low-level jet versus no gradient of vertical wind). We also reviewed some key publications along this line and started revising and improving an early version of manuscript on this subject. (bai.yang@noaa.gov)

5. Washington State University (WSU) Project Support

As a collaborator, we continued supporting a National Science Foundation (NSF) project awarded to WSU and Boston University. Titled, "The Role of Coherent Structures in Scalar Transport over Heterogeneous Landscapes," this project will conduct atmospheric boundary layer measurements at the INL's Grid3 area this summer. We created a project safety plan, an environmental checklist (for the purpose of environmental and safety compliance), and security plans (badge application) per INL requirements so that the university researchers will be permitted to carry out their research work at the INL site. We maintained close contacts with these researchers and assisted with their project preparation, such as information on the tower (pictures, dimensions and available space), ideas on instrument setup and their mounting gears, communication capabilities for data transfer, etc. (roger.carter@noaa.gov, bai.yang@noaa.gov)

6. Idaho National Laboratory (INL) Mesonet

The previously-reported failure of the INL Mesonet's primary radio repeater was discovered to be shifting of the radio antenna's support tower from its ideal position (see photo). Repairs/replacements are required prior to resuming normal operations; hopefully within a month. Meanwhile, the spring semi-annual calibration and maintenance activities were completed before

the end of June despite challenges including a delay in receipt of calibrated parts and having only one Electronics Technician.

The U.S. Department of Energy (DOE) funded the next phase of data logger and radio upgrades following a multi-year system test where six stations operated with new radios. Phased implementation of upgrades was intended to verify equipment performance and reliability before committing the entire mesonet operation to the new equipment. Upgrades are planned this summer/fall for about half of the stations on the old system and, assuming these work well over the winter, the final phase of upgrades (all remaining stations) will be implemented next spring. These communications system upgrades significantly increase speed and capabilities, and potentially enables the connection of other types of meteorological equipment to the mesonet. (Jason.Rich@noaa.gov, Devin.Clinger@noaa.gov, Roger.Carter@noaa.gov)

7. Researcher Request for Historical Wind Data

ARL's Field Research Division (FRD) was contacted by researchers at the INL requesting wind gust data extending back to 1950. While FRD does have some historical records covering 1950 to present, not all the measurements we currently make are available and the records of what was done are sparse for some periods. Jason Rich was able to identify some summary tables for use by the requester. (Jason.Rich@noaa.gov)

8. HYRad Dispersion System

We are in the process of configuring a new HYSPLIT Radiological (HYRad) server to meet the needs of the INL. This server will provide limited, account-specific, access to HYRad and the new Viz+. During April and May, we successfully moved the HYSPLIT calculations to the new Windows server and integrated it into the HYRad system. Work is now commencing on developing a new contouring routine for the plume display. (Brad.Reese@noaa.gov, Roger.Carter@noaa.gov)

9. Emergency Operations Center (EOC) Drill

Bai Yang completed one final training, the Web EOC, in April before officially participating in a Team C EOC drill on April 23, with assistance from Jason Rich. Yang followed the checklist, developed procedures, and successfully provided the FRD supporting functionalities to this drill, which centered on a transportation accident involving a truck-bus accident on a main road at the INL. No plume projections were needed. (Jason.Rich@noaa.gov, bai.yang@noaa.gov)

10. Hazardous Weather Alert System

The NOAA/INL Weather Center issued nineteen weather alerts last quarter. Thirteen of the alerts were issued for lightning and the other seven alerts were issued for high winds. (Jason.rich@noaa.gov and bai.yang@noaa.gov)

11. Annual Site Environmental Report (ASER)

FRD participates in the generation of INL's ASER every year, and the FY18 report is being generated now. We are reviewing sections that describe FRD's activities and references to our past work. Jason Rich completed the Meteorological Monitoring Supplement to the report and Bai Yang ran additional dispersion calculations used in dose assessments that were not in the original request sent to Rick Eckman. Using the FRD Mesonet observations as meteorological drivers, Yang conducted two additional HYSPLIT model runs that simulated surface releases during 2018 for two different INL facilities – the Critical Infrastructure Test Range Complex and the Radiological Response Training Range. This task represented part of the FRD commitment and contributions to the INL Environmental Surveillance, Education, and Research Program that estimates annual radiological emissions and exposures to the public from the INL activities. (Roger.Carter@noaa.gov, Jason.Rich@noaa.gov, Bai.Yang@noaa.gov)

12. INL Weather Center Display Enhancements

A new radar/storm track display was added to the NOAA/INL Weather Center display. The display provides 30 days of historical radar and storm track data, and each days' worth of data can be displayed in five-minute increments. The radar data and storm track data can be displayed separately or together.

