Boundary Matters
Linking Earth and Sky
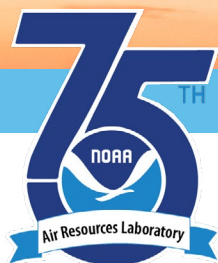
Celebrating 75 years

For 75 years, NOAA Air Resources Laboratory (ARL) research has supported our nation's need to understand the atmosphere and the means of atmospheric dispersion. Initially founded as the Special Projects Section of the U.S. Weather Bureau in 1949, the laboratory pioneered the development of atmospheric trajectory modeling, used in studies related to nuclear weapons. ARL research contributed to the development of today's Gaussian plume dispersion model and the globally-used HYSPLIT model. In 1965, western meteorological networks that took real-time data near the Idaho National Laboratory and the Nevada Test site and the office in Washington D.C.

NASA/USAF plane taking meteorological data at the Idaho National Laboratory.

came together under the name Air Resources Laboratory. The division in Oak Ridge, TN was added in 1971 and NOAA was formed in 1972.

Since its inception, ARL has added many valuable projects to its portfolio. Some of these include the U.S. Climate Reference Network, which provides long-term robust climate observations necessary to document climate change trends. The Urban Greenhouse gas Emissions Measurement and Monitoring was created primarily to reduce the lag between data collection and the availability of greenhouse gas emissions estimates. The HYSPLIT model, one of the most extensively used atmospheric transport and dispersion models in the atmospheric sciences community. And Forest Micrometeorology and Carbon Fluxes which is critical to NOAA's mission to forecast weather and air quality and predict future climate.

Activities celebrating the anniversary include:

- The publication of an article in the Bulletin of American Meteorology
- Three sessions at the American Meteorological Society Annual conference chaired by Director Dr. Ariel Stein and Deputy Director Dr. LaToya Myles
- Creation of the new Scientist-in-Residence opportunity
  - The selection of Dr. Osinachi Ajoku as the inaugural Scientist-in-Residence
- Open house hosted by ATDD in Oak Ridge, TN
- Open house hosted by SORD in Idaho Falls, ID

Partnerships have been an important part of ARL's success over the years. For example, the Special Operations and Research Division works closely with the Department of Energy and the Idaho National Laboratory. The Atmospheric Transportation and Dispersion Division partners with the Oak Ridge Associated Universities. ARL collaborates with many other NOAA labs and programs as well. The Atmospheric Modeling and Sciences Division is spending the summer working with the NOAA Chemical Sciences Laboratory on the AiRMAPS campaign, which is talked about later in this newsletter. Between all the productive partnerships and the scientists, engineers and technicians who are passionate and dedicated to their work, ARL will continue making great contributions for another 75 years.

Mark Heuer and Dr. Tim Wilson at one of the Open House demonstrations at ATDD

About NOAA's Air Resources Laboratory

ARL conducts research on the lowest part of the atmosphere, the boundary layer, where we live and breathe. World-class research contributes to accurate regional and global predictions of weather, air quality and climate variability. ARL also generates actionable information and highly localized forecasts to respond efficiently to a variety of emergencies.

Growing ARL Leadership

Matthew Brewer has accepted a new role as the Deputy Director for the Special Operations and Research Division in Idaho Falls, ID.

Matt was born and raised in Vancouver, Washington, and completed his graduate studies at the University of Washington while working under his advisor Dr. Cliff Mass. Thereafter, Matt had his first stint with SORD-Idaho as a postdoctoral researcher, working on the Wind Forecast Improvement Project II. Upon completion of that field project and in need of more excitement in his life, Matt went on to be a TV meteorologist for KIFI in Idaho Falls. Looking to amp up his excitement, he jumped at the chance to move to Puerto Rico to work for the National Weather Service for a while. In 2021 Matt missed the quiet life at home so he returned to SORD-Idaho and is very excited for what the future holds for his office.

