



Air Resources Laboratory

Atmospheric Turbulence & Diffusion Division

Oak Ridge, Tennessee

Conducting Research and Development in the Fields of Air Quality, Dispersion, and Climate

The Atmospheric Turbulence and Diffusion Division (ATDD) of the Air Resources Laboratory is located in Oak Ridge, TN. The Division conducts research and development in the fields of air quality, 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 studies across the U.S., as well as operate two permanent, long-term research stations in Oak Ridge: a site in the Walker Branch Watershed and at the Chestnut Ridge Environmental Study Site.

What We Do

ATDD's air quality research focuses on developing better methods for understanding atmospheric chemistry and the exchange of air pollutants between the air and the underlying surface. This work supports the development of effective air quality policies and more accurate air quality models to protect human and environmental health. Specifically, ATDD conducts short-term field studies to:

- Improve understanding of how compounds, such as ammonia and sulfur dioxide, move between the air and surface and impact sensitive ecosystems;
- 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 summer intern measuring concentrations of ammonia gas in the air near Duke Forest, NC.

Photo: NOAA



ARL equipment installed to characterize winds around the area of wind turbines. Study is a part of a cooperative agreement with Duke Energy. Photo: NOAA

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

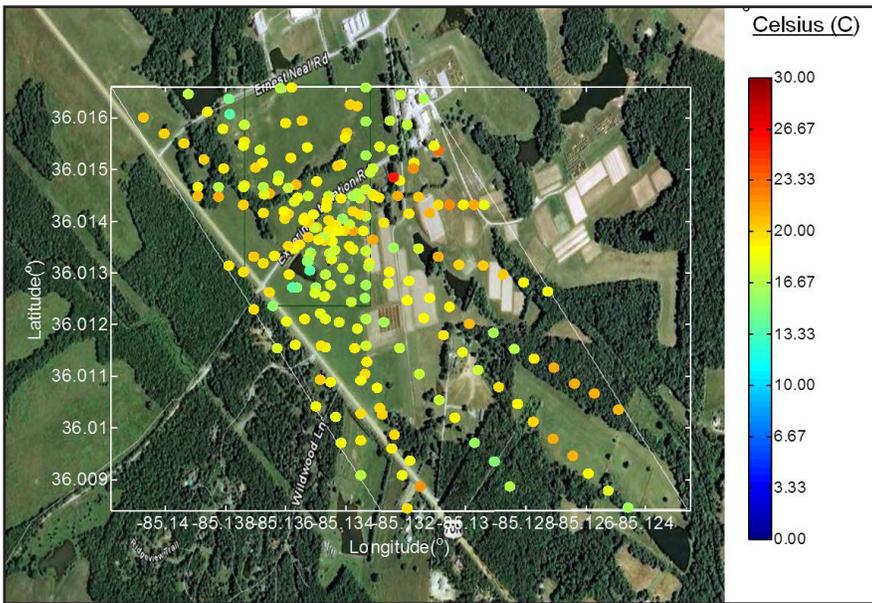
- Advance the understanding of atmospheric processes that occur on a small-scale within complex environments (e.g., urban and coastal areas);
- Enhance regional observing systems to address weather monitoring and research needs in order to better analyze and predict the lower atmosphere; and
- Improve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



ATDD engineers installing a US Climate Reference Network station at Wolf Point, MT. Photo: 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 networks 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; and
- Improve the understanding of interactions between the atmosphere, the land surface, and plants, which leads to better climate and weather predictions.



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: Jackson State University, Howard University, Harvard University, Towson University, 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