Work continued on the new web-based version of Viz+ that will replace the now defunct desktop version. This new version will integrate the mesonet data with radar and storm track data, provide summary data for each day, and provide a special file display. (Brad.Reese@noaa.gov)

13. Unmanned Aerial System (UAS) Program Office Support

A meteorological tower was installed at the Oliver Springs Airport in Oliver Springs, Tennessee, in early June and brought online on June 28, 2019. Testing continues to verify the integrity of the instruments before the data are made public.

A meeting was held on June 4, 2019, with representatives from Knoxville's McGhee-Tyson Airport terminal radar control facility regarding the beginning of daily profiles that will be flown using the Meteomatics small UAS (sUAS) at the Oliver Springs Airport in August 2019. The meeting was very successful and a certificate of authorization will be issued to ARL's Atmospheric Turbulence and Diffusion Division (ATDD) for daily flights up to 3,300 feet (1 km) from the Oliver Springs Airport.

Progress was made on testing the MD4-1000 Light Detection and Ranging (LiDAR) (mdLiDAR) system. A representative from Microdrones visited ATDD in June to conduct a training session and check the performance of both the MD4-1000 aircraft and the mdLiDAR system.

Planning continued for the upcoming Chequamegon Heterogeneous Ecosystem Energy-balance Study Enabled by a High-density Extensive Array of Detectors (CHEESEHEAD) experiment intensive operating periods scheduled to begin in July 2019 in Park Falls, Wisconsin. Meetings have been held with the airborne sub-group to coordinate flights made by ATDD's sUAS with those of the University of Wyoming's King Air aircraft that will also participate in the experiment. Planning for ATDD's participation in the Albuquerque International Balloon Fiesta in October 2019 also continued.

ATDD's second BlackSwift S2 was delivered in June 2019. Additional flight testing will be performed following the CHEESEHEAD and Balloon Fiesta events. (ed.dumas@noaa.gov, T. Lee, M. Buban, B. Baker)

14. Experimental HYSPLIT Products

Allison Ring and Alice Crawford developed a prototype web page which produces HYSPLIT trajectory runs based on alerts supplied by the volcanic cloud monitoring system at the National Environmental Satellite, Data, and Information Service-Cooperative Institute for Mesoscale Meteorological Studies. More information on the alerts can be found at https://volcano.ssec.wisc.edu/auth/login?redirect_to=%2F and the prototype web page with HYSPLIT trajectories can be found at https://www.ready.noaa.gov/hysplitash-bin/vaac1a.py? The web page is the one of the first steps in developing a system that will incorporate satellite information on volcanic clouds into the HYSPLIT modeling system.

Crawford extended the experimental ensemble fire-smoke HYSPLIT products from the conterminous United States to Alaska. The products can be found at https://ready.arl.noaa.gov/smoke-bin/ensmoke.py. Currently HYSPLIT operational products for the National Weather Service (NWS) are deterministic. Depending on the situation, the products may contain significant uncertainties which are not estimated or properly conveyed. Experimental HYSPLIT products are being developed which assess and communicate uncertainty in the modeled transport, dispersion and deposition of hazardous materials such as fire smoke. (alice.crawford@noaa.gov, allison.ring@noaa.gov)

15. HYSPLIT Python Graphics

HYSPLIT graphics currently produced by the READY web application are initially generated in the PostScript format by employing several FORTRAN plotting programs, then the PostScript plots are converted to image files using other software programs. Sonny Zinn rewrote the TRAJPLOT and CONCPLOT programs for plotting trajectories and concentration contours, respectively, in Python. This modernization effort will prove useful when adding new features. Well-known design patterns such as abstract factory, iterator, strategy, etc. were utilized to make code maintenance and feature additions easier. Adding a new type of vertical coordinate to the TRAJPLOT program in FORTRAN would take inspecting 16 if-blocks, or 456 lines, and making changes to some, if not all, of them. The new Python version has 3 if-blocks spanning only 46 lines, and a new vertical coordinate can be added by writing a class representing the coordinate and by changing an existing factory method; taking significantly less effort. The rewrites were carefully done to break the existing code logic into smaller, easily testable units that are typically

less than 20 lines. A total of 659 automated test cases were written for almost all of the class methods and functions, enabling unit tests to be run within a few minutes. (sonny.zinn@noaa.gov)

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

James Wood, Rick Lantrip, and Walt Schalk participated in two emergency response training exercises/drills as the Consequence Assessment Team (CAT) for the National Nuclear Security Administration (NNSA) Nevada Field Office (NFO). The activities were conducted on the NNSS and consisted of field exercises/drills that occurred there. 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 DOE/NNSA/NFO Emergency Response Organization. Dispersion and consequence assessment products were developed for use during exercise play as "ground truth". These exercises/drills simulated chemical, radiological, and transportation accidents on NNSS and at NNSS facilities.