The Air Resources Car on campaign

The ARC is on the road this summer! The ARL team left town on Saturday, June 22 to make the drive to Colorado. They drove the Air Resources Car (ARC) and a mini van to bring everything they needed to take measurements during the Airborne and Remote sensing Methane and Air Pollutant Surveys (AiRMAPS) campaign in the ARC and, using the same instruments, in the NOAA Twin Otter aircraft.

Poor air quality is a serious concern for the impact on public health. While overall air quality in the U.S. has improved significantly since the passage of the Clean Air Act, it is still the leading cause from weather for premature death. Estimated costs in the U.S. from air pollution-related illness are $150 billion/year. Being able to depend on comprehensive measurements helps decision makers make policy to reduce emissions and help them meet emission-reduction target goals.

Additionally, quantifying greenhouse gas emissions,

Xinrong Ren and Phillip Stratton repair a failed instrument.

especially from oil and gas operations, is important to understand how they affect the changing climate.

AiRMAPS is a series of studies led by NOAA Oceanic and Atmospheric Research and NOAA National Environmental Satellite, Data, and Information Service to provide comprehensive and quantitative top-down emissions data for methane, other greenhouse gases, and major air pollutants from oil and gas production basins and selected urban and agricultural areas.

NOAA Twin Otter plane with the Chemical Sciences Laboratory mobile lab, the Colorado Department of Public Health and Environment mobile lab and the Air Resources Car.

ARL joined NOAA's Chemical Sciences Laboratory, Global Monitoring Laboratory, Atmospheric Chemistry Carbon Cycle and Climate Program of the Climate Program Office, NESDIS Center for Satellite Applications & Research and the National Centers for Environmental Information on this campaign.

Fun fact! ARL is running a series called *On the Road with ARL* so everyone can follow along with our team as they travel across the country. Check it out on the ARL home page.

HYSPLIT team conducts a workshop for the National Weather Service

The HYSPLIT model directly supports NOAA's strategic goal of providing science-based use-inspired decision support tools. It is used around the world for emergency response, planning, assessment and for estimating purposes. The National Weather Service (NWS) Weather Forecast Offices use NWS-HYSPLIT to create simulations of real events, in exercises and to aid in planning and are typically shared with emergency management officials; in order to better support their needs, the NWS version has more features and capabilities than the publicly available HYSPLIT. So with the release of a new version, the HYSPLIT team partnered with the National Ocean Service Office of Response and Restoration to plan and conduct a workshop for the NWS Weather Forecast Offices in the central and southern regions on June 17.

Mark Cohen led the workshop with help from ARL colleagues Sonny Zinn, Alice Crawford and Christopher Loughner. NWS partners who contributed included Alexandra Kelly, Chris McKinney and Roham Abtahi. Dalina Swift-Viveros from NOAA's National Ocean Service's Office of Response and Restoration also supported the workshop.
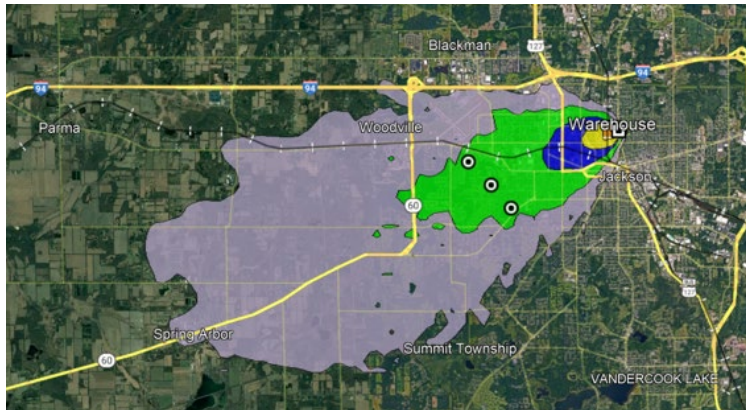
Plume showing a dispersion simulation done in the training.

