



Air Resources Laboratory

Atmospheric Turbulence & Diffusion Division

Oak Ridge, Tennessee

Conducting Research and Development in the Fields of Atmospheric Chemistry, Dispersion, and Climate

The Atmospheric Turbulence and Diffusion Division (ATDD), part of NOAA's Air Resources Laboratory, is located in Oak Ridge, TN. The Division conducts research and development in the fields of atmospheric chemistry, dispersion, and climate. Within each of these, emphasis is placed on the lowest part of the atmosphere closest to and most influenced by the ground — called the atmospheric boundary layer. ATDD scientists and engineers undertake a variety of atmospheric studies across the U.S., as well as operate two permanent, long-term research stations: one at the Walker Branch Watershed forested experimental area, and another at the Chestnut Ridge Environmental Study Site.

Our Research

ATDD scientists focus on developing better methods for understanding atmospheric chemistry and the exchange of air pollutants between the air and the underlying land and water surface. This work supports the development of effective air quality policies and more accurate air quality models to protect human and environmental health. ATDD conducts short-term field studies and develops and utilizes models to:

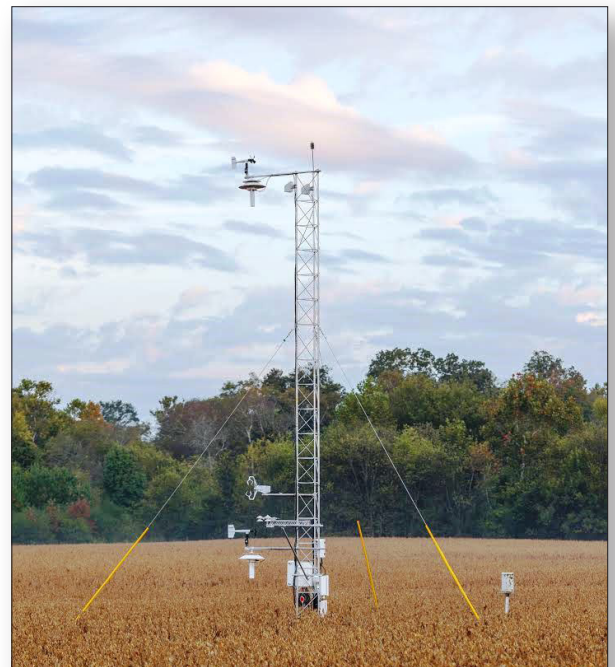
- Improve understanding of how compounds, such as ammonia, sulfur dioxide, and volatile organic compounds move between the air and underlying surface;
- Assess measurement techniques for a range of air pollutants, some of which can alter biodiversity and nutrient balances in forest environments; and
- Support characterization of emissions sources and other key factors that influence air quality in different regions.

ATDD's dispersion research focuses on providing critical data and insights about turbulence in the atmospheric boundary layer and the transport and diffusion of harmful material. This work supports many purposes, including providing forecasters with more accurate wind and weather data and assisting emergency managers' abilities to protect first responders and the public in the event of a hazardous airborne incident. Specifically, ATDD designs and establishes measurement systems to:

- Advance the understanding of atmospheric processes that occur on a small-scale within complex environments (e.g., urban and coastal areas);
- Enhance regional observing systems to address weather monitoring and research needs in order to better analyze and predict the lower atmosphere; and
- Improve weather forecast modeling to support more accurate predictions (e.g., of winds) and more reliable responses to homeland security incidents.



ATDD intern installing a sonic anemometer as part of a collaborative ammonia field study with the University of Illinois-Urbana Champaign at their Energy Biosciences Institute's Energy Farm in Urbana, IL. Photo: NOAA



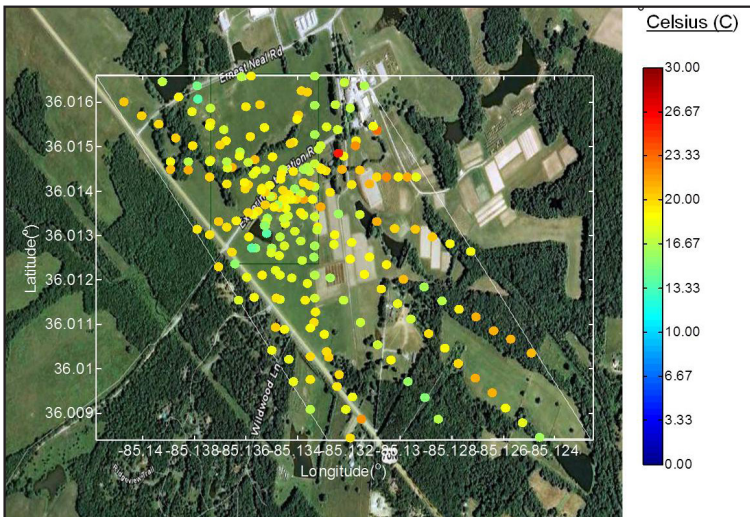
One of five research towers installed by ATDD on the Tennessee Valley Research and Extension Center at Auburn University. This 10 meter high meteorological flux tower was used to collect data over a soybean field to better understand and predict the initiation of severe weather. Photo: NOAA



Aurora Flight Sciences Corporation's Centaur aircraft flies low over the ATDD flux measurement tower near Prudhoe Bay, Alaska. The aircraft carried a new airborne instrument system, designed by ATDD and Harvard University's Anderson Group, to measure fluxes of carbon dioxide and methane. These same compounds were measured by instruments on the tower to groundtruth the aircraft data. Photo credit: NOAA

ATDD's climate research focuses on providing high quality, reference-grade measurements of critical climate parameters, such as air temperature, precipitation, winds, land surface temperature, and solar radiation. Comprehensive climate research requires accurate data, such as these, to assess and predict present and future states of the climate. Specifically, ATDD installs and maintains observation systems to:

- Further develop methods for measuring climate parameters with high accuracy and reliability;
- Measure trends and variability of temperature, precipitation, and other parameters at a national level;
- Improve the understanding of interactions between the atmosphere, the land surface, and plants, which leads to better climate and weather predictions; and
- Improve the understanding of how greenhouse gases may affect the climate in the melting permafrost regions of the Arctic.



A Google map of the area near the Crossville, TN Climate Reference Network site. The color dots represent land surface temperature data collected by aircraft and by the site itself. Results show a good comparison between the two and validate satellite observations. Image Source: NOAA

Our Partners

- Oak Ridge Associated Universities
- Other NOAA offices:
 - National Climatic Data Center
 - National Weather Service
- U.S. Department of Energy
- Oak Ridge National Laboratory
- U.S. Environmental Protection Agency
- U.S. Department of Homeland Security
- Academic Institutions: University of Illinois, Jackson State University, Harvard University, Howard University, Towson State, and the University of Tennessee
- Duke Energy, Inc.
- District of Columbia Emergency Management Agency

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ATDD Facility in Oak Ridge, TN;
 Photo: NOAA