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)

17. Special Operations and Research Division (SORD) Mesonet

SORD continued researching several areas in an attempt to improve the SORD/NNSS Mesonet. Communications, three-dimensional sonic anemometer improvements/upgrades, precipitation gauge replacement, and gauges that can better record snow, snow depth sensors, and radio communications top of the list of improvements. Sonic anemometers have to be reset on occasion.

Wayne Bailey continues to perform routine monthly maintenance and verification checks on the NNSS Mesonet. All stations have been improved to include critter-proof conduit near the ground, hose clamps to hold the conduit, and gathering and re-securing the cables to the tower. In addition, several solar panel brackets were replaced with a heavier duty bracing.

Walt Schalk and Rick Lantrip provided NNSS Mesonet data to several groups on the site for use in planning experimental and construction activities. James Wood provided monthly precipitation data to the environmental monitoring group.

Lightning Detection System: SORD continued working with its partners to install a new lightning sensor to the north, but getting information is challenging. We continued working to solidify our information technology support, and, once this occurs, Vaisala will return next quarter to upgrade the detection data processing software that will improve location accuracy and better delineate between inter-cloud and cloud-to-ground strikes. (walter.w.schalk@noaa.gov, james.s.wood@noaa.gov, rick.lantrip@noaa.gov, wayne.bailey@noaa.gov)

18. Support to U.S. DOE/National Nuclear Security Administration (NNSA) NNSS Projects and Experiments

Walt Schalk participated in several planning meetings in preparation for the third and fourth experiments in Phase II of non-proliferation experiments [Source Physics Experiments (SPE) – Phase I, Dry Alluvium Geology (DAG) – Phase II]. Discussions continue with Sandia scientists to determine collaborative and support areas, especially in the area of using balloons to elevate instrument platforms. Radiosonde releases are conducted to remain qualified.

James Wood, Rick Lantrip, and Schalk supported two non-proliferation SPE experiments on the NNSS, DAG-3 and DAG-4, in April and June, respectively. During the week of each experiment, the SORD team was on location in the field providing detailed point forecasts and weather surveillance, as well as participating in numerous experiment countdowns and practice scenarios. Due to the nature of the experiment, lightning/storm data/information and wind speeds (under five meters per second desired) were critical to the success of the experiment. A radiosonde balloon was released just after sunrise to help characterize the boundary layer environment and another balloon, released just after the experiment was executed, reached over 90,000 feet in each experiment. Both experiments were conducted on a Saturday due to Sandia's heliotrope flight restrictions. We assisted Sandia scientists with the release of their heliotrope balloons on both experiments by inflating the tow balloon. The real-time winds were close to the criteria; however, at execution time, the winds were below the desired threshold. The experiments were successful and a lot of good information was collected.

Schalk continues meeting with NFO contractor personnel monthly 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)

19. Simulations of Alaskan In-Situ Oil Burns

Mark Cohen carried out a screening analysis of particulate air pollution concentrations downwind of in-situ oil burns in Alaska using the HYSPLIT model. Prescribed oil burns are sometimes used as a response action after spills. The State of Alaska Department of Environmental Conservation requested technical assistance to estimate downwind concentrations of particulate matter less than 2.5 microns in diameter (PM2.5) so that populations will not be exposed to hazardous particulate levels. They are seeking to develop new model-based guidance, based on the PM2.5 air quality concentration threshold of 35 micrograms per cubic meter (ug/m3), to update existing guidance. The existing guidance is based on an earlier analysis based on a PM10 threshold of 150 ug/m3 (PM10 is particulate matter less than 10 microns in diameter). Example key questions include: *What distance downwind of an in-situ oil burn will the concentration of PM2.5 fall below the air quality standard? And how does this answer depend on the burn, site, and meteorological conditions?* HYSPLIT simulations were carried out for eight hypothetical North Slope and Cook Inlet oil-burn sites for four different months in 2018 (February, May, August, and November). NOAA's North American Mesoscale model outputs archived in HYSPLIT model format at ARL (12 km resolution) were used to drive the HYSPLIT model simulations. Sensitivity analyses were also carried out to investigate the impact of uncertainties on the simulation results. The results have