Roham Abtahi, Surface Transportation Program Manager and HAZMAT Coordinator from the Decision Support Integration Branch at the National Weather Service Headquarters, wrote to express his thanks to Dr. Cohen and the rest of the team for the workshop. He said:

> "The presentation was a level of effort beyond the scope of anything I've witnessed in 20 years with the NWS, including nearly 200 slides, interspersed with time for questions from the field, and broken down by category to equip the NWS forecaster with in-depth knowledge on a very complex topic."

Inspiring the next generation: meet the ARL interns

Ashley DeJuliannie is in her second year of a dual M.S. and Ph.D degree program at Georgetown University. Her master's degree will be in Environmental Metrology and Policy and she is going for a Chemistry Ph.D. She also has a master's degree in Chemistry from the College of Saint Scholastica in Duluth, MN where she earned her bachelor's degree in Biochemistry. Ashley loves the great lakes and hiking and "absolutely loved living next to Lake Superior while in Duluth."

Her program director, Dr. YuTe Tong connected her to NOAA where she is working with Dr. Barry Baker at the ARL Atmospheric Sciences and Modeling Division to develop new visualizations of National Air Quality ForeCast data. She is most excited to develop her python coding skills to help create an interface that allows for different visual representations of the data. She expects the skills she learns this summer will help her as she works towards her Ph.D in Chemistry.

Mishka Kandhari is a high school student with a deep interest in the environment and climate change. Her fascination with these topics led her to be an atmospheric sciences intern with Dr. Wei-Ting Hung in the ARL Atmospheric Sciences and Modeling Division. She is learning about atmospheric phenomena, how to analyze data and is contributing to research that improves our understanding of weather patterns and air quality. Mishka plans to major in either environmental or civil engineering. She decided to pursue this internship because she "wanted hands-on experience in a field that merges my passion for science with my commitment to addressing global environmental issues."

Duncan Santerre is a junior majoring in Atmospheric and Oceanic Science at the University of Maryland (UMD). He is working with Dr. Xinrong Ren through his connection with his professor, Dr. Russell Dickerson, and the UMD Climate Resilience Network. At ARL's Atmospheric Modeling and Science Division, Duncan is learning how to calibrate and operate the instruments that measure greenhouse gas and air pollution. He says that the work he is doing is strengthening his data analysis skills and that this internship has been a pivotal experience. Duncan will be going to Utah as part of the Utah Summer Ozone Study part of the AiRMAPS campaign. There he will be learning how to program and analyze data from the instruments on both the NOAA Air Resources Car and the same instruments ARL is deploying on the NOAA Twin Otter aircraft.

Justice Saxby is a first generation college student who is motivated to learn and get out to see the world. She has visited 12 new states since beginning college in 2021 with internships, conferences, academic courses and outdoor activities. She's an avid outdoorsman who has backpacked the Buffalo River Trail in Arkansas, kayaked the Current River in Missouri, hiked all five national parks in Utah, and gone white river rafting in Tennessee. As a first generation college student, she is motivated and works hard - going as far as having held four jobs on campus this past year. Justice is working with Dr. Xinrong Ren in ARL's Atmospheric Sciences and Modeling Division, where she went to Colorado and is also going to Utah this summer with the AiRMAPS campaign. After earning her undergrad, Justice plans to continue her education within the atmospheric sciences with an eye towards becoming a field based scientist collecting hard data around greenhouse gases and finding the connections to human activities to better inform policy makers.

Luca Zeng-Mariotti is a junior at the University of Maryland College Park studying aerospace engineering. He is assisting Professor Russ Dickerman's research at the University of Maryland by working under Dr. Xinrong Ren. This summer he is learning about gas sensors from lab calibration to data collection and the data analysis process while he helps with the instruments on both the Air Resources Car and the NOAA Twin Otter plane. He is excited to have spent time on the Airborne Methane Mass Balance Emissions in Colorado part of the AiRMAPS campaign. Luca says that working with a diverse group of scientists has been really beneficial to growing as a person and he has learned a lot from everyone. He is excited that this experience is giving him good insight into what it means to do hands-on scientific research, while letting him explore his interest in atmospheric sciences.

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