been described in a report: *HYSPLIT Simulations of Alaskan In-Situ Oil Burns*. An important finding was that the hour-to-hour, site-to-site, and month-to-month variations were found to be so large that a single guideline for a "safe" downwind distance may not be practical. Accordingly, it is recommended that consideration be given to developing a prescribed oil-burn forecasting system, based on NOAA weather forecasts and the HYSPLIT model, to predict whether and/or when any potential burn could be carried out without exposing downwind populations to hazardous levels of particulate matter. Such a system is already in place at NOAA to provide decision support for potential prescribed burns of agricultural and forested areas. (mark.cohen@noaa.gov)

ATMOSPHERIC CHEMISTRY AND DEPOSITION

20. AirNow Analysis and Verification

Patrick Campbell was involved in the development of a Python-based U.S. Environmental Protection Agency (EPA) AirNow analysis and verification package* for the National Air Quality Forecast Capability (NAQFC) - Community Multiscale Air Quality (CMAQ) modeling system (NAQFC-CMAQv5.0.2), which leverages the robust Model Observation Network Evaluation Tool available at https://github.com/noaa-oar-arl/MONET. This package is currently being used to support the ongoing joint NOAA-NASA Fire Influence on Regional to Global Environments and Air Quality (FIREX-AQ) campaign, and provides daily real-time NAQFC-CMAQ forecasts for numerous chemical variables and model heights above ground level, as well as comprehensive model evaluations updated daily. * For code and details, see https://github.com/drnimbusrain/naqfc_verify_scripts (Patrick.C.Campbell@noaa.gov)

21. NOAA Emissions and eXchange Unified System (NEXUS)

Patrick Campbell was a co-investigator on the proposal for, and initial development of, NEXUS. The past decade has experienced rapid advances in global aerosols and atmospheric composition (AAC) model prediction capabilities. AAC models are key components of unified forecast systems that often employ the Earth System Model Framework (ESMF; i.e., a high-performance, flexible software infrastructure for building and coupling weather, climate, and related Earth science models) for weather and climate predictions. Emissions of trace gases and primary aerosols are a critical component of AAC models and are often the most important component to ensure accurate predictions of trace species distributions. Developing these emissions inputs to AAC models; however, is often a laborious, time-consuming process, especially ensuring that the datasets are suitable for a range of spatial scales and applications. Furthermore, inventory-based emission inputs are subject to a bottom-up approach that is prepared separately (offline) and suffers distinct time lags from the AAC models, which affects both the timing and accuracy of trace gas predictions. In this work, the Harvard-NASA Emission Component is serving as the foundation of a new, unified emissions modeling framework capable of utilizing numerous emissions datasets (global and regional), that can be run offline (inventory-based) or online (processed-based), is ESMF-compliant, and can be easily linked to satellite data sources. Dr. Campbell performed initial development and testing of examples of model-ready anthropogenic emissions using a combination of global and regional anthropogenic emission

inventories with the NEXUS platform, and an initial assessment of NOAA AAC model simulations using these emissions is underway. (Patrick.C.Campbell@noaa.gov)

22. Investigation of Dynamic Leaf Area Index (LAI)

Patrick Campbell investigated the impacts of using a dynamic LAI on NAQFC-CMAQ air quality forecasts. It is well observed that LAI and vegetation fraction vary in both space and time, where different treatments of the land surface and land-atmosphere characteristics and processes in regional coupled models have implications for weather, climate, and air quality applications. Appropriate representation of the land surface and atmosphere characteristics and processes are also important for air quality and deposition forecasting and long-term projections. However, in the current NAQFC-CMAQ system, LAI is a static prescribed value of four (4) across the entire modeling domain. Thus, initial tests using a MOderate Resolution Imaging Spectroradiometer (MODIS) satellite-based LAI were employed using NAQFC-CMAQ, and results show significant differences in the LAI (Figure 1) and the resulting deposition and concentration predictions for trace gases and aerosols compared to the static LAI method. Although more tests are needed, incorporation of a spatially variable LAI in NAQFC-CMAQ demonstrates impacts on the model performance for ozone and particulate matter. (Patrick.C.Campbell@noaa.gov)

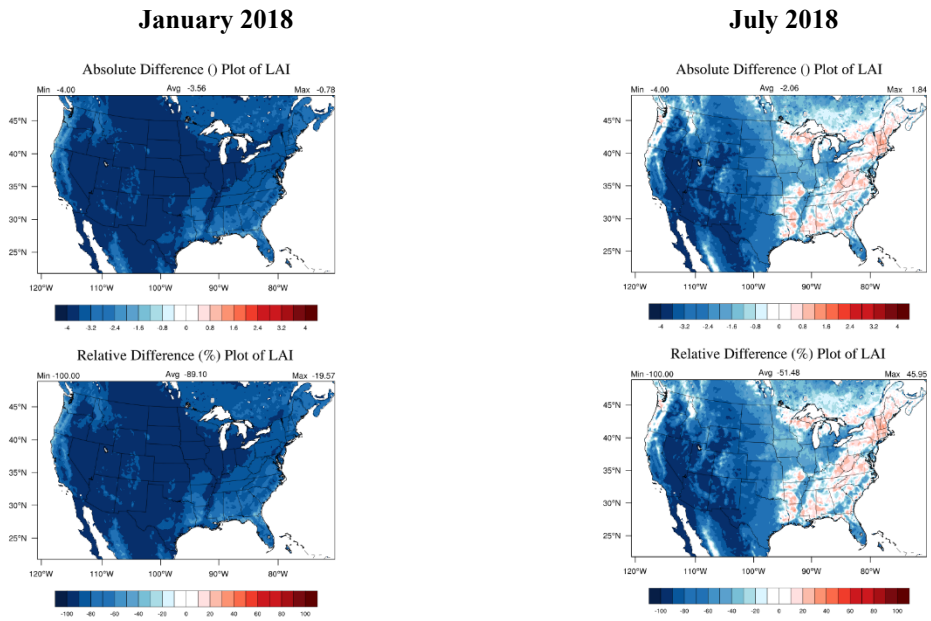

Figure 1. *Absolute (top) and relative (bottom) differences between the MODIS-based and static (=4) LAI in both the winter (left; January 2018) and summer season (right; July 2018).*

23. In-Canopy Wind Parameterization

Patrick Campbell has taken the lead on research and implementation of new in-canopy wind parameterization in Dr. Rick Saylor's Atmospheric Chemistry and Canopy Exchange Simulation System (ACCESS) model at ARL/ATDD. This work aims to improve predictions of the in-canopy wind in ACCESS, and future goals include extending the Massman et al. (2017) model in ACCESS as a new algorithm in regional scale NAQFC-CMAQ models to improve predictions of

wind adjustment factors and fire spread models that can used in predicting the strength and duration (i.e., a "Fire Weather Index") for fire emission forecasts. (Patrick.C.Campbell@noaa.gov)

24. **Community Multiscale Air Quality (CMAQ) Review Panel**

Rick Saylor served as a member of the CMAQ version 5.3 model review panel May 21-23 at the U.S. EPA's National Exposure Research Laboratory (NERL) in Research Triangle Park, North Carolina. NERL's Computational Exposure Division (CED) is responsible for maintaining and improving CMAQ and is preparing to release the latest version of the air quality modeling system, including updates to emissions processing, chemical and aerosol processes, land-use specific deposition and integrated source apportionment post analyses. The NWS's NAQFC uses CMAQ to produce forecasts for ozone and atmospheric PM with a diameter of less than 2.5 micrometers in the U.S. ARL works closely with NWS to transition updates of the model to NAQFC to provide continually improving forecast performance. (rick.saylor@noaa.gov)

CLIMATE OBSERVATIONS AND ANALYSES

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

Forty annual maintenance visits were performed this quarter. Four of the sites were in Alaska. (mark.e.hall@noaa.gov)

ARL 3rd Quarter Publications

Barkley, Z.R., Lauvaux, T., Davis, K.J., Deng, A., Fried, A., Weibring, P., Richter, D., Walega, J.G., Digangi, J., Ehrman, S.H., Ren, X., Dickerson, R.R. (2019). Estimating Methane Emissions From Underground Coal and Natural Gas Production in Southwestern Pennsylvania, *Geophysical Research Letters,* 46:8, 4531-4540, https://doi.org/10.1029/2019GL082131

Leeper, R. D., **J. Kochendorfer**, T. Henderson, and M. A. Palecki (2019). Impacts of Urban Built Structures on Air Temperature Observations, *J. Appl. Meteor. Climatol.*, 58, 1369–1380, https://doi.org/10.1175/JAMC-D-19-0002.1

Pierre, A., S. Justras, C, Smith, **J. Kochendorfer**, V. Fortin, and F. Anctil (2019). Evaluation of catch efficiency transfer functions for unshielded and single-Alter-shielded solid precipitation measurements, *J. of Atmos. and Oceanic Technol.*, 36, 865-881, https://doi.org/10.1175/JTECH-D-18-0112.1

Wilkerson, J.; Dobosy, R.; Sayres, D. S.; Healy, C.; Dumas, E.; **Baker, B.**; and Anderson, J. G (2019). Permafrost nitrous oxide emissions observed on a landscape scale using the airborne eddy-covariance method. *Atmos. Chem. Phys.*, 19, 4257-4268, https://doi.org/10.5194/acp-19-4257-2019

Conference Presentations & Invited Talks

Buisán, S.T., Craig D. Smith, **J. Kochendorfer**, M. Wolff, Y.-A. Roulet, J. L. Collado, J. Alastrué, T. Laine, R. Rasmussen, M. E. Earle, R. Nitu (2019). Applications of the WMO Solid Precipitation Intercomparison Experiment (WMO-SPICE) results for nowcasting activities. European Nowcasting Conference, Madrid, Spain, April, 2019.

Kochendorfer, J., M. Earle, D. Hodyss (2019). The development and testing of WMO-SPICE tipping bucket precipitation gauge adjustments, 76th Annual Eastern Snow Conference Meeting, Fairlee, Vermont, June, 2019.

ARL-EPA Spring 2019 Air Quality Modeling Summit: This one-day, scientist-to-scientist, atmospheric chemistry modeling meeting was held on April 8, 2019, at EPA's headquarters in Research Triangle Park, NC. Dr. Patrick Campbell significantly contributed to the overall motivation, initiation, and planning of the summit. Dr. Ariel Stein, ARL Acting Director and Director, Atmospheric Sciences Modeling Division (ASMD), and Dr. Tom Pierce, EPA Associate Director for Science at EPA's NERL CED, kicked off the event. ASMD's Pius Lee, Daniel Tong, Youhua Tang, Barry Baker, and Campbell participated in person and Tianfeng Chai joined remotely. An audience of over 40 scientists heard presentations in the morning, alternating between ARL and EPA scientists and showed relevant works related to air chemistry modeling in multiple temporal and spatial scales. Both the ARL and EPA teams presented work on global and regional air chemistry simulations. ARL focused on processes within the planetary boundary layer and its aim to improve air chemistry forecasts over the U.S. in a time scale from days to a couple tens of days (i.e. of sub-seasonal and seasonal scales). EPA's global models focus on decadal to multiple year scales on climate modifications due to air chemistry. Both teams showed that a two-way feedback mechanism exists between air composition and atmospheric dynamics: weather. Two afternoon break-out discussion sessions discussed collaborative opportunities to improve pollutant emission modeling, air chemistry for particulate matter, and coupling between global and regional atmospheric models. (Patrick.C.Campbell@noaa.gov)

Other

DOE Meteorological Coordinating Council (DMCC) Activities: Walt Schalk prepared / finalized the agenda and ran a bi-monthly (every other month) conference call that consisted of a round robin update of program status of those present, recent DMCC activities and projects, and site met program discussions. Another topic of interest was an introductory discussion regarding DOE's definition of a "qualified meteorologist". Planning continues for the annual meeting in September in Knoxville, TN.

SORD Website: Work continues to add improvements, updates, and new capabilities to the website. The address is www.sord.nv.doe.gov. (walter.w.schalk@noaa.gov)

First Southeast Idaho Integrated Warning Team: Jason Rich attended this event held at the Pocatello NWS on June 21. Comprised of individuals from a variety of professions, this team will

notify the public about potentially hazardous weather and help provide resources once hazardous weather occurs. (Jason.Rich@noaa.gov)

Safety

The FRD Safety Manual requires a number of safety checklists to be completed every two years, and we recognize that safety is extremely important. The staff convened as a new Safety Committee on June 28 and completed all required safety checklists for the year. We identified a handful of minor deficiencies that we are working to correct.

In April, FRD completed both the semi-annual wipe tests required by the U.S. Nuclear Regulatory Commission for electron capture detectors containing radioactive materials and the required annual self-assessment.

Jason Rich attended the Pocatello Safety Fest in April, participating in classes such as “Fall Protection Overview”, “Make an Impact! Workplace Mindfulness Applications”, and Effective Communication”.

Jason Rich provided training on communication skills at the May staff meeting and Bai Yang provided training on heat stress at the June meeting.